Higher education on urban forestry in Europe: an overview

FRODE ANDERSEN, CECIL C. KONIJNENDIJK AND THOMAS B. RANDRUP

Skov og Landskab, Danish Forest and Landscape Research Institute, Hørsholm Kongevej 11, DK-2970 Hørsholm, Denmark

Summary

In order to meet the demands of modern, information-based society, higher education in natural resource management needs to be transformed. Enhanced mobility of students and staff, multi- and transdisciplinary approaches, as well as innovative educational approaches are called for. Moreover, the urban component needs to be better incorporated, as exemplified by the emerging field of urban forestry. This paper relates to the developments in higher education within the context of education on urban forests and urban trees in Europe. Presented here are the main findings of a comparative European study led by the Danish Forest and Landscape Research Institute within the framework of the EU-funded COST Action E12 'Urban Forests and Trees'. In order to obtain an overview of the status of higher education on urban forestry in Europe, 180 educational institutions in 28 countries were sent a questionnaire. Results show that urban forestry is an expanding element of European education, as urban elements are becoming incorporated in higher education on natural resources. Urban forestry is primarily taught as a part of educational programmes in related disciplines rather than at a more integrative level, dealing with all elements of urban green structures. Student numbers in urban forestry programmes and courses are still relatively small. High staff-to-student ratios seem to facilitate the use of a wide range of educational approaches and methods. Higher education in urban forestry involves a broad range of disciplines and tries to find ways of incorporating natural and social science approaches. Together with the general trend towards internationalization in education, this calls for better co-operation between educational institutions, nationally and internationally.

Introduction

Transforming higher education

In October 1998, the United Nations Educational, Scientific and Cultural Organization (UNESCO) organized the first World Conference on Higher Education. More than 4000 administrators, educators and students gathered in Paris to discuss the challenges facing higher education at the brink of a new millennium. Participants agreed that higher education would need to be transformed dramatically according to the new demands of society. Globalization, democratization, the progress of science and technology, environmental concerns in an urbanizing society and social exclusion were mentioned as main aspects to be taken into account. Modern, globalizing society had increasingly become

dependent on knowledge and information, thus underlining the importance of adequate higher education (UNESCO, 1998).

The Conference identified some of the major challenges for higher education as follows (UNESCO, 1998):

- The need to offer relevant and high-quality education based on societal demands.
- The need to develop partnerships for higher education, for example between the public and private sector.
- The need for innovative multidisciplinary and transdisciplinary approaches in higher education.
- The need to enhance international co-operation and exchange in higher education.

Similar challenges were identified at major meetings on higher education in Europe. The Sorbonne Declaration on Higher Education, issued by the ministers of education of France, Germany, Italy and the UK in 1998, called for mechanisms to facilitate the international mobility of students and staff. These mechanisms would include harmonized educational structures, credit transfer systems, and teaching in major European languages (Sorbonne Declaration, 1998; Lust and Nachtergale, 2000). A European meeting on higher education for preparing the UNESCO conference (held in Palermo, 1998) also called for internationalization in higher education, as well as for institutional diversification, more self-managed learning, a changing role of teachers towards becoming 'coaches', and a central role of research within higher education, among others (UNESCO, 1998). The above developments also show the importance of regularly and critically reviewing existing education programmes in order to judge whether the existing offer still meets societal demands.

Higher education in natural resource management

The call for major transformations in higher education has also affected education in natural resource management, including forestry, ecology, nature management, landscape architecture and other fields. Societal demands for and pressures on natural resources have changed dramatically over recent decades, which means that new types of natural resource professionals with closer ties to society are required (see Kennedy and Thomas, 1995).

Within forestry, the discussion on the future of higher forestry education has been particularly intense during the past few decades. Lust and Nachtergale (2000) provided an overview of several European workshops held on forestry education, as well as a number of reports issued as inputs to the debates. Several authors (Konijnendijk, 1995; Schmidt *et al*., 1998; Lust and Nachtergale, 2000) identified similar key elements of future forestry education, among which were:

- Enhancing the (international) mobility of students and staff in European higher education in forestry, for example by means of better credit transfer systems and curriculum harmonization. A better mobility is also related to enhancing lifelong learning opportunities. A number of universities offering higher forestry education have benefited from being part of an international exchange programme for students and staff, but international exchange and co-operation could be developed further.
- Promoting multidisciplinary and transdisciplinary approaches in which natural and social sciences are combined. Traditional forestry education focuses very much on the natural sciences, and social aspects are not always properly integrated.
- Developing innovative educational approaches and methods, including problem-oriented education and better use of information technologies. Education should be more directed towards individual student needs. The traditional lecture still dominates in current forestry education in many European countries.

Those involved in discussions on transforming forestry and natural resource education also mention *urbanization* as a main factor to take into account. Natural resource managers are increasingly operating in or near urban environments. Traditionally, they have not been educated to deal with the demands and pressures of urban societies. This has led to a call for better inclusion of the 'urban element' into natural resource management education (see, for instance, Konijnendijk, 1995; Kennedy and Thomas, 1995; Schmidt *et al*., 1998).

Higher education on urban forests and trees

The attention paid to the urban dimension of natural resource management has steadily increased over the years. This is, for example, illustrated by the emergence of urban forestry as an interdisciplinary approach towards the planning, design, establishment, and management of all forest and tree resources in and near urban areas (e.g. Miller, 1997; Forrest *et al*., 1999). Initiatives such as COST Action E12 'Urban Forests and Trees', a network of European urban forestry researchers funded by the European Union, were set up to further develop research on urban forests and trees. COST stands for 'European co-operation in the field of scientific and technical research', and has as its main objective the co-ordination of national research at the European level. COST Action E12 'Urban Forests and Trees' is one of nearly 200 ongoing COST Actions. It is operative from 1997 until 2002, and involves more than 80 experts from 22 European countries. The main objective of the 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 forestry as a scientific domain in Europe (COST E12, 1997). In 1999, the Action was also given a mandate to inventory existing higher education on urban forests and urban trees in Europe, and to identify future educational needs (Randrup *et al*., 2001).

This task was commissioned to the Danish Forest and Landscape Research Institute, co-ordinator of COST E12. It carried out a review of higher education on urban forests and urban trees in Europe in 1999 and 2000, in close collaboration with COST E12. Objectives of the study were to:

- Document the efforts being undertaken in urban forestry higher education in Europe today. (Within the COST E12 expert network it was known at the outset of the study that specific higher education on urban forestry in Europe was a very recent phenomenon, probably emerging during the mid-1990s.)
- Define general characteristics, problems and opportunities.
- Facilitate the establishment of international co-operation in urban forestry higher education.

Methodology

Study topic

For the purpose of the study, 'urban forests' and 'urban trees' were defined as forest stands and trees with amenity values situated in or near urban areas. Interactions between human society and the urban forest resource with regard to preferred form and functions and ways to manage the resource to achieve these were categorized into three main groups, as presented in Table 1.

In accordance with this matrix, the educational offers included in the review had to deal with one or more of the following aspects: function, planning, design, selection, establishment and management of *urban* woodlands, parks and/or street trees. Higher education was defined as education at the level of a B.Sc. (Bachelor of Science) or comparable degree (such as Bachelor of Arts, some types of forest engineers), and higher degrees (including Master's and Ph.D.). A differentiation was made between the following elements of education:

- Urban forestry degree programmes or curricula
- Urban forestry courses or modules.

Schmidt *et al*. (1998) defined a course as a teaching module on a specific subject, whereas all courses together make up a degree programme or a curriculum resulting in a higher degree.

Data collection

Comparison of higher urban forestry education in European countries was based upon two types of data sources:

- Survey of urban forestry *programmes* and *courses* via a questionnaire distributed among higher educational institutes in Europe.
- Additional sources of data, including an additional survey of urban forestry *courses*, personal communications, reports and journal articles, and educational programmes.

Questionnaire structure

First, a questionnaire for collecting information on higher urban forestry education was developed. The questionnaire consisted of four sections, linked to, for example, the structure of programmes and courses:

Table 1: Matrix describing the different elements of urban forestry (Konijnendijk and Randrup, 2002)

	Street trees	Urban parks and gardens	Urban and peri-urban woodlands
Form, functions, policies, planning and design			
Selection of plants and establishment methods			
Management			

- Basic questions concerning the institution, e.g. contact details, expertise and general development in urban forestry higher education at the institution.
- Specific questions on urban forestry degree programmes/curricula, e.g. duration, level, students, contents and methods.
- Similar questions concerning urban forestry courses/modules.
- Open section where institutions were asked to provide additional information.

Distribution

The questionnaire was sent out to the urban forestry experts representing their country on the Management Committee of COST Action E12 (later referred to as 'national co-ordinators'). At the time, 21 countries were represented. In addition, contact persons in seven non-represented European countries were asked to distribute the questionnaire. The remaining European countries were not included in the survey since no national contact persons working within the field of urban forestry could be identified.

The national co-ordinators were left in charge of the selection of relevant institutions within each country. Although this might have affected the comparability of results between countries, this approach was followed because national co-ordinators were regarded as having a better overview of relevant educational institutions in their respective countries than the overall study co-ordinators. In all, 180 departments/sections/units (hereafter 'departments') of 158 European educational institutions were contacted.

Data analysis

Data analysis had the above-mentioned data sources as input. For each of the countries for which data on higher education were provided, a country report was compiled.

The objective of the study was to provide a first, tentative, overview of higher education on urban forestry in Europe in general. Therefore, the data provided were weighted equally, and the considerable differences between the European countries, e.g. in relation to culture, landscape conditions and degree of urbanization, were not included in the data analysis. The larger part of the data could be coded and used for descriptive statistical analysis. Replies to questions were summarized, presented and analysed per question and, as a next step, the replies to different questions were compared/combined, primarily in a qualitative way. Especially for the latter, and for putting results into a broader perspective, additional sources of data were used. The main

units of comparison were the individual programmes and courses/modules.

Despite the large number of educational institutions that provided data for the study, no reliable statements could be made about the internal and external validity of the study. In-depth statistical analysis was therefore not attempted. The comparative and descriptive study, however, provided a preliminary overview of higher education on urban forestry in Europe.

Results and discussion

Responses

Of the 28 countries contacted, the following 24 responded (see Figure 1), making them the focus of this survey: Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and Yugoslavia. The respondents from the Czech Republic, Hungary, Iceland, Poland and Yugoslavia responded that, in their opinion, they did not offer higher education on urban forestry.

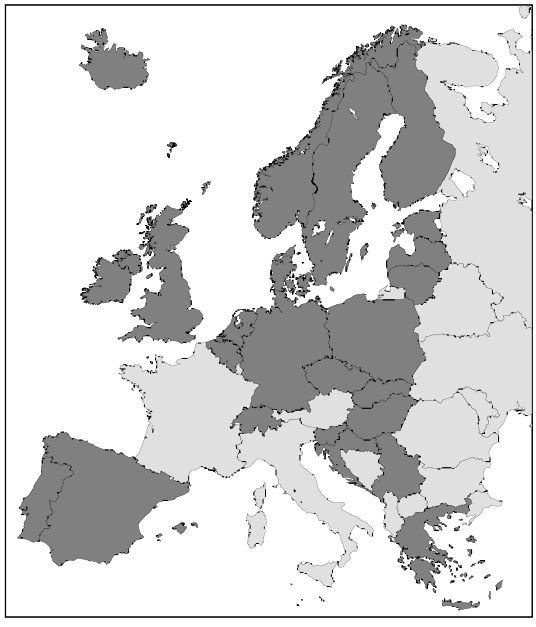

Figure 1. Map of European countries that responded to the questionnaire on higher urban forestry education.

Completed questionnaires and other detailed information were received from 61 departments at 49 educational institutions, describing 31 degree programmes and 191 courses/modules. The following results are based on the data provided by these 61 departments.

The positive responses were distributed as shown in Table 2.

European urban forestry education – development

The development in student numbers and the development in the number of educational offers at the institutions were surveyed. Retrospective data as well as information on future expectations were gathered.

Over the past 10 years, student numbers have increased for 17 per cent of the courses/modules and 35 per cent of the degree programmes. Numbers decreased only in 1 per cent of the courses/modules and 10 per cent of the degree programmes. In the future, student numbers are expected to increase in 42 per cent of the degree programmes, and decrease only in 6 per cent of these programmes.

The past and expected development in the number of urban forestry-related educational offers at the departments is summarized in Figure 2. The departments experiencing an unchanged situation or an increase in the number of urban forestry-related degree programmes and courses/ modules are dominant in all four cases shown in the figure. Focusing on the differences, the figure seems to indicate a shift from developing new courses/modules towards developing new degree

Table 2: Distribution of positive responses to the questionnaire on higher education in urban forestry

	Educational institutions	Departments
Offered urban forestry education	70	84
Supplied detailed information	49	61

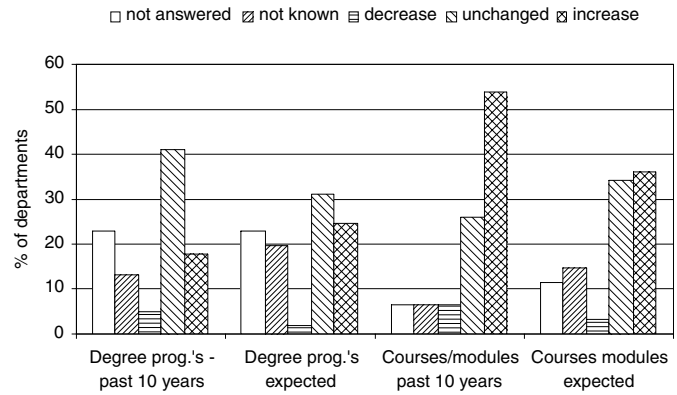

Figure 2. Development in the number of educational offerings in urban forestry in Europe.

programmes. More than half (54 per cent) of the departments had developed new courses/ modules over the past 10 years, whereas only 36 per cent of the departments were planning to develop new courses/modules in the future. Regarding the degree programmes, 18 per cent of the departments had developed new programmes over the past 10 years, but 25 per cent of the departments planned to develop new programmes in the future.

The questionnaire did not define time-scale and probability in relation to expected development. This may have influenced the comparability of the responses. It is not expected, however, to have influenced the main finding, which is that European student interest in urban forestry and the offer of urban forestry higher education have both increased over the past 10 years, and are likely to continue to increase.

When comparing these results with a review of urban forestry education in the USA (Hildebrandt *et al*., 1993), similar trends were identified regarding the significant growth of urban forestry as an educational discipline. The increasing importance of urban forestry was also identified in a report on forestry education in Europe issued by a network of European universities offering forestry education (Schmidt *et al*., 1998).

The role and size of urban forestry education

As seen in Table 3, student numbers in urban forestry-related education were generally found

Table 3: Student numbers in higher urban forestry education in Europe

Number of students per annum	Percentage of degree programmes	Percentage of courses/modules
<5	16	3
5–10	13	6
11–20	39	18
21–30	3	13
30–50	10	6
>50	6	2
Not answered*	13	52
Total	100	100

* The percentage of 'not answered' in relation to courses/modules was primarily due to 39 per cent of the courses being mentioned in the additional survey where this specific question was not included. The additional survey was needed to obtain additional information on the contents and scope of the education on offer in urban forestry (e.g. size of the urban forestry component in course offered). It was kept simple due to time constraints and to encourage a high response rate.

to be below 30, with the largest group of programmes (39 per cent) enrolling 11–20 students per annum. At the same time, the vast majority of urban forestry-related education – 89 per cent of the courses/modules and 74 per cent of the degree programmes – was being taught at bachelor and master levels. The courses/modules were fairly evenly distributed between the bachelor and master levels (43 and 49 per cent, respectively), whereas the largest group of programmes (45 per cent) were at the bachelor degree level. Seen in this context, student numbers seem relatively low, indicating that the status of urban forestry at many European educational institutions is that of a specialized niche, rather than of a large, independent field.

When asked to describe degree programmes that explicitly deal with urban forestry, the 61 responding departments described 31 individual degree programmes. An examination of the degree programme titles showed that only eight of these programmes (26 per cent) had the terms urban/community forestry as part of their title (Table 4).

Although the possibilities of drawing conclusions on the content of a degree programme based on its title are limited, the distribution of, and variation in, title keywords indicate that urban forestry is only established to a limited extent as an independent field of higher education in Europe. However, urban forestry seems to be an important element of several other fields of higher education, for instance landscape architecture and horticulture.

Table 4: Presence of keywords in degree programme titles identified through the questionnaire on higher education on urban forestry in Europe

Keywords in degree programme titles	No. of times the keyword appeared
Landscape Architecture/Design/ Planning	8
Urban Forestry, Urban/Community Forest Management	8
(Landscape) Gardening	6
Arboriculture	4
Horticulture	4
Other	28

Table 5: The 38 disciplines mentioned as main expertise of the department (listed alphabetically) in response to the questionnaire on higher education on urban forestry in Europe

Agriculture	Geography
Arboriculture	Geology
Architecture	Horticulture
Biology	Hunting
Botany	Landscape architecture
Civil engineering	Landscape ecology
Construction	Landscape technique
Countryside management	Leisure studies
Crop production	Mechanics
Dendrology	Nature conservation/ management/protection
Design with plants	Planning science
Economics	Plant pathology
Electronics	Sociology
Environmental science	Soil science
Equine studies	Technology
Food technology	Town planning
Forestry	Tree biology
Garden art/design	Urban design
Genetics (diversity)	Water management

Multidisciplinary approach

Does urban forestry education follow the general call for more multidisciplinary and transdisciplinary approaches? The departments involved in the study were asked to define their main areas of expertise. As seen in Table 5, 38 different disciplines were mentioned. The average was 3.4 disciplines per department, ranging between 1 and 11 different types of expertise per department. The departments that offered urban forestry-related degree programmes mentioned 28 different disciplines as the main expertise of their degree programme teaching staff, the average being 5.6 disciplines per degree programme (ranging between 1 and 11).

Master's and Ph.D. level degree programmes recruit students who have already acquired an appropriate disciplinary background. The total number of different student backgrounds in urban forestry-related Master's or Ph.D. level degree programmes was 18, with an average of 3.5 different student backgrounds per degree programme (ranging between 2 and 6).

The variety in main expertise of the departments (38) may be lower, as the characteristics of a few of the responses indicated that they

concerned the faculty, or even the whole university, rather than the targeted department/section/unit. Additionally, different interpretations of the word 'main' could have resulted in different departments having an uneven impact on the results. It should also be noted that the results regarding student background were based on a relatively small amount of data (13 degree programmes). However, these reservations still permit the following conclusions.

There is strong variation in the disciplinary approach to urban forestry education in Europe. Each urban forestry-related degree programme involves a wide spectrum of staff expertise, and the urban forestry-related Master's/Ph.D. programmes attract students from a wide range of disciplinary backgrounds. Seen as a whole, European urban forestry-related education involves a broad range of disciplines.

The characteristically varied and multidisciplinary character of urban forestry education was also noted in a review of urban forestry education in the USA (Hildebrandt *et al*., 1993). This may be interpreted as a lack of homogeneity and of clear standards in urban forestry education. As mentioned, however, the World Declaration on Higher Education for the Twenty-first Century (UNESCO, 1998) states that higher education should reinforce its role of service to society, mainly through an interdisciplinary and transdisciplinary approach in the analysis of problems and issues. In that context, it may be stated that the multidisciplinary character of urban forestry higher education meets modern demands and this could become one of the primary strengths of the discipline.

From the types of departmental main expertise mentioned by at least 20 per cent of the departments, a 'top eight' emerged. When comparing this with the 'top eight' of staff expertise mentioned in urban forestry-related degree programmes, and the 'top eight' student backgrounds in urban forestry-related Master's/Ph.D. degree programmes, six disciplines recurred in all three categories. These disciplines are listed in Table 6. Although their individual ranking varied for the three categories, they all appeared to be central to urban forestry-related education in Europe.

In an overview of urban forestry research in Europe (Konijnendijk *et al*., 2000), main disciplinary backgrounds of institutes involved in research on urban forests and urban trees were identified. The six central disciplines identified above are included in the top nine disciplines in the research overview (note: horticulture and arboriculture were combined in the research overview), indicating that these six disciplines are central, not only in urban forestry higher education, but also in urban forestry research in Europe.

Table 6: Central disciplines in urban forestry education in Europe (listed alphabetically)

Arboriculture
Biology
Forestry
Horticulture
Landscape architecture
(Landscape) Ecology

In the research overview, forestry and horticulture (in combination with arboriculture) were found to be the clearly dominant disciplines, whereas the distribution of central disciplines in urban forestry higher education was relatively even, indicating that no single discipline is dominant in European urban forestry-related higher education.

Integrating natural and social sciences

Transformations in natural resource management in higher education should also encompass a better integration between the natural and social sciences. Considering the importance of urban forests and trees as contributors to urban public space and recreational possibilities in the urban environment (see Bradley, 1995; Kennedy and Thomas, 1995; Ball 1997), it might have been expected that social sciences and aesthetics would have been central disciplines in urban forestry higher education. The results show, however, that most central disciplines in European urban forestry higher education mentioned above have – traditionally – been primarily related to natural sciences.

Bearing in mind that the reservations regarding data quality mentioned above also apply here, the data seemed to indicate that overall, higher education on urban forestry in Europe has placed low emphasis on disciplines related to social sciences

and aesthetics. These were found among the expertise of departments and degree programme teaching staff, but they were varied, infrequently occurring and unevenly distributed.

Educational strategies and approaches

UNESCO and others call for a diversification of educational approaches and teaching methods, for example in terms of enhancing group work, problem-oriented learning and the use of information technology. How does this relate to urban forestry education in Europe?

The average number of educational approaches or methods applied in each degree programme is 4.8, ranging between 3 and 9, indicating variation in European urban forestry-related educational programmes.

The seven most popular educational approaches are shown in Figure 3. The two approaches or methods that are applied within more than 80 per cent of the degree programmes are lectures and practical training/field work. The role of practical training and fieldwork is relatively large, which follows the suggestion for developing this strategy by, for example, UNESCO (1998). Within Europe, this method has been identified as one possibility for moving from teaching to self-managed learning. This change requires a stronger emphasis on the personal skills of students, a point that has also been identified within forestry education (Schmidt *et al*., 1998).

The educational approaches or methods 'group work' (e.g. project-oriented group work) and 'workshops' are both relevant in the development of such skills, and the complex nature of urban forestry only seems to strengthen the case for the application of such strategies. Within traditional forestry education, some concern has been raised on how a change from relatively inexpensive lectures to more teacher-intensive teaching forms could be financed (Schmidt *et al*., 1998). In this respect, possibilities of applying educational methods that develop the personal skills of the students seem relatively good in urban forestry higher education. This relates to the current role of urban forestry education as a specialized niche, and the high staff–student ratio.

The largest group of degree programmes (42 per cent) involved more than five staff members and the most common annual student number on degree programmes was 11–20 students (39 per cent). Although no systematic comparison with other relevant education was made, the researchers feel that this indicates that European urban forestry higher education has a relatively high staff number per student. The necessity of covering a broad range of disciplines could perhaps explain the need for a relatively high number of individual staff members.

A conflict may exist in the individual urban forestry-related degree programme between the need for qualified education involving a wide range of disciplines and the need to keep staff numbers at a realistic level compared with

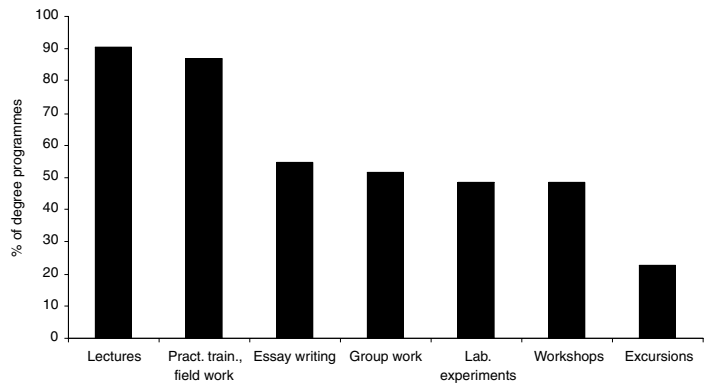

Figure 3. The educational strategies/approaches applied in more than 20 per cent of the degree programmes on urban forests and urban trees in Europe.

student numbers. If this is the case, increased co-operation, internally at the educational institutions and nationally and internationally between institutions, could be a realistic strategy to ensure high quality multidisciplinary education in combination with effective use of staff resources. This again highlights the point about enhanced mobility.

Conclusions

Value of the study

This review of urban forestry higher education is, to the authors' knowledge, the first of its kind in Europe. It deals with a field of education that in most parts of Europe is in its infancy, where no clear and generally accepted definitions exist.

Although a definition of urban forestry education was included in the questionnaire, the results presented here are still based on a heterogeneous group of departments. This group consisted of departments that were considered to be relevant by the national co-ordinator/contact, and which identified their own educational offerings as being urban forestry-related. Furthermore, in spite of a considerable effort, a number of contacted departments, institutions, and even nations, did not respond to the survey. It is therefore likely that relevant European urban forestry-related programmes or courses/modules exist which were not included in the review. Consequently, the survey presented here should not be regarded as a complete overview of European higher education on urban forestry.

Opportunities and recommendations

The review did, however, compile information on many of the efforts being undertaken in urban forestry higher education in Europe today. Through the data analysis presented above, the review also identified a number of general problems and opportunities in European higher education on urban forestry, making it possible to address these at the European level. The primary opportunities identified by the researchers concern:

Enhancing student and staff mobility, for example through the development of systems for credit transfer, international co-operation and recognition of degrees and diplomas. Urban forestry degree programmes currently result in a wide range of degrees, not all following the B.Sc.–M.Sc.–Ph.D. system. Some inspiration may be gained from the USA, where the Society of Municipal Arborists has developed standards and procedures for programmes that grant degrees in urban forestry (Miller, 1994). European higher education in forestry has also benefited from an international exchange programme for students and staff (Schmidt *et al*., 1998).

A further development of *inter- and transdisciplinary approaches*, corresponding to the multidisciplinary character of urban forestry and urban forestry education.

A better *integration of natural and social sciences*, which means a stronger emphasis on disciplines related to social sciences and aesthetics than is the case at present in most forestry education in Europe (Schmidt *et al*., 1998). Themes to be addressed may be the role of urban forestry in relation to the aesthetics of the urban public space, recreational demands of the urban population, public participation, conflict management, and so forth. It could be relevant to review existing social sciences education in, for instance, forestry, landscape ecology and landscape architecture, as well as existing aesthetics education in, for example, landscape architecture.

Further emphasis *on teaching methods that develop personal skills and adapt to the complex character of urban forestry*, e.g. practical training, fieldwork, group work and workshops. At the University of Wisconsin (USA), urban forestry degree programme students are encouraged to involve themselves in a summer internship, the reason being that this makes them more desirable to employers upon graduation (Miller, 2001). Similar arrangements are already also encouraged or obligatory in many European universities (see, for example, Schmidt *et al*., 1998).

In short, the review has provided a necessary first foundation for the further development of European higher education on urban forestry. This field of education acts as an example of current transformations in higher education throughout the world, driven by rapid societal changes. As an emerging field of education, it is trying to answer the calls for mobility and internationalization, multi- and transdisciplinarity,

integration of natural and social science approaches, and innovative educational methods. In the words of Professor Robert Miller of the University of Wisconsin: 'Urban forestry is now a global enterprise and it will continue to expand in scope and opportunity. Educators and scientists can and must be prepared to meet the needs of the globe's urban citizens' (Miller, 2001).

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