

**COST E12**

**Urban forests and trees**

**A. BACKGROUND**

In Europe, more than two thirds of the population live in urban areas, and partly because of that, the quality of the urban environment is increasingly recognized to be a key ingredient of the economic regeneration of European cities. In forestry, it now seems that the emphasis in afforestation is very often on multipurpose projects and in urban fringe areas where outdoor recreation and landscape amenity play a major role. Trees have an impact on the abiotic and social aspects of a city's environment and urban forests influence people's perception of the city, as well as provide recreational opportunities and increase the wildlife. These influences, which are sometimes combined with wood production, make the urban areas particularly important. Therefore, sustainability of forest stands and urban trees are important to the rapidly growing number of urban inhabitants.

Recent research has shown that urban trees benefit communities economically, socially and environmentally. But trees in urban environments face harsh growing conditions. Heavier traffic patterns have increased the demands for road construction and have changed the growing conditions for many roadside trees. Furthermore, pollution from traffic has a strong detrimental impact on urban trees. In urban situations along streets and roads, and on building sites, soils can be impenetrable to root growth due to compaction. Compaction will restrict water

and oxygen available to roots, and cause waterlogging which may kill roots with poor drainage conditions. Tree roots impeded by compacted soil have a strong tendency to grow into utility lines causing obstruction of these. Regular maintenance of utility lines causes severe damage to tree roots both inside and outside the lines. Furthermore, soil may lack sufficient nutrients when it consists of waste products left by the building industry. The urban growing conditions may also be impeded due to shading effects, wildlife, de-icing salt, collisions with vehicles, vandalism, etc. Healthy trees withstand these pressures better than stressed trees and good growing conditions will help the trees to return benefits to the community.

The harsh urban growing conditions have caused the vitality of urban trees to fall drastically during the last 30 - 40 years. The average lifespan for a newly planted street tree is as low as 7 - 15 years.

In Denmark every inhabitant "pays" approximately ECU 12 per year for the maintenance of parks and other green areas in urban settings. A conservative guess is that Denmark can be regarded as an average country in European terms when it comes to maintenance of urban forests. Escalating the Danish price to European terms gives a value of ECU 2,9 billion (240 million inhabitants in Europe x ECU 12). The amount spent on European research in urban forestry is uncertain. According to Danish circumstances, research in relation to urban forestry is calculated to cover only approximately 0,1 to 0,5% of the total urban forestry maintenance costs. The equivalent in Europe is then approximately ECU 300 million. In the UK alone, urban street trees are estimated to be worth over ECU 200 million.

More than 700 000 street and roadside trees die from de-icing salt damage applied to roads and roadsides every year in Western Europe. Also forest stands in close proximity to roads are damaged by de-icing salt making this number even bigger. Given a conservative value of ECU 20 per tree, replacement costs would be a minimum of ECU 14 million.

Replacement costs caused by other factors such as drought, atmospheric pollution, low soil moisture and oxygen and vandalism could cost more than ECU 50 million.

Urban forestry is one of the most used terms in relation to trees in or near the urban environment. But urban forestry has had difficulties in finding a final definition. The difference between arboriculture and forestry may be seen as the difference between whether the maintenance is carried out on the individual tree (arboriculture) or the stand of trees (forestry). An urban forest can be defined by its placement in or near urban areas and by its multi-functional aspects given shade, amenity values, etc. Therefore, urban forestry can be defined as: planning, design, establishment and management of trees and forest stands with amenity values, situated in or near urban areas.

Trees are probably the most important natural element in the urban landscape.

Development of urban forestry therefore must be regarded as a common responsibility. As the number of researchers working with subjects related to urban forestry is limited, interdisciplinary collaboration and international relations are very important keywords for this COST Action.

## Current state of the art

European research into urban forestry is limited. So far, the most important research comes from the United States. This is based on a different approach to urban forestry overall. Urban forestry is often related to shade trees in the United States. For example, shade is regarded as a heat reducing element. Therefore it is common to have legislation in order to encourage tree cover. This gives trees both an aesthetic and an economic value. When the authorities legislate, they are obligated to initiate research, provide guidelines and actually maintain urban forests. This is not the case in Europe. The history and shape of the cities do not provide the same patterns of urban tree planting as seen in the United States. Although the list of benefits obtained from urban forests is long the resources spent on urban forestry research in Europe is relatively low.

Two thirds of the European population lives in urban areas and therefore urban forest stands and urban trees are important factors in the urban environment. However, harsh urban growing conditions have caused the vitality of urban trees to fall drastically during the last 30 - 40 years. The purpose of this COST Action is increasingly important because the growing urban population needs the benefits associated with urban forests and because the research into urban forests is widespread but not coordinated within Europe.

In March 1996 a proposal for a Concerted Action called "Urban Forestry Network" was submitted under the European Community Fourth Framework (PL96-1620). The technical/scientific evaluation was very good, but the proposal was considered ineligible under the FAIR-program. Therefore, the many researchers involved in the Urban Forestry Network (in all approximately 100 researchers from 22 European countries – including the Baltic countries) are very keen on this COST Action.

## B. OBJECTIVES AND BENEFITS

The main objective of this Action is to improve the knowledge base needed for better planning, design, establishment and management of urban forests and urban trees in Europe, and, by doing this, to establish urban forests and urban trees as a scientific domain in Europe.

### *Description of State of the Art*

The Action will improve the European urban forests and trees through the establishment of a comprehensive description of the state of the art on urban forests and trees. This description will include available relevant European research resources and ongoing work.

### *Creation of a lasting network*

The Action will create a lasting European, multi-disciplinary research network on urban forests and trees and identification and promotion of interactions with relevant other international networks will be made.

### *New research*

The Action will establish new research tasks and make priorities for urban forests and trees and propose new research projects, all at the European level. This will raise awareness of the benefits of urban forests and trees and concerns in the population at large.

Furthermore the Action will:

- Improve the methods of valuation of the benefits and costs of urban forests and trees.
- Improve the methods of establishment of urban trees.
- Improve the methods of management for urban forests and trees.

Also the Action will work for interactions with other COST Actions and international organizations as the topics of Urban Forests and Urban Trees are related to many aspects of the environment and to human behaviour.

The possibilities of rather intensive cultivation within urban forests provides a good chance to develop methods, systems and knowledge with a fruitful spin-off for forestry in general, since it is in a phase of change towards "close to nature" forest management and reforestation.

In developing countries urbanization has been dramatic in creating an environment practically without any amenities. Therefore, the results of this COST Action can be very important to the development and improvement of urban forests in developing countries.

This Action will facilitate the transfer of research results and existing technology. It will lead to new approaches and management techniques of urban forests throughout Europe.

### C. SCIENTIFIC PROGRAMME

The scientists and professionals working under this Action will originate from many different backgrounds as researchers within biology, geography, sociology, forestry, urban planning, horticulture, arboriculture and landscape architecture may all be involved in dealing with urban forests and urban trees. Very often the researchers will concentrate on aspects related to their original discipline and therefore most of the research within urban forestry is applied research. This means that the results are very often directed towards local or regional problems. Common European problems needs to be highlighted through research which will cover local, national and international problems related to urban forests and trees.

The overall scientific programme will be divided into three basic working groups. Each of the three groups will form a key-base in the Action as shown in Section D. On the basis of the three groups new research tasks will be formulated. In the working groups, national pilot studies will be initiated. The pilot studies will highlight national identities. The national identities will, on the basis of the working groups, be incorporated into new European research tasks. In this way, the Working Group Coordination will elucidate the variation between the participating countries but will also be the base for the formulation of new research tasks.

The following list presents the three working groups in relation to topics. In each of the three groups obvious specific research tasks are mentioned.

#### 1. Objectives and functions of urban forests and urban trees

- Assessment of urban forest benefits which includes people's valuation of their living environment.
- Planning and design of urban forests and trees which incorporate a stand of uneven structured and aged trees, with amenity values.
- Design of urban tree planting with respect to the infrastructure in order to secure optimum growing conditions for the trees.
- Development of models for strategic planting of street trees.



2. Establishment of trees for urban uses, including identification and selection of species, provenances and cultivars

- Establishment methods of urban forests and urban trees which are superior in the harsh urban growing mediums.
- Selection of urban tree cultivars against new environmental constraints such as de-icing salts.
- Selection of trees with good survivability in form of alternatives to Elm trees (*Ulmus spp.*) in Northern Europe and Plane trees (*Platanus spp.*) in Southern Europe.
- Use of provenance selection for urban purposes (collection of propagation material from different geographical locations).

3. Management of urban forests and urban trees

- Development of a management method which can produce a multi-functional, biodiverse and sustainable urban forest.
- Development of methods to predict weak and hazardous trees in order to determine the vitality of street trees.
- Exchange of pruning and thinning techniques, supplemented with regional silvicultural practices throughout Europe.

- Development and exchange of basic knowledge of the pathogens that affect trees in order to systematize this subject.
- Development of Geographic Information Systems (GIS) as a planning and management system related to urban forests and trees.
- Development of management methods which ensure optimum coordination between aesthetics, infrastructure and growth rates for street trees.

As one of the first tasks, comprehensive descriptions of the state of the art in each of the three working groups will be made. This will be done on the basis of national representatives who report to the working group leadership. Individual presentations will be made on the first workshop/seminar, to be held at the very beginning of the second year of the Action.

Proceedings presenting short communiqués of the national and European levels of research in each of the three working groups will be published on the basis of the first workshop/seminar. The presentation of the Action, and the proceedings, will also be presented on the Internet.

In each working group research tasks will be initiated and coordinated between the participating countries and other research networks and organizations. When the scientific tasks have been developed, national pilot studies will be coordinated and initiated (see examples on topics above) and exchange programmes will be established. The individual pilot studies may be formulated within and/or between the working groups. *All pilot-study trails will be presented in publications containing (i) national results and (ii) a summary of the European dimension within the topic.*

The pilot studies will primarily be carried out on a national basis but coordinated by the working groups and eventually by the management committee. On the basis of the national (but highly coordinated) pilot studies, new international and multi-disciplinary research programs will be formulated.

In each working group the specific outcome will be a presentation of the state of the art and a discussion of definitions and new research tasks. This will be presented in printed form as well as on the Internet.

As a final product of the Action a book/proceedings from the 5th and final workshop/seminar will be published. The book will discuss methods for improvement of the European urban forests and urban trees and will present future research tasks, all at the European level.

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## E. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Slovenia , Spain, Sweden and the United Kingdom.

On the basis of estimates made by the Action Proposer for a Network Programme and taking into account the coordination costs to be covered over the COST budget of the European Commission, the overall cost of the activities to be carried out under the Action has been estimated, in 1996 prices, at roughly ECU 8 million.

The total number of person-years involved in the Action is expected to be 45, spread over 75 researchers.

This estimate is made valid under the assumption that all the abovementioned countries but no other countries will participate in the Action. Any departure from this will change the total costs accordingly.