Journal of Environmental Planning and Management, 2023
https://doi.org/10.1080/09640568.2023.2197557

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Stewardship and green infrastructure in England. Planning perspectives informed through an investigation of urban green infrastructure

Clive Davies[a]* and Rocío Santo-Tomás Muro[b]

[a]*School of Architecture, Planning & Landscape, Newcastle University, Newcastle upon Tyne, UK;* [b]*Escuela Politécnica Superior, Universidad San Pablo-CEU, CEU Universities, Alcorcón, Madrid, Spain*

(*Received 13 September 2022; revised 14 March 2023; final version received 27 March 2023*)

The aim of this study is to explore the relationships and perspectives of stakeholders involved in the stewardship of 'urban green infrastructure' in England. We used stewardship of the urban forest network (trees and associated green space) as a focal point by referring to four meanings of 'Stewardship', i.e. Motivation, Ethic, Outcome and Action proposed by Peçanha Enqvist et al. (2018). We studied the perspectives of stakeholders through a multi-regional approach, in five English cities (Newcastle/Gateshead, Leeds, Sheffield, Coventry and Bristol), assessing their views expressed via questionnaire and analysing responses through NVivo. We found support for stewardship as a key aspect of urban green infrastructure planning, one that encourages 'bottom up' participation. In the specific area of urban forestry in England we propose that to ensure a co-stewardship role, planning professionals and citizens should work together at all levels to identify key roles and stewardship niches that are complementary.

Keywords: urban green infrastructure; urban forestry; stewardship; green planning processes; co-governance

1. Introduction

Urban green Infrastructure (UGI) is increasingly being valued for a multitude of reasons ranging from its role in public health and well-being, nature protection, informal as well as active recreation and as venues for social interaction (Dinnie, Brown, and Morris 2013; Raymond *et al*. 2017; Young *et al*. 2014; Kardan *et al*. 2015). It is also a major consideration in local planning and is widely appreciated by local communities (Santo-Tomás Muro 2021). Increasingly, within the context of sustainability and resilience, green infrastructure networks with connectivity between green spaces are considered a planning priority (European Commission, 2015; Swanwick, Dunnett, and Woolley 2003a). In English cities, one of the most notable features of green infrastructure is their trees (Newcastle City Council 2018b), which not only adorn parks, gardens and woodlands but also line

*Corresponding author. E-mail: clive.davies@newcastle.ac.uk

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

many streets. Many of these trees have attained significant cultural and heritage meanings for local communities and are highly representative of a given locality (Edwards 2006). In planning terms, trees can set the scene for a whole range of development issues which, approached positively, can add to the quality of new development in amenity and ecosystem services terms. Given the attachment of local communities to their urban trees, they also provide a lens through which to consider wider issues linked to 'green' planning, notably through the concept of 'stewardship'.

Stewardship can be understood to be a part of governance; a coordinated process that is "the sum of the many ways individuals and institutions (formal and informal), public and private, manage their common affairs" (Keping 2018; Commission on Global Governance 1995, 22). For the purposes of the study, the authors adopted the terms 'urban tree stewardship' to describe the relationship between governance and coordination of management processes of individual and small groups of trees, and 'urban forest stewardship' where this covers all trees and associated habitats across a larger (normally municipal) area. A study by Peçanha Enqvist *et al*. 2018, established a framework for stewardship and its different meanings: Motivation, Ethic, Outcome and Action. This framework was used to inform the study.

Whilst there is a general recognition of the benefits of urban forestry and urban green infrastructure (UGI) in civil society (Benedict and McMahon 2006; Mell 2013; Davies *et al.* 2015), the situation regarding who is responsible for the supervision and management of urban trees in England is complex. This complexity is detrimental to the health, wellbeing and expansion of urban tree cover and obfuscates tree care in the eyes of the public. For example, trees associated with infrastructure corridors can be the responsibility of local authorities, the Highways Agency, private owners at many different scales, Network Rail and infrastructure service companies. It is in this context that the need arises to update the understanding of urban forestry/urban tree stewardship and link it to the broader discussions around diverse, and often conflicting, value sets in urban 'green' governance. Although the investigation was focused on England, we hope that it has relevance to other regions, at a national level and internationally. The research focus has led us to a discourse on nature perceptions and value systems regarding stewardship.

The planning and management of urban green infrastructure is also a major funding and human resource issue in financially limited situations (Hansen *et al*. 2017; García-Lamarca, Anguelovski, and Venner 2022). In England, public finance has been reduced across all sectors for most years in the past decade, especially so in respect of green space and allied issues (e.g. green infrastructure, urban forestry) which are non-statutory services (Martinsson, Gayle, and McIntyre 2022). In view of this, our intention was to see whether research on the planning perspectives of urban green infrastructure and the role of stewardship would allow conclusions to be drawn that would be useful to strategic green infrastructure providers in the public sector.

In view of all the above, the overarching aim of this study is to explore the different perspectives of actors/stakeholders involved in the stewardship of green infrastructure by using urban tree management as a focus for the exploration of wider issues. We identified the need to assess that a qualitative study of actors could be useful in revealing gaps in current knowledge, leading to recommendations for further study and provide insights into co-design and co-delivery processes in urban planning. This led to a research question; is the concept of urban forestry/tree stewardship of increasing interest and relevance and what does this illustrate in terms of the planning and management of urban green infrastructure. Depending on the answer to this question this

could have wider implications of how stewardship could enhance other green planning processes, notably the uptake and acceptance of Nature Based Solutions (NBS).

To start to untangle relationships around Stewardship it was considered necessary to understand the views of decision makers, tree professionals as well as 'tree' activists. To achieve this, the key study objective was determined to gather decision makers and activists' views in the context of *Motivation, Ethic, Outcome and Action* (Peçanha Enqvist *et al*. 2018).

2. Context and literature review

In little more than 30 years green infrastructure has emerged as a key urban planning issue (Benedict and MacMahon 2002), although one that is best known in professional circles rather than by the public. Starting from its roots in North America, the concept has evolved significantly in the wider European context (European Commission 2013). The concept was extensively explored in the EC-funded GREEN SURGE project, which ran from 2013-2017 (Pauleit *et al*. 2020). This project addressed how Urban Green Infrastructure contributes to urban sustainability and helps cities tackle a range of contemporary issues. In the field of urban planning, five interwoven elements were identified; policy objectives, planning principles, planning processes, governance arrangements and implementation measures (Davies *et al*. 2015). These planning elements all have relationships with stakeholder participation and actions to encourage (Owino 2016).

Across much of Europe, and notably so in the United Kingdom, trees are considered as an integral element of Urban Green Infrastructure (UGI) contributing ecological, social, and economic benefits (Young *et al*. 2014; Kardan *et al*. 2015; Kabisch *et al*. 2016) and are frequently used to illustrate what green infrastructure looks like on the ground. In this paper, we have adopted this definition of urban forestry used by UN FAO: "Urban forests can be defined as networks or systems comprising all woodlands, groups of trees, and individual trees located in urban and peri-urban areas; they include, therefore, forests, street trees, trees in parks and gardens, and trees in derelict corners. Urban forests are the backbone of the green infrastructure, bridging rural and urban areas and ameliorating a city's environmental footprint" (FAO 2016, 2)

Multiple definitions of stewardship exist; frequently occurring keywords found in dictionaries relate to 'care and management', 'responsibility' and 'trust'. In respect of urban trees and forests, this implies that the stewards are not only responsible for their management but are also trusted to do so. Inter alia, if the duty of care lapses, so does the trust of the wider community in the stewards' abilities to manage the resource responsibly. The idea of 'common good' and 'responsibility towards landscape' (Ostrom 1990) raises the question of whether public authorities are responsible if there is a degradation of the urban forest in extent or management. This link between planning and management strategies is widely explored through literature, either through the study of cultural values (Jones and Cloke 2002; Cohen 2004b), or through the examination of the actors involved in the management of urban forest (Svendsen, Campbell, and Lindsay K. Campbell 2008; Perkins 2011)

The notion of what stewardship means is constantly being evaluated by researchers and practitioners, owing to the many nuances it can entail. The current discourse on stewardship goes well beyond the management of resources, with increasing importance given to ethical responsibility, cooperation and involvement (Gundersen and Mäkinen 2009; Bieling and Plieninger 2017). As well as Peçanha Enqvist *et al*.'s (2018), identification

of four meanings of "ethic, motivation, action and outcome", similar terms to landscape stewardship, strongly linked to context and scale (Brown and Mitchell 2000) imply a strategic approach towards the environment by connecting nature and culture.

The notion of governance of green spaces is also being redefined and is regarded as significant (James *et al*. 2009; Kim, Han, and Kim 2015; MacKenzie, Pearson, and Pearson 2019), especially when debating the role of citizen involvement and community groups in decision-making processes (Conway, Shakeel, and Atallah 2011; Conway 2016), political agendas and the ownership of land. Although scarce, there are currently studies looking at the relationship between urban forestry and governance, by paying attention to processes and interactions rather than benefits and technical aspects (Lawrence *et al*. 2013); therefore noting the importance of human behaviour and perceptions in the establishment and maintenance of (urban) green resources, as well as the difference between modes of governance depending on the actors involved (Arnouts, van der Zouwen, and Arts 2012).

A large part of the literature on this topic acknowledges multiple benefits associated with urban environmental stewardship, revolving generally around ecosystem services, the decision of whether or not to maintain trees not only has environmental effects, but also leads to economic results, usually monitored and monetarized through tools such as i-Tree software, and which leads to the claim that maintenance costs often outweigh the cost of replacement trees (Vogt, Hauer, and Fischer 2015).

However, it is not all benefits when we look at green infrastructure, and particularly at urban trees. There are some 'disbenefits' associated with perceptions and experiences of urban green, and urban trees in particular: environmental injustice and inequality, problems of inclusion, allergenicity, etc. (Cariñanos and Casares-Porcel 2011; Cariñanos, Casares-Porcel, and Quesada-Rubio 2014; Lyytimäki 2017; Byrne 2017). The study of governance in urban forestry should gravitate towards more inclusive and equitable actions, integrating the knowledge of services and disservices provided by urban trees.

In general, resources are scarce and insufficient, and stewardship ends up depending on donations, trusts and other voluntary actions (Svendsen, Campbell, and Lindsay K. Campbell 2008). A growing number of studies are now focusing their attention on the role of volunteers and community engagement, including professional arborists and landscape architects, who become key figures in achieving tree survival, and not only in the planting of new trees (Breger *et al*. 2019). There are an increasing number of stewardship groups whose role is to build bridges between public agencies and civic organizations, hence contributing to the management of urban ecosystem services (Connolly *et al*. 2013). However, most of these studies are in the United States, which suggests the need for similar studies to be carried out elsewhere.

In short, as stated above, stewardship for this study depends on motivation, ethics, action and outcome, influenced in turn by the concepts of care, agency and knowledge (Peçanha Enqvist *et al*. 2018). When connecting these concepts with urban forests and trees, we find that motivation relies on the benefits they can provide, whether they are economic (e.g. Song *et al*. 2018), environmental (e.g. Dunn-Johnston *et al*. 2016) or social (e.g. Carmichael and McDonough 2018), and provide us with a high quality of life. The ethics factor is about responsibilities towards nature and the environment (Krasny *et al*. 2014), especially about the desire to put something back into society and nature, as well as leaving behind a legacy for the next generation. Outcomes are about the whole lifecycle of the urban tree or forest (Roman *et al*. 2015); from seed to

saw and the ecosystem services accrued throughout its lifespan. From the exploitation of the trees as an urban resource (e.g. fruit, shade, nutrients, cycling or aesthetic quality) to the end of life harvesting or removal of trees, as well as the celebration of trees by communities. Finally, action is about the planning and delivery of urban trees and forests: from the planting of trees to the aftercare and maintenance of trees (Cohen 2004a).

When it comes to the motivational aspects of stewardship, the benefits of urban trees and forests matter greatly. In terms of ecological assets, street trees actively increase urban liveability by reducing stormwater runoff, improving air quality, storing carbon, providing shade and ameliorating the urban heat-island effect (Mullaney, Lucke, and Trueman 2015), as well as supporting biodiversity and connectivity for urban fauna (Burden 2006). Trees provide ecosystem services to the city, including pollution removal, temperature regulation and noise reduction (Newcastle City Council 2018a).

Focusing on the social gains, studies have shown that urban street trees promote contact between community residents, encourage physical activity and stimulate social cohesion (Dillen *et al*. 2012; Hauru, Niemi, and Lehvävirta 2012). Well-maintained urban street trees generate significant economic benefits for communities and local governments, such as increases in property prices, reductions in overall public health costs associated with heat-related illnesses and deaths and a reduction in overall climate resilience costs (Swanwick, Dunnett, and Woolley 2003). In addition, urban trees can lower energy costs by reducing the need for heating and cooling of buildings (Rolls and Sunderland 2014). An increase of sales in shops located in streets with trees has also been noted (Wolf 2005), since they can change the perception of space from the consumers point of view. Social benefits are most successfully realised when urban street tree governance actively involves citizens in the planning, development and care of street trees, thereby legitimating diverse perspectives on street trees and bridging technological and ecological goals held by local officials with social-cultural aims held by residents (Gulsrud, Hertzog, and Shears 2018). Whilst recognising some negative factors, for instance an increase in allergenicity (Cariñanos *et al*. 2019), there is overwhelming evidence that the benefits of urban trees far outweigh the negative aspects (Hastie 2003; Livesley, McPherson, and Calfapietra 2016).

3. Methodology

3.1. Research strategy

Having identified the issue of urban tree/urban forestry stewardship as of notable importance in green infrastructure planning, we consulted local stakeholders to ascertain views on stewardship of urban trees in the case study cities, via questionnaire, using, as stated in the introduction, the stewardship of the urban forest network (trees and associated green space) as a focal point. We searched for people involved in the stewardship of urban trees and green infrastructure in the case study area, dividing the profile of the stakeholders into four groups: Local Authority, Academia/Researcher, Organisation Leader and Volunteer. There were both open/ended questions and space where they could write and expand their answers. In the case of the definitions, a maximum length was allowed (see Section 3.3). We collected a total of 26 questionnaires, with at least one profile of the stakeholders for each case study.

The questionnaires were designed to obtain both quantitative and qualitative data (particularly the latter), which was then interpreted by means of thematic analysis, using NVivo software. Furthermore, we linked concepts arising from both the interviews and the literature review (e.g. Community Cohesion, Media exposure, Sense of personal ownership, etc.) to the four meanings of stewardship mentioned in the introduction: Motivation, Ethic, Outcome and Action (Peçanha Enqvist *et al.,* 2018). After consultation, we elected to use the term 'green planning processes' (GPP) in the questionnaires instead of 'green infrastructure planning' (GIP) because it is a more open-ended concept (less technical). Whilst stakeholders working in planning would know the GIP term, volunteers or people from community organisations were expected to be unfamiliar with it.

As we were interested in the perspectives of different stakeholders, qualitative information was key in order to understand the values arising from specific situations and contexts, as our research suggests, enabling a more in-depth analysis of details and nuances. The use of these methods is particularly relevant for the study of landscape perceptions, given the desire to understand the subjectivity of the elements to be analysed (Strauss and Corbin 1998). Thus, local factors become increasingly relevant, with a more and more individualised point of view, highlighting the value of everyday issues.

3.2. The case studies

Understanding context is essential when interpreting perceptions and site values. A case study framework was considered as the most operative way of working, to illustrate different perceptions across the country and to enable comparisons between them (Ylikoski and Zahle 2019). Case study research has previously proven to be a useful tool, particularly in the study of urban forestry stewardship, and more generally to avoid over-standardisation (Svendsen, Campbell, and Campbell 2008; Lawrence *et al.* 2013).

All case studies are located in England and, hence, we caution that the situation may vary in other parts of the United Kingdom and require interpretation. For the study, we selected a regional approach based on a transect across England on a North East - South West Axis choosing Newcastle/Gateshead, Leeds, Sheffield, Coventry and Bristol as case study cities (Figure 1). This transect covered four recognised English regions (Northeast, Yorkshire and the Humber, West Midlands and the South West) and all the chosen cities had comparable population density.

The northernmost case study is the combined settlements of Newcastle upon Tyne (north of the River Tyne) and Gateshead (south of the River Tyne). Newcastle is the foremost settlement and centre for communications, education and cultural industries whereas Gateshead on the south of the River Tyne is more industrial and a dormitory settlement for Newcastle. Newcastle is notably constrained by its boundaries, whereas Gateshead has a more substantial peri-urban area within its municipal boundary. The next proximate case studies are both in the region of Yorkshire and the Humber (Leeds and Sheffield). Both have metropolitan characteristics and sizeable rural hinterlands. Sheffield is very hilly rising to 548 metre asl. Leeds is the largest city by population of those selected and the regional centre for Yorkshire. Coventry and Bristol are in the West Midlands and Southwest regions of England respectively. Coventry has long historic roots and grew extensively in the 19th and 20th centuries, most notably

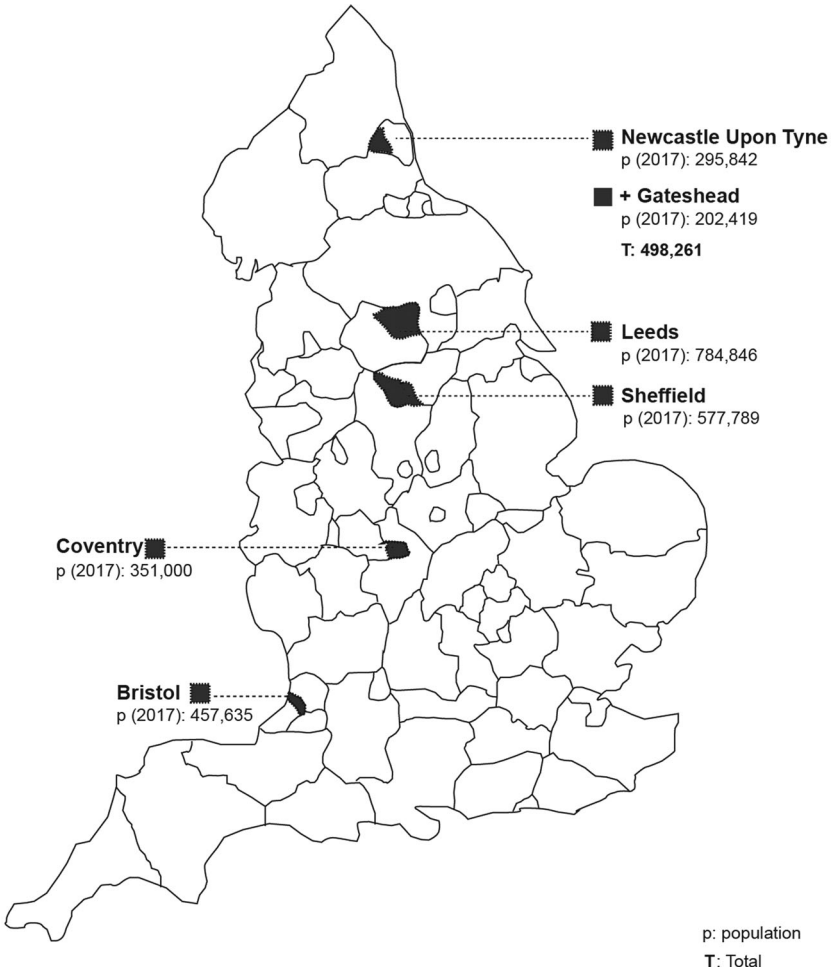

Figure 1. Administrative divisions of England highlighting the case studies. Prepared by the authors.

with respect to automotive engineering. Seriously damaged in the second world war from bombing, the city was substantially rebuilt after 1945. The City of Coventry has a constrained municipal boundary. Bristol has become known as a 'green city' and was European Green Capital in 2015. It has also been highlighted as one of the most divided in respect of minority disadvantages in education and employment (Elahi, Finney, and Lymperopoulou 2017), whilst in contrast it has also been referred to as a city for young people with 'hipster' lifestyles (Goodier and Davis 2019). In terms of landform, Bristol has much in common with Sheffield, as both are notably hilly.

It should be reported that both Sheffield and Newcastle have come in for criticism over their urban tree management. Sheffield was reported as an urban tree crisis 'hotspot' and a major source of civil protests (Castle 2018; Rotherham and Flinders 2019). The tense situation resulted in multiple citizen concerns developing into action groups, street protests and civil disobedience (Dalton 2018; Drury 2018; Burn 2019). Newcastle also attracted criticism, although less civil protest. The press reported a series of poor practices affecting the stewardship of street trees, from local newspapers

(e.g. Newcastle's *Chronicle Live*) to international journals such as *The New York Times* (Castle 2018).

3.3. Qualitative analysis: NVivo codification process

While the study of experience depends largely on subjective elements, qualitative tools enable researchers to evaluate different perspectives in a systematic manner. These tools largely rely on specific social patterns, moving away from great generalities about the notions of place, thus putting the focus on more individualized and personal elements than quantitative techniques do (Flick 2004). In general, qualitative research is based on four principles: understanding the meaning of participants' responses, investigating the influences provided by the context, understanding the processes that lead to the results and admitting the subjectivity of the researcher (Maxwell and Reybold 2015).

Despite the search for rigour, this type of method recognises the subjectivity of the researcher, which in some way guides the study process. It is important to distinguish which elements are affected by this subjectivity, and what this implies for the results and their interpretation. This risk of subjectivity, inherent to any qualitative study focused on perception, is assumed and controlled by systematising and focusing on the method, while at the same time acknowledging the role of the researchers in the election of the topic, methods and the analysis (see Moon and Blackman 2014; Phillips 2013).

As described before, in order to assess the different perspectives on Stewardship, a written questionnaire was sent to different selected stakeholders in each case study area: administration and/or local authority figures, researchers, managers of organisations and volunteers (Figure 2). The collection of questionnaires was carried out in 2021, when we contacted stakeholders via email, sending them a survey with the questionnaire in PDF format, and attaching a link to the same using SurveyLegend as an online tool, so they could be completed online if they preferred. Several follow-up email messages were sent to non-respondents.

The questionnaire was designed to be semi-structured, as it had close-ended questions and open-ended ones, along with space for adding comments. In this way stakeholders could express their opinions more freely. Using a similar structure in every interview enabled comparison between cases and individuals. The set of questions included the description of their involvement regarding the planning, management or care of their local area, how the current state of tree management today compared to the duration of their involvement, and questions about possible factors that could have impacted tree management in recent years (COVID-19, Climate Change, modifications to public policies, new urban development or budgets and finance). Respondents were asked about the involvement of the local community, whether there has been an increase or a decrease and whether they could provide a definition of 'green planning processes' and 'stewardship'. They were also asked if they considered themselves as 'stewards' of green infrastructure in their local area. Responses were limited to 140 characters, in an attempt to be as specific as possible.

The data were analysed using NVivo, a software tool for organising and managing qualitative data (Bergin 2011). The responses were classified according to attributes or properties: case study and type of involvement. We identified "nodes", i.e. categories of analysis; themes, concepts, ideas or experiences based on the connections emerging

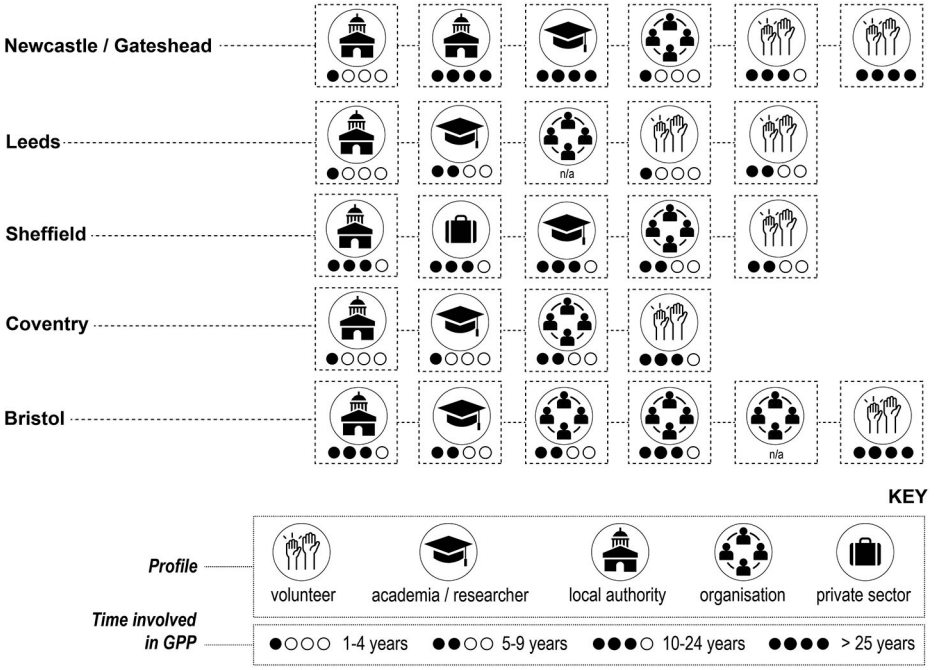

Figure 2. Attributes of respondents. Prepared by the authors.

from the interview narratives (Sabariego 2018; Schettini and Cortazzo 2015). This process was based on grounded-theory coding practices (Figure 3), including 'open coding', 'axial coding' and 'selective coding', according to hierarchy relationships of the concepts arising (Santo-Tomás Muro, Sáenz de Tejada Granados, and Rodríguez Romero 2020).

Two different types of nodes were defined, ones exclusively related to the questions themselves (i.e. local community engagement or impact factors of tree management) (N1), and others referring to the concepts in relation to the stewardship of urban trees (N2), based on the four meanings of Stewardship in Peçanha Enqvist *et al.* (2018). After the codification, we ran "queries", to examine the relationships and number of references between files, attributes and nodes. For this study we opted for "Matrix Coding Queries", which allowed us to visualise the distribution of categories between the different files by cross-referencing data, and "Hierarchy Charts" which reflects the percentage ratio of the references given in the interviews in each of the nodes, giving an overview of the main issues and concerns in each case.

4. Results and analysis

4.1. Green infrastructure, stewardship and stakeholder results

The definition of the concepts "Green Planning Process" (GPP) and "Stewardship" (in GPP) by stakeholders helped to gain a better understanding of their views in order to probe the differences and similarities between both concepts generally, but trees and green infrastructure specifically. When reflecting upon the concepts, the most

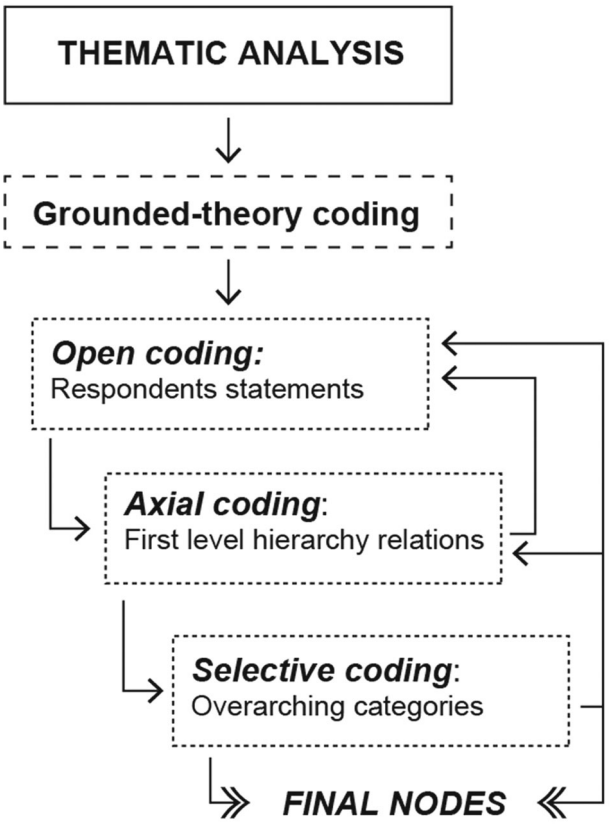

Figure 3. Coding process diagram. Prepared by the authors.

mentioned words were 'development', 'environmental' (and/or 'environment') and 'trees', followed by 'future', 'spaces' and 'green', (Figure 4).

In general, all definitions showed a relationship between planning and natural elements (green spaces, wildlife habitats, nature, etc.). Only three stakeholders were unable to provide some sort of definition. Responses included:

- "(GPP is a) coordinated process, involving the local community, of preserving and improving … local green spaces" (Newcastle/Gateshead, Volunteer)
- "Linking ecology as part of the planning process" (Leeds, Volunteer).
- "Planning process in which environmental and economic outcomes are weighted fairly and high environmental standards are required in new development" (Newcastle/Gateshead, Organisation)
- "Taking account of environmental matters throughout the planning process and putting them at the heart of plan making and decision taking" (Coventry, Local Authority)
- "Use development to improve the environment at best and not damage it at least" (Bristol, Organisation)

According to the interpretation of 'Stewardship', the most mentioned words were 'wildlife', 'environment' 'spaces' and 'care' followed by mentions of 'management' 'responsibility' or 'protect(ing)' (Figure 5).

Figure 4. Word cloud created with the definitions of 'green planning process'. Prepared by the authors with NVivo Software.

Figure 5. Word cloud created with the definitions of 'stewardship'. Prepared by the authors with NVivo Software.

Overall, stakeholders agree that stewardship is the act of managing, observing and protecting Green Infrastructure, and in particular urban forestry. Most of the stakeholders also agree on the importance of nurturing existing elements and leaving something for the next generation, as part of a legacy which in turn suggests responsibility towards the environment. Responses included:

- "It sounds like action rather than words" (Bristol, Volunteer)
- "Overseeing a planning process to make sure it takes into account everything, not just humans but also wildlife too". (Bristol, Organisation)

- "Responsible management protecting urban green space on behalf of communities". (Coventry, Organisation)
- "Looking after the green spaces once the development work has finished. Should be ongoing for the future" (Newcastle, Volunteer)
- "Preserving, protecting and enhancing the natural environment including urban trees and green spaces" (Sheffield, Organisation)

Most of the stakeholders considered themselves 'stewards', by referring to their involvement in green planning processes, but not necessarily managing (except for people involved with the local administration), protecting urban green elements. Only three people did not think of themselves as stewards. Responses included:

- "In terms of ensuring they are properly taken into account within my remit in terms of developing and implementing planning policy then, 'yes'." (Coventry, Local Authority)
- "Our role as Tree Wardens is to protect, plant and promote trees in Coventry." (Coventry, Organisation)
- "Yes - campaigned and written reports to protect threatened woodland. Doing woodland design for a proposed community woodland. Comment on planning consultations for local environmental groups" (Leeds, Organisation).
- "Not an active steward, but an indirect one through my research and teaching" (Sheffield, Academic)
- "I enjoy taking photos of weather changes with tree shading" (Instagram) (Bristol, Organisation)

4.2. Impact factors in recent years

4.2.1. COVID-19

Due to the context of uncertainty caused by the pandemic during the period of study, COVID-19 is one of the factors to be considered. According to stakeholders, lockdowns have led to an increased awareness towards the importance of green infrastructure, as it has incremented the need and demand for accessible greenspaces, and a better understanding of its benefits, "COVID-19 has encouraged people to become familiar with and appreciate their local green spaces"; (Coventry, Organisation). However, another respondent noted that there was nothing really tangible arising "Maybe more expectation about (tree) planting (not management)" (Bristol, Local Authority).

On the other hand, several stakeholders commented how it has negatively affected some volunteer groups. As explained by one of the stakeholders contacted, "Lockdowns and subsequent fear of socialising have affected our volunteer groups. They've also changed the habits of lots of people. Council Officers have been working, (but) volunteering ceased" (Bristol, Organisation), "COVID-19 has shown how dependent we are on older volunteers in greenspace stewardship. They have often been shielding, classed as vulnerable and (are) not necessarily au-fait with ZOOM and other online software to organise meetings." (Sheffield, Researcher). According to stakeholders, the pandemic has also negatively affected financing/resources and management, as it has broken up teams, resulted in less work in maintenance of urban trees (Bristol, Organisation) and reduced manpower (Sheffield, Researcher). Visits to sites have also

been reduced, due to lockdowns, which resulted in an increased reliance on photographic evidence (Coventry, Local Authority).

4.2.2. Climate change

Although not many comments arise from this factor, most of the stakeholders agree that tree planting is part of the solution to the climate change issue, as they help mitigate the carbon footprint "Greater publicity emphasising the importance of trees in relation to climate and health" (Coventry, Organisation). Nature For Climate funding for Community Forests was mentioned, where funding goes directly towards urban forestry to promote environmental improvement (Leeds, Organisation). However, the general feeling is that whilst the benefits of trees in climate change mitigation are widely known, there are insufficient actions to promote the improvement of the current situation.

According to stakeholders, the growing presence of the climate change agenda in the collective debate has made people more vocal on specific issues (Coventry, Local Authority), and that the increased recognition of ecosystem services might lead to more tree planting. Others insisted on the importance of not only new planting, but nurturing of veteran trees, to offset the consequences of climate change, "Felling and canopy loss is adding to climate change … we need to plant, but more importantly save the mature tree stock" (Coventry, Organisation). The aftercare of trees was also mentioned, "Trees and plants we have planted have needed lots more care throughout the growing season than previously" (Bristol, Organisation).

4.2.3. Changes in public policies

There seems to be a greater emphasis on trees in local administrations, with an increasing number of public policies in terms of urban forestry planning (e.g. "City Council is keen to see large increases in tree planting - urban forestry unit leading on this" (Coventry, Local Authority), although not always making Tree Wardens involved in the development of local strategies, according to volunteers. The general perception is that there is still a need to increase community engagement and their relationship with the administration "Abolishing neighbourhood partnerships has meant that people who are likely to volunteer have no link with the Council anymore" (Bristol, Organisation). There were very few national strategies mentioned, only the UK Tree and Woodland Strategy and the Environment Bill.

Some criticism was focused on planning policies "The government's leanings towards a more laissez-faire planning system and its failure to fund local authorities adequately are likely to impact heavily upon retention of urban trees and upon grounds maintenance." (Newcastle, organisation) and on the outsourcing of public services "The outsourcing of public services has impacted adversely on tree management in Sheffield and elsewhere I believe" (Sheffield, Academic). The consequences of Brexit were only commented on by one stakeholder "Policy changes post-BREXIT - ELMS, public money for public goods equals increased woodland planting" (Leeds, Organisation). Most strategies appear to be focused on planting, and not on nurturing or managing existing elements "Much funding available for Tree Planting initiatives, although may be short term and doesn't take into account maintenance" (Sheffield, Local Authority).

4.2.4. New urban development

Responses have shown an acknowledgment towards the increased awareness of green policies in new urban development plans, with references to Nature Recovery Networks, and Biodiversity Net Gain, "(There is an) increased awareness of the need for proper replacement rates for removed trees and protection first." (Leeds, Organisation). However, the consequences of new constructions are seen as negative, with a negative impact on urban forestry "Building on Green Belt land is destroying trees, hedges, and biodiversity. HS2 (high speed rail) is doing huge damage locally" (Coventry, Organisation).

There is a general sense that green space is being built on: "Lost another important piece of important green land to housing yesterday and a golf course 2 weeks ago" (Coventry, volunteer). The general demand is that future urban development should include green infrastructure elements, considering urban forestry: "If new urban development is planned well with good CIL/S106 systems, it might have some benefits for urban tree management. However, urban sprawl and poorly planned development or that containing no GI (Green Infrastructure) would mean fewer trees, or non-maintained ones." (Newcastle, Organisation). There is also considerable scepticism towards the implementation of the Biodiversity Net Gain (Sheffield, Academic). We looked for mentions of actions regarding urban trees and development: "Newcastle has lost thousands of trees over the last 10 years – 2019 a bit fewer as development stalled" (Newcastle, Academic), and "trees are not adequately protected in urban development projects. Many are felled or damaged by building works" (Sheffield, Academic).

4.2.5. Budget and finances

Most of the respondents were not able to provide a specific or global budget figure destined to green planning processes, but most stakeholders did share some insights regarding this factor. There is a general feeling that trees are not given enough recognition in public policies. For example, some local authority members commented how there had been budget reductions in the public sector, which have affected woodland management: "Tree officer post hours were cut a few years ago - corporate decision as I understand it" (Coventry, Local Authority). Also, they claim how maintenance and management of urban forestry has been neglected "Tree maintenance (is) not seen as important. Whole budget for maintenance (was) nearly lost 4 years ago" (Bristol, Organisation). Although some cuts were originated by the pandemic, some stakeholders claim that these cuts started before "The real cuts were pre-2019, Austerity under the Cameron government, – 2019 hasn't seen an improvement" (Newcastle, Academic). Stakeholders from Sheffield also mentioned Austerity as the origin of reduced staff numbers. The issue of cutbacks is a recurring one when discussing budget and financing: "The local authority budget for parks and countryside management continues to be drastically reduced" (Sheffield, Academic).

However, there seems to be a change in some administrations' attitude towards urban forestry: "The council tried to cut the budget for street trees a few years ago, but they realised it would mean loss of street trees in the long term and have reinstated the funding" (Bristol, Organisation). However, the fact that efforts are focused on planting rather than maintenance was commented on: "Significantly, maintenance, watering (and) strategic thinking are all at risk because of ongoing attacks on

long-term management budgets. Sure, there's lots of money for tree planting, but where's the revenue funding for the ongoing management?" (Sheffield, Academic).

4.2.6. Local community involvement

The impact of community engagement was generally acknowledged as positive, although the degree of assessment varied. 50% of respondents claimed that community involvement is perceived as positive, compared to 23% who perceive it as negative. 19% of the respondents did not know whether this involvement was (viewed as) positive or negative.

In Sheffield, in one of the centres of community-led initiatives towards urban forestry protection, this perception seems to have shifted over time "Used to be negative (Sheffield tree protests): now finally moving to a more positive situation' (Sheffield, Organisation), with the STAG organisation now very active in the planning processes: "Sheffield Tree Action Groups is a major stakeholder in street tree management in Sheffield. Tree Wardens, Collaborative Street tree strategy produced, between Amey, SCC & STAG. Active engagement in council policy" (Sheffield, Volunteer). Other people in different locations have also become more active in the protection of green spaces, "I've been involved since the Council cut down three trees bordering my property. Formed Tree Group, then Coventry Tree Warden Network" (Coventry, Volunteer).

69% of the interviewees believed that citizen involvement has increased in recent years "More people have joined the tree wardens, and many are now involved in green/climate groups" (Coventry, Volunteer), versus 19% who considered that it has decreased. 12% did not know. The main argument given by those who believe the number of volunteers had dropped is that it is a consequence of the pandemic "The lockdowns and subsequent fear of socialising have affected our volunteer groups" (Bristol, Organisation), although not the only one: "Over recent years number of Countryside Rangers has reduced significantly so this must mean there is less citizen engagement" (Newcastle, Volunteer).

However, as the numbers show, this reduction is not noticeable in all places "The Friends have about 200 subscription-paying members." (Bristol, Volunteer); "There are 100 Tree Wardens across Coventry and interest is currently growing as people become more aware of the services trees provide" (Coventry, Organisation). Even the pandemic has had, for some of the stakeholders, some positive influence in the growth of citizen involvement: "Just my perception but climate change and the pandemic have increased peoples' focus; however loss of/changes to green and open space have always been controversial in the planning process so have always attracted active engagement." (Coventry, Local Authority).

5. Discussion

The decision to refer to Green Planning Processes rather than specifically Green Infrastructure Planning appears to have been vindicated, as there were very few queries about definitions, which can be related to the fact that, even though Green Infrastructure is currently one of the key planning issues (Benedict and MacMahon 2002), it is a concept that is best known in professional circles rather than by the

public. Furthermore, the role of urban trees/urban forestry seems synonymous with green planning to many.

Based on the results, it also appears that the word 'planning' is seen as referring to strategy and development and stewardship is synonymous with management and responsibility once the development has finished, gravitating towards ideas such as 'common good' and 'responsibility towards landscape' (Ostrom 1990), and reinforcing the link between planning and management strategies (e.g. Cohen 2004b; Svendsen *et al.* 2008; Perkins 2011). Increasing importance is given to ethical responsibility, cooperation and involvement (Bieling and Plieninger 2017; Gundersen and Mäkinen 2009).

We also determined that, in a study of this kind, we can talk of 'stewards' and defined this as those who 'collectively take shared responsibility' rather than 'stakeholders' which brings with it compartmentalised associations. This resonates with the idea pointed to in the introduction, that stewardship can be understood as part of the coordinated process of governance, in the sense that 'the sum of the many ways individuals and institutions (formal and informal), public and private, manage their common affairs' (Commission on Global Governance 1995, 22; Keping 2018). Paying attention to processes and interactions (Arnouts, van der Zouwen, and Arts 2012; Lawrence *et al*. 2013) and noting the importance of human behaviour and perceptions is proven a useful tool while studying the modes of governance or stewardship.

With respect to the four meanings of stewardship proposed by Peçanha Enqvist *et al.* (2018), i.e. *Motivation, Ethic, Outcome and Action*, these work equally well in the context of stewardship of urban trees in all the case study cities. Figure 6 shows the correlation between the meanings of stewardship in the context of urban forestry (e.g. aesthetic values, community cohesion, sense of personal ownership, legacy towards the next generation or respect for nature). To do this we integrated the findings of the literature review with the comments and conversations with stewards (as nodes in the codification) to have an overview of the applied stewardship of urban trees, converging on 'Stewardship Action' (Peçanha Enqvist *et al.* 2018) namely: care, knowledge and agency.

Thus, among the main elements related to 'Motivation', we find references to the 'direct personal benefits' arising from urban forestry and urban green infrastructure, importance of the 'aesthetic values', 'community cohesion' or the effects on the 'health and wellbeing' of citizens. In terms of 'Outcome', we acknowledge the importance of 'motivated citizens and volunteers' and 'locally skilled workforce', as well as the 'sense of personal ownership' of urban green infrastructure among stewards. According to the meaning 'Ethics', 'democracy and governance' play a key role, along with 'individual social contract', 'sustainable growth' and 'respect for nature'.

With regards to green infrastructure, we observed how the proportion of the different meanings of Stewardship varied considerably depending on the question asked. Remarkably (Figure 7.1), the proportion of the answers according to the stewards was similar to proportions proposed by Peçanha Enqvist *et al.* (2018) and also our theoretical adaptation proposed in Figure 6, with a slight predominance of the 'Ethics' factor over 'Motivation' and 'Outcome' and a strong focus on 'Actions'. Within the 'Actions', the focus was on the 'nurturing of trees', 'planting new species' and 'urban planning'. 'Respect for nature' was the principal concept behind the 'Ethics' meaning, 'community cohesion' according to 'Motivation', and 'Adequate resources for urban forestry care' referring to 'Outcome'.

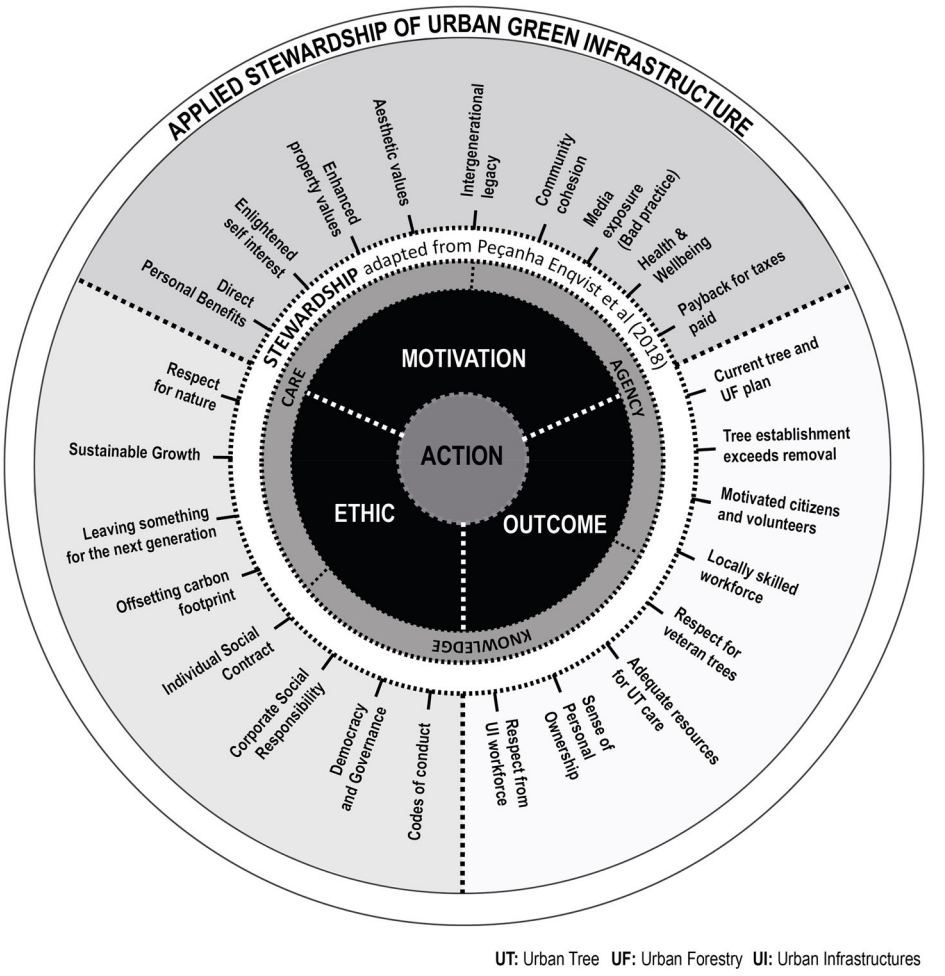

Figure 6. Theoretical applied stewardship of urban green infrastructure. Figure prepared by the authors, adapted from Peçanha Enqvist *et al.* (2018).

When focusing on the definition of stewardship, 'Ethics' and 'Actions' were the most important meanings when defining 'stewardship' (Figure 7.2). 'Actions' included the nurturing and management of trees and the integration of green infrastructures (existing or new) into local urban planning and future development. When looking at the ethical aspects of stewardship we found that it applied to long-term concepts such as leaving something for the next generation or more immediate ones such as using trees to offset the carbon footprint and balance urban growth. There were notions related to citizenship too, such as 'putting something back rather than always taking something out'. Whilst 'Motivation' and 'Outcome' were also acknowledged, this was to a lesser degree, linking to the importance of community cohesion, the direct personal benefits, and the need for adequate resources for urban (tree) management.

In terms of limitations, we recognise that since the questionnaire materials referred to trees and that there was some selective bias towards those engaged in this area (e.g. tree wardens), that the 'nurturing of trees' would be a substantive result, and this proved to be the case. Nevertheless, it is notable that 'action' is seen as an important

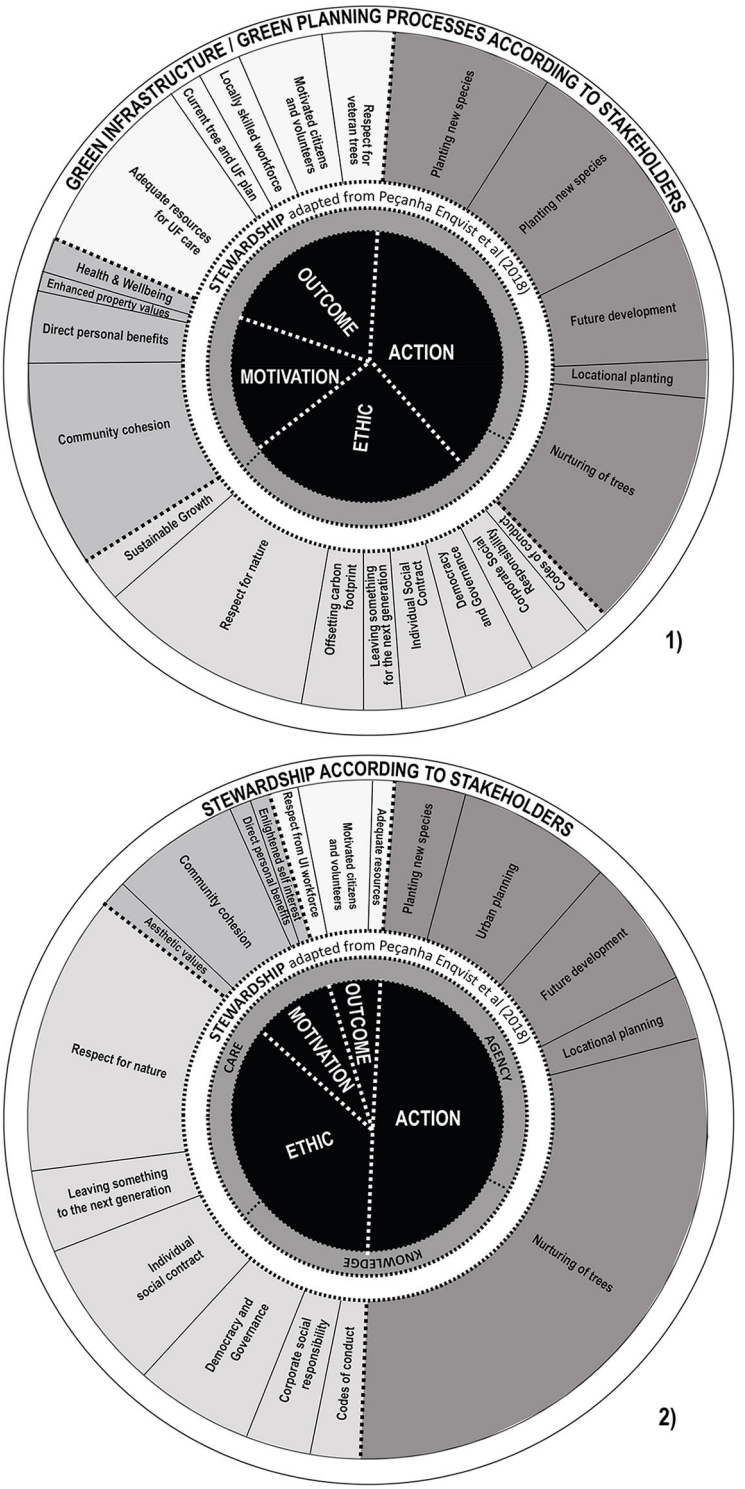

Figure 7. (1) Proportion in which the four meanings of 'stewardship' are mentioned when referring to GI/GPP (2) Proportion in which the four meanings of 'stewardship' are mentioned in the definitions of 'stewardship' and of 'considering themselves a steward'. Figure prepared by the authors, adapted from Peçanha Enqvist *et al.* (2018).

concept in terms of stewardship. There are practice implications here, as it suggests that stewards are looking for actionable activities to undertake. Local government, including those responsible for community involvement in environmental/green projects clearly have a role in identifying 'tasks' that can be undertaken by volunteers that are of a practical nature. This is not new of course, but it confirms the necessity of capturing community and individual goodwill to the benefit of the local environment. It can also be interpreted that the current generation is not that different to earlier ones in 'wanting to do their bit'.

Also, to emerge as important was 'respect for nature'. This is an encouraging finding, as it suggests that stewards are not only motivated by human-centred factors but also by respect for the needs of biodiversity. Urban areas are known to be important refuges for biodiversity (USDA Southern Region 1990; Kabisch *et al*. 2016) and hence this finding is encouraging in terms of the sustenance of that. Another area for comment is 'community cohesion' which can be interpreted as including a range of shared activities that bring people closer together. There is arguably a link with another category 'individual social contract' too. Taken together both comments suggest there is a wish for people to work together for the benefit of their community.

In terms of urban planning, it is certainly the case that stewards see urban green infrastructure as important, although they are likely unfamiliar with the term outside of 'professional circles'. Unfamiliarity is certainly not the issue with 'trees' which are well understood and are a natural focal point for both urban professionals and citizens to work together on (or as was once seen, but now resolved in Sheffield, as a basis for conflict). Careful communications and an understanding of the importance of trees are messages that can be drawn from this study. Stewards are also natural allies when it comes to resources; for instance, volunteers at the community level are a resource to be encouraged and whilst there is a cost to servicing local needs this delivers more than 'green benefits' but also 'social cohesion'. Stewards are also allies when it comes to fighting for limited resources by lobbying politicians, tactical voting in elections, social media campaigning and creating a media storm when change is needed.

Several discussion points emerged from the impact factors which were sourced from the questionnaires. In respect of COVID-19, it is noted that this led to a downward trend in volunteering, not least as many volunteers are older and were most concerned about their vulnerability to the virus. Furthermore, this same group lacked confidence in using digital tools such as ZOOM to continue their engagement. Whilst COVID-19 measures have relaxed, this concern could re-emerge if new variants of COVID-19 prove to be more virulent leading to cyclical rises and declines amongst older volunteers as the pandemic waxes and wanes. In respect of climate, the view seems to be that people are growing in confidence and being more vocal on this issue. Respondents identified that there is a focus and new resources for tree planting but not for the management of existing trees. This is a key long-term dilemma and not a new one either. As new tree plantings mature the need moves inexorably towards tree management with associated costs and an increased need for specialist arboricultural and forestry skills. The question of whether local authorities, central government or private actors can engage with this dilemma remains open. It is also the case that people seem to be more aware of local issues when it comes to green infrastructure and urban forestry than national policies and strategies. This suggests that there will remain a long term 'key actor' role for local authorities into the future.

New urban development remains widely seen as destructive rather than constructive when it comes to green planning issues and certainly not conducive to green infrastructure. The extent to which this is true is beyond the scope of this study, but for those engaged in planning new development is surely a concern that the view 'at large' sees new development as negative rather than a positive 'opportunity'. Finally, we were surprised to find that a substantial percentage of respondents saw community involvement (23%) as having a negative impact. This is not insignificant and suggests that there are actors who prefer to operate independently and without constrained freedom of actions.

6. Conclusions

This study has identified planning perspectives arising from stewardship of green infrastructure in England through an investigation of urban trees. The findings lead us to conclude that issues of stewardship of urban trees/urban forests is more complex than a single issue and depends on multiple actors and local factors. We also found that the meanings of 'stewardship', as proposed by Peçanha Enqvist *et al.* (2018), provide a useful framework to understand the interests and roles that multiple actors adopt.

For instance, regarding the 'Motivation' of individual citizens, the direct benefits to health and wellbeing are among the different motivations that drive stewardship actions. Hence, those developing local strategies for green infrastructure or more widely any green planning process could use the stewardship model to develop interventions and mechanisms for direct volunteer engagement by stressing how health and well-being benefits will arise.

Members of society recognise that they have responsibilities (or 'Ethics') to wider society that are greater than that linked to their individual wellbeing, albeit the two are not entirely separate in any case. This is manifested by a desire to respect nature through conservation, protection and intervention measures but also through a social contract incorporating democracy and governance through community engagement. It does, however, lead to resistance to changes that endanger nature, as seen by the campaign against tree loss in Sheffield, or more generically by resistance to new development more so when this is seen as locally disruptive to nature and people.

When it comes to 'Outcomes' there is a sense that adequate resources for urban forestry/green infrastructure care are needed and an expectation that monies will be provided for this. Normally this is through the 'public purse', but this might be a soft issue should private operators be prepared to invest. This is known to be a cause for concern in local authorities where mechanisms such as S106 agreements can fund new tree planting, but which eventually fall back on local authority budgets when the trees reach the management stage. Indeed, most developers want to develop and 'move on', hence there is a need for a long-term mechanism to secure resources. This is not only related to trees but also other green networks and types, such as wildflower meadows which also have specific management needs. The need for skills is also relevant here not only to ensure that volunteers are adequately trained and competent but also paid employees. Judging by the salaries offered, the practical nature of employment in the green infrastructure sector has erroneously been seen as low-skilled but is highly skilled, especially when it comes to arboriculture and ecological management.

According to stakeholders, 'Actions' were the most important element when defining 'stewardship', mentioning the nurturing of trees, the role of present and future

urban planning and the dichotomy between planting new trees vs protecting veteran trees. Locational planning is clearly a highly charged action when it comes to new development allocations. Recognising this, local planning authorities would be advised to move beyond the noble process of community consultation to a higher level of community engagement, especially in the design and management stages of any new development to ensure that there is a substantial majority prepared to engage with, and be enthused by, new elements of green infrastructure provided through that development. Essentially, this could be described as 'foresight' rather than 'hindsight' in green planning processes.

Finally, in the specific area of urban forestry in England, we propose that to ensure a co-stewardship role planning professionals and citizens should work together at all levels of local policy making and planning to identify key roles and stewardship niches that are complementary. We further recommend that an ecosystem services/social science framework be used by planning authorities rather than relying principally on arboricultural management and spatial approaches. Also, in the present resource-limited environment, stewardship offers a number of ongoing planning and management benefits. These include the role of motivated citizens acting as local advocates, potential recruitment of volunteer partners in management tasks and raising additional funds through fundraising for local nature-based interventions. Whilst some stewardship can be self-starting and self-perpetuating, the potential can be further enhanced by direct engagement between public authorities both with already active stewards but also securing the interest of new ones. Given the short funding cycles in public organisations, stewardship can offer longer term oversight, care and management.

Funding

This contribution was supported by the Project 'Perspectives on 'Stewardship' in Green Planning Processes viewed through an investigation of urban tree management in the UK, funded by the David Robbins Fund for Urban Planning Research (Newcastle University). This study is also part of the project "The Peri-urban Landscape of Madrid: Views from the memory to the new city" (June 2020 - May 2024), reference PID2019-110693RB-I00), of the Ministry of Science and Innovation, and the State Research Agency (doi: 10.13039/501100011033), for which we are grateful for its funding.

References

Arnouts, Rikke, Mariëlle van der Zouwen, and Bas Arts. 2012. "Analysing Governance Modes and Shifts: Governance Arrangements in Dutch Nature Policy." *Forest Policy and Economics* 16 (March): 43–50. doi:10.1016/j.forpol.2011.04.001.

Benedict, M. A., and E. D. McMahon. 2006. *Green Infrastructure: Linking Landscapes and Communities* Washington, DC: Island Press.

Benedict, Mark, and Edward MacMahon. 2002. "*Green Infrastructure: Smart Conservation for the 21st Century*." *Renewable Resources Journal* 20: 12–17.

Bergin, Michael. 2011. "NVivo 8 and Consistency in Data Analysis: Reflecting on the Use of a Qualitative Data Analysis Program." *Nurse Researcher* 18 (3): 6–12. doi:10.7748/nr2011.04.18.3.6.c8457.

Bieling, Claudia, and Tobias Plieninger. 2017. *The Science and Practice of Landscape Stewardship*. Cambridge: Cambridge University Press. doi:10.1017/9781316499016.

Breger, Benjamin S., Theodore S. Eisenman, Madison E. Kremer, Lara A. Roman, Deborah G. Martin, and John Rogan. 2019. "Urban Tree Survival and Stewardship in a State-Managed Planting Initiative: A Case Study in Holyoke, Massachusetts." *Urban Forestry & Urban Greening* 43 (July): 126382. doi:10.1016/j.ufug.2019.126382.

Brown, Jessica, and Brent Mitchell. 2000. "The Stewardship Approach and Its Relevance for Protected Landscapes." *The George Wright Forum* 17 (1): 70–79. doi:10.2307/43597664.

Burden, Dan. 2006. "Urban Street Trees: 22 Benefits Specific Applications," 21. http://www.walkable.org/download/22_benefits.pdf.

Burn, Chris. 2019. "Sheffield Council Blames 'Exceptional Pressure' in Apology for Misleading Residents over Tree-Felling Work." *The Yorkshire Post*, 2019. https://www.yorkshirepost.co.uk/news/sheffield-council-blames-exceptional-pressure-in-apology-for-misleading-residents-over-tree-felling-work-1-9619446/amp?__twitter_impression=true&fbclid=IwAR0pLyhtQQ-wnDCRRvbDbw9hHWuA2NmW1S2xZFbJYvzE-26pKwPFtr2ggKQ.

Byrne, Jason. 2017. "Urban Parks, Gardens and Green Space." In *The Routledge Handbook of Environmental Justice*, 1st ed., edited by Ryan Holifield, Jayajit Chakraborty, and Gordon Walker, 437–448. London: Routledge. doi:10.4324/9781315678986.

Cariñanos, Paloma, and Manuel Casares-Porcel. 2011. "Urban Green Zones and Related Pollen Allergy: A Review. Some Guidelines for Designing Spaces with Low Allergy Impact." *Landscape and Urban Planning* 101 (3): 205–214. doi:10.1016/j.landurbplan.2011.03.006.

Cariñanos, Paloma, Manuel Casares-Porcel, and Jose Manuel Quesada-Rubio. 2014. "Estimating the Allergenic Potential of Urban Green Spaces: A Case-Study in Granada, Spain." *Landscape and Urban Planning* 123 (March): 134–144. doi:10.1016/j.landurbplan.2013.12.009.

Cariñanos, Paloma, Filipa Grilo, Pedro Pinho, Manuel Casares-Porcel, Cristina Branquinho, Nezha Acil, María Beatrice Andreucci, et al. 2019. "Estimation of the Allergenic Potential of Urban Trees and Urban Parks: Towards the Healthy Design of Urban Green Spaces of the Future." *International Journal of Environmental Research and Public Health* 16 (8): 1357. doi:10.3390/ijerph16081357.

Carmichael, Christine E., and Maureen H. McDonough. 2018. "The Trouble with Trees? Social and Political Dynamics of Street Tree-Planting Efforts in Detroit, Michigan, USA." *Urban Forestry & Urban Greening* 31 (April): 221–229. doi:10.1016/j.ufug.2018.03.009.

Castle, Stephen. 2018. 2018. "Toxic Tea and Other Tales From an English Tree War - The New York Times." *The New York Times*, https://www.nytimes.com/2018/03/13/world/europe/uk-sheffield-trees.html.

Cohen, Shaul E. 2004a. *Planting Nature: Trees and the Manipulation of Environmental Stewardship in America*. Berkeley: University of California Press. http://www.sciencedirect.com/science/article/pii/S1618866705000385.

Cohen, Shaul E. 2004b. *Trees and the Manipulation of Environmental Stewardship in America*. 1st ed. Berkeley: University of California Press. http://www.jstor.org/stable/10.1525/j.ctt1pp1z3.

Commission on Global Governance. 1995. "Our Global Neighborhood: The Report." Oxford: Oxford University Press. http://sovereignty.net/p/gov/gganalysis.htm.

Connolly, James J., Erika S. Svendsen, Dana R. Fisher, and Lindsay K. Campbell. 2013. "Organizing Urban Ecosystem Services through Environmental Stewardship Governance in New York City." *Landscape and Urban Planning* 109 (1): 76–84. doi:10.1016/j.landurbplan.2012.07.001.

Conway, Tenley M. 2016. "Tending Their Urban Forest: Residents' Motivations for Tree Planting and Removal." *Urban Forestry & Urban Greening* 17 (June): 23–32. doi:10.1016/j.ufug.2016.03.008.

Conway, Tenley M., Tooba Shakeel, and Joanna Atallah. 2011. "Community Groups and Urban Forestry Activity: Drivers of Uneven Canopy Cover?" *Landscape and Urban Planning* 101 (4): 321–329. doi:10.1016/j.landurbplan.2011.02.037.

Dalton, Jane. 2018. "Councils Could Be Banned from Felling Trees without Consulting Locals after Three Years of Sheffield Protests." *The Independent*, 30 December 2018. https://www.independent.co.uk/news/uk/home-news/trees-councils-fell-chop-down-residents-rights-urban-areas-michael-gove-a8703546.html.

Davies, Clive, Rieke Hansen, Emily Rall, Stephan Pauleit, Raffaele Lafortezza, Yole De Bellis, Artur Santos, and Ivan Tosics. 2015. *Green Infrastructure Planning and Implementation: The Status of European Green Space Planning and Implementation Based on an Analysis of Selected European Cityregions*. Green Surge Project. https://www.researchgate.net/publication/273654142_Green_Infrastructure_Planning_and_Implementation_-_The_status_of_European_green_space_planning_and_implementation_based_on_an_analysis_of_selected_European_city-regions#fullTextFileContent.

Dillen, Sonja, Sjerp de Vries, Peter Groenewegen, and Peter Spreeuwenberg. 2012. "Greenspace in Urban Neighbourhoods and Residents' Health: Adding Quality to Quantity." *Journal of Epidemiology and Community Health* 66 (6): E 8. doi:10.1136/jech.2009.104695.

Dinnie, E., K. M. Brown, and S. Morris. 2013. "Community Cooperation and Conflict: Negotiating the Social Well-Being Benefits of Urban Greenspace Experiences." *Landscape and Urban Planning* 118: 103–111. doi:10.1016/j.landurbplan.2013.07.011.

Drury, Colin. 2018. "Sheffield's Tree Massacre: How Locals Battled to Protect Europe's Greenest City." *The Independent*, 18 April 2018. https://www.independent.co.uk/news/long_reads/sheffield-tree-massacre-parks-green-city-spaces-felling-street-council-yorkshire-a8286581.html.

Dunn-Johnston, Kristina A., Jürgen Kreuzwieser, Satoshi Hirabayashi, Lyndal Plant, Heinz Rennenberg, and Susanne Schmidt. 2016. "Isoprene Emission Factors for Subtropical Street Trees for Regional Air Quality Modeling." *Journal of Environmental Quality* 45 (1): 234–243. doi:10.2134/jeq2015.01.0051.

Edwards, David. 2006. "Social and Cultural Values Associated with European Forests in Relation to Key Indicators of Sustainability EFORWOOD D2.3.1." https://efi.int/publications-bank/social-and-cultural-values-associated-european-forests-relation-key-indicators.

Elahi, Farah, Nissa Finney, and Kitty Lymperopoulou. 2017. "Bristol: A City Divided ?" *Centre on Dynamics of Ethnicity*. https://www.runnymedetrust.org/uploads/CoDE Briefing Bristol v2.pdf.

European Commission. 2015. *Towards an EU Research and Innovation Policy Agenda for Nature-Based Solutions & Re-Naturing Cities. Final Report of the Horizon 2020 Expert Group on "Nature-Based Solutions and Re-Naturing Cities."* Luxembourg: Publications Office of the European Union. doi:10.2777/479582.

European Commission. 2013. "Green Infrastructure (GI) Enhancing Europe's Natural Capital." *Communication from the Commission to the European Parliament, the European Economic Council, the European Economic and Social Committee and the Committee of the Regions*. Brussels: European Commission. https://www.eea.europa.eu/policy-documents/green-infrastructure-gi-2014-enhancing.

FAO. 2016. *Guidelines on Urban and Peri-Urban Forestry*, by F. Salbitano, S. Borelli, M. Conigliaro *and* Y. Chen. http://www.fao.org/3/a-i6210e.pdf.

Flick, Uwe. 2004. "Investigación Cualitativa: Relevancia, Historia y Rasgos." Ch 1. in *Introducción a La Investigación Cualitativa*, 15–28. doi:10.1157/13068212.

García-Lamarca, Melissa, Isabelle Anguelovski, and Kayin Venner. 2022. "Challenging the Financial Capture of Urban Greening." *Nature Communications* 13: 7132. doi:10.1038/s41467-022-34942-x.

Goodier, M., and K. Davis. 2019. "Bristol Named among UK's Most Hipster Places Based on Google Searches." *Bristol Live*, 13 April 2019. https://www.bristolpost.co.uk/news/bristol-news/bristol-named-among-uks-most-2756848.

Gulsrud, Natalie, Kelly Hertzog, and Ian Shears. 2018. "Innovative Urban Forestry Governance in Melbourne?: Investigating 'Green Placemaking' as a Nature-Based Solution." *Environmental Research* 161: 158–167. doi:10.1016/j.envres.2017.11.005.

Gundersen, Vegard, and Kirsi Mäkinen. 2009. "Aldo Leopold and Stewardship: Lessons for Forest Planning and Management in the Nordic Countries?" *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography* 63 (4): 225–232. doi:10.1080/00291950903368334.

Hansen, Rieke, Emily Rall Lorance, Rolf Werner, and Pauleit Stephan. 2017. "Urban Green Infrastructure Planning a Guide for Practitioners." *Green Surge* 1 (September): 94. doi:10.13140/RG.2.2.10100.86406.

Hastie, Chris. 2003. "The Benefits of Urban Trees." https://www.naturewithin.info/UF/TreeBenefitsUK.pdf.

Hauru, Kaisa, Aki Niemi, and Susanna Lehvävirta. 2012. "Spatial Distribution of Saplings in Heavily Worn Urban Forests: Implications for Regeneration and Management." *Urban Forestry & Urban Greening* 11 (3): 279–289. doi:10.1016/j.ufug.2012.03.004.

James, P., K. Tzoulas, M. D. Adams, A. Barber, J. Box, J. Breuste, T. Elmqvist, et al. 2009. "Towards an Integrated Understanding of Green Space in the European Built Environment." *Urban Forestry & Urban Greening* 8 (2): 65–75. doi:10.1016/j.ufug.2009.02.001.

Jones, Owain, and Paul Cloke. 2002. *The Place of Trees and Trees in Their Place*. New York: Routledge.

Kabisch, Nadja, Niki Frantzeskaki, Stephan Pauleit, Sandra Naumann, McKenna Davis, Martina Artmann, Dagmar Haase, et al. 2016. "Nature-Based Solutions to Climate Change Mitigation and Adaptation in Urban Areas: Perspectives on Indicators, Knowledge Gaps, Barriers, and Opportunities for Action." *Ecology and Society* 21 (2): 51–64. doi:10.1007/978-3-319-56091-5.

Kardan, Omid, Peter Gozdyra, Bratislav Misic, Faisal Moola, Lyle J. Palmer, Tomáš Paus, and Marc G. Berman. 2015. "Neighborhood Greenspace and Health in a Large Urban Center." *Scientific Reports* 5: 11610. doi:10.1038/srep11610.

Keping, Yu. 2018. "Governance and Good Governance: A New Framework for Political Analysis." *Fudan Journal of the Humanities and Social Sciences* 11 (1): 1–8. doi:10.1007/s40647-017-0197-4.

Kim, Kyung A., Kyu-Young Han, and Jun Han Kim. 2015. "Changing Green Space Governance for Urban Regeneration: A Transition Perspective on Urban District Parks in Seoul." *In True Smart and Green City? 8th Conference of the International Forum on Urbanism* 012: 339–353. doi:10.3390/ifou-c012.

Krasny, Marianne E., Sarah R. Crestol, Keith G. Tidball, and Richard C. Stedman. 2014. "New York City's Oyster Gardeners: Memories and Meanings as Motivations for Volunteer Environmental Stewardship." *Landscape and Urban Planning* 132: 16–25. doi:10.1016/j.landurbplan.2014.08.003.

Lawrence, Anna, Rik De Vreese, Mark Johnston, Cecil C. Konijnendijk van den Bosch, and Giovanni Sanesi. 2013. "Urban Forest Governance: Towards a Framework for Comparing Approaches." *Urban Forestry & Urban Greening* 12 (4): 464–473. doi:10.1016/j.ufug.2013.05.002.

Livesley, S., G. McPherson, and Carlo Calfapietra. 2016. "The Urban Forest and Ecosystem Services: Impacts on Urban Water, Heat, and Pollution Cycles at the Tree, Street, and City Scale." *Journal of Environmental Quality* 45 (1): 119–124. doi:10.2134/jeq2015.11.0567.

Lyytimäki, Jari. 2017. "Disservices of Urban Trees." In *Routledge Handbook of Urban Forestry*, edited by Francesco Ferrini, Cecil C. Konijnendijk van den Bosch and Alessio Fini, 164–176. London and New York: Routledge. doi:10.4324/9781315627106-12.

MacKenzie, Andrew, Leonie J. Pearson, and Craig J. Pearson. 2019. "A Framework for Governance of Public Green Spaces in Cities." *Landscape Research* 44 (4): 444–457. doi:10.1080/01426397.2018.1444153.

Martinsson, Karl, Damien Gayle, and Niamh McIntyre. 2022. "Funding for England's Parks down £330m a Year in Real Terms since 2010." *The Guardian*, 23 August 2022.

Maxwell, Joseph A., and L. Earle Reybold. 2015. "Qualitative Research." In *International Encyclopedia of the Social & Behavioral Sciences:* Second Edition, 685–689. London: Elsevier. doi:10.1016/B978-0-08-097086-8.10558-6.

Mell, Ian. 2013. "Can You Tell a Green Field from a Cold Steel Rail? Examining the 'Green' of Green Infrastructure Development." *Local Environment* 18 (2): 152–166. doi:10.1080/13549839.2012.719019.

Moon, Katie, and Deborah Blackman. 2014. "A Guide to Understanding Social Science Research for Natural Scientists." *Conservation Biology: The Journal of the Society for Conservation Biology* 28 (5): 1167–1177. doi:10.1111/cobi.12326.

Mullaney, Jennifer, Terry Lucke, and Stephen J. Trueman. 2015. "A Review of Benefits and Challenges in Growing Street Trees in Paved Urban Environments." *Landscape and Urban Planning* 134 (February): 157–166. doi:10.1016/j.landurbplan.2014.10.013.

Newcastle City Council. 2018a. "Trees, Landscaping and Development SPD SCOPING REPORT." https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/planning-and-buildings/planning-policy/trees_landscaping_and_development_spd_scoping_report.pdf.

Newcastle City Council. 2018b. "Trees Newcastle. Newcastle City Council Tree Strategy 2018-2023." Newcastle Upon Tyne. https://www.letstalknewcastle.co.uk/files/2018_08_Appendix_1_Revised_Tree_Strategy.pdf.

Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*." Cambridge: Cambridge University Press.

Owino, F. O. 2016. "Urban Green Space Planning as a Strategy for Transformation of Ecotourism in Kisumu City." PhD Thesis (Unpublished), Jaramogi Oginga Odinga, University of Science and Technology.

Pauleit, Stephan, Rieke Hansen, Emily L. Rall, Werner Rolf, and Martina van Lierop. 2020. "Green Infrastructure for the City of the Future. Perspectives from Europe." *Working Papers*. Bologna: Centro nazionale di studi per le politiche urbane.

Peçanha Enqvist, Johan, Simon West, Vanessa A. Masterson, L. Jamila Haider, Uno Svedin, and Maria Tengö. 2018. "Stewardship as a Boundary Object for Sustainability Research: Linking Care, Knowledge and Agency." *Landscape and Urban Planning* 179: 17–37. doi:10.1016/j.landurbplan.2018.07.005.

Perkins, Harold A. 2011. "Gramsci in Green: Neoliberal Hegemony through Urban Forestry and the Potential for a Political Ecology of Praxis." *Geoforum* 42 (5): 558–566. doi:10.1016/j.geoforum.2011.05.001.

Phillips, Louise. 2013. *Knowledge and Power in Collaborative Research: A Reflexive Approach*. New York: Routledge. https://www.routledge.com/Knowledge-and-Power-in-Collaborative-Research-A-Reflexive-Approach/Phillips-Kristiansen-Vehvilainen-Gunnarsson/p/book/9781138920613.

Raymond, Christopher M., Berry Pam, Margaretha Breil, Mihai R. Nita, Nadja Kabisch, Mark de Bel, Vera Enzi, et al. 2017. "An Impact Evaluation Framework to Support Planning and Evaluation of Nature-Based Solutions Projects. An EKLIPSE Expert Working Group Report." Wallingford, UK doi:10.13140/RG.2.2.18682.08643.

Rolls, Sophie, and Tim Sunderland. 2014. "Microeconomic Evidence for the Benefits of Investment in the Environment - Review." *Natural England Research Reports* Number 057 2: 79. http://publications.naturalengland.org.uk/publication/6692039286587392.

Roman, Lara A., Lindsey A. Walker, Catherine M. Martineau, David J. Muffly, Susan A. MacQueen, and Winnie Harris. 2015. "Stewardship Matters: Case Studies in Establishment Success of Urban Trees." *Urban Forestry & Urban Greening* 14 (4): 1174–1182. doi:10.1016/j.ufug.2015.11.001.

Rotherham, Ian, and Matthew Flinders. 2019. "No Stump City: The Contestation and Politics of Urban Street-Trees: A Case Study of Sheffield." *People, Place and Policy Online* 12 (3): 188–203. doi:10.3351/ppp.2019.8283649746.

Sabariego, Marta. 2018. "Análisis de Datos Cualitativos a Través Del Programa NVivo 11 PRO Dosier 1. Tutorial Del Programa." http://www.provalisresearch.com/index.html.

Santo-Tomás Muro, Rocío. 2021. *Urban Green Infrastructure in Madrid: Techniques of Perceptive Analysis of Landcape in the Contour of the City*." Madrid: Universidad San Pablo CEU.

Santo-Tomás Muro, Rocío, Carlota Sáenz de Tejada Granados, and Eva J. Rodríguez Romero. 2020. "Green Infrastructures in the Peri-Urban Landscape: Exploring Local Perception of Well-Being through 'Go-Alongs' and 'Semi-Structured Interviews.'" *Sustainability* 12 (17): 6836. doi:10.3390/su12176836.

Schettini, Patricia, and Inés Cortazzo. 2015. "*Análisis de Datos Cualitativos En Investigación Social*." Buenos Aires: Procedimientos y Herramientas Para La Interpretacion Cualitativa.

Song, Xiao Ping, Puay Yok Tan, Peter Edwards, and Daniel Richards. 2018. "The Economic Benefits and Costs of Trees in Urban Forest Stewardship: A Systematic Review." *Urban Forestry & Urban Greening* 29: 162–170. doi:10.1016/j.ufug.2017.11.017.

Strauss, Anselm, and Juliet Corbin. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd Ed. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd Ed. Vol. 31. Thousand Oaks, CA: Sage Publications, Inc. doi:10.1177/1350507600314007.

Svendsen, Erika S., and Lindsay K. Campbell, Lindsay K. Campbell. 2008. "Urban Ecological Stewardship: Understanding the Structure, Function and Network of Community-Based Urban Land Management." *Cities and the Environment* 1 (1): 1–31. doi:10.15365/cate.1142008.

Swanwick, Carys, Nigel Dunnett, and Helen Woolley. 2003. "Nature, Role and Value of Green Space in Towns and Cities: An Overview." *Built Environment* 29 (2): 94–106. doi:10.2148/benv.29.2.94.54467.

USDA Southern Region. 1990. *Benefits of Urban Trees: Urban and Community Forestry, Improving Our Quality of Life*. Forestry Report R8-FR 71. United States Department of Agriculture Southern Region. http://www.efaidnbmnnnibpcajpcglclefindmkaj/http://www.sci-links.com/files/Benefits_of_Urban_Trees.pdf.

Vogt, Jess, Richard J. Hauer, and Burnell C. Fischer. 2015. "The Costs of Maintaining and Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature." *Arboriculture & Urban Forestry* 41 (6): 293–323. doi:10.48044/jauf.2015.027.

Wolf, Kathleen L. 2005. "Trees in the Small City Retail Business District: Comparing Resident and Visitor Perceptions." *Journal of Forestry* 103 (8): 390–395. doi:10.1093/jof/103.8.390.

Ylikoski, Petri, and Julie Zahle. 2019. "Case Study Research in the Social Sciences." *Studies in History and Philosophy of Science* 78 (December): 1–4. doi:10.1016/J.SHPSA.2019.10.003.

Young, Celeste, Roger Jones, John Symons, Renee Walton, Emily Boucher, Ian Shears, John Milkins, et al. 2014. *Investing in Growth: Understanding the Value of Green Infrastructure*. Melbourne: Victoria University. https://www.vu.edu.au/sites/default/files/cses/pdfs/investing-in-growth-workshop-report-visesccwp22.pdf.