

4 DISCUSSION

4.1 The Nature of Publicly Owned Urban Street and Park Trees

The urban forest consists of all woody vegetation in and around urban areas (Miller, 1997) and includes both privately and publicly owned woodlands and individual trees. This study was concerned with the urban individual street and park trees only and not the woodland trees, primarily because many research projects have already examined the structure, benefits and management of urban woodlands in Scandinavia. Few projects have aimed at identifying policies and practices in the management of individual street and park trees.

Unlike in the UK, where the Town and Country Planning Act 1990 gives local authorities the power to protect privately owned trees from felling, topping, lopping and other wilful damage or wilful destruction (HMSO, 1990); local authorities in Sweden can only really care for the publicly owned tree resource. Trees thought to be worthy of protection can be detailed at the planning stage of new development through the Planning and Building Act (MSD, 1987), and the Environmental Act makes it the duty of the local authority to preserve biodiversity (MD, 1998), which could be done through the protection of trees and the promotion of the benefits of urban trees, but the local authority cannot control privately owned trees the way it can be done in the U.K. through Tree Preservation Orders. However, local authorities may decide that privately owned trees in certain areas of interest cannot be felled without a license and this must be detailed in development and preservation plans of the area. The Planning and Building Act also outlines penalties for any person who has felled a tree unlawfully.

Under the Planning and Building Act, every local authority should have a unitary development plan that outlines areas for development within the local authority and supply guidance for decisions made on land use (MSD, 1987). Furthermore, the Act states that planning has to take into consideration nature and the benefits of nature, and that it shall promote aesthetically pleasing design of green space. Buildings should be situated where clean air can be provided and noise pollution avoided; and the urban built environment has to be designed so that it takes parks and other green space into consideration as the percentage of hardened surfacing should not generally increase. Detailed plans may regulate vegetation for limited parts of the local authority. It is obvious from this Act that nature and green space form an important part of the built environment in Sweden. Furthermore, the Environment Act (MD, 1998) states that local authorities have a responsibility to promote sustainable development and biodiversity, and that people have the right to a clean and healthy living environment. This

further adds to the fact that green space is a central theme in Swedish legislation.

This central theme of green space and nature in Swedish legislation may stem from the fact that a large part of Sweden is covered in trees, woodlands, and forests. Apart from the very southern part of the country and the inner parts of the largest urban areas, wilderness is never far from your doorstep and the Swedes have often been called a nature-loving people. An important piece of legislation that is deeply embedded in the Swedish psyche is the right of public access to the wilderness, or 'everyman's right' ('Allemansrätten' in Swedish). This is a convention of property right under the Environment Act (MD, 1998), which allows the public the right of access to the land, be it publicly or privately owned. The convention forms the basis for recreation, providing the possibility to walk or camp on somebody else's land for up to three nights, and to pick wild flowers, mushrooms and berries (Naturvårdsverket, 2006).

The results of the study showed that the number of publicly owned street trees ranged from 0 to over 29 000, with an average of 2 818 (table 3.2), and the number of park trees ranged between 30 and 1 000 000, with an average of little more than 42 000 (table 3.3). This may seem to indicate a rather small urban forest, but since the average percentage of tree covered urban area that belongs to the local authority was only a bit over 51 percent, with a minimum of two percent (table 3.4), the number of trees must be many more. Furthermore, the size of urban areas in this study varied immensely, from 4 158km² (415.8ha) to 172 040km² (17 204ha) (Sweden Statistics, 2005a), and this too will have an impact on the number of publicly owned trees.

In the UK the Government is committed to encouraging the expansion of total tree cover as part of Local Agenda 21 (DETR, 1994). This is crucial in a country where total tree cover is not more than 11 percent. In Sweden though, where the tree cover situation is very different, it may be legitimate for local authorities in smaller urban areas with a small amount of publicly owned trees to argue that they will not need more trees as there is plenty in private domain and in the rural areas surrounding the urban areas. The Swedish Government is also committed to ensuring sustainable development through Local Agenda 21, but the objectives are very different from those of the UK, because of the varying conditions of the two countries. One of the objectives set out by the Swedish Government to be met within one generation relates to forests and forest management, but not to individual trees. Three objectives could be seen as relating directly to urban street and park trees: good built environment, clean air and biodiversity, and it may be seen as more important to implement these objectives in larger urban areas than in the smaller ones. In larger

urban areas it may be essential for the quality of life to protect the existing trees and plant more, so that desolate, vegetation-less streets will be a thing of the past. Trees provide people with a sense of place and a re-connection to nature, which might have been lost inside the large city. In smaller urban areas, nature is more close-by, and a sense of place and history is often already present in the residents.

4.2 Urban Tree Management

The management of urban forests has been defined as the planning for and management of a community's tree resources to enhance the quality of life (USDA, 1990), and the process integrates the economic, environmental, political and social values of the community to develop a comprehensive management plan for the urban forest (Miller, 1997). It has also been clearly established in the literature that urban tree management needs to be not only planned, but also systematic and integrated (*e.g.* Johnston, 1989; Miller, 1997; Konijnendijk *et al.*, 2005). To achieve the aims of the planned tree programme the maintenance of the tree stock needs to be scheduled and regular, because without the systematic approach, management becomes inefficient and ineffective (Johnston and Rushton, 1998). In addition to this, the stakeholders in the community need to be involved in the planning and management of the urban forest if the tree programme is to be effective and cost-efficient (Booth, 2005).

One of the aims of this study was to find out what background and qualifications the persons responsible for the management have and what their budgets are; and to ascertain the extent to which local authorities take a planned, systematic and integrated approach to the management of their trees. The following sections will discuss the results for each of these aims.

4.2.1 Information about the Respondents

The questionnaire that underlies this study was completed and returned by almost 58 percent of the sample population (table 3.5), which makes it feasible to believe that the information given may provide a general picture of the state of local authority tree management in Sweden. The largest number of replying local authorities were located in the east of the country (table 3.7; see also fig. 2.1 for map); the east is one of the more densely populated parts of the country (Sweden Statistics, 2005a).

The number of questions answered in each section of the questionnaire may give an indication as to how informed the respondents are of their tree resource. The least number of replies were to the section 'Inventories and Strategies', while most respondents had answered all the questions in the sections 'Information about the

Person Responsible for the Tree Resource' and 'Budgets and Resources' (table 3.8). This suggests that while most respondents know their budget and what human resources they have, they are unaware of the specific quantities of the resource they are supposed to be managing, and do not have a clear strategic plan on which to build the management.

26.32 percent of the respondents were female and 73.68 percent were male. This points to the tradition of Swedish parks management being a male dominated profession.

The job titles given were divided into categories, to allow statistical analysis. 14 out of the 51 (27.45 percent) that responded to this question were City Head Gardeners, which is generally the person responsible for the overall greenspace management of the urban area, although not all urban areas have this position. The most frequently stated job title fell within the category 'Parks management', followed by categories 'Landscape engineer' and 'Landscape architect' (table 3.9), which suggests that urban tree management is not seen as a specialist field, but something that could be carried out by anyone with knowledge and interest in horticulture. For Landscape architects and in many cases also Landscape engineers, this is true. University level training in horticulture, landscape architecture and landscaping often includes certain aspects of arboriculture, such as general tree biology, selection, establishment and maintenance. Since the average percentage of the employee's working time spent on tree-related issues was only 13.23 (table 3.17) it is perhaps not peculiar that the job title most often indicated was within parks management. Only two respondents stated that they were employed as arborists, both of these local authorities had a population of more than 50 000. One of these stated that he spends 75 percent of his time on tree-related matters.

Budget per head of population was calculated using the data from section B and population data from Sweden Statistics (2005a), for use in statistical analyses. Budget per head of population varied considerably in relation to job title category (fig. 3.1). Categories 'Parks management', 'Landscape architect' and 'Others', which included section and team leaders, had much smaller budget per head of population than did categories 'Arborist', 'Horticulturists' and 'Landscape engineer'. The employees stating section leader or team leader may not be fully aware of the many potential benefits of the urban tree resource and may subsequently not be able to argue for an increase in budget. One reason for the Arborists showing a higher budget per head may be that in appointing a tree expert as the person directly responsible for the tree resource, the local authority is showing awareness of the values and benefits of trees to the wider community and the importance of proper management in order for the

community to acknowledge and take part of these benefits.

Budget per head also varied considerably according to the job titles 'City Head Gardener', 'Landscape architect' and 'Others' (fig. 3.2). Respondents stating 'City Head Gardener' had on average twice as large budget per head as did those stating a job title other than 'City Head Gardener' and 'Landscape architect'. City Head Gardeners are generally thought to have quite a large influence in urban area greenspace politics, which may explain the differences in budget per head.

Although it would be ideal to have a tree expert in charge of the resource, it is recognised that some local authorities do not have enough urban trees to care for that would warrant employing an arborist, but that a person with varied skills and knowledge is preferred.

A majority of the respondents worked in either a Parks or a Technical department (table 3.10). This points to the tradition of tree maintenance being carried out by the same people who mow the lawns and excavate streets for services. 16.36 percent stated that they worked in the Environment/ Development department, which suggests that these local authorities see urban trees as part of the wider living environment and that trees therefore need to be part of the planning of the wider community. A development department may also see the need for trees to be taken into consideration early on in the planning stages of new development.

Budget per head of population varied according the department stated (fig. 3.3). Streets departments had a larger average budget per head than the other departments, although the standard error indicates that this data may not be close to a true mean. Technical and Parks departments had on average a lower budget per head than Development and Environment departments, only further suggesting that local authorities that include trees in the overall planning of the living environment can better justify an increase in budget.

73.03 percent of the respondents were responsible for street, park *and* woodland trees (table 3.11), while 13.46 percent were only responsible for park trees and 1.92 percent (one respondent) was responsible for only the street trees in public domain. It does not seem that population size of the local authority has anything to do with the fact that a majority of the local authorities do not have separate employees responsible for individual trees and for woodlands. Giving responsibility to only one person may increase the overall knowledge of the urban forest, which in turn may prove to be beneficial for the community. However, if the number of trees is large, then it may be better to divide responsibility between one or more employees. These employees

should nevertheless work in close contact with each other to maximise knowledge and resources.

72.20 percent of the respondents had a university level degree as their highest qualification (table 3.13). 25.90 percent stated having a qualification from post-compulsory education at college level, and 1.90 percent (one respondent) stated having only a qualification from compulsory nine year education.

The persons stating further education as their highest qualification had on average spent more years in a managerial post than those stating higher education as their highest qualification (fig. 3.4). This suggests that employees with only a college-level certificate have to work longer to reach a managerial post. The mean number of years spent in a tree-related managerial post within the local authority was 15.80, with a minimum of one year and a maximum of 38 years (table 3.12).

Budget per head of population varied according to the level of highest academic qualification (fig. 3.5). Those employees that stated having a university level qualification had on average a higher budget per head than those with only a college-level certificate or less. The reasons for this may be many. Perhaps the persons who have gone through a higher education seek work in local authorities with more money to spend on trees, or where politicians are more willing to spend more money on trees, or where the health situation within the tree stock is such that more money has to be spent on trees, for public safety.

66.70 percent of the respondents indicated Horticulture, Parks or Landscaping as their background (Table 3.14). Only 8.70 percent (twelve respondents) indicated Arboriculture as their background. These results point to the fact that arboriculture is a relatively new discipline in Sweden, and trees have traditionally been cared for by parks workers and horticulturists. As mentioned above, this is not to say that trees have generally been cared for with less knowledge by a horticulturist than they would have been by an arborist, as qualified horticulturists and landscapers generally have an accurate idea of the care that is needed for city trees.

73.17 percent of the respondents stated that they have attended arboricultural short-courses (table 3.15). This is a very encouraging number, especially as so few of the respondents have any qualifications in arboriculture. Attending short-courses is a very efficient way of learning about new methods of tree care and management, and every local authority that takes pride in its tree resource or aim to, should send their employees on these courses at least once every year. Many short-courses are set up by Movium – Centre for Urban Public Space at the Swedish University of Agricultural Sciences, but private

arboricultural companies also provide courses on various topics. Jönsson and Gustavsson (2002) have remarked that managers with qualifications in for example forestry, landscape architecture and horticulture differ distinctly in terms of management of the resource. Forums such as Movium and the Swedish Tree Society may bring these individuals together and provide them with knowledge of the framework for management procedures that suit the urban forest and the community as a whole.

44.44 percent of the respondents were members of a professional arboricultural organisation (table 3.16). 34 percent of the respondents read arboricultural journals and 66 percent read other journals related to green issues. As with short-courses, memberships to professional organisations and readership of journals can provide information on best practice and new methods and subscriptions to tree-related journals should be provided for by the employer. If arboriculture is to move forward in Sweden there is a need for new management methods and practices to be tried out in local authorities, and to be conveyed to the wider public so that benefits may be perceived.

Those respondents that stated they were not members of any professional arboricultural organisation had a mean higher budget per head of population (fig. 3.6). Two arboricultural organisations were named by the respondents, the Swedish Tree Society and the International Society of Arboriculture (ISA). The Swedish Tree Society was established in 1992 and is concerned with increasing professionals' knowledge of street and park trees. Since 1998, the society also acts as the Swedish chapter of ISA, however, members can choose to be part of only the Tree Society. Respondents that were members of the ISA had a higher mean budget per head than those that stated being members of only the Swedish Tree Society (fig. 3.7). This may suggest that ISA members can exert more influence in budgetary, and therefore also, management decisions. It may also suggest that respondents that are member of only the Tree Society are perhaps also members of a horticultural or landscaping organisation and do not see it worthwhile to join a specialised tree organisation.

As mentioned above, the mean percentage working time spent on tree-related issues was 13.23, with a minimum of 1 percent and a maximum of 75 percent (table 3.17). The most frequently stated percentage was 5. The mean percentage for local authorities with a population of less than 50 001 was 7.69 and for local authorities with a population of more than 50 001 the mean percentage was 26.42. There was a significant association between population size and the percentage working time (table 3.18). The higher the population of the local authority the more likely it was that the respondent spent a larger percentage of his/her working time on tree-related issues. Larger populations may

generate a heavier work load of dealing with complaints but also community involvement.

The percentage working time also varied according to the number of street trees (fig. 3.8) and according to job title categories (fig. 3.9). Respondents in local authorities with more than 10 000 street trees spent a considerable larger percentage of their time on tree-related issues than did those employees in local authorities with less than 10 000 street trees, which may be explained by the fact that a larger number of trees generally increase the amount of time spent managing those trees. Arborists, Landscape architects and Landscape engineers spent a considerably larger percentage of their working time on tree-related issues than Horticulturists and Parks managers. This may suggest that Arborists, Landscape architects and Landscape engineers are specialist job titles, and these may be employed in local authorities that need a more specialised employee to manage the tree resource and to coordinate efforts within the tree programme. Horticulturists and Parks managers on the other hand, may have to be more general in their approach to the management of all greenscape.

Urban tree management is a dynamic and creative concept that embodies both maintenance and development aspects. The manager of the tree resource needs to be aware of not only the requirements of the tree stock, but the needs of the community. It is essential that the manager networks with all people involved in the maintenance and planning even though these may not be situated in the same departments. The manager should perhaps ideally be situated in an environmental planning department rather than a parks maintenance department, as a planning department generally oversees all parts of the community and not only the green structure. It is encouraging that a majority of the tree managers have attended short-courses as these will further the manager's knowledge of tree management. In the long-term, that knowledge will, if used correctly, result in a higher profile for the urban forest and a place for trees on the local political agenda that may result in increased funding for the tree programme.

4.2.2 Budgets

The mean total budget for tree-related work in 2004 was 1 084 696 Swedish Kronor (SEK), with a minimum amount of 50 000 SEK and a maximum amount of little over 9 000 000 SEK (table 3.19). Budget per head of population was calculated as a means of better comparing local authorities with each other, and the mean budget per head was 25.25 SEK, with a minimum amount of 3.33 SEK and a maximum amount of 204.01 SEK (table 3.20). This wide range suggests that local authorities vary considerably in the priority given to trees in the annual budget.

Budget per head of population varied considerably according to the location of the local authority (fig. 3.10). Local authorities in the east, west and south had a higher mean budget per head than did local authorities in the north and midlands. Since population figures do not relate to the number of trees in the local authority, an analysis between budget per head and number of street trees was carried out. Budget per head increased when the number of street trees increased, although those with between 0 and 500 trees spent almost as much per head of population as did those with between 501 and 1 500 street trees (fig. 3.11). This may be the result of good management within the tree programme, with clearly defined goals and targets.

Only 35.42 percent of the respondents could give an accurate record for the total annual budget for tree-related work for 2004 (table 3.21), which may be explained by the fact that a majority of local authorities, if not all, do not have separate tree budgets, but funding for trees are often allocated from a general greenspace budget, which may include funding for everything from park benches to children's play areas. There was no significant association between population size and having or not having accurate records (table 3.22). Budget per head of population varied considerably according to whether or not an accurate record was given for the tree budget (fig. 3.12). Those indicating an accurate record had on average more than twice as large budget per head as did those indicating that the budget figures were only an estimate, this was further indicated by the fact that there was a significant association between budget per head and having or not having accurate records (table 3.23). This suggests that local authorities that spend a larger amount on their trees may be more prone to keep records of budgets and expenditure, perhaps as a way of justifying at least the same amount for the following year's budget.

The most frequently stated change in the total annual budget over the past five years was an increase; this was stated by 48.98 percent of the respondents (fig. 3.13). 20.41 percent stated a decrease and 30.61 percent stated that there had been no change. 22.73 percent of the respondents indicated an increase of 51 percent or more (table 3.24). One respondent indicated an increase of more than 100 percent.

The reasons given for any increase in the budget were divided into categories. The majority of the respondents stated that 'New planting' and 'Replacing dead/dying trees' were the main reasons for any increase (table 3.25). Dutch Elm disease was responsible for a substantial proportion of the increase in budget, as was 'Re-organisation'. 5.26 percent (one respondent) stated that the increase was due to the launch of a politically supported tree strategy document. Budget per head of population varied according to the main reason given for any increase

(fig. 3.14). The respondent stating the launch of a tree strategy document as the main reason had by far the largest budget per head. Those stating reasons 'Dutch Elm Disease' and 'Replacing dead/dying trees' had a larger budget per head than those stating 'Re-organisation' or 'New planting'. It is not surprising that the launch of a tree strategy document can increase the budget, as this is a document that provides a foundation for making long-term decisions on management practices and budgets. The fact that the strategy document was supported by the politicians working in the local authority is probably also a reason for the increase, as this provides power to the objectives and action plans outlined in the strategy.

The reasons given for any decrease in the budget needed not to be divided into categories, as all respondents stated the same reason: general savings within the local authority (table 3.26). In general, the first budget cuts are to the sectors where it will create the least public concern in the short-term, like tree maintenance. Even though a tree may be hazardous and/ or dying, it will usually take many years before stakeholders in the community will notice, whereas a broken street lamp or an un-mowed lawn will have the switch-board at the local authority overflow with calls. Informing politicians and stakeholders about the many benefits of the urban forest may be one way of working against further decreases, although it is recognised that time will already be an issue for a stressed local authority employee working within severe financial constraints.

Explanations given as to how the size of the total annual tree budget in 2004 was determined were divided into three broad categories. 65.79 percent of the respondents stated that a specific tree budget did not exist, but that trees were allocated funding from a department budget that has to cover many other areas as well (table 3.27). 26.32 percent stated that the budget was based on the budget for the previous year's work, and 7.89 percent stated that the tree programme was allocated funding when needed for reactive maintenance purposes. These figures are very discouraging, as they indicate a complete lack of a planned approach to urban tree management.

An amount spent per tree was calculated using the amount spent on maintenance in 2004 (table 3.28) divided by the number of street and park trees (tables 3.2 and 3.3). The mean amount spent per tree in 2004 was 72.03SEK, with a minimum amount of 1.30SEK and a maximum amount of 500.00SEK. This amount varied according to the location of the local authority (fig. 3.15) and to the number of street and park trees in each local authority (fig. 3.16). Local authorities in the east and midlands spent more on maintenance per tree than local authorities in the west and south. Local authorities with between 0-500 trees spent more on maintenance per tree than did local authorities with

more trees to care for. For park trees, local authorities with between 501 and 1 500 trees spent more on maintenance per tree than did local authorities with more park trees. Ideally, the amount spent per tree should not vary significantly between local authorities, although it is understood that spatial planning, growing conditions, disease infestation and political willpower will vary between local authorities.

The results on budgets suggest that a planned approach is lacking in local authority tree programmes. It seems that many local authorities do not rate tree care as highly as other services which are perhaps seen as more important, such as lawn mowing and flower bed maintenance, as neglect of these is more noticeable in the short-term. This prioritising of services results in many local authorities not having a separate budget for street and park trees. This may turn into a downward spiral, as a low profile tree programme is less likely to attract funding, and less funding will result in neglected trees which may result in less political and community support for an already faltering tree programme. The management of urban street and park trees needs to be proactive, but this will be difficult if tree managers are not aware of the tangible benefits of the urban forest and what financial value the resource actually has. Arnold (1993) has suggested that a cost/benefit approach may be useful which places a monetary value on the lifetime cost of a tree and its tangible benefits and contribution to the public. This would provide a stepping stone towards better knowledge of the tree programme service, and towards a planned approach of its management. The planned approach needs also to be manifested in a tree strategy document, which will further facilitate the justification of any funding.

4.2.3 Planned Management

In the last decade there has been a significant reinforcement in the need for action on a worldwide scale to protect and conserve trees and woodlands. In 1997 the proposition *The Swedish Environmental Objectives – environment politics for a sustainable Sweden* was handed over from the Government to the Parliament for approval (Swedish Government, 1997). This was the Government's response to the 1992 UN Conference on the Environment and Development in Rio de Janeiro (Miljömål, 2006). In signing the Rio Declaration on Environment and Development, the Government agreed to adopt Agenda 21, a comprehensive plan of action to be taken in every area which humans impact on the environment, which recommends all nations to produce sustainable development strategies (UN, 2005). The Government is now committed to improving the management and conservation of forests, and although individual trees such as those in urban areas are not mentioned in *The Swedish Environmental Objectives*, three of the objectives could be seen as relating directly to urban

street and park trees: good built environment, clean air and biodiversity.

The planned approach has long been used in resource management (Mazotti and Morgenstern, 1996). A strategic plan provides a foundation for making the best decisions possible and the flexibility to change them, as well as fostering confidence in the resource. Booth (2005) suggests that strategic plans create a blueprint for administration and management of a tree programme, which effectively would mean that they provide consistency in the management process through time and staff changes. To be sustainable, any urban forest programme needs to be planned with a long-term view of benefits.

There are three fundamental steps in developing a planned approach to resource management (Johnston, 1991): the inventory to find out the extent of the resource; the setting of aims and objectives; and the setting of targets through management plans. This process should be continuous and also revised through feedback from the proposed objectives, and in light of changing circumstances (Johnston, 1991).

A majority of the respondents could not state an accurate record for the number of street or park trees (72 percent and 80 percent respectively; tables 3.29 and 3.30). There was no significant association between population and having or not having accurate records for the number of street or park trees (tables 3.31, 3.32) or between having or not having a tree strategy document and stating accurate records for the number of street or park trees (tables 3.33, 3.34). 29.03 percent of the respondents replied to the question of what percentage of the urban area was covered in trees, and none of these stated accurate records for the percentage provided (table 3.35). Even less respondents (27.42 percent) replied to the question of what percentage of the total tree covered urban area was in public domain, and none of these stated accurate records (table 3.36). Inventories are essential to not only justify budgets but to locate planting sites, identify management needs and locate hazardous trees in need of repair or removal (Miller, 1997). A survey need not to be complex but needs to provide some minimum level of information that will allow the manager to make intelligent management decisions (Bassett, 1978). The results above demonstrates that a majority of local authorities do not have correct nor extensive information on their tree resources, which makes it impossible for these local authorities to make informed, long-term decisions.

Tree policy documents can be used to detail broad objectives of a tree programme. More useful though to the overall management is a tree strategy document that not only specifies aims and goals, but provides an indication of the way in which the targets will be achieved. 41.17 percent stated that they had a separate

tree strategy document, and 34.62 percent indicated that they had a separate tree policy document (table 3.37). Out of the respondents that replied having a tree strategy and/or tree policy document, six replies stated that there were also other strategy documents in use within the local authority that relate to street and park trees. There was no significant association between population and local authorities having a tree strategy document (table 3.38). These are relatively positive results if compared with Johnston and Rushton's survey of British local authorities (1999) where only 17 percent stated that they had a tree strategy. But on the whole, less than half of the surveyed local authorities having a tree strategy document is a disappointing but not surprising result. It has been suggested that one reason for the lack of public sector strategies is that strategies is a means of securing competitive advantage, and since local authorities have traditionally had a monopoly over provision of, for example, tree care there has not been a need for a strategy (Porter, 1985; Horwitz, 1979). Today, when many services have been privatised and local authorities seem to need accurate justification for any spending, the strategy document is essential if individual services are to gain internal advantage over other provisions and secure the necessary funding (Booth, 2005). A strategic document may also outlive short-lived political trends and ideas, in favour of a sustainable living environment, such as that aimed for in the Government's document *The Swedish Environmental Objectives* (1997).

Budget per head of population varied considerably according to the various relevant strategies/policies named in the questionnaire (fig. 3.17). The local authorities that stated having a tree strategy and/or tree policy document had a mean larger budget per head than did those local authorities that did not state having a separate tree strategy/policy document, just like it was predicted above. Interestingly, the six local authorities that stated that there were also other strategy documents in use that related to street and park trees, not only the tree strategy/policy document, had a mean larger budget per head than those stating only separate strategy/policy documents. This suggests that if the tree strategy document and trees in general are mentioned and cross-referenced in other strategy documents, recognition for the tree programme becomes greater, and funding may increase.

The mean amount spent per tree on maintenance in 2004 was greater for the local authorities that had a tree strategy document than for those that stated not having a tree strategy document (fig. 3.18). The reason for this may be that the strategy document created a larger percentage of planned maintenance for the year 2004, which the increased budget then covered. It may also be because local authorities that have produced tree strategy documents have committed themselves to caring for and enhancing the urban forest, and they may take trees and their management more seriously

than local authorities that have not committed themselves in the same way.

Ten of the tree strategy documents named by respondents were sourced via the internet and reviewed for this study, and it was concluded that few of them were proper strategy documents with action plans included, but reminded more of broader policy documents. A majority of the documents did not name other strategy or policy documents relating to the city trees, or mention the departments and partners responsible for management and maintenance. A fundamental principle of urban forestry is that it requires an integrative view, so that all stakeholders within the Council that have a hand in the urban forest can co-ordinate their efforts across all departments and partners, and that the different elements of and associated with the urban forest are not managed in isolation of each other (Johnston, 2001). Action plans need to be formulated to include the method of delivery, participants, and resources (NUFU, 1999), and the targets set also need SMART – specific, measurable, achievable, relevant and timed (DCLG, *unpublished*). Without action plans, the delivery of the strategy is very unlikely to be successful. None of the strategies reviewed stated that the public was consulted during the drafting of the document. The values of the residents and other stakeholders of a community is what should drive a tree programme, and the local authority cannot expect to know what the public wants without asking them their opinions.

There were a few strategy documents that stood out from the rest as well written documents, and these may be used as examples of good practice for local authorities that are drafting a strategy, or revising an existing strategy.

A majority of the responding local authorities with tree strategy or policy documents launched these from 1996 and onwards (table 3.39). The two local authorities with the largest population launched their tree strategies between 1990 and 1995. It is not surprising that a majority of tree strategies were launched at this time. The Rio Declaration was signed in 1992, and only after that were environmental strategies discussed openly on a local level (Miljömål, 2006). The launch of the tree strategy of one of the larger local authorities in 1990 may have been the result of the work of an ambitious tree expert.

Only one respondent stated that an arboriculturist had been involved in developing the most relevant strategy/policy (table 3.40). 47.83 percent stated that a Landscape architect was involved, and 43.48 percent stated that a Horticulturist was also involved. This reflects the green sector and tree maintenance in general as being carried out by professionals with a horticulture background. It is however disappointing that the arboriculturally trained professionals that run

private consultancies are not consulted when such an important document is being drafted. Although the likes of Landscape architects and others with a real interest in trees are thought to have some knowledge of tree management, in general arboriculturists with qualifications from higher education are trained see the wider benefits of proper management and have knowledge of a wider range of solutions for urban tree management.

The preservation and enhancement of the urban forest is feasible only when concepts and targets are effectively incorporated into the urban forest development (Pauleit and Duhme, 2000). Extensive policy and strategy documents provide the framework for the management that will facilitate conservation and improvement, and local authorities need to develop, distribute and use these documents to ensure sustainability of the resource. It was disappointing that so few of the respondents had an accurate record for the tree stock and its spatial distribution. In order for managers to properly assess programme objectives and management procedures it is essential that the extent of the tree resource is known. The Government could encourage local authorities to produce local tree strategy documents through national guidelines that recognise planned management of urban greenspace as vital for a wide range of priorities, such as the objectives outlined in the document *Sweden's Environmental Objectives*. This would certainly provide local authority politicians with an incentive to act on urban forest issues on behalf of central government and the community.

4.2.4 Systematic Management

As stated above, good management involves the setting of goals and objectives, prioritising these and developing specific management strategies to achieve them (Miller, 1997). The implementation of a tree strategy must be based on a systematic approach towards the maintenance of the tree resource, if that resource is to yield sustainable benefits.

Crisis management is the opposite of systematic management, where maintenance work is carried out in a response to complaints, requests and hazardous situations. The more work that is identified early on and carried out in a scheduled, systematic way, the less need there will be for residents to complain, or for situations to become hazardous. Kielbaso *et al.* (1987) regarded a level of 40 percent or more for all maintenance work being carried out on a regular cycle as an indication of a systematic approach to tree management. This percentage would mean that a majority of the work is carried out on a crisis basis, which over the long-term will not meet the goals of the community. The author of this report suggests that at least 60 percent of the work has to be undertaken

regularly for the management to be systematic. On average, the local authorities involved in this study estimated that 60.62 percent of the maintenance work was carried out in a systematic, scheduled way (table 3.41), and the most frequently stated figure was 80 percent. This is truly encouraging as systematic maintenance of the tree stock is the only way to realise any planned objectives. There was no significant association between population or the number of street/park trees and local authorities carrying out more or less than sixty percent of their maintenance on a systematic cycle (tables 3.42, 3.43, 3.44).

The mean budget per head of population varied according to the percentage of systematic maintenance (fig. 3.19). The local authorities that estimated undertaking more than 70 percent of their maintenance on a regular cycle had a larger mean budget per head than those stating a lower percentage. This was perhaps unexpected, as systematic maintenance usually reduces the cost of maintenance, but perhaps the budget is allocated differently in these local authorities than in those with a lesser percentage of systematic management.

60 percent of the local authorities inspected their street trees on a systematic basis (table 3.45) and 47.73 percent inspected their park trees regularly (table 3.46). None of the local authorities with more than 100 000 residents inspected their street or park trees regularly. There was no significant association between population or the number of street/park trees and local authorities inspecting their trees regularly (tables 3.47, 3.48, 3.49, 3.50). Systematic inspections are the foundation on which systematic management plans are built as these will identify the needs for maintenance, particularly hazard abatement. It is alarming that the street trees in the most densely populated urban areas are not inspected frequently, as the more dense the population, the more likely it is to have a hazard target that can get injured or damaged by a failing tree or part of tree.

The mean budget per head of population was larger in those local authorities that carried out systematic inspections of their street and park trees (fig. 3.20 and 3.21). This is not surprising as budgets can be planned more easily for regularly cycled tasks, and a higher budget can be argued for. The mean amount spent on maintenance per street and park tree in 2004 was larger in those local authorities that did not undertake systematic inspections (fig. 3.22 and 3.23). Neither is this surprising as this may indicate a higher level of crisis management, which is known to be more costly (Miller, 1997).

The mean frequency of inspections was 14.56 months for street trees (table 3.51) and 14.78 months for park trees (table 3.52). The most frequently mentioned period between inspections was 12 months for both

street and park trees. The frequency of inspections should vary between areas of different target ratings and between different conditions of the tree stock, for example an isolated park tree may be inspected less frequently than a tree in the middle of a busy city square; but generally trees should be inspected at least every three years. In today's litigious society it is increasingly important to frequently inspect all sources of liability. In case an accident occurs, the manager can show that the local authority was not negligent.

44.44 percent of the responding local authorities used a computerised management system for their trees (table 3.53). There was a significant association between population and usage of a computerised management system (table 3.54). The larger the population, the more likely it is that the local authority is using a computerised management system for street and park trees. However, there was no significant association between the number of street and park trees and local authorities using a computerised system (table 3.55 and 3.56). The reason for this may be that the funding system of local authorities is population based (Verva, 2006) and does not take into account the local need for asset management, in this instance the number of trees under each local authority's jurisdiction. The benefits for a local authority in using a computerised management system for trees are potentially numerous. A well developed system will enable the persons involved in the management of the urban forest to query the database in a variety of ways and to analyse the outcomes of those queries. Management reports will allow planning in advance of systematic work programs for all arboricultural operations and schedules, and priorities for maintenance may be assessed. These management reports will also enable the department to utilise its assets to its full advantage by allocating equipment and labour appropriately, and thereby demonstrate cost effective management and increase in productivity (Thurman, 1983). As mentioned above, individual tree records also have application in cases of public liability for damage caused by a local authority tree (Crossen, 1989). The information stored on the database, such as surveys, condition notes and maintenance history records, not only facilitate identification of potential liability but also provides the basis for a local authority's defence of claims, where it is crucial for the local authority to be able to show evidence of reasonable care, should legal action arise. Moreover, the information derived from a well structured tree management system can be disseminated for use as a public relations tool, to inform the stakeholders or governmental organisations of the extent, value and nature of the urban forest (Johnston, 2002).

A few respondents stated that there was a computerised management system installed but that there were no resources available to update the system. This is thought to be true for many local authorities, especially

as many respondents also remarked that the percentage of systematic maintenance was decreasing as the budgets were steadily decreasing. However, it is thought that once a computerised system is up and running and in use by all urban forest key players within the authority, the many benefits will outweigh the time it takes to maintain the system.

The mean budget per head of population was larger in the local authorities that stated using a computerised management system (fig. 3.24). This underlines the discussion above that the information on the system will help justify budget increases. Not surprisingly, the mean amount spent on maintenance per tree in 2004 was larger for those local authorities that did not use a computerised system. This may suggest that these local authorities practice a higher level of crisis management, or do not have adequate records of scheduled work, which, as mentioned above, has proven to be more costly in the long run (Miller, 1997).

Mature trees may not suffer as badly if the systematic maintenance is postponed for a year or two, but newly planted trees need regular post-planting maintenance. The mean rate of tree mortality within the establishment phase was 6.24 percent, while the most frequently stated rate was 5 percent (table 3.57). These encouraging figures suggest that most responding local authorities undertake some kind of systematic post-planting maintenance. However, only 10.42 percent of the respondents stated that they had an accurate record for this figure, which suggests that the true mean of mortality rate might be higher. As mortality rate reflects on the management skills of the respondent, it is thought that mortality rate may be estimated at a percentage that is to the advantage of the respondent.

A mean of 80.23 percent of all tree-related work was carried out by in-house staff (table 3.58). A majority of the local authorities with a population between 10 000 and 100 000 stated that 100 percent of all work was undertaken by in-house staff. The mean number of hours charged by arboricultural consultants in 2004 was 211, with a minimum of 20 hours and a maximum of 800 hours (table 3.59). There was a significant association between the percentage work that was carried out by in-house staff and the number of hours charged by consultants (table 3.60). The larger the amount of work carried out by in-house staff, the less likely it is that arboricultural consultants perform tree-related consultancy work. There was no significant association between population and the percentage work undertaken by in-house staff (table 3.61). The mean amount spent on maintenance per tree in 2004 varied considerably according to the percentage work being carried out by in-house staff (fig. 3.25) The local authorities stating that between 21 and 99 percent was performed by in-house staff had a larger mean amount per tree than local authorities that stated less than 21 percent or that 100 percent was undertaken by in-house

staff. In general, this may suggest that it is less costly to contract work out, or that if maintenance is done by an in-house gang it is easier to get more money for maintenance, or that more maintenance is performed if the work is not contracted out.

The respondents were asked to rate seven factors that may be considered when selecting trees for a planting scheme. 'Quality' and 'Ultimate size' were the factors that were most highly prioritised, followed by 'Long-term maintenance cost' (fig. 3.26). 'Initial impact', 'Purchase cost' and 'Establishment cost' were rated as medium priority, and 'Local availability' as the lowest priority. The quality of the planting stock is important in terms of future benefits and cost efficacy, and the ultimate size is very relevant in an urban setting where space is limited. These figures suggest that local authorities see the benefits of higher purchase and establishment costs in the long term. However, it would be preferable if local authorities would support local growers instead of favouring extended transport and in many cases overseas shipment.

Tree care is a long-term, low intensity process, as change in almost any form represents a stress for trees (Clark *et al.*, 1997), and maintenance has to be systematic for the urban forest to supply environmental, social and economic factors and benefits over time. It was encouraging that the mean percentage of maintenance undertaken in a systematic way was more than 60 percent for the responding local authorities, although these only constitute a small part of all local authorities with responsibilities for urban trees. It is essential that local authorities strive for a higher percentage of systematic maintenance, not just for the benefit of tree health but also for the benefit of the entire tree programme. Systematic maintenance goes hand in hand with the planned aspect of urban forestry; neither will function properly without the other. For ease of securing a higher percentage of systematic maintenance, more local authorities should invest in a computerised management system. As discussed above, the benefits of a sustainable system for the entire management programme are many.

4.2.5 Integrated Management

The integrated aspect of urban tree management is concerned with the various individuals and groups that play a role in urban tree management, both within and outside the local authority. This study focused on the stakeholders and partners in the community and to what extent local authorities involve them in the management of the publicly owned trees.

Sustainable management involves integrating and co-operating with the public, private and voluntary sectors to identify opportunities for a coordinated effort to guide urban development in a way that will take

advantage of all the social, economic and environmental functions available from the urban forest (Gustavsson *et al.*, 2005). Sustainable ideas, visions and policies can only be developed through an increased cooperative approach.

Johnston (1989) describes a common scenario where the local authority assumes that the tree management service is appreciated if there are no complaints from the public. The local authority must approach the public in order to ascertain their views on the service before they can properly assess the success of the service. A minority of the respondents (46 percent) stated that their local authorities did involve the general public in tree-related issues (table 3.62). There was no significant association between population, budget per head of population or having a tree strategy document and involving the public (tables 3.63, 3.64, 3.65). The most frequently mentioned type of involvement with the public was that the public informed the local authority of hazardous trees (fig. 3.27). Other types of involvement included receiving ideas and views from the public; getting sponsored by the public; and informing the public about tree issues. It is discouraging that so many local authorities did not truly integrate with the public. This integration has to be a two-way experience, co-operation is not only about the local authority being notified of hazardous situations, but the local authority needs to inform and educate the public on tree-related issues, and the public needs to be given an effective voice in influencing the management of their trees if the tree programme is to be a success.

41.30 percent of the respondents stated that they involved organisations outside the local authority in the tree management programme (table 3.66). There was no significant association between population and involving organisations (tables 3.67). However, there was a significant association between having a tree strategy document and involving organisations (table 3.68). This may suggest that local authorities which have and use a tree strategy document have more concerns for the well-being and enhancement of the urban forest, and value the importance of letting environmental and educational organisations take part in the management process.

The most frequently mentioned type of involvement with organisations was receiving ideas and views from the organisations and the local authorities informing the organisations about tree issues (fig. 3.28). Other types of involvement included sponsorship, practical volunteer work, activities with school children and providing the organisations with technical advice. The types of involvement stated by the respondents show a more integrated approach to involving organisations than to involving the public. Organisations seem to be more involved as they not only supply the local authority with their ideas and needs but they receive

something in return from the local authority. It is possible, given the disquiet nature of a large part of the public that are interested in local authority issues, that local authorities find it more worthwhile to interact with organisations because these are organised and professional entities within the community, in contrast to individual members of the public.

A majority of the respondents (53.19 percent) stated that they involved private companies in the tree management programme (table 3.69). However, when looking at the types of involvement indicated by the respondents it becomes clear that what many see as integrated management is actually just providing the private companies with work, without giving anything but good-will in return (fig. 3.29). The other type of involvement was giving technical advice to companies. There was no significant association between population or having a tree strategy document and involving private companies (tables 3.70, 3.71). The urban tree programme may thrive from partnerships with both organisations and private companies, but there is a need for the local authority to set aside resources for partnerships to be successful. It may be difficult to justify these resources as local authorities have traditionally acted as self-contained units within the community.

Three local authorities indicated a wider community involvement beyond the involvement mentioned above, with schemes such as adopt-a-tree, practical volunteer work and guided walks. These three local authorities had between 15 001 and 100 000 residents. Two of these also mentioned close co-operation with organisations which lobby for city centre tree planting and general greening of the urban areas. It is discouraging that only three respondents (6.19 percent) seemed to integrate truly with the stakeholders and partners in the community. Urban tree management is a dynamic process, which is influenced by stakeholder and partner needs and by political tides. Schemes such as those used by the three local authorities above are good ways of uniting the community in tree-related issues, and should be part of the tree programme in all urban areas.

Time and budget constraints may be the main reason for local authorities not integrating more thoroughly with the community. Community involvement does require a not unsubstantial amount of time for organisation and supervision, but there are ways of relieving the local authority of many aspects that may be time-consuming. Many local authorities in the UK have successfully used voluntary Tree Wardens which has enabled tree officers to concentrate on the technical aspects of urban forest management (Johnston and Rushton, 1999). Local authorities in Sweden could adopt this scheme as it most probably would result in an increase in the level of input into the tree programme from the public. Another way of increasing

community involvement may be to establish local tree forums that keep a consistent focus on the urban forest so that these issues do not get lost in the overall planning of the urban area. This forum could be made up of representatives from, for example, residential housing associations, environmental groups, retail parks, schools, as well as professionals from the private sector who are involved in the management of the urban forest. Guidelines from central government could remind local authority politicians and tree managers of the importance of community involvement for success and sustainability of the urban tree programme, and encourage them to allocate resources for this sort of integrative approach.

4.3 The Future of Urban Tree Management in Sweden

The results from this study have provided a wealth of insight into local authority urban tree programmes. Results show that most local authorities are far from managing their urban tree resource in a planned and integrated way. A majority of the responding local authorities did not have special tree budgets, did not have accurate numbers for their tree stock, did not have tree strategy documents, did not use a computerised management system, and did not integrate with the stakeholders in the community. Far more encouraging was the mean amount of maintenance work that was undertaken in a systematic way: 60.62 percent. Equally encouraging was the fact that a majority of responding local authorities inspected their street and park trees on a regular cycle.

Urban forestry is at a relatively early stage of development in Sweden, and urban street and park trees have traditionally been managed by foresters and parks attendants. This may account for the relatively poor quality of local authority urban tree management demonstrated in this study. As trends move towards a more sustainable management of all private and local authority services, the approach to urban tree management will hopefully change to the better. Institutions and organisations such as, for example, the Swedish University of Agricultural Sciences (SLU) and the Swedish Tree Society work actively to raise the interest in and knowledge of urban trees among professionals.

A few tasks for improving the overall performance of urban local authority tree programmes are outlined below. The main priorities regard the planned and integrated aspect of management, which this study has demonstrated to be the least successful.

The first step is to prepare high quality information about the tree resource so that it can effectively support urban planning, public involvement and decision-making processes (Schipperijn *et al.*, 2005). This

information needs to be objective, reliable, representative and comparable. Without reliable information it is unlikely that any argument in support of the tree programme and its budget can be successful. A computerised management system that is connected to a GIS-system should be installed in all local authorities and used for collecting, storing and analysing data.

It is essential to the development of a sustainable approach to urban tree management that local authorities prepare a tree strategy document that outlines long-term objectives, and management plans for at least ten years ahead. A formally adopted strategy document shows that the local authority is committed to caring for the generally largest components of the living environment, and the strategy document can facilitate budget decisions and resource allocation beyond the sort of reactive crisis management that many local authorities are experiencing today. To be effective over time, the strategy document will need to be reviewed and revised every five years.

In drafting the strategy document some sort of community needs assessment has to be undertaken, through forums, questionnaires or exhibitions in public institutions and spaces. This could also be a way to interest volunteers in taking part in the tree programme. A small-scale tree warden scheme is very likely to be successful, and these volunteers could, through information spreading and educational tools, help raise the profile of the tree strategy document as well as the entire tree programme. In many areas of larger urban areas, there is a need to foster environmental neighbourhood pride, and tree wardens could function as coordinators of the residents' efforts to shape their living environment.

Implementation of a tree strategy must be based on a systematic approach towards maintenance. Although many responding local authorities already undertake a large proportion of their maintenance work on a regular cycle, there is one area that needs improvement. Systematic inspections of street and park trees should be undertaken by all urban area local authorities. This is especially important in identifying possible hazardous trees, but it will also inform of maintenance requirements and planting opportunities; information which is essential if a planned approach is to be kept.

The tasks outlined above should be prioritised by all urban area local authorities, if the urban tree resource is to remain a source of benefits to the wider community.

To encourage local authorities to produce local tree strategy documents, central government could supply national guidelines that recognise the importance of planned management of urban greenspace. Central government could also offer a cost-share solution to

local authorities that wish to develop a tree strategy document, so that local authorities where political winds are not favouring expansion of greenspace management too can modernise their tree programme. Sponsorship or a cost-share programme would certainly prove that the Government is truly committed to the national environmental objectives it has set out. Further central government guidelines could be supplied in order to put a financial value on the tree resource, to facilitate budget allocation and planning. A financial value would be of benefit on a national level, therefore it is suggested that central government finance a committee to work out a formula that is consistent with Swedish conditions.

If the profile of urban tree management is raised and more political support gained for tree-related issues, the future of local authority urban tree management in Sweden could potentially be a very interesting area for a tree manager with interest in and knowledge of the many benefits supplied to the community by the urban forest.