Original article

Pragmatic factors outweigh ecosystem service goals in street tree selection and planting in South-East Queensland cities

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ABSTRACT

Competing demands between diverse considerations and the benefits sought make urban street tree species selection an extremely complex and challenging process for municipal land and tree managers, influencing urban greening initiatives across the world as well as in Australia. This paper presents findings from a qualitative study with tree managers and other relevant officers from local municipal authorities in South-East Queensland, Australia that examined factors influencing street tree selection and planting. Participants outlined three predominant motives for planting street trees: environmental (100%), visual and aesthetic (92%), and statutory (92%). In contrast, participants identified species characteristics (100%), site factors (100%), costs (92%), and management and maintenance issues (83%) as the most important governing factors for street tree species selection. Only half of the officers noted ecosystem services (50%), along with visual and aesthetic benefits (50%) as species selection factors. Economic, health, socio-cultural and community benefits were not mentioned among the species-selection criteria. The interviews with municipal officers revealed that the parameters governing street tree species selection in South-East Queensland do not conform to the environmental and aesthetic reasons that were cited as the primary motivations for planting street trees. Local research focused on the benefits and problems of Australian street tree species may empower councils to revise their street tree policies and integrate ecosystem services and disservices as part of the process of selecting appropriate species.

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1. Introduction

The processes by which urban forests are created, maintained and transformed are complex, involving private and public actors, planned and ad hoc processes, diverse land tenures, and broad range of environmentally and socially place-specific contexts (Konijnendijk et al., 2005). Over the past forty years, in many countries, including Australia, the management of urban forests has become less ad hoc, particularly through the strategic intent of municipal governments and the professionalisation of tree managers (Young and McPherson, 2013; Davison and Kirkpatrick, 2014a). The growing sophistication of urban forestry has been driven by an expanding research base documenting the vital role of trees in the liveability and sustainability of cities (Roy et al., 2012).

In this paper we focus on one key element of urban forest management; namely, street tree species selection. Although trees have

long been feature of urban streets (Lawrence, 2008), the task of finding tree species that are appropriate for planting in these specific, and often harsh, built environments has probably never been straightforward. It is, however, an increasingly difficult task as both the list of benefits sought from street trees and the competing demands placed by urban space continue to grow. In response, the key decision-makers in street tree species selection, municipal land and tree managers, have to take into account diverse considerations, including wide climatic and regional diversity in the palette of appropriate street tree species (Roloff et al., 2009; Sjöman et al., 2012a, 2012b). This complexity is reflected in the international literature that presents species selection is a multistage process (Amir and Misgav 1990; Li et al., 2011; Sjöman et al., 2012a, 2012b). This process typically involves five steps: (i) developing design guidelines (Amir and Misgav, 1990; Li et al., 2011); (ii) outlining site constraints (Ware 1994; Pauleit 2003); (iii) identifying desirable species characteristics (Amir and Misgav, 1990; Sæbø et al., 2003); (iv) evaluating species (Roloff et al., 2009); and (v) shortlisting and trialling candidate species (Amir and Misgav, 1990; Saebo et al., 2005; Sjöman and Nielsen, 2010; Sjöman et al., 2012a, 2012b).

The evaluation and trialling of street tree species to determine their suitability in specific environmental conditions encompasses a wide array of factors (Miller 1997; Saebo et al., 2005). These factors include ecological performance, such as drought tolerance (Sæbø et al., 2003; Roloff et al., 2009), particularly in relation to changing climate (Tsiros 2010) and disease resistance (Nagendra and Gopal, 2010); visual and aesthetic features, such as form and height (Williams, 2002; Kirkpatrick et al., 2012); economic considerations, such as establishment cost (Lohr et al., 2004; Saebo et al., 2005); environmental fit, such as soil conditions, underground structures and above-ground utilities (Ware 1994; Pauleit 2003; Lacan 2007); and maintenance issues, such as pruning, leaf-shedding, and fruiting (Miller 1997; Saebo et al., 2005). Historic planting and fashion also play important roles (McPherson, 1998; Pincetl et al., 2013a).

Street tree selection also requires knowledge of the perceptions and needs of local residents (Williams, 2002; Flannigan, 2005; Schroeder et al., 2006), tree managers (Elmendorf et al., 2003; Schroeder et al., 2003), and other urban professionals whose remit includes the urban forest, such as publicly and privately employed planners and arboriculturalists (Kirkpatrick et al., 2013; Davison and Kirkpatrick, 2014a). The personal preferences, opinions, emotions, and habits of residents (Williams, 2002; Kirkpatrick et al., 2012) and tree managers (Amir and Misgav, 1990; Li et al., 2011), as well as wider cultural, economic, and political contexts (Braverman 2008), can complicate aspirations for a rational selection process. Given this potentially exacting process of species selection, it might be expected that a dedicated team of street tree professionals would oversee this process within local municipal authorities, but this is not always the case (Stevenson et al., 2008).

In Australia, tree managers within local municipal authorities are generally responsible for coordinating the process of selecting, planting, and managing street trees (Kirkpatrick et al., 2013; Davison and Kirkpatrick, 2014a). While tree managers are often located within recreation and green space departments, urban forest strategies increasingly involve greater interaction with non-tree officers, including built environment professionals, such as planners, engineers and architects, who may have competing policies, requirements and interests in relation to street trees (Davison and Kirkpatrick, 2014a, 2014b). However, little is known about street tree selection processes in Australia. This paper presents findings from a qualitative study with tree managers and other relevant officers from municipal authorities in South-East Queensland (SEQ) that examined the key factors influencing street tree selection and planting, including the different interests and concerns of diverse professionals involved in managing street trees. The implications of findings on municipal urban greening initiatives in Australia as well as across the world are discussed.

2. Methods

2.1. The study area

In Australia, a 'metropolitan local municipal area' having "a resident population of over 30,000, with more than half of the population living in an urban area, is defined as a city" (Government of Western Australia 1995, p. 11). The local municipal authority responsible for managing the 'city' is referred to as a city council. Located in subtropical South-East Queensland (SEQ), the fastest growing urban regions in Australia, the study area encompasses five cities: Brisbane (SEQ1), Gold Coast (SEQ2), Logan (SEQ3), Ipswich (SEQ4), and Redland (SEQ5) (Fig. 1). The nature and geography of urbanisation is quite uneven across these South-East Queensland cities (Australian Bureau of Statistics, 2011; Department of Infrastructure and Transport, 2013). Deforestation and rapid urban-

isation has fragmented dense eucalypt forests that dominated this region's pre-European vegetation formation, leaving very few suitable native species for planting in consolidated urban areas (Bradshaw, 2012). To mitigate the impacts of rapid urbanisation, these cities are currently pursuing a range of urban greening initiatives, including prioritising shade and promoting native species.

The South-East Queensland city councils in this study each have a centralised single department for managing street trees: the Natural Resources department of Brisbane City Council, Gold Coast City Council's Citywide Greening department, the City Works department of Ipswich City Council, the Parks Planning and Design department of Logan City Council, and the City Services department of Redland City Council (Ipswich City Council, 2012; Brisbane City Council, 2014; Gold Coast City Council, 2014; Logan City Council, 2014; Redland City Council, 2014). However, some additional departments, such as urban planning, landscaping, infrastructure, and engineering are involved in preparing street tree policies and managing street tree programs within the Brisbane and Gold Coast city councils, due to the size of these municipalities and the complexity of issues they manage.

2.2. Data collection

The study sample comprises twelve municipal officers responsible for street trees in the cities of Brisbane, Gold Coast, Logan, Ipswich, and Redland. Similar to Kirkpatrick et al. (2013), and Davison and Kirkpatrick (2014a), semi-structured interviews were used for the investigation, in accordance to an informed consent protocol approved by Griffith University's Human Research Ethics Committee. This method allowed for information about street tree selection to be placed in the context of the personal experiences, preferences, insights and concerns of tree managers (Bryman, 2012).

The street tree policies and programs of the cities in the study area were analysed using Bryman's (2012) document analysis technique in the research design to identify potential participants and to help frame interview questions. Potential participants were contacted by telephone, informed about the aims of the research, and invited to participate in the interviews. The sample included eight 'tree officers', including arboriculturalists and horticulturalists from all five councils, as well as four 'non-tree officers' from the infrastructure and engineering services, planning, and landscaping departments of Brisbane and Gold Coast councils. Interviews were audio-recorded and of 60 min duration. Questioning explored motives for planting street trees, perception of street tree benefits and costs, regulatory frameworks affecting street trees, and the rationale for and the process of street tree selection.

2.3. Data analysis

Data were analysed using a combination of qualitative and quantitative strategies (Bryman, 2012), although in keeping with semi-structured interview methodology, the sample was evocative and not intended to be statistically representative. Participants and the councils were given a pseudonym to maintain anonymity (Table 1). Interviews were transcribed verbatim and in full (Dunn, 2006), and edited for clarity without compromising cadence or meaning. A content analysis of the interview transcripts was undertaken by the first author to derive the key themes (e.g., environmental reasons for planting, site factors informing species selections) numerically and generate a coding tree (Bryman, 2012). The coding tree and the key themes were then used to code the interview transcripts, followed by a frequency analysis and comparison of the key themes (Tables 2 and 3).