Perceptions of urban forestry stakeholders about climate change adaptation – A Q-method application in Serbia

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ABSTRACT

Both the public and policy-makers are concerned about the observed impacts and anticipated future consequences of climate change. Attention to adaptation focuses on reduction of climate change vulnerability and increase of adaptive capacity. In order to better understand the role of decision-making in urban forestry, this paper assesses the perceptions of urban forestry stakeholders towards climate change adaptation, in the city of Belgrade (Serbia), based on Q-method interviews. The views of respondents were clustered into three distinct perspectives: (a) '*Management-oriented perspective*', (b) '*Sceptics*', (c) '*General-awareness perspective*'. Overall, a majority of interviewees (50%) are allocated to group (a), about a third to group (c), and only a minority (15%) to group (b). The sceptics' perspective holds the opinion that climate variations are normal and there is insufficient evidence to prove the existence of climate change. Representatives of the two other perspectives recognize climate change as a challenge, but adopt different opinions to communication and coordination of the adaptation process. While the '*Management-oriented perspective*' is advocating for more bottom-up initiatives and improvement of dialogue between stakeholders, the '*General-awareness perspective*' opine that climate change is an issue to be governed by the national level organizations. Through these three varied perspectives, the main factors for the current lack of responses to climate change adaptation and related needs in urban forestry are identified: lack of coordination and communication between stakeholders, lack of scale-relevant technical and scientific data, lack of specific regulations and financial means. To move forward, we recommend empowering various stakeholders, improving organizational relations and introducing various means of education and information-sharing mechanisms.

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1. Introduction

Climate change has arrived on the political agenda as a major driver of environmental change, and is listed among the top five risks for the next ten years (World Economic Forum, 2013). The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that anthropogenic influence on global climate change is evident (IPCC, 2014). While generally perceived as a global political concern, it is principally at local level where action is needed (Schreurs, 2008). Cities have a significant role in this, both as drivers of climate change, and as areas of impact (Corfee-Morlot et al., 2011). European cities are expected to face several challenges from direct climate change impacts, including increased incidence of heatwaves threatening human health, more frequent and intense droughts, inland floods and storms affecting inhabitants, infrastructure, and ecosystems (Rosenzweig et al., 2011). Thus, it is important to both address current urban centres' risks and vulnerabilities to climate change, and also to build and adopt new measures for future changes (Satterthwaite et al., 2007).

1.1. Urban forests and climate change adaptation

Blue (i.e. water) and green (i.e. forests, parks, green corridors) infrastructures are becoming increasingly recognized in regulating problems posed by climate change in cities (Ecologic Institute, 2011). Urban forests represent one of the key components of green infrastructure. Defined as "*all the trees and woodlands in and around urban areas*" (Konijnendijk et al., 2006, p. 98.), they fulfil multiple demands of citizens and are an important factor influencing their well-being (Konijnendijk et al., 2006). The

role of urban forests in climate change mitigation, i.e. acting as a carbon sink (Nowak, 2000), and mitigating impacts are well recognized, for instance intercepting particles and gaseous pollutants (Nowak, 2000), cooling the air (Lawrence et al., 2011), reducing wind speeds and shading, and reducing storm water runoff (Ordóñez et al., 2010). On the other hand, climate change adaptation activities are less frequently reported (Ordóñez et al., 2010). A number of studies have been published on the role of urban forests in climate change adaptation (Gill et al., 2007; Kendal and McDonnell, 2014; Pötzelsberger et al., 2015), on climate change adaptation measures in urban forests and tree management (Roloff et al., 2009; O'Brien et al., 2012), and on the role of pests and diseases under a changing climate (Tubby and Webber, 2010). However, only a few studies have been devoted to the understanding of the social and cognitive aspects of adaptation processes focusing particularly on urban forest resources (Matthews et al., 2015; Ordóñez Barona, 2015; Sheppard, 2015). Adaptation in forestry is widely seen as a more complex challenge than mitigation, involving more subtle stakeholder interaction (Buizer and Lawrence, 2013). Adaptation responses in urban forest systems are mainly focused on reducing the system's climate vulnerability and increasing its climate adaptive capacity (Adger et al., 2007). This vulnerability has been analyzed in three dimensions: (i) environmental (e.g. related to structure of urban forests, urban trees stress), (ii) social (e.g. existence of urban forestry institutions, the skills of forestry officials), and (iii) economic (e.g. budget, valuation of forests) (Ordóñez et al., 2010). The cognitive aspects of adaptive capacity, such as perceptions and motivations to take action, are part of social dimension, which reflect the ability of the system to cope with challenges (Hobson and Niemeyer, 2011).

1.2. Stakeholders' perceptions and climate change adaptation

Because social vulnerability depends on relationships between individuals, as well as their environmental, economic and political circumstances (Lindner et al., 2010; Jones et al., 2014), it is necessary to understand social perceptions of climate change, the individual actors involved, and the institutions and their interrelations (Blennow and Persson, 2009; Niemeyer et al., 2005). These perceptions are often diverse (Crona et al., 2013), and understanding this variety helps to identify how decision-makers value the risks and benefits, how or why do they make certain decisions and what are the rationales behind them (Jones et al., 2014; Pidgeon and Fischhoff, 2011). The World Economic Forum (2013) has recommended that more attention must be given to how decisions are made in the context of economic and environmental challenges, because this shows the status and gaps in the system's capacity to make a change. In their view, decisions are influenced by perceptions of the actors, which is an active process of understanding the reality. Furthermore, Pidgeon and Fischhoff (2011) suggest that making decisions is dependent on how effectively analytical results are communicated and how relevant they are for decision-making. In their view, pathways towards effective action on climate change must identify cognitive biases, and means to respond to them (Pidgeon and Fischhoff, 2011; World Economic Forum, 2013), preferably with involvement of both natural and social scientists (Leiserowitz and Barstow, 2010). Hence, planning adaptation actions requires a multitude of actors and decisions that need to be coordinated in order to get a collective response to climate change (Corfee-Morlot et al., 2011). In this respect, one of the requirements is understanding the perception of climate risk of various stakeholders (Adger et al., 2007), as a starting point for creation and comparison of decision options (Pidgeon and Fischhoff, 2011).

1.3. Assessing the perception with Q-methodology

There is a documented discrepancy between the generally accepted scientific knowledge of climate change and the knowledge of stakeholders (Yousefpour and Hanewinkel, 2015; Crona et al., 2013). Perceptions of climate change are a subjective risk that affects the capacity of a society to develop between adaptation, non-adaptation, or maladaptation (Wolf, 2005; Hobson and Niemeyer, 2011), and play an increasingly important role in forest risk assessment (Yousefpour and Hanewinkel, 2015). This article looks at the stakeholder dimension more specifically, with the aim of assessing the perceptions of urban forestry stakeholders towards climate change adaptation in urban forests of the city of Belgrade (Serbia). With a focus on social and institutional elements of adaptive capacity, the following research questions were defined:

- Recognition: do urban forest stakeholders recognize climate change adaptation as an issue in urban forest management? Which aspects of the adaptation process do they identify as important?
- Knowledge: do urban forest stakeholders have the knowledge about possible options and skills to respond to necessary adaptation actions?
- Political efficacy: how do members of government, city agencies and organizations address the issue of climate change adaptation and how do they implement that in practice?

The paper uses Q-methodology, which tests and clusters the level of consensus and discordance of selected stakeholder's subjective perceptions. Q-studies related to climate change conducted so far have mainly assessed the perceptions of the public. In contrast, our focus here is on the subjective judgements of stakeholders who have direct/indirect influence in decision-making.

2. Material and methods

2.1. Description of studied area

Almost 60% of the population of the Republic of Serbia live in urban settlements, of whom 23.1% (1.66 million) live in the capital city of Belgrade (Census Atlas, 2014). The administrative territory of Belgrade has 3222 km^2 (Vojković et al., 2010) with a population density of around 513 inhabitants per km^2 (Census Atlas, 2014). In fact, the total population of Belgrade has increased by 250% since 1948 (Vojković et al., 2010). Population increase and post-socialist transformation of society since the 1990s have influenced the degradation of urban structures, transforming the urban region into a "confusing pattern of planned and unplanned areas" (Stupar, 2004), often at the expense of green areas (Gudurić et al., 2011). This has resulted in poor quality of urban environment and decreased forest coverage (Gudurić et al., 2011).

In this study, the term 'urban forests' is used to refer to all forest resources within the administrative border of Belgrade. They cover 12% of the total city area (35 980 ha) and are mainly located in suburban municipalities (Ratknić et al., 2009). Urban forests are managed by the State Agency 'Serbia Forests' – office 'Belgrade' and by the Public Utility Company 'Greenery Belgrade' (Gudurić et al., 2011). Forest areas are mostly small in size, fragmented and unequally distributed throughout the city area (Ratknić et al., 2009). Deciduous tree species have the largest share (96.2%) (Gudurić, 2013), with the majority consisting of artificially established stands (45.2%), natural coppice forests (44%), natural high forest (10.7%), and shrubs and bushes (0.1%) (Ratknić et al., 2009). The Afforestation Strategy of Belgrade (2011) has the stated aim of establishing