Forest Research

Trees and Woods in Scottish Towns: The role of Local Authorities

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Contents

List of Tables

Summary

Forest Research (FR) was commissioned to provide a snapshot of the state of urban tree management by local authorities in Scotland in a study entitled Trees and Woods in Scottish Towns (TWIST). Research themes were identified in partnership with a steering group comprising members of Forestry Commission Scotland, Arboricultural Association and several Scottish local authorities. To address these, FR carried out interviews with tree officers from nine local authorities, focusing on tree management in specific towns, examining tree stock of varying size and age; and analysing relevant documents such as tree strategies. This was supplemented with a short survey distributed to all 32 Scottish local authorities (response rate: 69%).

The findings paint a sobering picture of the state of urban tree management in Scotland. Trees often tend to be perceived as a liability, not as an asset, resulting in reactive – rather than proactive - tree management. Data on trees is limited, incomplete and difficult to access. Budgets, already experienced as inadequate, are dwindling further; staff are not always appropriately qualified; and their organisations are not always supportive.

Some positive examples are highlighted, and opportunities to address the status quo are identified, for example improving data, learning from success, involving communities in urban trees and woodland management and enhancing socio-economic valuations of trees and woodlands.

1. Introduction

Good urban tree management needs up-to-date tree data, a strategy and management plans and skilled staff. This study was commissioned to take stock of current information on urban tree resources and management by local authorities (LAs). As the first such study in Scotland it provides a brief overview of the issues, focusing on lessons from best practice, constraints and priorities for further work.

LAs are key stakeholders in urban forestry for the following reasons:

- They hold responsibility for planning and development
- They are elected representatives, and the most local level of executive government in Scotland
- They are major landowners in many Scottish cities.

A review of relevant literature and in particular the substantial Trees in Towns II study in England (Britt and Johnston 2008), combined with consultation with the steering group, highlighted a number of themes to be explored:

- Drivers and barriers in urban tree management
- Urban tree strategies and policies
- Impact of town size and age of tree stock on tree and woodland management
- Budgetary constraints and opportunities
- Urban tree inventory and inspection regime
- Management of heritage trees
- Trees with TPO-status and in conservation areas
- Statutory requirements
- Staff skills and expertise
- Data management and accessibility
- Public and private tree health.

To explore these themes we used three sources of information:

- Qualitative interviews with a sample of LAs focusing on specific towns of varying size and age of tree stock (see Table 1)
- Existing documentation on tree and woodland management (such as strategies and management plans).
- A short questionnaire distributed to all 32 LAs in Scotland, requesting information on:
  - tree/woodland (policy) documents
  - tree/woodland resources
  - tree/woodland data
  - community involvement.

A copy of the final questionnaire and cover letter can be found in Appendix 1. More information on the methods can be found in Appendix 2. An overview of all data tables and statistical analyses[1] used for reporting which have not been included in the main text of this report can be found in Appendix 3.

A total of 22 LAs (69%) returned the questionnaire (see Table 1). Of these, 15 (47%) provided us with complete data, including the three largest cities (Glasgow, Edinburgh and Aberdeen). Results from these combined methods provide information about (urban) tree management practice in 26 out of 32 Scottish LAs (81%) (see Table 1).

In the following report quotations from respondents are given in italics, but following professional guidelines and respecting their anonymity, we do not attribute individual quotations to specific LAs or staff.

[1] Given the relatively small number of data points and the high proportion of missing local authorities in many of the tests, results of statistical analyses may not be generalizable to Scotland as a whole.

Table 1. Overview of local authorities (LAs) providing different types of data (1 = *yes, 0 = no*) (% of all 32 Scottish LAs).

LA	Interview data (town)	Questionnaire data	Interview or questionnaire data
Aberdeen City	0	1	1
Aberdeenshire	0	1	1
Angus	0	1	1
Argyll & Bute[a]	0	1	1
Clackmannanshire	0	1	1
Dumfries & Galloway	0	0	0
Dundee City	1 (Dundee)	0	1
East Ayrshire	0	1	1
East Dunbartonshire	0	1	1
East Lothian	0	0	0
East Renfrewshire	0	1	1
Edinburgh, City of	0	1	1
Eilean Siar[a]	0	1	1
Falkirk[a,b]	0	1	1
Fife	1 (Glenrothes)	1	1
Glasgow City	1 (Glasgow)	1	1
Highland	0	1	1
Inverclyde	0	0	0
Midlothian	0	0	0
Moray	0	1	1
North Ayrshire[a]	0	1	1
North Lanarkshire	1 (Cumbernauld)	0	1
Orkney Islands	0	1	1
Perth & Kinross	1 [multiple towns]	1	1
Renfrewshire	0	0	0
Scottish Borders[a]	1 [multiple towns]	1	1
Shetland Islands	0	0	0
South Ayrshire	1 (Ayr)	0	1
South Lanarkshire[a]	0	1	1
Stirling	1 (Stirling)	1	1
West Dunbartonshire[a]	0	1	1
West Lothian	1 (Livingston)	0	1
Total	**9 (28%)**	**22 (69%)**	**26 (81%)**

N.B.: [a] = Only partial questionnaire data available; [b] = Questionnaire data derived from completed pilot questionnaire

2. Context

2.1. Who owns urban woods and trees in Scotland?

I've become increasingly aware that … we are losing street trees

Most of the LAs could provide some estimate of the total area of land covered by trees and woodland, but Stirling was the only one where this was informed by a full survey of all LA-owned trees. Information on how the urban woodland owned by the LA compared to the total urban woodland cover was lacking in most cases. One exception to this was Glasgow for which the woodland survey by the City Woodland Initiative indicates a resource of 1600 ha, equivalent to 64% of all urban woodlands, in LA ownership. In Dundee, 90-95% of all trees are in public ownership (if we include those owned by Health Trusts and Scottish Enterprise Tayside).

Other significant landowners managing trees mentioned in interviews and strategy documents include private individuals, Forest Enterprise Scotland, Network Rail, BEAR Scotland, Amey, and housing associations. The LA is responsible for management of its own trees and woodlands, and only intervenes in trees and woods owned by others when planning or tree preservation issues are concerned.

Three new towns (i.e., Cumbernauld, Glenrothes and Livingston) were included in the interviewing sample and represent a special case where a significant proportion of the urban woodlands is owned and managed by NGOs (Scottish Wildlife Trust, Woodland Trust Scotland) or a subcontractor (e.g., The Green Belt Group). These woodlands were handed over to them by the respective Development Corporation. In Cumbernauld, for example, about half the woodlands were described as owned by Scottish Wildlife Trust, ('four big woodlands'), while the LA owns a similar area but consisting of smaller woodlands.

2.2. Drivers

Based on the interviews, three sets of drivers of LA tree and woodland management could be discerned:

- Statutory requirements
- Strategies and plans
- External support

2.2.1. Statutory requirements

Interviewed staff referred to the following statutory requirements of direct relevance to LA tree and woodland management:

- A duty of care under the Occupiers Liability (Scotland) Act 1960, which implies that LAs are required to take reasonable steps to ensure the safety of those passing by trees. However, this Act does not imply that the LA needs to guarantee tree safety nor does it impose a requirement on the LA to survey each and every tree in a town. In addition, guidance has been produced by the Health & Safety Executive (HSE) on "Management of Risk from Falling Trees"
- A duty to make Tree Preservation Orders (TPOs) on trees with high amenity value if deemed necessary, which is advised by the Town and Country Planning (Scotland) Act 1997
- A duty to improve conservation of biodiversity under the Nature Conservation (Scotland) Act 2004
- A duty to contribute to reducing carbon emissions under the Climate Change (Scotland) Act 2009
- A duty to prepare a local plan to minimize flood risk under the Flood Risk Management (Scotland) Act 2009 in which trees are likely to play a role
- A duty to ensure health and safety in relation to trees next to roads under the Roads (Scotland) Act 1984.

Apart from the duty of care and the duty to make TPOs, the above statutes are not highly prescriptive in regard to their implications concerning urban tree management. This has resulted in variation between LAs in the extent to which the four latter statutory requirements inform actual tree and woodland management.

Interviewees felt that the strongest driver for LAs to engage in tree inspections and woodland management is an increasing concern by senior management over public safety in relation to trees. They indicated that trees are often very close to houses and windthrow has increased markedly over the last few years. Several interviewees referred to a case in which Birmingham City Council was successfully prosecuted by the Health and Safety Executive for breach of the Health and Safety at Work Act. The case involved a mature tree which fell in a storm on 3 December 1999, killing three people in their cars. The Council was fined and served notice to improve its systems to provide suitable and sufficient routine inspection, including identifying all trees and woodland, procure competent advisors as necessary, and carry out and record necessary remedial actions (BBC News, 2002; Hazell, 2014).

These statutory requirements are the starting point for all LA tree management, and some interviewed staff felt that they provide a real opportunity:

Just now is a golden moment, we have a Biodiversity Duty, we have the Climate Change Act, we have the requirement to reduce carbon. Woodlands could be seen as a carbon sink, woodlands should be seen as a means to undertaking our climate change duty, so there are two legal requirements now that we could start to peg things onto and we can peg woodland into being an item that would help deliver on both of those legal requirements.

2.2.2. Strategies and plans

The Town and Country Planning (Scotland) Act 1997, as amended by the Planning etc. (Scotland) Act 2006, requires LAs to prepare a development plan for their area, and update it every five years. Local Development Plans (LDPs) provide the vision for how communities will grow and develop in the future. These development plans include information on the planning and protection of trees. This is informed by national policy guidance on Trees and Woodlands described in the Scottish Planning Policy (SPP). Where relevant, this might also be informed by the spatial vision for Scotland outlined in the National Planning Framework 2 (NPF2), Strategic Development Plans, Planning Advice Notes (PANs) and Circulars. The Scottish Government has produced guidance ("The Right Tree in the Right Place" (Forestry Commission Scotland, 2010)) which encourages LAs to prepare a forestry and woodland strategy as a supplementary document to their Local Development Plan.

Some interviewees indicated that preparing a forestry and woodland strategy at local level is important in order to highlight the various benefits associated with urban woodlands, including climate change mitigation, flood prevention, supporting biodiversity and enhancing human well-being:

In that respect… if we had a strategy that could showcase the benefits and linkages between different things, then it is much easier for us to explain these things to other departments – because we've showcased the links, we have shown where the benefits are, where the relationships are, where the synergies are and where it would be of benefit for collaborative working. We then might have the ability to pool budgets and to work smarter, if we had the strategy, we would then be able to go for external funding.

Besides the contention that it allows for the allocation of additional funds to urban trees and woodlands, preparation of the woodland strategy might also be facilitated by the perception that it will improve the efficiency and consistency of communication with the public around tree-related matters and provides guidance to private landowners.

In addition to checking with policy guidance prepared by the Scottish Government (see Section 2.2.1), many LAs also consulted other resources in preparing a trees and woodlands strategy. In relation to tree and woodland policy, interviewees had consulted guidance provided by:

- The Health & Safety Executive
- The National Tree Safety Group (The Common Sense Risk Management of Trees)
- The British Standards Institution (The British Standard - Code of Practice for Trees from Nursery to Landscape)
- The International Society for Arboriculture (Tree Risk Assessment Guidebook).

Some had also looked up examples of similar documents prepared by LAs in England.

Respondents noted that despite the wealth of relevant guidance, a gap with actual tree management remains:

> *It's getting professionals, other professionals to agree or even to recognise what the Arboricultural Association says. They've done some excellent work to help produce British Standards and so forth, but we're still not seeing it implemented at ground level, so not to say that they shouldn't continue to try, but what I would like to see, what tree officers like me want to see is a difference, a real difference, and it's very difficult…*

Other LA plans might also motivate the development of a strategic approach to urban tree and woodland management. Each LA is required by Planning Advice Note (PAN) 65 to prepare an Open Space Strategy towards strategic management of their outdoor environments. This will typically include a section on the management of trees. The Open Space Strategy is important because it is used to derive budgets for different LA activities related to the outdoor environment. Furthermore, it describes objectives and prioritised actions to meet these, such as the preparation of documents specific to (urban) trees and woodlands.

Under the Environmental Assessment Act 2005, LAs are required to apply a Strategic Environmental Assessment (SEA) to new plans, policies and programmes, to assess how these might impact on biodiversity, landscape, flora, and fauna. As a result, the benefits of trees and woodlands are increasingly being recognized in local plans, programmes and strategies (e.g., Corporate Plan, Community Plan). This policy tool has the potential for trees and woodlands to be considered more broadly across the LA.

Local governments are also obliged to engage in Single Outcome Agreements (SOAs) with national government, which are mutual agreements on what the LA will aim to achieve in terms of improving quality of life and opportunities of local people. These can include targets related to urban trees and woodlands.

2.2.3. External support

A different set of drivers is emerging to encourage a focus on proactive tree management. This takes the form of external grant schemes (e.g., Woods In and Around Towns (WIAT)[2], Central Scotland Green Network (CSGN)[3], Heritage Lottery Fund) that can be accessed to help improve the urban woodland specifically:

> *I can say, hand on heart, that the asset management would not have happened to anything like the extent it's happened if CSGN wasn't there. … CSGN in my view is an excellent grant system because it's light touch, it manages to cover a vast array of outcomes and leaves a lot to the imagination.*

Grants were recognized as a key policy tool for central government to exert influence over urban woodland management. In this regard, the WIAT programme was mentioned most frequently because it was a recent scheme that targeted urban woodland specifically. In general, there was high satisfaction regarding the impact of WIAT on improving urban woodland management as well as the greater value placed by Forestry Commission Scotland (FCS) on urban woodlands that it showcased.[4]

A drawback of relying on external funding, perceived by one of the interviewees, is that it does not guarantee improved woodland management in the long run:

> *Because the trouble with some of these* [sites] *is you can't go in and do them, even if it's something you'd like to do, because you're just worried if there's going to be too much wind blow afterwards. So that's probably one of the problems with these just being one-off'ers, you go in and you just have to go back, and you'd love to go in and take out half the trees, but you can't, because you'll end up with an awful lot*

[2] "The WIAT programme provides the focus for Forestry Commission Scotland's work on improving quality of life in towns and cities. … At its core, the programme retains the following objectives: Bringing neglected woodland into management; Creating new woodlands; Supporting people to use and enjoy their local woods." http://www.forestry.gov.uk/wiat

[3] "The Scottish Government's second National Planning Framework (NPF2) identifies the CGSN as one of only 14 National Developments, considered by Ministers to be essential elements of the strategy for Scotland's long term economic recovery and development. … It will comprise: A strategic network of woodland and other habitats, active travel routes, greenspace links, watercourses and waterways, providing an enhanced setting for development and other land uses and improved opportunities for outdoor recreation and cultural activity." http://www.centralscotlandgreennetwork.org/about

[4] In addition to the positive feedback regarding WIAT, some negative views were expressed regarding the scheme as well. Firstly, there was a desire for WIAT to include street trees, small strips of woodland or fragmented woodland, and to extend to smaller communities. In new towns, these smaller woodlands were described as provoking the most public queries and complaints, owing to their proximity to housing. Secondly, there was a need for improved guidance around submitting a WIAT bid.

> *falling over, and so it's just that gradual taking out of what you feel's safe to take out, and then hoping you'll get a grant in a few years' time.*

At least one LA was also successful in applying to the Scottish Rural Development Programme (SRDP) for urban woodland enhancement.

Proactive tree management, through facilitating the development of management plans, is in some cases also fostered by NGOs and Government Agencies with an interest in conservation. They achieve this through collaborating with LAs around maximizing the potential of urban trees and woodlands for purposes of access, amenity value and conservation. For example, the Dundee Trees and Woods in Greenspace (TWIG) project, aimed at coordinating the efforts of various stakeholders in managing the trees and woodlands of the city, involved a partnership between the LA, FCS, Scottish Natural Heritage (SNH) and Greenspace Scotland. Similarly, CSGN and associated local networks, such as Glasgow and Clyde Valley Green Network, provide support in developing policy and management documents relevant to urban trees and woodlands in Central Scotland.

Within the near future, another driver for proactive tree management is likely to become increased knowledge on tree numbers and characteristics, allowing for better insights into the (monetary) benefits that trees provide for a town, through proprietary valuation software.[5] Such data could be used to make the case for an increased urban tree budget in line with existing guidelines for asset management:

> *it will help us in terms of on the more strategic side, being able to demonstrate in pounds and pence, the value of this set of trees, of the urban forest…. For example … go to managers, the management and other folk in the council, to say "this is where we start, this is why it's important", because it allows them to measure.*

2.3. Barriers

Two factors which limit tree management were mentioned most frequently:

- Lack of resources
- Low levels of interest in trees at senior management level

The importance of urban trees and woodlands is not always appreciated by senior LA management, which may be related to cutbacks affecting woodland management over the last few decades:

[5] The names of software packages to assess socio-economic benefits of trees are not included here as this is considered commercially sensitive information.

> *… We previously had a parks department and again, through the financial constraints, services and departments have had to amalgamate and in so doing, the Parks department, which once had its own Director, has now gone from Director and a huge team to a manager underneath someone else. So we have become very much more diluted and we have less strength. Therefore, the importance and the value have been diminished, so the requirement for these things is not necessarily seen …. Because we are so diluted, the attention goes more onto play equipment or even summer bedding because that is a higher profile than the woodlands.*

Another barrier to tree management is a lack of communication and integration between departments. LAs include a large number of stakeholders with varying agendas, resulting in fragmentation of the knowledge and ideas about why a tree and woodland strategy might be relevant:

> *Part of our problem is that while I may know about Biodiversity Duty and Climate Change Duty, the Park Strategy Team probably doesn't know about it, the Planning department will not make the connections and our Operational side wouldn't necessarily.*

Undertaking tree surveys is also constrained by a fear of legal liability. Several respondents pointed out that, if a tree is inspected, the LA then needs to carry out any recommended work as soon as possible. The current perception is that if a tree incurs damage after a need for remedial works has been identified, but before action has been taken, the LA is most likely to be held accountable for the damage.

> *So you're actually safer not surveying than you are if you have. So what you should do is actually go out with a contractor, survey one tree, right do the work, right let's move to the next one. That's the safer way of doing it because if you end up with all this information and you don't do anything with it, you're goosed.*

3. Urban forestry documents

3.1. Purpose of documents

Where it exists, a trees and woodlands strategy outlines a vision and objectives for the woodland in the LA as a whole. These objectives are linked explicitly to relevant national and local policy guidance, statutory requirements and potential funding sources. The strategy may also showcase how the wider environmental, social and economic benefits of the woodland could contribute towards meeting the objectives of other policy frameworks (e.g., Scottish Planning Policy, Climate Change Act). It thereby represents a local interpretation of national policy. Although the implementation of the strategy will be different for each individual woodland, strategy documents are typically prepared for the LA as a whole as supplementary guidance to the Local Development Plan. Interpretations of the strategy at woodland-level can be found in the woodland management plan.

A woodland management plan is a document that describes specific management recommendations (including a prioritisation of actions) for one or more woodlands. Some LAs have a large number of management plans for different woodlands, typically prepared in response to external funding bids. Others have one woodland management plan for the LA as a whole that encompasses recommendations for individual woodlands. These recommendations are typically derived from a combination of (non-tree specific) woodland survey information and relevant local and national policy guidance in relation to tree management. This information is usually included within the introduction of the management plan.

Good practice: *The wider social, economic and environmental benefits of trees are not always recognized by senior management. One respondent indicated that having tree and woodland specific documentation contributes to putting the management of these assets higher up the political agenda through improving councillor's awareness of these wider benefits. That is, information written down in an official document is more difficult to ignore than information disseminated face-to-face. The preparation of a strategy and urban tree management plan can therefore be highly relevant in increasing opportunities for proactive tree management within towns.*

3.2. Existence of urban forestry documents

The relevant survey questions are shown in Box 1.

Fewer than half of the LAs indicated having an existing trees and woodlands strategy, although several are in preparation and in total 64% have a draft or approved strategy.

Most of these have been produced at the level of the LA, and only a few are specific to individual towns or sites, or apply to an area larger than the LA.

Nearly all strategies have been adopted as policy and 44% of all strategies included funded actions.

The majority of strategies were launched in the past four years, possibly as a result of guidance provided through the publication of the "The Right Tree in the Right Place" by the Scottish Government (Forestry Commission Scotland, 2010) (see Section 2.2.2). Two thirds of all strategies make provision for revision in their strategy with an interval of approximately five years.

Box 1.

Strategies

Question A1: Respondents were asked to indicate if their local authority had any formal, committee-approved tree/woodland strategy or management plan(s). The response categories provided were: "yes", "no" and "in preparation".

Management plans

Question A2: Respondents were asked to provide some detail for each of the strategies and management plans that were currently implemented. They were asked to state: name of document, year of launch, if it was adopted as policy (yes or no – strategies only), the inclusion of funded actions (yes or no), the spatial scale of the document (town-/site-specific, local authority or region), provision for revision (yes or no), and if yes, the number of years between revision).

Of the 22 respondents to the survey, 12 (54%) have or are preparing management plans. Unlike strategies, management plans tend to be prepared at the level of the individual woodland, resulting in individual LAs having up to 38 management plans. Of those LAs with management plan(s), just over a third include funded actions in the document. Slightly over half of all LAs have stated a provision for revision in their management plans; the period between revisions is five years on average.

Statistical hypothesis testing indicates that LAs with tree management plan(s) tend to have a larger population than those without such management plans.

The interviews revealed that management plans are typically only prepared for medium to large woodlands. None of the interviewed LAs had included street trees as part of their management plan and in only one example was an effort made to incorporate privately owned woodland into the management plan.

Some interviewees indicated that management plans would probably be most effective if these take into account the town at/near which woodland is located because of pressures and needs specific to the local context. For example, a small town in a given LA might be more expensive to serve than a large town due to its remoteness, which requires operational staff to travel longer distances. Hence, for small towns, a higher investment of resources into volunteer engagement might be justified. However, only two LAs reported having implemented town-specific woodland management plans. In these cases, drivers included particularly high tree density close to houses and infrastructure.

Owing to resource constraints, woodland management plans are not always implemented:

> *… Due to timescale, we employed an outside consultant to come in and liaise with us and produce a series of detailed woodland management plans for 20/21 major woodland sites we've got. So that's been carried out and they're sitting waiting to be used in the next funding bid!*

In some cases, LAs prepared additional documentation to outline how to deal with enquiries and complaints around individual trees or to make explicit the LA's approach to risk management of trees (e.g., frequency of inspections based on location). This reduces the cost of staff time in dealing with public enquiries and improved tree safety. It also leads to a more consistent approach to dealing with trees within the LA.

Good practice: Public enquiries and complaints around urban trees tend to focus on tree-related nuisance (e.g., leaf litter, blockage of light, interference with satellite signal, broken branches etc.). A tree policy that outlines standardized responses to common enquiries and complaints can be an effective means of reducing tree officer time spent on dealing with enquiries and complaints. Based on the tree policy, FAQs to be put on the council website and scripts for the service helpdesk assistants can be prepared. In one council, it was reported that the tree policy at least halved the number of enquiries the tree officer had to deal with on an annual basis.

4. Tree and woodland data

4.1. Tree surveying

The relevant survey questions are shown in Box 2.

Box 2.

Question C1: Respondents were asked to indicate if, and how, different categories of trees and woodland (public open spaces, street trees, woodland, TPOs, education premises) had been surveyed by their LA within the past five years.

Question C6: Respondents were asked to provide the types of data that are publicly available and their means of access.

The majority of LAs have conducted a sample or partial survey of trees in public open spaces, streets and in woodlands in the past five years, while about half of all LAs have surveyed TPO-trees and trees on education premises over this period. Full surveys are much less common; up to a fifth of all LAs have recently carried out this type of survey across the different categories of trees and woodlands. The most surveyed is the "education premises" category for which about a quarter of LAs held recent survey data on all trees (see Table 2).

Table 2. Number of local authorities (LAs) carrying out tree surveying of different categories of trees and woodland, split by type of survey (% of LAs responding).

	Public open sp.	Street trees	Woodland	TPOs	Education premises
Full survey	3 (15%)	4 (20%)	3 (15%)	2 (11%)	5 (28%)
Partial survey	14 (70%)	10 (50%)	10 (50%)	6 (32%)	4 (22%)
Sample survey	0	2 (10%)	2 (10%)	1 (5%)	0
Total surveyed	**17 (85%)**	**16 (80%)**	**15 (75%)**	**9 (48%)**	**9 (50%)**
Not surveyed	3 (15%)	4 (20%)	5 (25%)	10 (53%)	9 (50%)
Total	**20 (100%)**	**20 (100%)**	**20 (100%)**	**19 (100%)**	**18 (100%)**

N.B.: The categories of trees/woodland provided is an abbreviated version of that used in the Trees in Towns II publication (Britt & Johnston, 2008).

There was strong variation in the level of surveying by LAs. Only one fifth of all LAs had carried out at least a partial survey across all five categories of trees and woodlands in the past five years; 10% had neither conducted a partial nor a full survey for any of the

categories of trees and woodlands. However, there was also one LA that indicated having full survey data across all five categories of trees and woodlands.

Most LAs share tree and woodland-related data with the public. TPO-data is most commonly available; it is shared by three quarters of all LAs and in most instances can be accessed on the LAs website. Survey information could be accessed by the public in a quarter of all cases; usually by contacting a member of staff. A small number of LAs also shares data on heritage trees on their website.

We tested for a relationship between the number of tree/woodland categories that are surveyed and available tree management budget. This revealed a strong, albeit not statistically significant, relationship.

The interviews revealed potential issues with tree data quality. In two cases in which full records of urban trees within a town were reported, trees had not been surveyed by professional tree assessors, which may have compromised the validity of data. Furthermore, recorded information was limited and did not include tree condition. This can be problematic because tree management is informed by available data:

> *I would like to be able to click on something and see what's been done, what needs to be done, do we need to replace trees, how many trees have died, all these kind of basic management procedures.*
>
> *I would love to do it* [an urban tree survey]*. I think it's an essential part of good arboriculture management, and it's one of the golden rules of asset management. Know what you have, and that is the baseline information for any asset management plan, and I would love to be in a position to commence an individual tree survey for each and every site that the Council owns outside of woodlands*
>
> *We're looking to see if there's any external funding to help us record up to two million trees in the city, at the present time on the computer we've only got about 7000 and we had a false start last month, where they gave me this new hardware and I collected about 700 trees on it and I handed it into IT to download and put in the system, to see how the software was recording it, they lost it all!*

The value of carrying out tree surveys is highlighted in an example from Glasgow (see Box 3). Although several respondents perceived their lack of a complete and/or valid tree inventory as a limitation, it was also pointed out that more knowledge would not necessarily lead to better management in view of ongoing budget cuts.

The interviews revealed that none of the LAs had data on individual private trees other than TPO-trees.

Box 3.

Case study: Outcomes of a street tree survey in Glasgow

Not unlike many other local authorities (LAs) in Scotland, street tree surveys have only been done to a very limited extent for the city of Glasgow. As a result, the LA was unaware of what, and how many, street trees it owned for a long period of time. To tackle this issue, Glasgow City Council and Central Scotland Green Network recently commissioned a pilot tree survey in four areas of the city. Illustrative for the importance of undertaking street tree surveys, the previously estimated number (c. 6000) of street trees within Glasgow differed by a factor of 12 from the current estimate based on extrapolating the findings of this study (c. 71,000 trees).

Apart from improved knowledge of the tree stock, another benefit of this study is that it led to the development of a database template that can be used towards recording tree data and provides an inspection timetable based on that information.

Being the subject of targeted management plans, LAs tend to have a better idea of woodland coverage than of street tree numbers. Glasgow, until recently, was no exception. In 2004/5, the City Woodland Initiative commissioned a survey of all Glasgow's woodlands. The City Woodland Initiative was a partnership between the LA, FCS, SNH and other NGOs. This identified over 1600 ha of urban woodland in Glasgow, of which approximately 64% is in LA ownership.

4.1.1. Tree inspections

The relevant survey question is shown in Box 4.

Box 4.

Question C4: Respondents were asked to indicate if, and how many (all, some or none), trees were inspected systematically across five categories of trees and woodland (public open spaces, street trees, woodland, TPOs, education premises). They were also asked to specify the number of years between inspections for each of the categories.

The majority of LAs carry out systematic inspections of at least some trees for each of the following categories: street trees, woodland and public open spaces. TPO-trees and trees on education premises are inspected by slightly less than half of all LAs. Few of these LAs, however, carried out systematic inspections of *all* trees within any one of the above categories (See Table 3).

Table 3. Number of local authorities (LAs) carrying out systematic inspections of individual trees in different locations, split by type of inspection (% of LAs responding).

	Street trees	Woodland	Public open spaces	TPOs	Education premises
All trees	6 (33%)	4 (21%)	5 (26%)	1 (6%)	6 (33%)
Some trees	6 (33%)	8 (42%)	10 (53%)	6 (35%)	2 (11%)
No trees	6 (33%)	7 (37%)	4 (21%)	10 (59%)	10 (56%)
Total	**18 (100%)**	**19 (100%)**	**19 (100%)**	**17 (100%)**	**18 (100%)**

Around one fifth of LAs inspected at least some trees across all five categories, while a similar proportion inspected none of their trees on a systematic basis. None of the LAs systematically inspected all trees across all five categories; nearly half of all LAs did not carry out full systematic inspections in any of the categories.

With regard to those categories of trees and woodland in which systematic inspections were carried out on at least some trees, there was some variation in the mean number of years between inspections. Most frequently inspected were trees in woodlands and public open spaces (approximately once every four years). This was followed by street trees and trees on education premises (approximately once every five years). TPO-trees were inspected with the lowest frequency (approximately once every eight years).

Our interviews revealed that in many cases data on individual trees is only recorded in response to a request for service. As a consequence, problems with trees near housing and infrastructure tend to be more easily discovered than problems with (woodland) trees situated further away.

> *No, we don't record individual trees unless there is a record of a request for service. So you're a customer, you come to me, a tree down the road is about to fall down, basically we put down the details of that tree or if it's not going to come down, why it's not going to come down.*

Proactive surveys of individual trees tend to happen in high risk areas only (i.e., trees in school grounds, parks & cemeteries when next, or close, to paths). The extent to which such surveys in high risk areas are being undertaken varies between LAs, with some LAs not carrying out any proactive surveys in high risk areas at all.

> *What I've got, what I was saying about risk management is a big concern to everybody, we have produced a draft strategy on risk management of the trees, which highlights all the trees in high, medium and low risk management areas, obviously the high risk areas around schools, streets and other areas of high density populations, they're on the high risk* [management area map]*, which means we would attempt to inspect those trees on an annual, if not twice annual, basis. And then there's all other areas, dependent on the populations and densities and the age class of the trees, they come down the higher risk* [are in lower risk

management areas]*, which don't need to be inspected by professional tree people on an annual basis, but other people managing other things in the area can report any possible defects for us to go back.*

However, even when committed to do so, it is not always easy to inspect all trees in high risk areas on a frequent basis, given the lack of resources:

It's fine for street trees where you have one tree and it's very obvious, and you can drive along the road and you can say "that tree may well have an issue", but it's a different kettle of fish when you've got small little patches of woodland with people walking through on paths. It's a lot more difficult, because there's really no way that you can have very frequent inspections of those trees unless you have a route for every single countryside ranger to walk along inspecting all the trees, right I've walked through this path and didn't see any major problems, tick.

Data on works carried out to trees was recorded by each of the interviewed LAs. Typically, all complaints and enquiries are logged, prioritised and then updated in the system once completed.

4.1.2. Electronic recording

The relevant survey questions are shown in Box 5.

Half of all LAs indicated that they have a computerised tree management system. Half of these used an off-the-shelf system, one fifth a bespoke system and nearly one third a system developed in-house.[6] These systems are used for recording arboricultural tree survey data, recording public enquiries and ordering tree works.

Box 5.

Question C2: Respondents were asked to state if their LA uses a computerised tree management or inventory system.

Question C3: Respondents were asked to specify the name, purpose and source (off-the-shelf, bespoke or developed in house) of any tree management software that they were using

Similar to the authors of Trees in Towns II (Britt & Johnston, 2008), we also used an index called 'urban weighting' for statistical testing. This variable is a percentage with a range from 0 to 100 reflecting that proportion of the total population of each of the LAs living in a settlement with 3,000 or more inhabitants. We also looked at relationships of

[6] The frequencies at which different software packages are used have not been copied into the report as this is considered commercially sensitive information.

our questionnaire data with variables such as population size and tree budget. The additional statistical tests that we ran showed some indications for differences in urban weighting and tree management budget between LAs with and without a computerised tree management system. However, these trends were not statistically significant.

Three types of tree management software are used:

- Asset management software
- Specialist arboricultural software
- Software to assess socio-economic benefits of trees

Asset management software enables the tree officer to access and store geo-tagged data on tree history, management and enquiries when visiting a site using a tablet. It does so by storing GPS-data associated with each tagged tree and plotting this on a GIS-map. Some software packages also provide the option to attach photographs to entries. Some interviewees indicated having a software package that was used across the whole LA, which facilitated knowledge exchange.

Good practice: Although expensive, an arboricultural software package has the advantage of providing a platform on which all tree-related data is stored in one database. This benefits proactive tree management and facilitates effective responding to enquiries from the general public.

Specialist arboricultural software packages enable users to link a broader range of geo-referenced data, including management history, surveying, tree risk and valuation data, TPO- and conservation data, and enquiries.

One LA was in the process of commissioning a sample survey to quantify the socio-economic value of trees (and Edinburgh had completed one last year). This can be done using proprietary valuation software through inputting information such as tree diameter, height and species for all trees in a certain area. Some software packages also allow for estimates of socio-economic value of larger areas to be made on the basis of a sample survey.

> *what it does is it moves the debate around urban trees forward and it brings urban trees into the Sustainable Cities agenda, because we're able to put values on existing [ecosystem] services…It's a campaigning tool…It's a way for the public to connect to the tree population that they didn't have before.*
>
> *I think what we've got better at doing is making our case in a more rational way…money that we invest in doing surveys yields data, and data leads to arguments, and successful arguments lead to resources*

Respondents highlighted the advantages of recording tree-related data electronically. Compared with paper records, electronic record systems:

- Make data input easier.
- Facilitate proactive tree management because it can automatically indicate when individual trees need to be inspected.
- Improves efficiency of dealing with public enquiries around tree condition and management procedure.
- Allow links to geospatial data which, when transferred to GIS, permit automatic risk assessment by determining the distance of trees to pathways.

Good practice: Although the cost of proprietary valuation software and running a sample survey can be high, some LAs have managed to overcome this barrier through partnering with NGOs and Governmental Agencies. A crowdsourcing programme for data recording could also be considered, an example of which is provided by the RE:LEAF programme in London. It should also be noted that the long-term financial benefits of quantifying the socio-economic value of trees probably outweigh the short-term cost due to it being instrumental in putting a monetary value on trees, resulting in increased management and protection.

5. The management approach: proactive vs. reactive

In this section we look at the way different LAs balance their statutory duties and risk management, with the possibility of expanding and improving the urban forest resource. Information for this came from the qualitative interviews, supported by the survey question shown in Box 6.

Box 6.

Question C5: Respondents were asked to estimate the percentage of all maintenance work on trees and woodlands, in terms of required time, that is currently done on a systematic, regularly scheduled cycle.

On average, about a quarter of all tree management carried out by LAs is done on a scheduled, proactive basis with the remaining three quarters of work being reactive. Nearly one fifth of LAs spend over 70% of time spend on maintenance on scheduled tree maintenance and nearly half undertaking less than 10% of their tree works on a proactive basis (see Figure 1). LAs thus vary in their approach to urban tree management with some focusing all of their resources on reactively dealing with liabilities, and others also managing trees proactively based on a long-term vision.

Interviews also showed a tendency for LAs to engage in reactive urban tree management, focused on ensuring health and safety. This reflects mandatory responsibilities and liabilities (see Section 2.2.1). Foresters and arboriculturists working for LAs therefore invariably spend a considerable amount of time dealing with trees and woodlands in response to enquiries and complaints by the public. These can relate to either nuisance or perceived danger. Dealing with reactive work can take up a considerable amount of time, especially with storms in recent years resulting in widespread windthrow.

> *We deal with tree enquiries from a whole host of places, whether it's from councillors…, whether it's MSPs, whether it's general public, whether it's other organisations and roughly speaking, I think I'm right in saying that … excluding storms, we maybe run to in excess of a couple of thousand enquiries a year*

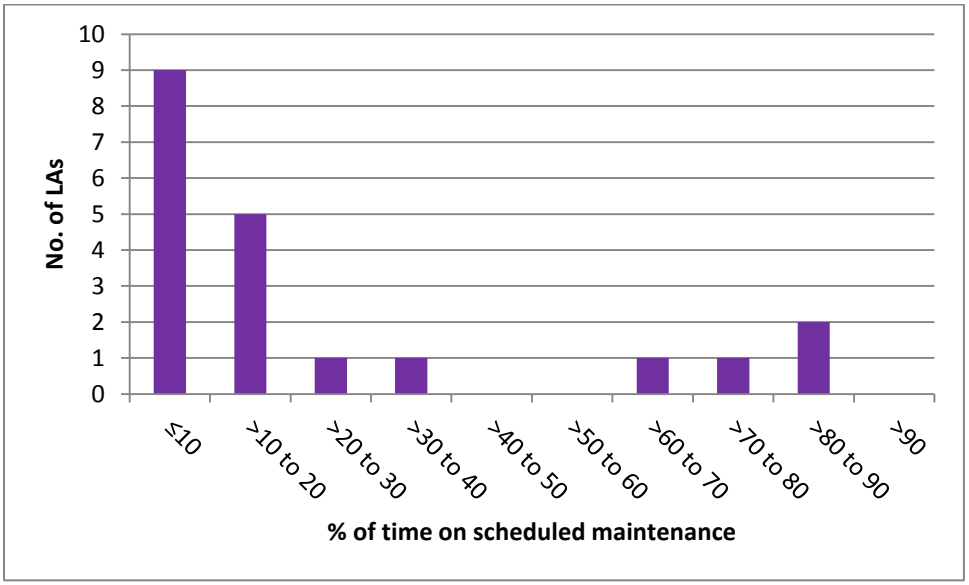

Figure 1. Percentage of maintenance work on trees and woodland, in terms of required time, that is scheduled (as opposed to "on demand") for each local authority (LA).

This focus on health and safety leaves little scope for proactive urban tree and woodland management. This is reflected in the limited availability of complete and validated tree inventories, town-specific tree and woodland strategies and management plans for urban woodlands. To engage in proactive urban tree and woodland management, the LAs are increasingly relying on external funding schemes (see Section 2.2.3), and the particular commitment of individuals within the organisation to this cause.

> *It's reactive rather than proactive, which I'm not terribly happy about, but again it's a matter of resourcing a more proactive approach and how you actually define the areas, and that is a very big process for us, because … we have got a hell of a lot of trees, and … being peri-urban, are very accessible to the public. So as soon as we open that Pandora's Box, it's a rod for our own backs.*

As a result of limited proactive tree management, many of the trees and woodlands in towns were perceived to be in a state of neglect. This is illustrated by the following comment by a (non-LA) community ranger:

> *a lot of the sites that we're taking over, have been unloved for a long, long time. Nobody's taken ownership, bad stuff goes on in them, and people don't go into them. We come along and then we start changing that. And we're delivering… Instantly the expectation goes up, because we're not the Council, they're like, oh wait a minute, this might actually have something. I think that's key, the expectation is really low.*

6. Internal organisation

In each LA, the two principal departments that deal with trees and woodlands are Environmental, and Planning – often referred to respectively as Environmental Services (or Land/Neighbourhood Services), and Development & Planning. The former deals with enquiries, strategy and tree works, whereas the tree-related activities of the latter concern trees with TPO-status, trees in Conservation Areas, and trees in new developments.

6.1. The Environmental Services Department

Environmental Services is typically further split into sections (e.g. Landscape Design, Events, Countryside Rangers, Greenspace). The arboriculturists, foresters and staff with tree-climbing and chainsaw certificates tend to work in a single section (often called Green Space or Parks) and have a variety of responsibilities:

> *So he* [the tree officer] *is dealing with strategy, policy, advice to planners, storms, like we had last week so everything gets obviously put to the side when there is a storm, you've got to deal with the health and safety issues and we've also got staff, the operational side, so it's dealing with the operational stuff plus the big picture.*

In the majority of LAs, this section is responsible for trees in parks, woodlands and on the perimeter of private housing. This does not imply that (sections within) other departments do not have a responsibility for managing trees as well. Housing, Roads, Social Work and Education have each been mentioned as owning tree assets. For example, Roads tends to own some of the roadside trees, Housing the trees in LA housing schemes, Social Work the trees around care units and Education the trees on school grounds.

In most instances, the Environmental Services department is split between staff working on operational and strategic aspects of tree and woodland management. Although situated within the same section, the operational and strategy service do not necessarily communicate closely with each other:

> *We have operational and strategy and that's how it's divided. They're both within the same service but it then splits, you would have thought that these two sections would be joined together, so that there is a lot of communication between the two but there is very little communication, even though they're within the same service ... which is frustrating! But we also have the challenge that the strategy side does not have the time to undertake work on the woodlands, which is equally frustrating.*

6.2. The Planning Department

The Planning department deals with enquiries around tree ownership, TPO-trees and trees in Conservation Areas. The Planning department is also responsible for decision-making around TPO-applications relating to land purchases and planning proposals. It takes into account the amenity value of trees on sites that involve a planning application. In the case of new developments, the landscape officer in Planning takes account of national policy on design that includes tree-related criteria. The department is thus also important in ensuring sufficient provision of trees in new developments.

Good practice: The landscape officer can potentially have an important influence on the provision of urban trees and woodlands, although this was rarely highlighted by the respondents. This is illustrated by a case in which the landscape officer in Planning was involved in the preparation of a CIRIA report on the benefits of large trees within an urban context and also attended STOG-meetings.

Arboriculturists within the Parks/Greenspace sections are often asked for advice on matters such as tree health and the safety of planned works on, or nearby, trees since landscape architects or officers in Planning tend to lack the expertise in order to make such judgements. In most LAs, the tree officer is also invited to comment on planning applications and new site designations. Conversely, a landscape officer may also be invited by the tree officer to provide advice on the tree strategy, the socioeconomic value of trees and site-specific statutory requirements.

A challenge related to the involvement of two departments in tree management is that tree inspectors are not always consulted when a new development is planned with trees on site. And even if consulted, there is no guarantee that advice is followed-up.

Good practice: A lack of communication between different departments was experienced by many respondents as a barrier to tree management. West Lothian council has a dedicated Neighbourhood Environment Team (NET), which was described as a 'unique set-up' by respondents. Under this model, sections manage those assets for which their front line operational team has the right skills. Thus, the Park/Greenspace section is responsible for all public trees, parks and open spaces in town, Roads for all tarmac in town etc. Furthermore, there was no split between strategic and operational in the Environmental Services department of this LA, which was experienced as advantageous in terms of mobilizing staff:

One of the obvious advantages of this model is that it overcomes the communication challenges for staff who work in different sections/departments. The NET-structure could be an effective means to overcome such issues with communication because it enhances cross-fertilisation between different sections within the LA.

7. Resources

7.1. Budgets

The relevant survey questions are shown in Box 7.

Box 7.

Question B1: Respondents were asked to specify an estimate of their total annual budget for tree management in the financial year 2014/15 (including staffing cost).

Question B2: Respondents were asked to provide an estimate of the percentage increase or decrease in their LA budget for tree management in the past five years.

Having a mean budget of £231,962, expenditure on tree management per head of population by Scottish LAs (£1.18) is below the England average of 2004 (£1.38). Corrected for inflation[7], the figure for Scotland is nearly 35% below that of England. Based on the given expenditure per head of population, the estimated total annual tree and woodland budget of all Scottish LAs is £6,160,333 (SE = £1,238,800). Although English LA budgets for tree and woodland management could have increased at a rate below inflation over the past 10 years due to the economic downturn, a difference in expenditure is likely to persist given the size of the gap.

There is high variability in the expenditure per head of population on trees and woodlands (see Table 4). While about a quarter spend £0.50 or less, two LAs spend over £2.50 per head of population.

Table 4. Budget per head of local authority (LA) population for tree and woodland management.

Budget p/head (£)	No. of LAs	% of LAs responding
≤ 0.50	4	27%
>0.50 to 1.00	4	27%
>1.00 to 1.50	3	20%
>1.50 to 2.00	2	13%
>2.00 to 2.50	0	
>2.50 to 3.00	2	13%
Total	**15**	**100%**

[7] The price indexes used to derive the 2004-14 inflation rate were derived from the Consumer Price Index published by the Office for National Statistics. The Scotland figure could be slightly conservative as a small number of local authorities indicated to have excluded variable income from grants and mitigation schemes from their budget estimate.

The majority of LAs (60%) have had a stable tree management budget over the past five years when corrected for inflation. A fourth of LAs have faced budget cuts whilst the financial resources of two LAs increased. On average, LAs have had a slight decrease in tree management budget over the past five years (corrected for inflation).

Statistical analyses were run to check if budget per head of population could be linked to other variables. This showed a significant, positive association between budget per head of population and population density.

The interviews confirmed that open space management (including woodland management) is bearing the brunt of budget cutbacks as it is not considered to be one of the "big themes" at senior management level.

Diminishing financial resources can put considerable pressure on the strategic side of tree management, which was reported to affect collaboration across different departments in particular. This is exemplified one case where an LA tree officer was instructed to refrain from acting as a consultant on tree-related matters to other departments. A respondent from a different LA provided another striking example: the Environmental Services strategy team lacked the staff resources to produce an Open Space strategy, which then had to be developed by another department not principally involved with green space (including trees and woodlands) management.

Two interviewees commented that communication between departments had improved as a result of budget cuts, reorganisation and clearer delineation of staff roles.

7.2. Staff resources and skills

The relevant survey questions are shown in Box 8.

The number of FTEs employed to undertake activities related to tree management varies widely between LAs (see Figure 2). Most staff are employed in the Environmental: Operational section (over four FTEs on average). The majority of LAs employ less than one FTE in the Planning/Development department and Environmental: Strategic section.

Box 8.

Question B3: Respondents were asked to state the number of full time equivalents (FTEs) their LA employed to manage trees and woodlands. They were asked to split FTEs by the following departments: Planning/Development, Environmental Services: Operational and Environmental Services: Strategic (see Sections 4.1 & 4.2).

Question B4: Respondents were asked to report the percentage of total LA tree budget that is spend on contractors (incl. consultants) and to summarize their activities.

Question B5: Respondents were asked to list their relevant professional and academic qualifications.

Question B6: Respondents were asked to list their relevant professional memberships.

Question B7: Respondents were asked to indicate what number of LA-employed staff has forestry and/or arboricultural qualifications.

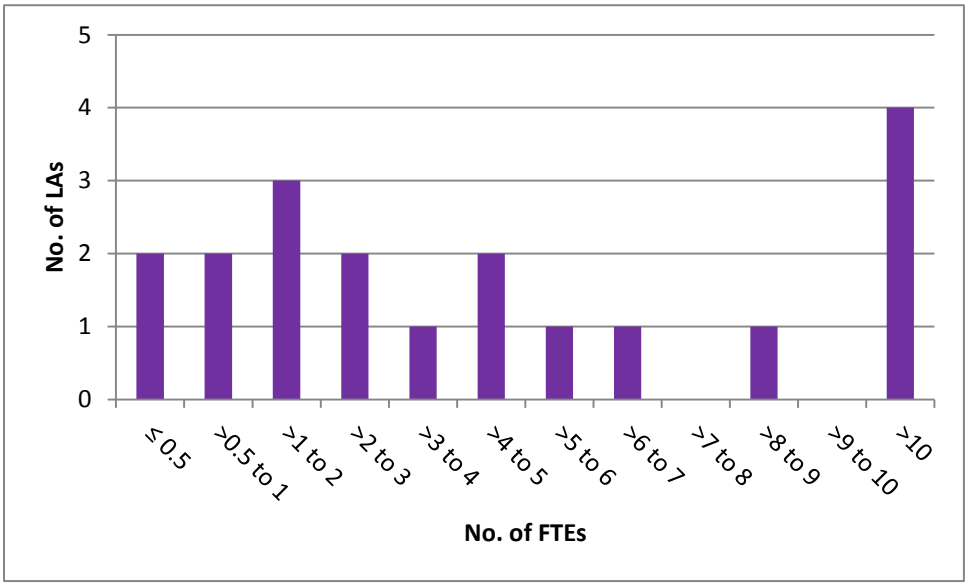

Figure 2. Number of total officer full time equivalents (FTEs) allocated to the management of trees and woodlands for each local authority (LA).

The degree to which tree management is outsourced varies widely with more than a third of LAs spending less than 10% of their budget on contractors, whilst about a quarter of LAs spends over 70% of their budget externally (see Figure 3). On average,

nearly 35% of the tree and woodland budget is outsourced. Outsourcing is mainly done around tree surgery, felling and removal, tree (and wildlife) surveying and inspections, consultancy and tree planting.

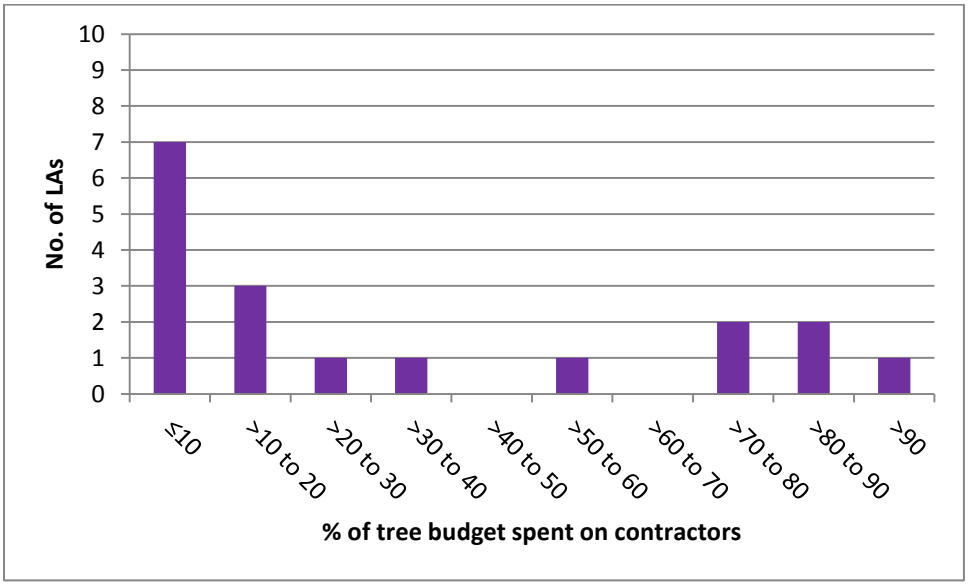

Figure 3. Percentage of total tree budget spent on contractors (incl. consultants) for each local authority (LA).

Of the LA staff completing the survey, the majority reported having a relevant professional qualification classed at QCF-level 5 or higher. A minority reported having no relevant qualification at level 3 or higher. When looking specifically at qualifications in the fields of arboriculture and forestry, nearly half of all respondents had a qualification with QCF-level 5 or higher. Twenty-five percent of respondents did not have a qualification at level 3 or higher. When interpreting these findings, it should be noted that we asked for qualifications of the responding officer. Although this is likely to be the person with the highest qualification in either forestry or arboriculture employed by the LA, this might not have always been the case. Respondents indicated having, on average, nearly three members of staff with relevant qualifications at QCF-level 3 or higher.

Just over half of all respondents indicated having a relevant professional membership. Fifty percent of respondents are members of the AA (Arboricultural Association). The ICF (Institute of Chartered Foresters) and ISA (International Society of Arboriculture) were only mentioned by 15% and 10% of respondents, respectively.

Statistical analysis was carried out to check if the availability of staff FTEs for tree and woodland management could be linked to population density. A statistically significant

positive relationship was established. This could not be explained by the relatively high population size of densely populated LAs. Densely populated areas thus tend to have more staff managing trees, regardless of their population size.

The interviews revealed that the number of tree officers has declined over the last couple of decades. In many LAs, tightening budgets are an ongoing concern, leading to possible further reorganisation and redundancy.

In response to this, there is an increasing demand on staff dealing with trees and woodlands to generate income. In some of the LAs, budget for tree management is therefore generated through doing work on a chargeable basis for other departments (e.g., Housing, Education), external organisations (e.g., NHS, universities) and sale of wood products. As a result, LAs often generate a profit on the management of trees and woodlands. Such income is not necessarily re-invested in the management of urban trees and woodlands.

Good practice: Although urban tree management undoubtedly benefits from staff with forestry and arboriculture skills and expertise, the importance of a strong network cannot be underestimated. A number of the LAs in this study have been assisted by NGOs, Government Agencies and partnerships (e.g., CSGN) in preparing their woodland management plans. Although the LA was sometimes approached to collaborate, a number of such partnerships had also been initiated by the tree officer him- or herself. A strong network could further contribute to the council's awareness of funding schemes and could increase the odds of being successful in obtaining funds.

LAs are increasingly applying for external funding in order to undertake park- and woodland-specific projects. Current and recent sources of funds for urban woodlands include the WIAT programme, Scotland Rural Development Programme, Landfill Communities Fund, Heritage Lottery and partnerships such as Central Scotland Green Network.

The majority of LAs interviewed had a dedicated front line tree management team comprising tree surgeons and staff with an emphasis on practical qualifications. In some cases, employees with forestry and/or arboricultural skills are also required to contribute to general grounds maintenance. One LA no longer has a tree management team as a result of a recent reorganisation. Depending on available expertise, staff numbers and machinery, external contractors are called upon to support tree and woodland management activities. Some LAs are also increasingly relying on countryside rangers, as opposed to trained arboriculturists, to carry out proactive tree inspections.

7.3. Learning

Respondents indicated a need for regular training and knowledge exchange to keep their knowledge and skills up-to-date. Important platforms for them are Scottish Tree Officer Group (STOG) and the Arboricultural Association. The dissemination of information around issues of best practice provided by these organisations was experienced as relevant and highly inspiring by many of the respondents.

However, some respondents felt that the frequency of knowledge-sharing opportunities had declined over the last 15-20 years. Furthermore, senior management did not always support staff to engage in knowledge exchange and networking during working hours:

> *I think this is a fantastic way in and certainly, obviously coming into arboriculture and the courses that I then had to undertake and speaking to people, you get a tremendous amount of knowledge from that and you think, "all right!", from lecturers and things like that and it's great experience. You then speak to these people about your experiences and think "oh right!", and it's a tremendous sharing of knowledge and I just think these things are now diminished, diminished greatly and it's such a shame because it's now looked upon as being, "it's a day out".*

The degree to which LA staff dealing with urban trees had informal connections to colleagues from other LAs varied. The frequency at which respondents were contacted with enquiries by external colleagues was also highly variable. Overall, occasions on which tree-related matters were discussed informally with tree officers from elsewhere were few and far in between. Some respondents expressed a need for increased knowledge sharing with professional arboriculturalists in order to verify the standard of their own practice:

> *… if I'm on courses or whatever, I'll definitely speak to them [members of Scottish Tree Officer Association]. … if I come across them, I will try and get into anybody's head, any way to try and improve my knowledge or improve the systems because I'm basically improvising and making it up myself.*

In most LAs, senior management encourages their forestry staff to attend refresher courses on a regular basis. However, one respondent indicated that there is no strong incentive for staff to train themselves beyond chainsaw certificate level as tree climbers are not paid more than those doing grounds maintenance. An interesting observation was that in some LAs, respondents did not attend STOG-meetings as they did not consider themselves to be a tree officer, whereas in others job title was not perceived to be a barrier to attendance.

The respondent of one LA indicated that there had been a 'Best Value Review', which included 'benchmarking' against other LAs. This led to a series of meetings to discuss how different authorities address similar areas of work such as tree protection.

8. Community engagement

The relevant survey question is shown in Box 9.

Box 9.

Question D1: Respondents were asked to indicate in what aspects of community involvement in trees and woodlands their LA is involved. The following response categories were given (with examples): informing the public, public consultation, tree data collection, care and maintenance, shared decision-making, community-led decision-making and other)

Apart from one LA, all respondents reported one or more types of community involvement in tree and woodland management. On average, LAs indicated engaging in about half of the activities listed in Table 5 with some LAs indicating to engage in up to six of the given categories of community involvement. Care and maintenance as well as consultation were activities engaged in by the majority of LAs. More than half of LAs also involved communities through informing, shared decision-making and community-led decision-making. Data collection by the public was much less common; a tree warden (or similar) scheme was in place in less than a fifth of all LAs.

Table 5. Number of local authorities (LAs) undertaking different types of community involvement with trees and woodlands.

Type of community involvement	No. of LAs	% of LAs responding
Informing	14	67%
Consulting	17	81%
Data collection	3	14%
Care and maintenance	17	81%
Shared decision-making	12	57%
Community-led decision-making	11	52%
Other	1	5%

N.B.: Listed under the "Other" category was the following activity: charity and woodland groups carrying out project work on public land with LA consent.

Statistical analyses revealed that LAs with higher population sizes and tree management budgets tend to engage in a higher number of activities involving communities in their local trees and woodlands. The link between budget and community involvement could not be explained by the higher population numbers of LAs with high budgets. Budget increases are thus likely to increase the breadth of community engagement activities undertaken by an LA.

The interviews revealed that involvement of community groups in tree management is appealing to LAs because these groups can bring in funds that the LA cannot apply to (e.g. Heritage Lottery Fund, Landfill Communities Fund). They also help LAs delivering upon objectives around increasing participation in decision-making. In some cases, the LA actively promoted community involvement, whereas in other cases the community took a leading role in collaborating with the LA around a woodland-related project.

'Friends' groups tend to focus on making the woodlands more accessible (e.g., constructing paths and benches), increasing woodland amenity value (e.g., putting in art works and visitor information signs) and woodland biodiversity (e.g., installing bird/bat boxes). Respondents emphasised that community groups to not replace any of the LA's responsibilities.

Some LAs experienced problems around sustaining community groups, which can take up a lot of staff time around group coordination and project management. Perth & Kinross was the only LA of those interviewed, which has a tree warden scheme. To sustain this, the LA organizes four tree warden meetings each year during which tree officers provide training in basic tree inspection. Although regarded as very helpful as local 'eyes and ears', tree wardens were not relied upon to meet the duty of care. In other LAs, a tree warden scheme had typically been considered but not implemented because of a perception that it would increase demand on staff resources.

Good practice: Many LAs perceive the tree warden scheme to be expensive and time-consuming. Yet, those who had direct experience of implementing this scheme did not share these views. Tree wardens are valued particularly for alerting the LA about tree-related problems or about high amenity trees under threat of planning proposals. They are also seen to be proactive and to require little guidance. Other councils could potentially benefit by reconsidering a tree warden scheme.

In those LAs with woodland management plans, public events had been organized by community officers for the purpose of public consultation. In all cases, there had been very little response to this by members of the public.

In one instance, woodland within the town was leased by a community group, whereas in another LA several community groups managed publicly owned woodland through signing a management agreement with a local NGO.

9. Specific tree management issues

In this section we expand on some of the specific challenges and opportunities around themes highlighted by respondents.

9.1. Protection of (heritage) trees

A number of respondents expressed concern over the protection of urban heritage trees. A heritage tree is one that is unique because of its cultural and historical value, which is reflected in its age or structural properties.

Although some heritage trees have a degree of protection because of their TPO-status or position within a Conservation Area, these mechanisms were reported not to serve the purpose of protecting heritage trees, for the following reasons:

- LAs are advised to put a TPO on trees with high amenity, as opposed to heritage, value and only when such trees are under threat of development;
- The tree officer is not in a position to make decisions around TPO-applications and trees with TPO-status; he/she only acts as a consultant to Planning.

These concerns are summarised in the following example:

> *There's one* [TPO-application] *that I really wanted them to do, but they* [the Planning department] *are resisting, they feel that the planning conditions are enough, and I don't think they are. I think once the development is finished, I'm worried what happens to trees. That planning permission was under restrictions that were put on the developer but not the people who have entered those houses and have got massive trees behind their house.*

In the current system, formal inspections of heritage trees are not necessarily more frequent than those of other trees. If a problem is discovered, however, heritage trees tend to be managed quite intensively. Several respondents indicated a need (and opportunity) to review tree TPOs under new legislation which requires that these are reviewed every five years.

Perth and Kinross is an LA with a particular high density of heritage trees. The representative of this LA expressed that the majority of these trees were not under threat. Nonetheless, he indicated that more could be done to protect heritage trees:

> *The Woodland Trust and other organisations have been campaigning to give heritage trees green monument status, like list them, some really important trees, and I think we could do a lot more to protect trees, not only from development, but just purely and simply. … I can say quite confidently that the majority of them aren't under threat.*

Instead, the respondent from this LA, as well as some of his colleagues elsewhere, pointed out that more could be done to protect the heritage trees of the future:

> *What concerns me is the … trees that could become heritage trees. It's all very well people saying oh but it's only a young tree. Well if you don't let it get old then it won't ever become a heritage tree. If you disregard young trees as not being important, I see there being a gap in our care for trees as a society.*

Related to this, some respondents expressed frustration over their lack of power to insist on replacing trees within Conservation Areas, under current planning legislation. As a result, there is a gradual loss of trees in Conservation Areas.

One respondent suggested that more could be done to protect ancient woodlands from being developed, which would aid in protecting heritage trees as well as increasing woodland cover nationally.

9.2. Pests and diseases

All respondents showed awareness of pests and diseases threatening their woodland. The current scale of tree health issues as a result of pests and diseases was, however, small in all LAs that were part of the study. Several respondents indicated having issues with *Phytophthora ramorum* on mature conifers and rhododendrons. Bleeding canker of the horse chestnut was also reported as well as ongoing issues with Dutch elm disease. In many of the towns that are part of this study, Ash made up a significant proportion of the total tree cover. In some of the LAs, *Chalara fraxinea* was therefore a real concern. At the time of interviewing, however, none of the LAs experienced Ash dieback at a major scale:

> *The principle disease we are encountering in Perth & Kinross at the moment on Council land is ash dieback. We reported several sites affecting young woodland with ash as a major component last summer to the Forestry Commission. We haven't yet witnessed any mature ash with Chalara.*

Despite the perceived threat, LAs tend to deal with pests and diseases on a reactive basis only: affected trees are felled and not planted again. In addition, species (e.g., Ash) under threat of a pest or disease are typically not included in any new planting proposals. The main barrier to proactive management of pests and diseases is lack of budget:

> *Yes … we've drawn up, with Forestry Commission help, with research help, the management plans to look after the control of all these nasty diseases that have come up. We've been one of the few authorities in Scotland that have been tending to manage Dutch elm disease and it's only recently with budget cuts, that again we've had to halt proactive management of the disease.*

There is a concern that if the Chalara issue becomes a major problem for us, whether we have the resources available for the necessary inspections, notifications and implementation of phytosanitary measures within the Council. The general opinion in upper management seems to be that we will deal with this if and when it becomes an issue.

Limited budget also influences the frequency of tree inspections and the level of expertise of tree inspectors. Inspections are typically carried out by arborists and/or countryside managers and the level of professional tree inspection training varies between staff:

The way we monitor pests and diseases within the Council is through the Arborists, who have both undergone the Professional Tree Inspection course, and also through the vigilance of our team of Countryside Rangers.

There is only one tree officer here with expertise on identifying pests and diseases. Although the part time rangers have had some training in identifying hazardous trees, they have had no pests and diseases identification training. No additional or specific resources have been allocated for dealing with pests and diseases and no formal training has been arranged. We are reliant on the FC's website for tips on identification and up to date information.

We have three full time trained tree officers who get regular CPD by attending seminars on pests and diseases (especially the now regular Forest Research seminars).

As a result, some LAs rely to an extent on private individuals for reports of pests and diseases:

We are following the guidance given by the government and are reliant to a certain extent on vigilant members of the public and community groups reporting incidences of the disease.

9.3. Trees on private land

The LA typically has limited data and management influence on trees and woodlands that are not in their ownership. The only exception to this is when trees are under a Tree Preservation Order (TPO) or are situated in a Conservation Area. In many cases, tree officers expressed some concern over tree neglect in areas that were not under their own management.

Are we allowed to extend to private, because there's a legal point there I think? And I think if we start surveying trees on private land, we're then taking at least partial responsibility for those trees? I don't think we can go down that route.

> *There was a previous pilot project about surveying trees in conservation areas, and they did extend the survey to the first five metres of gardens … but that was done with volunteers, that wasn't done with Council officers doing the surveys.*

It is expected that this will change with the recent High Hedges Act (2014), which requires the LA to act upon complaints by members of the public regarding the blockage of light by a high (>2 m) hedge or two or more closely spaced trees. Some concern was expressed around the possible increased demand on resources and consequences for urban tree cover that this bill might bring about.

In the case of pest, disease or tree safety issues, the powers of the LA are, however, limited. Although in the case of Dutch elm disease, the Dutch Elm Disease Local Authorities Act allowed the LA to inspect elms on private land, such a mandate was not reported in relation to other tree species. Furthermore, one respondent indicated a need for legislation that allows for intervention when a private tree is unsafe:

> *What we haven't got in Scotland, like they have down in England, a Miscellaneous Provisions Act, to go onto private land to make trees safe. Up here we haven't got that so if there's a dangerous tree in a back garden which is dangerous to somebody else's back garden or property, we can't do anything.*

9.4. Adapting to climate change

Access to up-to-date tree and woodland information via regular tree surveying was perceived to be of crucial importance in the development of management plans and strategies that take into account the specific dynamics of the local woodland. Some respondents also indicated the need for a long-term vision in relation to climate change and threats such as pests and diseases:

> *Beech, we've got climate change coming in, is beech going to be able to sustained in this area in 50 years' time? We want Beech to live for the next 150 odd years, there is no point in me planting or proposing to plant beech, thinking of 150 years' time, if we are going to have such a problem with water ... So should we be looking at lime? Should we looking at more of our pines again?*

> *I think that in light of climate change and the likelihood of tree failure, we need to basically build further away from trees.*

Climate change and related factors are, however, not the only factor feeding into proactive management. Future amenity and biodiversity value of woodlands is also regarded as important. For instance, the majority of trees in towns, especially the more recently planted ones, tend to be quick growing, short lived trees such as Birch and Alder. Two respondents indicated that, in response to this, they now aim to plant a

mixture of short living and long living trees. One LA commissioned a report on growing large species in urban areas.

To achieve proactive tree management which takes into account factors such as climate change, it is important for LAs to learn about research in this area. Research is actively disseminated by NGOs such as Greenspace Scotland, which provides assistance on writing reports on topics such as how to re-design parks in order to improve carbon sequestration. Current guidance, however, does not necessarily take into account some of these future influences on woodland make-up and condition:

> *So the British Standard is not much help in that respect for trees on development sites I don't think, because it tells people the absolute closest that you can go to a tree with a building, but it doesn't take any account of climate change and it doesn't take any account of blocked light, leaf litter and all of the complaints, some of which are petty in some cases, but that's all the stuff that we have to deal with and every other local authority does as well.*

10. Conclusions

1 This study is the first to provide an insight into the state of urban tree management in Scotland.

2 Focusing specifically on local authorities (LAs), it highlights several interconnected areas of concern: i) data on urban trees is limited, incomplete and difficult to access, ii) inadequate resources are under ongoing pressure, and iii) trees tend to be perceived as a liability, not an asset, resulting in reactive tree management.

3 We found that very few LAs had a complete picture of their trees and the condition they were in. Surveys and systematic inspections were least common in relation to TPO-trees, and those on education premises. Lack of data is problematic as an up-to-date and complete tree inventory is an important first step to formulating the priorities of the tree and woodland strategy and planning of tree works. There were striking contrasts between LAs, with some carrying out systematic inspections of all trees and others not carrying out any inspections whatsoever.

4 Several LAs are not yet using computer-based databases. Those who are, found it advantageous to be able to integrate information from inventory, TPOs, enquiries, inspections and management, and link it to a specific tree on a map. This approach facilitates both internal and external communications about tree management.

5 Available financial resources per head of population for LA tree and woodland management are relatively low in Scotland compared with England. Moreover, tree and woodland budgets have declined in a quarter of all LAs, although densely populated areas tend to have more staff managing trees, regardless of their population size. Positive exceptions can be found where budgets have increased, but we identified a recent tendency for LAs to generate a profit on the management of trees and woodlands. Such income is not necessarily re-invested in the management of urban trees and woodlands.

6 Arboricultural staff are experiencing job insecurity. One LA no longer has a tree management team as a result of a recent reorganisation. There is a trend to outsource aspects of tree management to contractors, while some LAs lack staff with advanced arboriculture and/or forestry qualifications.

7 Budget cuts lead to reorganisation, often resulting in a more disjointed approach to tree management as staff members dealing with trees work in different teams and buildings. This affects ease of communication and understanding between different staff members around issues such as trees in new developments, granting TPO-status, the socioeconomic value of trees and interpretation of statutory requirements.

8 Local authorities with higher population densities have a higher available tree and woodland budget per head of population, as well as more staff members working in this field. This implies that proximity of trees to people is seen to justify higher investment in tree management.

9 In many LAs "fire-fighting" management is the norm, with the majority of LAs spending less than 20% of the time allocated to tree and woodland maintenance on proactive management activities. This reactive approach is also reflected in the limited number of LAs that have tree and woodland strategies and management plans.

10 This strain is also evident in the typically "laissez-faire" approach to tree pest and disease outbreaks. Most local authorities appear to be aware of the risk but have no contingency plans or resources set aside to deal with this issue. Moreover, none of the LAs inspects trees on private land for pests and diseases.

11 Factors which influence success include: budget, commitment and vision of individual staff members, support from senior staff, community engagement and visible success with external funding.

12 Increasing the budgets of LAs for urban tree and woodland management provides the most straightforward opportunity for improving the status quo. However, given the current climate of public sector budget cuts this is unlikely to happen in the short term. Tighter legislation to support urban forestry would help to ensure it is a priority.

13 Other opportunities might be found in making the most of the rising awareness of the socioeconomic value of urban trees and woodlands, particularly in terms of human health and well-being. Highlighting the socioeconomic value of trees, as is currently done in Glasgow, helps to access funds. Greater community engagement can be achieved through citizens volunteering in woodland management activities or citizens reporting tree-related issues such as pests and diseases. Community groups can access certain types of funding that the LA cannot. However, success with community engagement is variable and does not reflect the empowering types of engagement that are usually seen as most effective.

14 Further work is needed to understand and share lessons from strong performance, and to explore alternative and collaborative models for urban woodland ownership and management such as those involving community groups, NGOs, private owners and/or FCS.

References

BBC News (2002) Council fined over tree deaths. Monday 15 July 2002. Available at: news.bbc.co.uk/1/hi/england/2129673.stm.

Britt, C., & Johnston, M. (2008). *Trees in Towns II: A new survey of urban trees in England and their condition and management* (No. 9). London: Department for Communities and Local Government.

Forestry Commission Scotland (2010) The Right Tree in the Right Place. Edinburgh, 69 pp. Available at: www.forestry.gov.uk/pdf/fcfc129.pdf/$FILE/fcfc129.pdf

Hazell, J. (2014) A Tree Owners' Responsibilities. Available at: jhazell.com/wp-content/uploads/2014/08/2014-08-04-A-Tree-Owners-Responsibilities.pdf

Appendix 1: The TWIST survey and cover letter

Survey

Trees and Woods in Scottish Towns Questionnaire

A steering group with members from Forestry Commission Scotland, Arboricultural Association and several Scottish local authorities has commissioned Forest Research to conduct a scoping study on the current status of tree and woodland management by local authorities in Scotland. The results will help shape central and local government policy on trees and woodlands associated with towns in Scotland. This questionnaire is being sent to all Scottish local authorities to provide an overview of key issues. As part of this Trees and Woods in Scottish Towns (TWIST) study, we are also undertaking a number of in-depth studies by interviewing local authority staff.

We kindly ask you to contribute to this research by filling out the questionnaire below. It might be that some consultation with colleagues is required. Completing the questionnaire is likely to take 30-60 minutes of your time, depending on your familiarity with the required data.

All replies will be treated in strict confidence. No data will be published that can be traced back to individual local authorities or officers, unless permission is granted by the relevant respondents. All those local authorities participating in the survey will be sent research outputs.

Your contribution would be highly appreciated and we look forward to your response.

Please complete this questionnaire in MS Word. To check a box, simply double click on the appropriate box and set the default value to 'checked'. Please use the Return key if you require more space for providing your response.

Local authority

Name of authority:
Your name (optional):
Your job title (optional):
Your department:

Tree/woodland documents

1) Does your local authority have any formal, committee-approved tree/woodland strategy or management plan(s)?

	Yes	No	In preparation
Strategy	☐	☐	☐
Management plan	☐	☐	☐

2) If answered 'yes' to any of the above, please answer the following questions for each of the available documents:

- Name of document:
  …
- Year launched
  …
- Adopted as policy (applies to strategies only):
  Yes☐ No☐
- Does it specify how actions will be funded?
  Yes☐ No☐
- Does it apply to a specific town/site, the whole local authority area or a region overlapping the local authority boundaries?
  Town-/Site-specific☐ Local authority☐ Region☐
- Does the document provide for any revision? AND, if it does, please give the number of years specified between each revision:
  Yes☐ No☐ Number of years between revisions: …

For additional documents, please give the same information by copying the headings into the space below:

Tree/woodland resources

3a) Please give (an estimate of) your local authority's total annual budget for tree management for the financial year 2014/15, including staffing cost:

- Total annual budget for tree management: £…

3b) Taking account of inflation, please estimate the percentage increase or decrease in your local authority's budget for tree and woodland-related work in the past five years:

Increase: …% Decrease: …% No change: ☐

4a) For each of the below departments, please outline how many staff (as measured in "full time equivalents" - FTEs) manage (processes related to) trees and woodlands? Please include all staff (i.e., managers/supervisors, operatives and those dealing with trees in relation to development). As for some staff members, trees and woodlands will only be part of their responsibilities, please provide an estimate of % of FTEs spent on tree- and woodland-related activities.

Department	FTEs	% of FTEs spent on tree- and woodland-related activities
Planning/Development		
Environmental services[8]: Operational		
Environmental services: Strategic		
Other (please specify): …		

4b) What percentage of total tree budget was spent on contractors (incl. consultants)?
… %

Please briefly summarize their activities:

5a) Please list your relevant professional and academic qualifications:

5b) Please list your relevant professional membership(s) (e.g., Arboricultural Association, Institute of Chartered Foresters):

[8] This department sometimes goes by a different name, but generally includes sections such as Green space, Parks, Landscape, Countryside etc.

5c) Please list the number of local authority staff with forestry and/or arboricultural qualifications: … staff members

Tree/woodland data

6) Please specify the categories of trees and woodland where your local authority has or has not conducted tree surveys within the last five years, and indicate whether this was a full survey of all such trees or only a partial (i.e., all trees within a discreet geographical part of the local authority) or sample (i.e., a representative sample of trees throughout the local authority) survey.
Please tick all that apply:

	Full survey	Partial survey	Sample survey	Not surveyed
Public open spaces	☐	☐	☐	☐
Street trees	☐	☐	☐	☐
Woodland	☐	☐	☐	☐
TPOs	☐	☐	☐	☐
Education premises	☐	☐	☐	☐

7a) Does your local authority use a computerised tree management or inventory system?
Yes☐ No☐

7b) If you answered 'yes' to 7a, please specify the name, purpose and source of this software:

Name of software: …
Purpose: …
Off-the-shelf☐ Bespoke☐ Developed-in-house☐

If using more than one software package, please give the same information by copying the headings into the space below:

8) Please specify the categories where your local authority carries out systematic inspections of individual trees, AND specify the average time between inspections:

	All trees	Some trees	No trees	Years between inspections
Street trees	☐	☐	☐	… years
Woodland	☐	☐	☐	… years
Public open spaces	☐	☐	☐	… years
TPOs	☐	☐	☐	… years
Education premises	☐	☐	☐	… years

9) Please estimate the percentage of all maintenance work on trees and woodland, in terms of time taken, that is currently done on a systematic, regularly scheduled cycle and the percentage that is done 'on demand' in response to requests, complaints or hazardous situations:

Scheduled: …% On demand: …% **Total: 100%**

10) What tree and woodland-related data is publicly available?
Please specify type of data (e.g., map and description of heritage trees, overview of TPO-trees, open space survey information), AND by what means it can be accessed by the public (through local authority website, by telephone etc.):

Type of data	Means of public access

Community involvement

11) In what aspect(s) of community involvement with trees and woodlands is your local authority involved?

Informing the public (e.g., talks, leaflets on tree care) ☐
Public consultation on tree- and woodland-related documents ☐
Tree data collection (e.g., Tree Warden scheme) ☐
Care and maintenance (e.g., tree planting, litter picks) ☐
Shared decision-making (e.g., Friends of Groups) ☐
Community-led decision-making (e.g., community woodland groups) ☐
Other (please specify) ☐
…

Further comments (optional)

…

Cover letter

Dear [contact name],

We would be grateful for your help in completing a short questionnaire on the current status of tree and woodland management by local authorities in Scotland. This will inform a key study of Trees and Woods in Scottish Towns.

The research has been commissioned by a steering group (including the Arboricultural Association, FC Scotland, and some Scottish local authorities) and it follows on from a recent scoping study.

By completing this questionnaire you will be helping to provide a better understanding of current challenges facing local authorities, and informing how support could be directed most effectively to manage urban trees, woods and forests.

We are distributing the questionnaire to all 32 Scottish local authorities with the aim of developing a complete picture of the challenges faced.

We would be very grateful if you would complete this questionnaire or, if you feel a colleague is better placed to do so, to forward it to them. It might be that some consultation with colleagues is required in filling out the questionnaire.

Completing this is likely to take around 30minutes of your time, depending on your familiarity with the required data. **Please could you return the completed questionnaire at your earliest possible convenience, preferably within two weeks from this date.**

Your contribution would be greatly appreciated and we look forward to your response. In case of questions or remarks, please do not hesitate to contact me using the contact information below.

Many thanks,
Alexander van der Jagt
Forest Research

Appendix 2: TWIST survey method

A first version of the questionnaire was formulated by the steering group together with the researchers. To maximize response rate, the number of questions was kept to a minimum. There was a strong overlap of these initial questions with some of those used in the Trees in Towns II questionnaire that was distributed to English local authorities for similar purposes (Britt & Johnston, 2008). To ease comparisons of data between Scotland and England, questions were reformulated in line with the Trees in Towns II questionnaire where relevant.

In the next stage, feedback on the draft TWIST questionnaire by relevant stakeholders was sought. To this end, it was distributed to members of the TWIST steering group, Central Scotland Green Network Trust (CSGNT) Advisory Group and a statistician. After revising the questionnaire to reflect the views of the consulted stakeholders, a pilot study was run involving the three local authority staff members that are on the board of the TWIST steering group. This resulted in a small number of final amendments.

The questionnaire was sent electronically to a specialist tree officer or other relevant contact within each local authority. Contact details were acquired by consulting with members of the TWIST steering group, Forestry Commission development officers, undertaking web searches and making telephone calls to local authorities. Contact persons were asked to consult with colleagues, if required, in providing their responses. The questionnaire could be completed in MS Word.

As it was not in the interest of this research to single out individual local authorities for (under-)performing and the questionnaire included items that could be assigned a level of sensitivity, LAs were assured that data would be treated in strict confidence.

Initially, local authorities were given two weeks to return the questionnaire. After that period, reminders were sent and an additional two weeks response time granted. Depending on circumstances, some local authorities received additional response time on top of that. A week before data analysis commenced, all local authorities with outstanding surveys were contacted and asked to return any (partially) completed work.

In agreement with the Trees in Towns II publication, elements of the questionnaire data were checked against demographic data. To this end, we made use from variables derived from the National Statistics Urban Rural Classification 2011-2012 Population Tables (see: http://www.scotland.gov.uk/Topics/Statistics/About/Methodology/UrbanRuralClassification/Urban-Rural-Classification-2011-12/Urban-Rural-2011-2012). This lists population data split by six urban rural classifications for each of the 32 Scottish local authorities. Given the specific interest of TWIST in urban trees and woodlands, two variables were derived from this dataset: population size and urban weighting. The latter variable was computed by adding up the population percentages listed in the “large urban”, “other

urban", "accessible small towns" and "remote small towns" columns. This resulted in a percentage reflecting that proportion of the total population living in a settlement with 3,000 or more inhabitants for each of the local authorities.

The approach to data analysis was similar to that used in the Trees in Towns II publication:

1. Frequency and descriptive data are reported – count, mean and standard deviation
2. Data is predominantly presented in tables to ease comparisons over time and between both studies
3. Statistical hypothesis testing was carried out to check for relationships between variables of interest, including: population size, weighted tree budget (i.e., tree budget per head of population) and urban weighting (urban population/total population). Only relationships that were statistically significant have been reported. Due to a combination of a relatively low number of data rows and missing data, the power of statistical tests to detect a significant effect was low in comparison to the Trees in Towns II publication (Britt & Johnston, 2008).

Appendix 3: Additional tables and statistical tests based on survey

A: Tree/woodland documents

Table 6. Number of local authorities (LAs) with a formal, committee-approved strategy, existing or in preparation.

Strategy	No. of LAs	% of LAs responding
Existing	9	41%
In preparation	5	23%
Total	**14**	**64%**

Table 7. Number of local authorities (LAs) with a strategy at different spatial scales; number of reported strategies adopted as policy and number of reported strategies including funded actions (% of LAs responding).

Spatial scale of strategy			Adopted as policy	Including funded actions
Town-/Site-specific	LA	Region		
1 (11%)	7 (78%)	1 (11%)	8 (89%)	4 (44%)

N.B.: One strategy, listed at the local authority scale, is also town-specific.

Table 8. Number of local authorities (LAs) with a strategy, split by year of launch; number of reported strategies with provision for revision, and mean number of years between revisions (% of LAs responding).

Year of strategy launch			Provision for revision of strategy	Mean no. of years between revisions
2000-2004	2005-2009	2010-2014		
1 (11%)	2 (22%)	6 (67%)	6 (67%)	5.17 (SE=0.95)

N.B. SE = standard error

Table 9. Number of local authorities (LAs) with (a) formal, committee-approved tree and/or woodland management plan(s), existing or in preparation.

Management plan(s)	No. of LAs	% of LAs responding
Existing	8	36%
In preparation	4	18%
Total	**12**	**55%**

Table 10. Number of local authorities (LAs) with woodland management plan(s) at different spatial scales; number of reported management plan(s) including funded actions and provision for revision, and mean number of years between revisions (% of LAs responding).

Spatial scale of management plan(s)			Including funded actions	Provision for revision of management plan	Mean no. of years between revisions
Individual woodland	Town	LA			
5 (63%)	1 (13%)	2 (25%)	3 (38%)	5 (63%)	5 (SE=1.15)

N.B. SE = standard error

Statistical hypothesis testing

It was checked using Mann-Whitney U tests whether LAs with and without a strategy or management plan differed in urban weighting, population size, weighted tree budget or total staff FTEs. This revealed a difference in population size between LAs with and without a management plan (U = 19, n_{Yes} = 8, n_{No} = 10, p = 0.03, 1-tailed). LAs with a woodland management plan tended to have a higher population than those without such a plan (see Figure 4). There were no additional tests with a significant outcome.

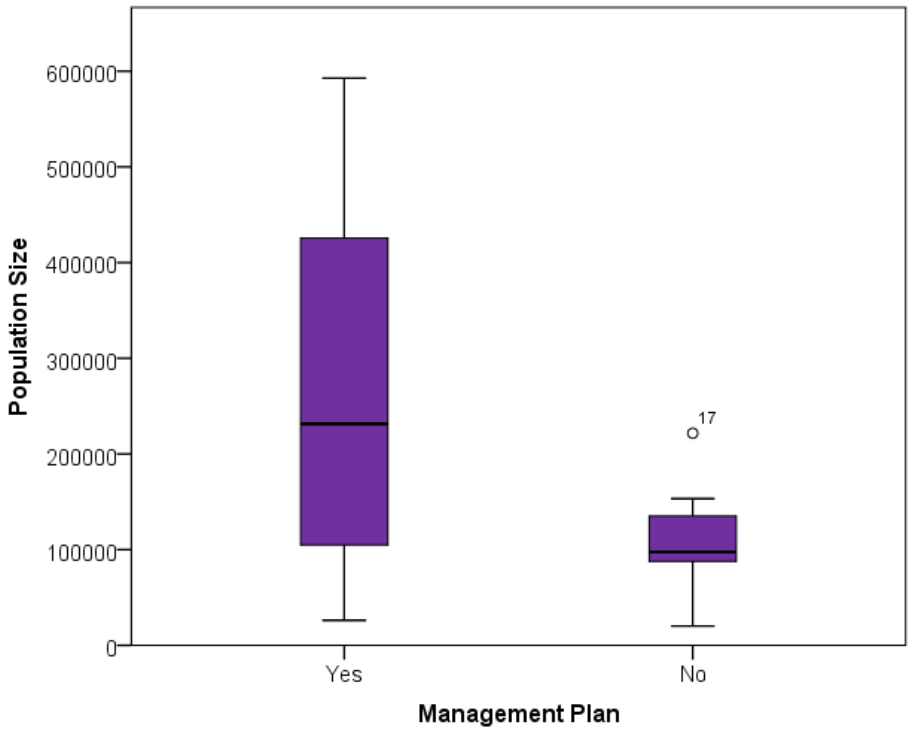

Figure 4. Boxplot representing population size for local authorities (LAs) with and without a management plan.

B: Tree/Woodland data

Table 11. Number of categories of trees and woodland with at least a partial tree survey for each local authority (LA).

No. of categories	No. of LAs	% of LAs responding	Cumulative %
0	2	10%	10%
1	2	10%	20%
2	2	10%	30%
3	5	25%	55%
4	5	25%	80%
5	4	20%	100%
Total	**20**	**100%**	

Table 12. Number of categories of trees and woodland with a full survey for each local authority (LA).

No. of categories	No. of LAs	% of LAs responding	Cumulative %
0	11	55%	55%
1	6	30%	85%
2	0		
3	2	10%	95%
4	0		
5	1	5%	100%
Total	**20**	**100%**	

Table 13. Number of local authorities (LAs) with a computerised tree management system, split by source of software.

Source of software	No. of LAs	% of total
Off-the-shelf	5	50%
Bespoke	2	20%
Developed-in-house	3	30%
Total	**10**	**100%**

Table 14. Number of categories of trees and woodland for which systematic inspections on some or all trees are carried out by each local authority (LA).

No. of categories	No. of LAs	% of LAs responding	Cumulative %
0	4	21%	21%
1	1	5%	26%
2	1	5%	32%
3	5	26%	58%
4	4	21%	79%
5	4	21%	100%
Total	**19**	**100%**	

Table 15. Number of categories of trees and woodland for which systematic inspections on all trees are carried out by each local authority (LA).

No. of categories	No. of LAs	% of LAs responding	Cumulative %
0	8	42%	42%
1	6	32%	74%
2	1	5%	79%
3	2	11%	90%
4	2	11%	100%
5	0		
Total	**19**	**100%**	

Table 16. Mean number of years between tree inspections at different locations, and associated descriptive statistics.

	Mean no. of years between inspections	Standard error	Range (in years)	No. of responses
Street trees	5.09	0.84	0.5 – 10	11
Woodland	3.85	0.44	1 – 5	10
Public open spaces	4.25	0.69	0.5 – 10	14
TPOs	8.33	2.53	3 – 20	6
Education premises	5.17	1.05	3 – 10	6

Table 17. Number of local authorities (LAs) sharing different types of data, and means of public access to data (% of LAs responding).

Type of data	No. of LAs	% of LAs responding	Available online	Available upon request
TPOs	15	75%	11 (73%)	4 (27%)
Heritage trees	2	10%	2 (100%)	0
Survey information	5	25%	1 (20%)	4 (80%)
None	3	15%	/	/

N.B.: Entries classified as survey information: GIS grounds maintenance information, open space survey information and tree locations on different land types (or similar). Tree and woodland policy documents, management plans and strategies were not considered as tree-and woodland-related data and have therefore not been included.

Statistical hypothesis testing

Mann-Whitney U tests were run to check if LAs with and without a computerised tree management system have a different urban weighting, population size or budget. None of these tests indicated a significant outcome although there were near-significant differences in urban weighting ($U = 28$, $n_{Yes} = 10$, $n_{No} = 10$, $p = 0.05$, 1-tailed) and tree management budget ($U = 12$, $n_{Yes} = 10$, $n_{No} = 5$, $p = 0.07$, 1-tailed) between LAs with and without a computerised tree management system.

The percentage of scheduled tree inspections, number of tree/woodland categories surveyed and number of tree/woodland categories inspected were unrelated to any of the above variables. The correlation between number of tree/woodland categories surveyed and tree management budget was, however, nearly significant ($r_S = 0.44$, $p = 0.05$, 1-tailed). It is thus likely that tree budget is positively linked to the number of categories in which an LA carries out partial or full surveys.

C: Resources

Table 18. Local authority (LA) estimates of total annual budget for tree and woodland management in the 2014/2015 financial year (incl. staffing cost).

Budget (£1,000)	No. of LAs	% of LAs responding	Cumulative %
≤ 100	7	47%	47%
>100 to 200	4	27%	73%
>200 to 300	1	7%	80.0%
>300 to 400	0		
>400 to 500	0		
>500 to 600	1	7%	87%
>600 to 700	1	7%	93%
>700 to 800	0		
>800 to 900	1	7%	100%
>900	0		
Total	**15**	**100%**	

Table 19. Change in local authority (LA) tree and woodland budget over the past five years (controlled for inflation).

Direction of change	No. of LAs	% of LAs responding	Mean % change
Decrease	4	27%	-21%
Static	9	60%	/
Increase	2	13%	+27%
Total	**15**	**100%**	**-5%**

Table 20. Number of officer full time equivalents (FTEs) in different local authority (LA) departments associated with the management of trees and woodlands (% of LAs responding FTEs).

Total FTEs	Planning / Development	Environment: Operational	Environment: Strategic
≤ 0.5	13 (69%)	3 (16%)	12 (63%)
>0.5 to 1	2 (11%)	4 (21%)	2 (11%)
>1 to 2	2 (11%)	3 (16%)	3 (16%)
>2 to 3	1 (5%)	1 (5%)	1 (5%)
>3 to 4	1 (5%)	1 (5%)	0
>4 to 5	0	1 (5%)	0
>5 to 6	0	2 (11%)	0
>6 to 7	0	0	0
>7 to 8	0	0	1 (5%)
>8 to 9	0	0	0
>9 to 10	0	1 (5%)	0
>10	0	3 (16%)	0
Total	**19 (100%)**	**19 (100%)**	**19 (100%)**

Table 21. QCF (Qualification and Credit Framework) level of staff qualifications, split by subject. (% of local authorities responding).

QCF-level of qualification	Highest relevant qualification	Highest arboriculture qualification	Highest forestry qualification	Highest qualification (arb or for)
None or ≤2	2 (10%)	10 (50%)	12 (60%)	5 (25%)
3	2 (10%)	2 (10%)	1 (5%)	3 (15%)
4	2 (10%)	3 (15%)	0	3 (15%)
≥5	14 (70%)	5 (25%)	7 (35%)	9 (45%)
Total	**20 (100%)**	**20 (100%)**	**20 (100%)**	**20 (100%)**

N.B.$_1$: The QCF-levels of qualifications were derived from the Arboricultural Association website: http://www.trees.org.uk/membership/Qualifications

N.B.$_2$: Only the highest relevant qualifications of staff completing the questionnaire have been recorded

Table 22. Number of memberships of knowledge exchange forums with relevance to trees and woodlands.

Membership forum	No. of local authorities	% of LAs responding
AA (Arboricultural Association)	10	50%
ICF (Institute of Chartered Foresters)	3	15%
ISA (International Society of Arboriculture)	2	10%
Other	3	15%

N.B.: All mentioned once: STOG (Scottish Tree Officers Group), SWHA (Scottish Wild Harvest Association), CWA (Community Woodland Association), CAS (Consulting Arborist Society), LI (Landscape Institute).

Statistical hypothesis testing

Spearman's rank correlations showed that the LA tree management budget per head of population was significantly correlated with urban weighting (r_S = 0.55, p = 0.02, 1-tailed). The relationship was positive, indicating that LAs with higher population densities tend to have a higher tree management budget per head of population.

Spearman's rank correlations were also used to check if there was a relationship between total of staff FTEs and urban weighting. This revealed a significant positive correlation (r_S = 0.65, p = 0.001, 1-tailed). It was checked whether this positive correlation could be explained by population size. Unlike the previous finding for budget, the positive link between total of staff FTEs and urban weighting was found to hold when controlling for population size (r_S = 0.60, p = 0.005, 1-tailed). Densely populated LAs thus tend to have more staff managing trees, regardless their population size.

D: Community engagement

Table 23. Number of activities involving the community in the management of trees and woodlands undertaken by each local authority (LA).

No. of activities	No. of LAs	% of LAs responding	Cumulative %
0	1	5%	5%
1	1	5%	10%
2	5	24%	33%
3	2	10%	43%
4	5	24%	67%
5	4	19%	86%
6	3	14%	100%
7	0		
Total	**21**	**100%**	

Statistical hypothesis testing

Spearman's rank correlations were run to check if the number of categories in which LAs carry out community involvement activities are linked to urban weighting, population size and tree management budget. This revealed significant positive relationships between the number of community involvement activities and population size ($r_S = 0.71$, $p = 0.001$, 1-tailed) as well as tree management budget ($r_S = 0.61$, $p = 0.008$, 1-tailed). In a next step, a Spearman's rank partial correlation was run to check if the link between number of community involvement activities and tree management budget would hold when controlling for population size. This correlation remained statistically significant ($r_S = 0.52$, $p = 0.03$, 1-tailed). Therefore, the relationship between community involvement and budget cannot be fully explained by the tendency of LAs with higher populations to have a higher tree management budget.