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Performance Based Planning of complex urban social-ecological systems: the quest for sustainability through the promotion of resilience

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Abstract

Urban systems and human settlements have been growing exponentially in size and complexity in the last decades, defying current approaches to sustainable development. While urban planning has been identified as one of the main tools for attaining specific sustainability goals, consideration of cities as complex social-ecological and adaptive systems challenges traditional views, demanding new flexible and creative planning solutions.

In this conceptual study, we analyse the capacity of performance-based planning (PBP) to provide sustainable solutions for urban planning problems. To do so, we examine the different conceptualizations of PBP in the current planning environment. To better define the challenges posed by the complexity of urban systems, we explore the similarities and common ground between PBP and other approaches such as adaptive planning and management (APM) and problem structuring methods (PSM). We analyse a case study, in Queensland (Australia), using SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis to identify potential advantages and barriers to the implementation of PBP. Finally, we discuss the potential role of APM and PSM in PBP, the utility of an extended conceptualization of resilience as an important reference for its implementation and a potentially stronger role for planners in PBP as decision shapers.

Keywords

Strategic planning; performance-based planning; complex adaptive systems; adaptive planning and management; problem structuring methods; resilience.

1. Introduction

1.1. Background

The United Nations 2018 Revision of World Urbanization Prospects reported that 55% of the world's population lived in urban areas in 2018 and that this figure is projected to rise to 68% by 2050 (United Nations, 2018). The fast pace at which urban areas are growing has important impacts on several elements, such as water bodies, natural vegetation, biodiversity, agricultural land, communities, jobs and transport systems (Forman, & Wu, 2016), leading to uncertainty regarding the sustainability of these areas. One of the objectives (Goal 11) of the United Nations 2030 Agenda for Sustainable Development is to "Make cities and human settlements inclusive, safe, resilient and sustainable" (United Nations, 2015). Among other targets, Goal 11 aims to increase social equity, reduce the environmental impact, mitigate and adapt to climate change and positive support economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning. Moreover, changes in urban areas should not only be interpreted in terms of land use and demography but should also take the growing complexity of the system and its biophysical, social, cultural and economic components into account. In this respect, cities are increasingly acknowledged to be complex adaptive systems (CAS) (Bibri, 2018; de Roo, 2018; Olsson, Folke, & Berkes, 2004; Preiser, Biggs, de Vos, & Folke, 2018), implying a multiplicity of elements and relationships in unstable and non-linear dynamics that result in a transformative character (de Roo, 2018; Sengupta, Raws, & de Roo, 2016). The interrelationships between natural and social processes and the involvement of people, nature and culture in the transformative and evolutionary dynamics characterize urban areas as social-ecological systems (SES) (Botequilha-Leitão, 2012; Kato, & Ahern, 2008). All of these aspects pose important challenges, for which planning systems can provide a solution (Batty, 2009; Ekman, 2018; Forman, & Wu, 2016). However, classic planning instruments do not seem to be

adequate for the task. These instruments have generally targeted stable situations, where uncertainty is low, and there is a reasonable understanding of the issues at hand (Albrechts, & Balducci, 2013). However, this level of stability is not observed in metropolitan regions and other highly dynamic urban environments. Hence, it is important to discuss the effectiveness of currently available urban planning approaches and systems. Performance-based planning (PBP) is an innovative approach to urban planning (Baker, Sipe, & Gleeson, 2006; Faludi, & Mastop, 1982). While classical planning is strongly based on 'conformance' (i.e. it aims to shape ('conform') the territory in a specific, planned way), PBP defines planning through frames of reference, which are open to adaptation and transformation and are thus easier to couple with the intrinsic dynamics of urban systems (Dorst, van der Jagt, Raven, & Runhaar, 2019; Feitelson, Felsenstein, Razin, & Stern, 2017; Pappalardo, & La Rosa, 2020). PBP involves participatory approaches and multiple stakeholder involvement (Aigwi et al., 2019; Albrechts, & Balducci, 2013; Faludi, & van der Valk, 1994; Faludi, 2000) and thus has a strong potential for sustainable planning adapted to the complexities of contemporary urban systems.

1.2. Objectives and approach

In this study, we analysed the practical application of PBP to sustainable urban planning. In order to carry this analysis out, we followed the steps outlined in Figure 1. We begin here by framing the PBP concept within current planning approaches.

INCLUDE FIGURE 1

We identified two major types of PBP. Thus, PBP1 is a hybrid between the two major types of planning that can arguably be identified in Europe, USA, Australia, New Zealand and

probably elsewhere, e.g. Israel (Alexander, Mazza, & Moroni, 2012; Feitelson et al., 2017), i.e. project planning (PP) and strategic (spatial) planning (SSP). By contrast, PBP2 is SSP (Fig.1-c). As we discuss in Section 2, PBP1 has two branches. According to Baker et al. (2006), PBP began in the 1970s in the USA at the local government level and represented a tendency to counteract prescriptive zoning with a more flexible approach to land-use control, natural resource planning and building regulation. New Zealand and Australia then followed suit in the 1990s. We discuss this theme further in section 3. A web search for PBP provided studies related to transportation planning (Grant et al., 2014; Overman, 2017) as the most frequent examples and included PBP and PBP & programming (PBPP) in the USA (Association of Metropolitan Planning Organizations, 2019). Nonetheless, in this study, we focused on urban planning.

We also explore the similarities between PBP and other approaches such as adaptive planning and management (APM) and problem structuring methods (PSM). APM aims to embrace the uncertainty associated with complex systems and adaptive management (Kato, & Ahern, 2008), and PSM confronts the 'wickedness' of public policy problems by framing them and addressing the types that exist (Hoppe, 2011, 2018). We advance that, arguably, a combination of these methods (APM, PSM, PBP) can reinforce the capacity of strategic planning to cope with the complexity of urban systems (Fig.1-b). We also approach urban sustainability by exploring the resilience of urban systems, conceptualizing them (Fig. 1-a) as both social-ecological systems (SES) and complex adaptive systems (CAS). Resilience thinking is a recognized approach that can help to explain the dynamics and sustainability of urban SES (Ahern, 2011; Folke, 2006; Li, Kappas, & Li, 2018) and leads to the inclusion of resilience as a component of sustainable urban policy and planning (Davidson, Nguyen, Beilin, & Briggs, 2019; Masnavi, Gharai, & Hajibandeh, 2019). We also adopted resilience thinking in combination with APM (Curtin, & Parker, 2014; Li, Kappas, & Li, 2018) and PSM (Herrera,

2017; Nevens, & Roorda, 2014). As resilience thinking strives to capture the overall behaviour of a system and to identify novel and innovative elements, enhancing social capital and learning from the actions undertaken in the territory (Curtin, & Parker, 2014; Pickett, Cadenasso, & Grove, 2004; Steiner, 2014), it involves a shift from discrete planning actions seeking specific outcomes. It thus constitutes a vision aligned with PBP approaches. Our analysis of the potential of PBP to address sustainable planning of urban CAS/SES borrows the seven generic, policy-relevant principles identified by Biggs et al. (2012) for enhancing the resilience of ecosystem services (ES) in SES, which, as urban systems, are subject to disturbance and ongoing change.

With the intention of emphasizing the practical applications of PBP, in Section 4 we identify some of the possible barriers to PBP1 implementation through a case study (Fig.1-d). On the basis of the results of an extensive literature review conducted on SCOPUS, we selected the following four articles published in international, peer-reviewed journals: Baker et al. (2006), Steele (2011), Frew, Baker, & Donehue (2016) and Kwok, Johnson, & Pojani (2016). These four articles focus on the implementation of PBP under the Integrated Planning Act (IPA) prevailing between March 1998 and December 2009 in Queensland, Australia. We believe that the studies constitute a relevant set for the subject under study. As PBP 2 is a strategic planning approach and many articles have addressed SSP over the last 40 years, we focused on PBP1 in a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. Finally, we define some key contributions (Fig.1-e) that PBP is expected to make regarding urban systems resilience enhancement to improve their sustainability.

2. PBP and the current planning environment

2.1 Current approaches in planning

Two major types of plans (or planning system models, e.g. Alexander et al., 2012; Janin Rivolin, 2008) appear to dominate the planning arena in Europe (Albrechts, 2004), as well as in the USA (Janin Rivolin, 2008) and elsewhere, e.g. in Israel (Alexander et al., 2012; Feitelson et al., 2018): strategic (spatial) plans (SSPs) and project plans (PPs), also called 'blueprint' plans (Albrechts, 2004). SSPs are indicative in nature, providing general guidance for spatial development. They originated from a decision-centred view of planning, derived by the Institute for Operational Research (IOR). They emphasize everyday decision-making processes, rather than plans per se, as being important (Faludi, & Mastop, 1982; Faludi, 2000). The context of SSPs is one of uncertainty and conflict, in which there is a need for mutual learning, and the focus is on implementation through communicative action (Albrechts, & Balducci, 2013). Thus, planning is envisaged not as a technical process, solely conducted by planners (as opposed to a sociocratic process) - as generally considered in PPs and in rational (classical, traditional) planning in the past - but rather as a process of "planning-as-learning", in which both planners and the several territorial actors or stakeholders interact within the planning process (Faludi, & van der Valk, 1994; Faludi, 2000) and in which co-production is key (Albrechts, & Balducci, 2013). Project plans (PPs) are more traditional and widespread, for historical and cultural reasons (Janin Rivolin, 2008). PPs are of a centralized, bureaucratic, technocratic and regulatory nature, as opposed to the sociocratic and indicative (non-binding) nature of SSPs. As part of a "top-down" approach, PPs rely on expert analysis by state or municipal planners, which produce legalistic-binding zoning plans, as fixed, end-product designs (Albrechts, 2004). Arguably, SSPs are preferable due to present needs of territorial governance, e.g. of regions and cities, especially in the European Union (Albrechts, & Balducci, 2013; Janin Rivolin, 2008).

These two types of plans coexist in national planning systems in Europe, e.g. in the Netherlands (Faludi, & van der Valk, 1994; Faludi, 2000), Belgium (Albrechts, 2004), Portugal (Amaro

Alves, 2007; Botequilha-Leitão, & Diaz-Varela, 2009; Fonseca Ferreira, 2007), Italy (OECD, 2017) and Spain (Farinós Dasí, Boira Marques, Palomo Torralva, & del Rio Franqueira, 2005; Farinós Dasí et al., 2015; Fernández Güell, 2006; Postigo Vidal, Pueyo Campos, & de Gregorio Cestero, 2012). SSPs are particularly appropriate for use at national and regional levels and at the European level (Janin Rivolin, 2008). Notwithstanding, they can be produced at local levels, e.g. the structural plans in the Netherlands and in the UK (Faludi, & van der Valk, 1994), or the strategic plans developed in the mid-1990s for medium-size cities in Portugal (Botequilha-Leitão, & Diaz-Varela, 2009) or for large and medium-sized cities in Italy (Sartorio, 2005). PPs are operational plans, providing a set of prescriptive actions, applied at the local level, e.g. the "Bestemmingsplan" (Zoning Plan) in the Netherlands (Faludi, & van der Valk, 1994), the "Plan General de Ordenación Urbana" (Urban General Plan) in Spain (de Terán, 1984; Fariña Tojo, & Naredo, 2010), the "Piano Regolatore Generale (PRG)" (General Regulatory Plan) in Italy (OECD, 2017) and the "Plano Director Municipal (PDM)" (Municipal Director Plan) in Portugal (Botequilha-Leitão, & Diaz-Varela, 2009).

2.2 Performance-based planning (PBP)

In the literature reviewed for this paper, we identified two major types of PBP: PBP1 is a hybrid between PPs and SSPs, and PBP2 has a strategic nature (SSPs). Each has distinct types of planning objectives (Mastop, & Faludi, 1997). The planning objective of the first is material and involves the outside world, such as the planning objective of PPs as proposed by Faludi & van der Valk (1994). It is focused on land use regulation and performance standards (Baker et al., 2006; Feitelson et al., 2017; Frew et al., 2016; See Table 1).

INSERT TABLE 1

According to Baker et al. (2006), various terms are used in the territorial context of their own research (USA, New Zealand and Queensland, Australia), i.e. performance zoning, impact zoning and points system, all of which are included under the broader terms of flexible zoning, effects-based zoning (New Zealand) and performance-based planning (Queensland) (Feitelson et al., 2017; see also Albrechts, & Balducci, 2013 for performance zoning). In the words of Baker et al. (2006, p. 396-397): "We use the term performance-based planning in the broader context of land use regulation focusing on zoning and planning outcomes, where results-based measurement is used at both the strategic and operational levels to attain desired outcomes". Performance-based land use regulation states that "impacts of land use are a function of intensity, or the physical characteristics or functions, rather than specific land uses themselves, e.g. commercial or residential" (Baker et al. 2006, p. 396). These approaches (PBP1) mainly refer to conformance, but they have moved on towards a different perspective, as compared to traditional "conformance-types" such as PPs, as they intend to counteract rigid prescriptive zoning regulations and allow for uncertainty in outcomes.

PBP approaches belonging to the second type (PBP2) can be defined as adaptive, non-conforming, social-interactive frameworks for decision-making. When a plan fails, i.e. the plan does not conform with the outcome, it is tempting to blame the planner. However, there are many possible reasons for plan failure, irrespective of whether the plan is good or bad, e.g. economic changes in the context, subsequent poor commitment from decision-makers, or the complexity of the system resulting in high levels of uncertainty. Thus, plans should be evaluated according to their capacity to shape ideas in spatial development (Janin Rivolin, 2008). According to Mastop, & Faludi (1997), plans should not be judged in terms of how a plan conforms with the outcome. These authors argue that plans are not only instruments to control outcomes; they can be used to guide our present and future actions and to coordinate

these actions. SSPs are different as they are all about decision-making processes and interactions between stakeholders, and the outcomes are undetermined. SPSs are based on consensus building and mutual adjustment, which are an emblematic characters of the Dutch planning system (van der Valk, 2002). In this respect, the plan is not a specific (material) object but a frame of reference for negotiations (Albrechts, 2004). In this context, departures from the plan are not necessarily ineffective: "A strategic plan may be interpreted freely, much as judges interpret (and thereby change!) the law in cases where strict adherence would create anomalies." (Mastop, & Faludi 1997, p. 820). SSPs should not be evaluated in the context of the spatial changes in the target area (conformance) as the object of planning is not a material object, i.e. "(…) the outside world we seek to change." (p. 820) but rather a set of operational decisions. The overarching goal of SSPs is that planners' ideas implicitly or explicitly influence and facilitate the decision-making process. An SSP performs well if it has helped to shape decisions, irrespective of whether the outcomes match the planned results (Faludi, & van der Valk, 1994; Mastop, & Faludi, 1997).

3. Understanding the capacity of PBP to cope with complexity: analogies with adaptive planning and management and problem structuring

3.1 Adaptive planning and management vs spatial strategic planning

Reflecting on the Greater London Plan, Foley (1963) used the term "adaptive" to describe an approach that "puts faith" in decentralized decisions, as in the concept of strategic, sociocratic planning, promoting an adaptive consensus between the administration and actors (e.g. market forces) through a process of mutual adjustment. The "adaptive" approach was used for a long time in natural resource planning and management (e.g. Holling, 1973; Gunderson et al., 1995; Peck, 1998). "Planning for change", adaptation planning or adaptive planning (Kingsborough,

Borgomeo, & Hall, 2016; Marchau, Walker, Bloemen, & Popper, 2019; Rauws, 2017; Roggema, Kabat, & van den Dobbelsteen, 2012) has recently been applied to social-ecological systems (SESs) such as cities and metropolitan areas. Adaptive planning translates adaptive management theories to land use planning and urban planning and design (Ahern, 1999, 2011, 2014; Botequilha Leitão, & Ahern, 2002; Botequilha-Leitão et al., 2006; Kato, & Ahern, 2008) also targeting the infrastructures and water resources in cities (Palazzo, 2019; Reeder, & Ranger, 2011). It addresses the uncertainty in planning and management, by providing guidelines for implementing and monitoring, aimed at collecting new knowledge, which will be incorporated back into the initial plan, e.g. Ahern (1999). Planning is thus a continuous, dynamic process (Botequilha-Leitão, & Ahern, 2002). According to Marchau et al. (2019, p. 16) planning "focuses on implementation of an initial plan prior to the resolution of all major uncertainties, with the plan being adapted over time based on new knowledge". More recently, Palazzo (2019) applied the concept to urban design to promote the resilience of city water resources.

Cities and metropolitan systems constitute examples of complex adaptive systems (CAS) (Olsson, Folke, & Berkes, 2004; Preiser, Biggs, de Vos, & Folke, 2018; Walker et al., 2002). CAS are networks of multiple interconnected elements, the dynamics of which are adapted to the environment, causing the whole system to evolve in particular ways (Holland, 1992). As a consequence, CAS present specific characteristics such as self-organization (i.e. organization without a central command), non-linearity (i.e. possibility of phase shifts or tipping points), unpredictability (i.e. difficulty to forecast the behaviour of the system), path-dependency (i.e. dependence on initial conditions), adaptive behaviour (i.e. adaptation to the environment), and hierarchical organization and emergence (i.e. organization in levels with divergent behaviour) (Crawford, 2016; Holland, 1992; Lansing, 2003; Miller, & Page, 2009). Considering urban

systems as CAS, e.g. Batty (2009), Portugali (2012), Sengupta, Raws, & de Roo (2016) and Wohl (2016, 2018), allows change and uncertainty to be expected and accounted for, acknowledging their complex and unpredictable web of connections and interdependencies, in the first step towards management actions that foster resilience.

Self-organization is an important and distinguishing characteristic of living systems that explicitly or implicitly incorporates several important concepts required to understand complex systems (Botequilha-Leitão, 2012). The capacity of a system to maintain its self-organization is closely related to the concepts of adaptation and resilience. "Resilience is the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and therefore identity" (Walker et al., 2006). Adaptive capacity resides in aspects of memory, creativity, innovation, flexibility and diversity of ecological components and human capabilities (Walker et al., 2002).

Biggs et al. (2012) proposed seven principles for building resilience in SESs: (P1) Maintenance of diversity and redundancy. All systems, including CAS, are safe-to-fail. Diversity is fundamental both to ecological and social systems and enables coping with uncertainty and change (Biggs et al., 2012; Forman, 1995; Low, Ostrom, Simon, & Wilson, 2003; Ostrom, 2009). Diversity ensures that enough material is available for adaptation in long-term evolution processes (Levin, 1999). Thus, highly diverse systems (e.g. species, actors, governance institutions, sources of knowledge) are generally more resilient than less diverse systems. Diversity not only includes how many different elements there are (variety), e.g. species of trees in a forest. It also considers how different these elements are from one another (disparity), e.g. the difference between an umbrella pine and a sequoia. Finally, it accounts for the quantity of each element (balance), e.g. the number of umbrella pines and sequoias in a forest.

Redundancy is an additional aspect to consider when promoting the resilience of a system. Functional ecological redundancy is the degree to which organisms have evolved to do similar things (Rosenfeld, 2002). In the face of a disturbance, a system that incorporates redundant elements can compensate more easily for the loss of failure of some of these components as its functions will continue to be ensured, thus making the system more resilient. (P2) Management for connectivity. The more connected SESs are, the greater the amount of information that flows between them, which may promote resilience in many different ways, e.g. facilitating the movement of species, material and energy throughout the landscape (Forman, 1995). Considering poorly connected networks in a city, e.g. of an economic nature, if the signs of a stressor go unnoticed and/or are not sufficiently diffuse, the city may be more prone to disturbance, such as an economic crisis. By the time the crisis is detected, the city may have already lost the resources needed to counteract and adapt successfully to this event (Desouza & Flanerhy, 2013). Differences in system structure, such as modularity and nestedness, may also be important. However, connectivity can work both ways – facilitating movement of species, people or knowledge or increasing the spread of a disease, fire or even a financial crisis. (P3) Management of slow variables and feedbacks. Slow variables are system variables that change slowly. (P4) Fostering complex adaptive systems (CAS) thinking, by adopting systemic thinking and incorporating uncertainty and change (see above). (P5) Encouragement of learning, promoting continuous learning and experimentation through adaptive and collaborative planning and management by e.g. monitoring and engaging participants (see below in P6). “More resilient systems can change, adapt and transform in response to disturbances while keeping their identity” (Biggs et al., 2012). (P6) Broadening participation. Participation in planning processes is of paramount importance, for many reasons, e.g. it supplies more information in the planning process and allows for actor empowerment, etc. (Botequilha-Leitão, & Ahern, 2002; Botequilha-Leitão, 2012; Musacchio, 2008). (P7)

Promotion of polycentric governance. Polycentric systems are composed of many decision-making centres, formally independent of each other (Ostrom, 2009), such as actors, institutions, cities, etc. Polycentric governance is a type of governance that is based on several governing bodies.

3.2 Problem structuring and PBP

Conceptualising urban areas as CAS provides a useful model for understanding - from a scientific and technical point of view - the complexity of a system through its elements, interactions, dynamics and emergent properties (Batty, 2009; Portugali, 2012; Sengupta et al., 2016; Wohl, 2016, 2018). Nevertheless, from a practical viewpoint, adaptive approaches should consider social dynamics as an important element, not only of the system but also of the planning process. In this respect, considering the way that a system and its inherent complexity are perceived by society and its institutions is a difficult task (Evans, 2019; Oreskes, 2004) due to the absence of a collectively acknowledged epistemological framework that could help to compensate for the lack of some information or the inability to perceive non-linear relationships and processes, among other issues. The interface between planning practices and urban CAS is therefore usually associated with particular type of problems, which are complex in nature and include multiple interacting elements, divergent stakeholder views, indiscernible limits and numerous uncertainties. The classical paradigm in science and engineering (i.e. efficiency-based, straightforward approaches to solving definable, understandable and consensual problems through a limited array of possible solutions) is not considered applicable. While the general definition of these as ‘Wicked Problems’ has gained currency in the last decades, following the works of Rittel, & Webber (1973), practical approaches have required more specific definitions (Turnbull, & Hoppe, 2018). From a more practical, policy-making viewpoint they may be considered ‘unstructured problems’ (Hisschemöller, & Hoppe, 1996;

Hoppe, 2011), as opposed to the 'structured' problems for which standardized, specific and precise solutions are foreseeable and replicable. Problem structuring methods (PSMs), a family of techniques and approaches initially related to the discipline of operations research, aim to assist in structuring problems – rather than directly producing a solution. They aim to model the problem structure, under the initial assumption that there may be not a single representation of what can be considered the problem itself and that the required elements and constraints may initially be undefined (Mingers, & Rosenhead, 2004; Rosenhead, 1989, 1996, 2013; Smith, & Shaw, 2019). From the point of view of problem structuring, urban planning may be approached as an unstructured, or moderately structured (see below) problem. Due to the diversity of stakeholder views and participatory levels in territorial governance systems, the lack of structure may lead to 'intractable controversies' (Hisschemöller, & Hoppe, 1996; Schön, & Rein, 1994), whereby a given situation is framed differently by different sectors of society – including those who may not consider the situation a problem. In response to such situations, Hoppe (2011, 2018) identified four possible styles of planning policy on the basis of a previous conceptualization by Thompson, & Tuden (1959) and Thompson (1967). These styles depend on the relationship between two dimensions: uncertainty in goals (i.e. the degree of agreement among multiple stakeholders on values at stake), and uncertainty in means (i.e. the degree of certainty about relevant and available knowledge). While classical planning approaches and regulatory policies allow for treatment of these problems with high levels of certainty in either goals and means (i.e. structured problems), specific approaches are defined for moderately structured or completely unstructured problems. If the lack of certainty concerns goals, it may be addressed through negotiation and coalition; likewise, low certainty in means may be addressed through conflict management and narrative building. Finally, serious attempts to manage unstructured problems require deliberation and (co-) learning from leadership (Dunn, 2018; Hoppe, 2011, 2018).

The aforementioned collective strategies that include negotiation, coalition, conflict management or deliberation could help in the process of problem structuring, as consistent with the conversational, mutual learning processes considered an essential part of PBP (Faludi, 2000; Janin Rivolin, 2008).

4. Discussion

4.1 Uncertainty levels faced by PBP

The interface between urban systems (considered CAS) and the planning process is characterised by high levels of uncertainty. As explained above, this uncertainty is brought about by the non-linear, emergent processes associated with the behaviour of the system. More specifically, two related uncertainty aspects can be identified: a) reception of the planned proposals by the stakeholders; and b) the suitability of the measures proposed by planners.

In the first aspect of uncertainty, the high levels of complexity brought about by multiple stakeholders with poor perceptions of causal relationships, fuzziness of entities and instability of planning contexts (de Roo, 2010) are often higher than considered possible to be dealt with by a technical mode of planning, i.e. that represented by conformance or blueprint approaches. As seen in the previous comments regarding problem structuring, the outcome may be characterised by the levels of agreement among the actors involved in the planning process, who may disagree on both planning means and goals. As an innovative approach to dealing with urban sustainability, PBP may have a structuring role, as two of its main advantages are its flexibility and creativity to deal with the high complexity of territorial and urban systems. As seen in previous sections, performance in planning promotes instruments capable of performing collective strategies (Janin Rivolin, 2008). Problem structuring approaches including negotiation, coalition, conflict management and deliberation (Hoppe, 2011, 2018) are thus aligned with the conversational, mutual learning processes considered an essential part

of PBP (Faludi, 2000; Janin Rivolin, 2008). Indeed, de Roo (2010) emphasizes the important role of intersubjectivity, developed through communicative, collaborative and participative approaches, when planning encounters this type of uncertainty. Examples of failure of PBP1 approaches are largely associated with lack of transparency, poor participation and ultimately the erosion of trust in planning systems by communities (Kwok et al., 2018; Steele, 2011).

The second aspect of uncertainty is well characterised by the incapacity of conventional approaches in planning to deal with the evolutionary character of CASs. Previous sections showed how adaptive management was generally developed as a response to unexpected changes in the system behaviour (Holling, 1973; Gunderson, & Holling, 2002). In this respect, adaptive and systemic approaches were also proposed to confront management as a "wicked" (or unstructured) problem (DeFries, & Nagendra, 2017). PBP can be considered to be aligned with such approaches: its focus on decision-making rather than on accomplishing an established vision of the territory allows changes in strategic planning that may adapt to new requirements or situations posed by the system. The inability to cope with temporal changes is, in fact, one of the main challenges associated with adapting planning theories to the different degrees of complexity in urban and territorial systems (de Roo, 2018).

4.2 Barriers to the adoption of PBP: from theoretical approaches to practical issues

To identify the pros and cons of the type of PBP adopted in the USA, Australia and New Zealand, i.e. PBP1 as reported by Baker et al. (2006), Frew et al. (2016), Kwok et al. (2018) and Steele (2011), we performed a simplified SWOT analysis on a case study that had been analysed by these four authors. The SWOT analysis was used in this research as a structured form of organizing pros and cons, both in the present (S, W) and in the future (O, T) (Botequilha-Leitão, & Ahern , 2002; Botequilha-Leitão et al., 2006). The case study analysed was the application of PBP in Queensland, Australia under the Integrated Planning Act (IPA)

that prevailed between March 1998 and December 2009. The IPA was later substituted by the Sustainable Planning Act (2009), reversing the process of PBP implementation returning the former state planning framework to a more rigid, controlled, prescriptive planning system (Frew et al., 2016).

INSERT TABLE 2

The SWOT analysis (Table 2) showed that one of the main problems regarding implementation of PBP as defined by IPA was the administrative inability to cope with the transition from a prescribed orientation in planning to a performance-based focus. The complexity of the process was not reflected by a consistent institutional change (Steele, 2011). In many instances, planners and developers failed to interpret the provisions of the planning scheme (e.g. assessment tables, desired environmental outcomes and performance codes). As planning schemes included 'acceptable solutions' accompanying the provisions, the tendency was to rely on these rather than the performance provisions (Baker et al., 2006). Consequently, planners and developers tended to revert to the more understandable zoning approach in the implementation, resulting in an unplanned 'hybrid' process of prescriptive and performance-based planning.

5. A proposal of key contributions: the role of PBP in urban sustainability and resilience

When participating in PBP, planners could and should play a stronger role – rather than producing an end-product, they should be involved in a framework whereby a process of guidance and continuous dialogue with the several stakeholders takes place. This would constitute a "learning-by-doing" process where both bottom-up and top-down initiatives

generate continuous and up-to-date planning information, e.g. Faludi, & van der Valk (1994, p. 237). In complex systems such as urban CAS, the role of strategic planners may be to shape the decision process (Bovaird, 2008) by direct, close involvement. Embedded in the fitness landscape as another actor the planner would, thus, have a crucial role – to provide assistance and guidance to the plan to move towards the general direction of the "great idea" behind the plan. This idea is derived from the adopted meta-policy, i.e. the so-called planning doctrine (Faludi, & van der Valk, 1994).

According to the latter author, ideas play a very important role in sociocratic planning. Since in the IPA case major issues were "to engender a common understanding", with "many different conceptualizations of sustainability" (in itself deeply contested), and that an impetus towards sustainability was provided by increasing consensus on climate change (Steele 2011, p. 219), we posed the following question: "Would resilience as a goal be more understandable and captivating as an operative meta-goal, and easier or more perceivable to convey and to put in practice?" Or to put it in another way, could it be that the very goal behind IPA (sustainability) itself contributed to the confusion regarding the role of PBP (Table 2)? Sustainability is a normative, value-laden concept. It includes assumptions or preferences about what people want, i.e. equity of resources for present and future generations. Moreover, people use the term "sustainability" in so many ways that can be difficult to reach a shared understanding, particularly on how to reach this "ideal" goal. At its core resilience advocates for adaptation to the effects of changes and disturbances. Unfortunately, over the last decade climate changes impacts have been increasing around the world in both magnitude and importance. These became very perceivable and present to the general public and to the public administration as a more immediate problem to deal with, compared to sustainability which is perceived as long-term process. Notwithstanding, "to say that resilience is simply a short-term reaction of a system would not be true. Indeed, it unfolds in the moment of a shock, but

resilience itself is based on the capacity to adapt and change over the long-term" (Rogov, & Rozenblat, 2018, 7).

According to Rogov, & Rozenblat (2018), there is a hierarchical relationship between sustainability and resilience, where resilience can be considered the "foundation" of sustainability, a requirement for urban sustainability, or a necessary condition for sustainability. The question posed in this paper "would be resilience be more perceivable to convey and to put in practice?" (relative to sustainability) is consistent with the statement made by Anderies, Folke, Walker, & Ostrom (2013), i.e. that "sustainability sets objectives for a system, while resilience is used as a means to meet those objectives". Both the administration and the general public can relate better to the practical, short-term dimensions of the problem (the tools used to attain the sustainability goals) than to the longer-term, normative, more ethereal dimension of sustainability. Importantly, the argument of this paper is not that sustainability should be dismissed as a concept altogether - far from it. These two terms are intrinsically interconnected, but resilience and ways of promoting it may arguably offer a better communication "package" to convey sustainability goals, because resilience also deals with social psychology and engineering (Luthar, 2003; Woods, 2006). Both should be the founding concepts in any planning doctrine that aims to produce more habitable, thriving and long-living cities.

"When cities are understood and accepted as dynamic, self-organizing systems, the concept of sustainability changes. Rather than aspiring to develop an idealized spatial form with associated ecosystem services—sustainability is challenged to build the resilience capacity of cities" (Ahern, 2013). In economic geography, resilience is approached as a process, not as a property of the system as in the ecological domain (Rogov, & Rozenblat, 2018). We argue that this challenge implies shifting the target from (spatial) form, and performance-based metrics such

as those reported by Baker et al. (2006) to assess its advance into (urban) processes (Neuman, 2005; Botequilha-Leitão, 2012), namely processes of interaction between actors.

The aforementioned role of resilience in conceptualizing sustainability, together with the issue of trust and its relationship with planning discretion in PBP, as proposed by Kwok et al. (2018), leads us to a series of considerations, addressed by the seven principles proposed by Biggs et al. (2012) for promoting resilience. Based on these considerations, we hereby propose a set of guidelines for implementing PBP coupled with resilience thinking to contribute to sustainability in urban CAS:

1. **Diversity and redundancy.** Bendor's (1985) research on transportation systems provided some interesting arguments for promoting diversity and redundancy in socioecological systems, e.g. "redundancy in public services can provide for higher service levels due to increased level of competition and increased reliability"; and "multiple *non identical* jurisdictions yields greater diversity and more flexible responses and less risk of being destroyed". In information systems, redundancy is seen as a major source of stability and strength. Another example provided by the former author reports research in 80 metropolitan areas which showed that the most efficient policing occurred in metro areas with 21 or more police departments, whereas the least efficient were those including seven or fewer departments (Parks, & Ostrom, 1999). In the PBP process of IPA in Queensland, there was a considerable state-wide shortage of expertise that greatly affected the development of local planning schemes (LPS), resulting in an excessive amount of low-cost LPS of low quality (Steele, 2011) (Table 2).

2. **Enhancement of social connectivity** to promote the trust and reciprocity necessary for collective action. The more connected the diverse actors of the decision arena are (e.g.

government, private consultants, institutions, individuals), the greater the flow of information between them, which can contribute to making the decision processes (a) more transparent, thus contributing to promoting trust, and (b) more efficient, thus potentially reducing implementation costs and the capacity to adapt to system changes either slowly (changes in the planning system) or suddenly (disturbances, e.g. due to climate change consequences, such as floods in urban systems). In the IPA case study in Queensland, the failed implementation was also due to lack of creative and collective collaboration between planning consultants and environmental and social specialists (Steele, 2011) (Table 2).

3. **Management of slow variables and feedback.** Social resilience is controlled by either fast or slow variables, e.g. respectively, technology and culture (Walker et al., 2006). In SES legal systems, values and traditions are some important slow variables (Walker et al., 2012). We understand the planning doctrine as a slow variable underlying PBP. Faludi, & van der Valk (1994, p. 11) refer to planning as "a dynamic process of interaction between the planning community and the outside world in which ideas play a crucial role". The development of "weltanschauung" – a broad view of the positions and roles of the several institution achieved by "a set of morally sustaining ideas", which in turn provide support for decisions, is pivotal to leadership (Selznik, 1953, p. 44-45, in Faludi, & van der Valk, 1994, p. 16). This vision is based on a set of core ideas that are fundamental and which do not change – in comparison with policies that can change rapidly (Roodbol-Mekkes et al., 2012), providing a conceptual planning background, i.e. the planning doctrine proposed by Faludi & van der Valk (1994). Its basic components (a principle of spatial organization and a set of planning principles) are accepted by most of the planning community as beyond discussion and regarded as self-evident, similar to the notions of "megapolicy assumptions" or "policy frames" (Faludi, & van der Valk, 1994, p. 15). Steele (2011) referred to the need for stronger leadership and long-term political vision in the IPA implementation process in

Queensland (Table 2), which directly consider planning doctrines as a meta-policy vision. We argue that resilience should be an integral part of a successful planning doctrine for PBP both in urban and non-urban environments (or fitness landscapes). According to Faludi, & van der Valk (1994, p. 245) "an adaptive doctrine is conceivable, (…) but not in a way that it would change to something different, i.e. new meanings may be attached to the existing concepts". It would thus translate plans as moving frameworks, as a meta-vision (or broad vision) to manage urban CAS, where the responses of actors function as feedbacks contributing to the auto-organizational nature of the whole system through a long learning process (Faludi, 2000). Connectivity between actors can benefit the adoption of meta norms underlying PBP, as research has shown that individuals who regularly work in teams are more likely to adopt norms and trust each other more than individuals who work alone. Moreover, the capacity to obtain fuller and more reliable information when individuals interact over time is benefited by reliable feedback (Ostrom, 2009). “It is the persuasive power of planning doctrine that makes for consensus” (Faludi, 2000, p. 315), thereby contributing to potentially increase the success of PBP.

4. **Fostering complex adaptive systems (CAS) thinking in PBP**. As explained above, the complexity of urban areas when confronted with planning reveals ‘wicked’ or unstructured problems (Head, & Alford, 2015; Sengupta et al., 2016; Mancebo, 2017). Most planning issues should be accepted as more complex than considered possible in a technical approach (de Roo, 2010, 2018). Thus, the goal of approaches to problems in urban CAS should not be to define an optimal solution based on maximization of goals, but to develop inclusive, deliberative and co-learning perspectives (Dunn, 2018; Hoppe, 2011, 2018) as a way of dealing with complexity. In this respect, one of the main advantages of PBP is that it can deal with the high complexity of territorial and urban systems in more flexible and creative

ways, providing an operative background for integrating problem structuring perspectives, which have been applied with positive results in complex urban environments (Mingers, & Rosenhead, 2004; Freeman, & Yearworth, 2016).

5. **Encouragement of learning about PBP and resilience**. Far from searching for a stable condition or unmovable plan, a precondition of PBP should be to foster continuous learning and experimentation through adaptive and collaborative planning and management. This is directly related to the system resilience. In this respect, in urban systems resilience goes beyond the ecological system and involves a broad set of social and economic issues and strategies (Ahern, 2013). One good example of the importance of active learning approaches is given in the Queensland case study: thus, in adaptive systems, reorganization fosters novelty and creative experimentation (Gunderson, & Holling, 2002). Resilience is therefore high (i.e. the system has a greater capacity to assume change), as is the potential of adaptation to changes, accumulated from the system's past in the form of knowledge, social capital etc. which can combine in novel ways due to the weakness of connections between the different elements of the system. Nevertheless, if resilience and adaptive potential are low, this may impede reorganization of the system. In the examples related to the IPA in Queensland, lack of expertise, strong connections with former views or methods and deficient power transfer (Baker et al., 2006; Kwok et al., 2018) hindered the capacity to use accumulated knowledge and establish new connections that lead to reorganization of the system, e.g. through institutional change and social adaptation.
6. **Broadening participation**. Participation in planning processes, an essential part of PBP, is of paramount importance for several reasons, e.g. it brings more information through co-learning experiences, allowing actor empowerment, and it reinforces equity in the planning process (Botequilha-Leitão, & Ahern 2002; Botequilha-Leitão, 2012; Musacchio, 2008). However, the lack of participatory approaches enhances unstructured planning. As

demonstrated by Kwok et al. (2018), in the case study of Kurilpa Point, Brisbane, under the Queensland IPA, the absence of an effective formal participatory approach was a major driver of distrust and frustration with the planning system. Local stakeholders generally perceived that while the discretionary powers brought about by PBP would be necessary to deal with uncertainty in socioeconomic, demographic or environmental changes, deviations from the initially agreed plans based on economic criteria for development were seen as of lacking transparency. The consequent erosion of community trust then fomented informal participation activities, whereby local citizens sought to influence the results of planning, demonstrating the adaptive capacity of the urban social-ecological system. Participation is, thus, intrinsic to CAS and, if not included in planning, it may appear as an opposing force.

7. **Promotion of polycentric governance**. According to the extensive research that Ostrom (2009), among others, developed on governing common-pool resources (CPR) in many American, Asian and African countries, government-led systems perform poorly in comparison with actor-led polycentric governance systems, particularly when local communities have high levels of rule-making autonomy. Polycentric governance enhances the resilience of the system in several ways that are consistent with the contents of the former guidelines (Biggs et al., 2012; Simonsen et al., 2014). It thus provides opportunities for learning and experimentation, enabling participation (P6) and improving connectivity (P2) between the elements of the system. However, from a practical viewpoint, the process of institutional change is expected to take the required time and should include new perspectives for reframing problems, reorganizing institutional capacities for governance, and defining ways of transformative change and learning (Steele, 2011). Adaptive management, widely promoted as an essential basis for sustainable development, often fails as a result of the malfunction of existing governance structures (Walker et al., 2004).

Governing for urban resilience implies radical social change, in which enhancing social connectivity represents a major challenge (Beilin, & Wilkinson, 2015). These authors edited a special edition of the journal "Urban Studies in which four themes emerged in the context of such change: action location; the scale of actors' influence and at which resilience processes operate; social justice; and local knowledge and memory. Action can be viewed from a top-down perspective (e.g. government policy), from a bottom-up perspective (e.g. community actions that place resilience in practice), or from the perspective of hybrid spaces between the areas where several institutions operate (e.g. NGOs and social networks that negotiate with all these actors and with themselves). The challenge is how to make these actors work together. Social justice indicates the need for an equitable distribution of resources, as social equity is a scarce commodity in urban (as in other) environments. Finally, local knowledge and memory are important for developing actions that resonate with local communities. When methods, tools and "know-how" already form part of the collective knowledge, they are easier to adopt and to apply. Subsequently, when (good) results are shared in the collective memory, these become more reliable and trustworthy.

6. Conclusion

Current trends in development and new functions of urban spaces demand innovative and creative approaches to planning. PBP is conceived as a new perspective surpassing traditional views based on the accomplishment of conformance objectives, usually followed by top-down implementation measures. By contrast, PBP considers the accomplishment of performance goals as the main reference for planning and stress co-learning, co-production and thus participatory approaches for its development, with the aim of attaining greater flexibility and creativeness in its implementation.

We analysed the capacity of PBP to generate sustainable solutions for cities with the help of some analogies and closely-related disciplines. We learned from adaptive management approaches how acknowledging cities and human settlements as complex adaptive systems is essential to understanding their social-ecological and evolutionary character, while recognizing the resilience of urban systems as one of the main guiding principles for making planning decisions with the objective of urban sustainability. Similarly, problem structuring methods show how specific, "one-size-fits-all" solutions are unattainable in complex environments. Problem-structuring approaches can therefore potentially play a role in PBP, by establishing an environment for co-learning, deliberative approaches to manage intractable controversies in public planning policies.

Finally, four important lessons can be learned from the assessment of real-world experiences in applying the PBP, regarding possible barriers for its implementation. The first is to understand that putting PBP into practice not only implies a change in planning regulations, but also a complete institutional change. This will affect many different levels of governance, ranging from the dimensions of power in the different administrative scales to the level of competence of practitioners and the capacity building needs regarding public participation. The second is understanding the danger of relying on specific elements of performance. For instance, the discretional capacity of policy-makers to make decisions may increase the agility of the approach; however, misinterpretation of the collective views of planning could lead to mistrust and opposition by the population as an adaptive consequence of planning. The third lesson relates to the perceived lack of a planning concept, or as the architect Louis Khan expressed it – a "strong idea", behind plans. This is similar to what Faludi, & van der Valk (1994) stated when discussing SSP, arguing for a planning doctrine and its importance for success of the planning system in the Netherlands (Salet, & Faludi, 2000). In other words, it is a metaphor that provides support for decisions (Coop, & Thomas, 2007) and can lead to a

"common understanding" (SWOT on Table 1), a "meta-narrative" that once embraced by the community provides for the previously referred to "self-guidance" (section 5, principle 3), and "the critical element of trust." The different ways of promoting resilience can arguably provide a set of tools to establish the pathway towards urban sustainability, both in the short and the long term. These tools are clearer and easier to put in practice by the different actors involved in PBP. The fourth and final lesson is that planners should play a stronger role in PBP in shaping the decision process from inside, via close involvement, embedded in the fitness landscape as another actor, at the scale where the resilience processes operate, involving local knowledge and collective memory. Rather than producing a plan, they should be closely involved in the entire process to provide guidance and enhance continuous dialogue with the parties involved – government, institutions, planners and the general public.

7. References

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PBP1	PBP2
Hybrid character: operational, blueprint planning combined with strategic planning	Strategic character
Technical approaches guided by goals	Participative approaches to define goals
Prescriptive: centralized, normative governance	Indicative: sociocratic, dynamic governance
Needs discrete milestones for decision-making	Needs every day decision-making
Flexible conformance logic	Adaptive, non-conforming, and social interactive logic
Results in a blueprint that cannot generally be modified	Produces a frame of reference open to future revision
Table 1. Comparison of PBP1 and PBP2 (see text for details)	

S	W	O	T
• Strong adhesion to the IPA across various sectors (state and local government, private planning sector) prior to the implementation process (γ) • IPA process has not been wholly in vain; it brought about fundamental changes both in the planning and development sectors, i.e. planners had to (a) take new responsibilities; (b) develop different skill sets; (c) engage with others in different ways (γ) • Recognized notable barrier removed by IPA: the ability of LG to prohibit development when making plans (α) • The number of PC quadrupled due to the IPA (γ) • Drafting attitudes operated through a lens of "*How to prevent bad development"* rather than "*How to promote good development*" (α) • PBP provides flexibility to PS, allowing discretion in decision-making by PC that could	• IPA failed to engender a common understanding, which resulted in experimental plan-making and finally in a dysfunctional PS (α) (β) • Policy and procedural confusion due to the different ways PBP was understood (γ) (β) • The deliberate absence of direction in the IPA created philosophical challenges to the broader community, where "omission" of detail added to the confusion (α) • IPA sent mixed messages – it was easier to describe what PBP is not rather than trying to describe what it is (α) • Great pressures on PC to prepare LPS (γ) • Expertise shortage state-wide (PC with staff shortages) (γ) • Plethora of low cost LPS proposals of low quality • LG burdening due to expansion of power and scope of LG (under LGA & IPA) (γ) • Drafting attitudes operated through a lens of "*How to prevent bad development"*	• Need for a single meta-narrative on sustainability (γ) • Need for greater leadership; (γ) • Longer-term political vision, resourcing & institutional capacity-building (γ) • Major review of IPA clarified planning procedures: LG roles; LPS more effective and less complex (γ) • Need for creative and collective collaboration between PC and environmental and social specialists (γ) • Dilemma (or challenge?) for planning practice: How to write a plan that does not readily say "no" to undesirable development, while also provides sufficient certainty in the planning process (α) • Find an alternative to the myriad planning strategies to implement IPA, i.e. (a) encourage what *is appropriate*, (b) discourage what *is not appropriate*, (c) somehow not exclude what *might be appropriate* (α) •	• Transformative change around sustainability is itself deeply contested – many different conceptualizations of sustainability (γ) • Difficulty in finding the balance between certainty and flexibility in the PS (α) • In neoliberal political environments, PBP may be a driving force for deregulation and withdrawal from the public sector; this may lead to criticism of PS (β), or even opposition and informal participation against planning (δ) (γ) •

counteract the rigidity of rules (δ)	rather than "*How to promote good development*" (α) • Technical requirements for updating performance standards and development assessment are costly, which make implementation difficult (β) • Discretion in decision-making depends on the ethos of the PC, in absence of which ambiguity and conflicting interpretation of the rules can be expected (δ)		

Table 2. Simplified SWOT analysis of the Queensland Planning System under the PBP regulated by IPA (1997) (based on Steele, 2011 (γ); Baker et al., 2006 (β); Kwok et al., 2018 (δ); Frew et al., 2016 (α)). Abbreviations: IPA – Integrated Planning Act (1997); LG – Local Governments (Councils); LGA - Local Governments Act (1993); LPS – Local Planning Schemes; PC - Planning Consultants; PS: Planning System.

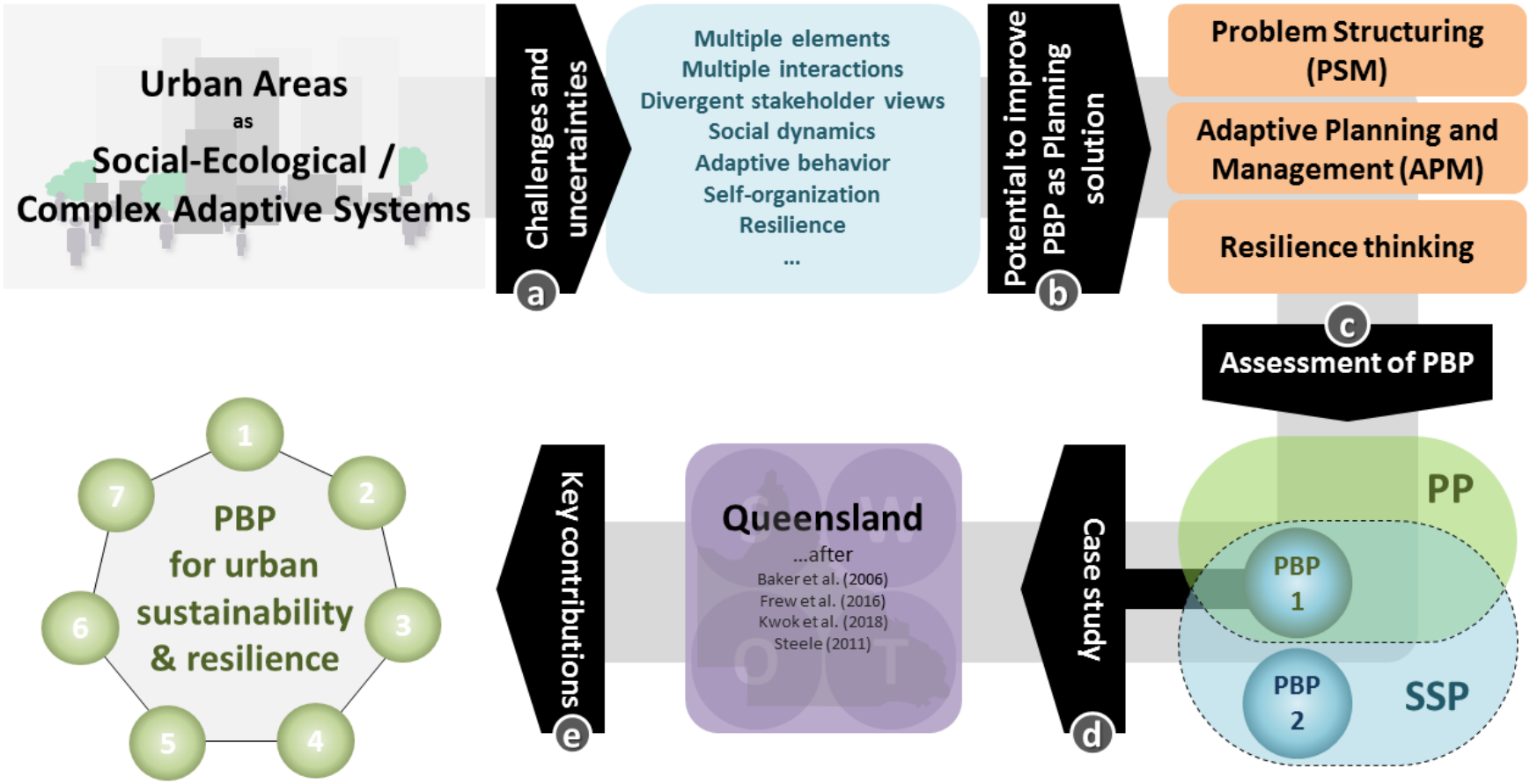

Figure 1. Graphical representation of the methodological approach. See text for details.