Uforest Training Needs' Assessment and Stakeholder Analysis Report
Uforest Project Deliverable 3.1

Corina Basnou (CREAF)

Ilaria Doimo and Colm O'Driscoll (Etifor)

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Documents author and Uforest contacts
Corina Basnou (CREAF), Ilaria Doimo and Colm O'Driscoll (Etifor)

Contributors
Joan Pino (Universitat Autònoma de Barcelona - UAB), Cecil Konijnendijk (Nature Based Solutions Insitute - NBSI), Rik De Vreese (European Forest Institute - EFI), Dennis Roitsch (European Forest Institute - EFI), Nadina Galle (GreenCity Watch), Petronela Candrea (Forest Design), Jorge Olivar (AGRESTA), Lluís Pesquer, Josep Maria Espelta and Florencia Florido (CREAF), Arianna Ruberto and Serena Cesca (Etifor).

info@uforest.eu
www.uforest.eu

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EXECUTIVE SUMMARY

This document reports the results of a training needs assessment (TNA) survey. **It provides an overview of the existing demand on training needs that promote innovation and entrepreneurship in urban forestry (UF) and the delivery of associated Nature-Based Solutions (NBS).** The survey targeted university students - undergraduates and graduates, as well as Ph.D. students - professionals and citizens from European countries and other continents. The survey results clarify the training needs and the state of education focusing on innovation in UF. The survey took place between 01/06/2021 and 30/06/2021 through the EUSurvey online platform, the European Commission's official multilingual online survey management tool. Storytelling was a powerful tool to engage and increase the number of respondents. **About 246 valid questionnaires were filled out by respondents of 27 different nationalities** (European and non-European). About 40% of respondents are involved in the education sector (academia, research, teaching) and hold a master's degree in a diverse range of fields (mainly interdisciplinary backgrounds represented by "Ecology", "Forestry" and "Other fields").

Main findings are:

▶ urban forests were acknowledged as NBS that offer a major chance for innovation, with possibilities to deliver lasting and tangible benefits across different social groups, in a range of environmental, economic and cultural settings. **More than half of the respondents consider NBS a key topic in their professional career.** Most respondents are familiar with the concepts of "NBS", "Ecosystem services", "Green and resilient cities", "Ecosystem restoration", "Biodiversity", "Climate change mitigation/adaptation" and/or "Nature conservation". Less familiarity was shown with other concepts like payments for ecosystem services, innovation, and entrepreneurship. Very little or little familiarity was shown with "Marketing", "Socio-economics", "Urban design", "Environmental justice", "Emerging technologies and artificial intelligence", and "Governance and policy";

▶ **more than half of respondents were not so familiar with the concept of UF.** Other knowledge gaps are related especially to estimating the potential production of Non-Timber Forest Products (NTFP) in a forest/area, assessing alternative forest management scenarios in terms of ecosystem service (ES) delivery or developing marketing strategies for trading ES;

▶ **the TNA identified a high demand for developing skills related to economics** (leadership and management, business modelling, financial planning, entrepreneurship), **social aspects** (cooperative leadership, societal impact, social business), **and communication and information technologies** (storytelling, cutting-edge technologies, IT, marketing and communication strategies, networking);

▶ regarding preferred **teaching approaches** and methods for training activities, most respondents cited **field visits and analysis of case studies** and **specific seminars** by both academic and non-academic experts. Findings indicate (a) the need for in-presence training and (b) for an alternative approach that could consist of **complementing existing university courses with dedicated training sessions** which are less demanding in terms of time and more focused on relevant and specific issues. Survey findings also suggest that besides receiving an appropriate theoretical background, **respondents would like to see how these issues could be implemented in practice**. Respondents (both academics and non-academics) also would like to learn about real cases related to experience and working in the UF sector.

The results confirm that UF is an interdisciplinary field, situated between nature, art, culture, education, social inclusion, economics, science and technology. Integration of the strategic aspects of UF such as policy-making, planning, and design is also required. Urban regeneration, inclusion, and environmental justice were also topics considered relevant by respondents. Transversal concepts (arts, storytelling, urban forest pedagogy, permaculture, artificial intelligence or connecting technology with urban nature) perceived as relevant and innovative in UF, should be also considered as potentially relevant topics for training, to improve both perceived knowledge gaps and soft and technical/professional skills. Survey findings indicate the need for interdisciplinary views when building more sustainable, livable, and inclusive cities.

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ACRONYMS AND ABBREVIATIONS

BSc ▸ Bachelor of Science

CSO ▸ Civil Society Organisations

EFI ▸ European Forest Institute

EFIMED ▸ Mediterranean Facility | European Forest Institute

EFUF ▸ European Forum on Urban Forestry

ES ▸ Ecosystem Services

EC ▸ European Commission

EU ▸ European Union

FAO ▸ Food and Agriculture Organization

GIS ▸ Geographical Information System

HEI ▸ High Education Institution(s)

ICLEI ▸ Local Governments for Sustainability

ICT ▸ Information and communication technology

IFSA ▸ International Forestry Students' Association

MSc ▸ Master of Science

NBS ▸ Nature-Based Solution(s)

NBT ▸ Nature Based Thinking

NGO ▸ Non-governmental organization

NTFP ▸ Non-Timber Forest Product(s)

PhD ▸ Doctor of Philosophy (i.e. doctorate)

RS ▸ Remote sensing

TED ▸ Technology Entertainment Design

TNA ▸ Training Needs Assessment

UF ▸ Urban Forestry

UN-Habitat ▸ United Nations Human Settlements Programme

UNEP ▸ United Nations Environment Programme

UNDP ▸ United Nations Development Programme

WHO ▸ World Health Organization

WP ▸ Work Package

1. INTRODUCTION

1.1 Urban forests and the Uforest project: general background

Recent trends of urbanization and climate change have negative impacts on our health and well-being, quality of life, biodiversity, and resilience in cities. This is leading us to rethink and revalue the way we plan, integrate and interact with our urban environments. However, innovating and implementing new solutions in urban environments that counter such trends and enhance resilience and livability of cities is not easy, also given the complex social and infrastructural organizational challenges that urban environments pose, It requires innovative approaches to, and communication between, sometimes less coordinated disciplines such as urban planning, urban design, and architecture, with forestry and urban ecology, as well as with socio-economic and information and communication technology (ICT).

To address these challenges, there is growing recognition of the opportunities of implementing **Nature-Based Solutions (NBS)**. The European Commission (EC) defines NBS as "solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience; such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions" (European Commission 2016). It further emphasizes that "NBS must benefit biodiversity and support the delivery of a range of ecosystem services" (European Commission 2016). In the past years, the EC has made recommendations to help increase the use of NBS and bring nature back into cities. It also developed a Research & Innovation (R&I) agenda that promotes NBS and their benefits to cities and territories, aiming at improving the implementation capacity and evidence base for deploying NBS and developing corresponding future markets. These recommendations are also expected to foster an *interdisciplinary* R&I and stakeholder community and the exchange of good practices in this field (Faivre et al. 2017).

Trees and urban forests are considered crucial contributors to greener, healthier, and more resilient and livable cities. Trees and urban forests are considered effective NBS that address global and societal challenges, simultaneously providing benefits for human well-being and biodiversity benefits. Urban forests can be defined as "as all forest stands and other tree dominated vegetation in and near urban areas" (Konijnendijk and Randrup 2005). Urban forests include forests, street trees, trees in parks and gardens, and trees in derelict corners (Salbitano et al. 2016). A simplified FAO classification (Salbitano et al. 2016) includes the following five types of green infrastructure as urban forests: peri-urban forests, city parks and urban forests (> 0.5 ha), pocket parks and gardens with trees (< 0.5 ha), trees on streets and public squares, and other green spaces with greens (for instance botanical gardens, urban agricultural plots or river banks).

As such, trees and urban forests connect the ecosystems and socio-economic systems of a city or a peri-urban area. These interlinkages can have multiple benefits (i.e. ecosystem services), connecting the provision of services and goods from urban forests with societal demands (Dobbs et al. 2011, Roy et al. 2012, Konijnendijk van den Bosch et al. 2017, Lafortezza et al. 2017).

1.2 State of urban forestry research and education

A growing body of literature has provided sound references and knowledge on urban forestry (UF) and the potential of urban forests as NBS (James et al. 2009, Ostoić and Konijnendijk van den Bosch 2015, Kabisch 2016, Tomao et al. 2017, Ferrini wt al. 2017, Lafortezza et al. 2018, DeBellis et al.2021 D.1.2 Clearing House). Urban forests generate substantial benefits, such as offsetting carbon emissions, removing air pollutants (Yang et al. 2005), reducing noise, regulating the microclimate, and providing recreation and amenity values (Konijnendijk van den Bosch et al. 2005). Various studies have documented important public health benefits associated with people's exposure to trees (Takano et al. 2002, Lovasi et al. 2008, Lafortezza et al. 2009, van den Bosch and Ode Sang 2017, Wolf et al. 2020). Recent research has suggested that proximity to trees corresponds with a lower rate of antidepressant prescription, and more precisely, that living within 100 metres of a tree was associated with lower use of antidepressants (Marselle et al. 2020). Frameworks for inclusive urban planning (including collaborative planning, co-design and public participation), policy and governance of urban forests or NBS have also been documented (Sipilä and Tyrväinen 2005, Janse and Konijnendijk van den Bosch 2007, Lawrence et al. 2013, Gulsrud et al. 2018, Konijnendijk van den Bosch 2018, Basnou et al. 2020, Davies et al. 2020). Other studies have highlighted the need for interdisciplinary views and of relating economic approaches (Tyrvänien et al. 2000, Gulsrud et al. 2013, Chan et al. 2018), ICT sciences, emerging technologies, and implementation of new concepts such as the Internet of Nature (Galle et al. 2019, Nitolawski et al. 2019) with UF projects and renaturing cities.

However, even if there is a sound body of scientific evidence on UF, education is much less developed, showing various challenges and gaps. **'Education'** has been defined as 'training and instruction ... designed to give knowledge and develop skills' (Oxford Advanced Learner's Dictionary 1989). Education takes place at many different levels, aimed at people with differing needs in terms of knowledge or skills to be acquired. Johnston (2001) lists three main fields of education within UF: (1) Formal educational courses at different levels ('school' or university education), (2) Training, referring to the acquisition of basic practical skills, and (3) Continuing professional development, i.e. frequent informal education to keep professionals abreast of new developments and knowledge in their field.

An earlier overview of **UF training and education** in Europe (Randrup et al. 2001, Konijnendijk van den Bosch and Randrup 2005) indicated that applied sciences with a focus on natural science-oriented fields such as forestry, horticulture, (landscape) ecology, and arboriculture dominate the research arena. On the other hand, disciplines and professions with a stronger societal character, such as landscape architecture and landscape planning, also play an important role. Overviews of research and good practice in UF (e.g., Konijnendijk et al. 2000) have stressed the importance of developing multi- and interdisciplinary approaches to studying, planning, designing, establishing and managing urban forests.

Given the wide range of skills and knowledge required to deal with both a varied natural resource and urban society, it is not easy to educate and train urban foresters. Various factors also make UF education a challenging field in Europe: current High Education Institution (HEI) curricula in the European Union (EU) do not provide specific training on urban forest related subjects. There is little cooperation within the knowledge triangle represented by universities, cities and businesses and there is little knowledge on the demand on training related to interdisciplinary fields. There is also a lack of interdisciplinary training and knowledge on how to best involve citizens and private and public sectors and on how to identify innovative practices to promote UF.

Therefore, there is an urgent need to implement urban forests in relevant curricula, nature pedagogics, and knowledge alliances, to strengthen the exchange and facilitate the co-creation of knowledge at the university-city-business partnership at EU level, promoting stewardship of natural resources and their ecosystem services (ES) at many levels. To tackle this, Uforest will create a cross-sectoral alliance that will connect often non-collaborative disciplines including urban planning, urban design, and architecture, with forestry and urban ecology, as well as with socio-economic and ICT, in order to provide training and support to students and practitioners working toward innovative UF projects. The Uforest project and alliance aims at promoting Europe's innovation capacity among universities, cities, and businesses to deliver a new approach to UF.

The Uforest project will do so by:

▶ facilitating the co-creation, and flow of knowledge among universities, local authorities, and businesses coming from four key disciplines: urban landscape planning, forest ecology, socio-economics and, information and communication technologies;

▶ promoting a new, multidisciplinary and global blended training course and programme on UF for both students and professionals;

▶ stimulating and activating entrepreneurship in students, researchers and professionals to provide public and private sectors with innovative and cost-effective UF solutions.

1.3 Objectives of the training needs assessment

"Research and assessment of needs" is the topic of the third working package (WP) of the Uforest project. It aims to better develop and tailor research and learning material and training courses to specific stakeholders and beneficiaries' needs. Moreover, it aims to better define specific knowledge and opportunities related to entrepreneurship and innovation in the field of UF through better targeted research at EU level.

The present research provides the base for developing a training course on innovation and entrepreneurship (structure and contents).

A stakeholder analysis was carried out to identify all possible key stakeholders that could be interested and targeted within the project. A database of contacts was further elaborated (students/learners, scientists/ researchers, entrepreneurs/business, citizens/public) and used also for the parts related to implementation, dissemination and communication. These included targeted MSc and PhD courses, Uforest interdisciplinary approaches, research groups, business sectors and networks, other alliances and initiatives. Secondly, a TNA survey was launched at EU and global level in order to assess the training needs of students and professionals in the field of innovation connected with UF, with a focus on the proposed interdisciplinary approaches: urban landscape planning, forest ecology, socio-economics and information and communication technologies.

2. METHODS

2.1 Stakeholder analysis

In the Uforest project stakeholders are defined as the people, groups and organizations "…affected by the project or in a position to influence it" (Eskerod and Huemann, 2013). In the later stages of the project, a database will be created to provide a basis for establishing the wider Uforest Alliance - the university-business partnership at EU level that strengthens the exchange and facilitates the co-creation of knowledge in UF.

The stakeholder analysis was carried out in two main stages:

1) stakeholder identification and;

2) stakeholder prioritisation (assessment of interest, influence and level of participation in the project).

2.1.1 Stakeholder identification

The stakeholder identification process was based on snowball sampling and was conducted through several channels:

a) A database built on a review of existing networks, local and EU projects in Uforest-related disciplines. The final database includes organizational and sectorial details of the stakeholders' organizations. It also gives an indication of whether or not the stakeholder organization has a related training course in an Uforest thematic area;

b) Additional stakeholders were identified from responses received from the TNA survey (based on contact details given by respondents) and of interests shown following the dissemination actions of Uforest partners;

c) The TNA survey was designed to allow respondents to suggest the names of relevant Stakeholders; storytelling was used to engage and raise awareness among stakeholders, fostering emotional connections and building a credible history around a concept (the survey, the urban forests and their benefits, in this case).

d) In-depth interviews with experts also supported the stakeholder identification process by sharing their experiences with their networks and by suggesting additional names for future case studies..

2.1.2 Stakeholder prioritisation

The stakeholder prioritization process involved categorizing the identified stakeholders according to their influence, interests, and levels of participation, at national, regional and international levels (Figure 1). The prioritisation process follows the classic Mendelow's Power/Influence grid methodology (Mendelow 1991):

▶ high power – High interest: these stakeholders are likely to be decision makers and have the biggest impact on the project success. You need to keep these stakeholders close, to manage their expectations;

▶ high power – Low interest: these stakeholders need to be kept in the loop with what is happening on the project. Even though they may not be interested in the outcome, they yield power. This type of stakeholders should be dealt with cautiously because they could use their power in a negative way if they become unsatisfied;

▶ low power – High interest: keep these people adequately informed, and talk to them to ensure that no major issues are arising. These people can often be very helpful with the detail of your project;

▶ low power – Low interest: monitor these people, but do not spend time and energy on excessive communication related to the topic at stake.

Figure 1. Power/Interest grid for stakeholders prioritization

The stakeholder prioritization process was followed by a subjective assessment by the authors of this report based on the data and additional information received about each identified stakeholder. This process helped to further focus on the first three categories of stakeholders of Mendelow's Power/Influence grid, which are considered strategic for Uforest.

2.2 Beneficiary TNA

A TNA is a systematic process of collection, analysis and interpretation of data on individuals, groups and/or organizational skill gaps (Wright and Geroy 1992, Brown 2002). The present assessment has the following specific objectives:

▶ to better understand stakeholders' current level of competency, skill or knowledge and their demands;

▶ to identify innovative training activities related to urban forests and UF.

In order to better tackle these objectives and to promote innovation and multidisciplinary views in UF and the delivery of NBS, the following keywords were identified as core to the promotion of the Uforest TNA:

▶ conservation, planning and management;

▶ ecology;

▶ biodiversity;

▶ ecosystem services;

▶ green infrastructure;

▶ NBS and Nature Based Thinking (NBT, sensu Randrup et al. 2020);

▶ citizens science;

▶ social innovation;

▶ cooperative planning;

▶ entrepreneurship;

▶ co-design.

The following points (common to co-design) related to shared knowledge and discovery were discussed and guided partners prior to the survey design (Figure 2). This approach was adapted from the Johari window, a communication model used to build relationship between team members (Brown and Harvey, 2006). Discovering the context (general knowledge), learning from the messages we are getting (I didn´t know this/ Others were not aware/Unknown to all), implementing and making decisions based on the shared discovery (represented by TNA results). In the same way co-design promotes better ideas, improves creativity and understanding of how users engage with services/products, this framework allowed to better tailor the survey and understand the respondents' needs related to UF.
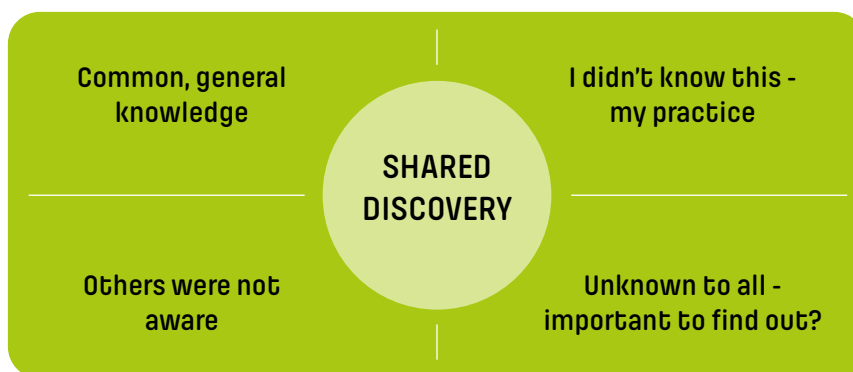
Figure 2. Main ideas followed to share knowledge

The TNA survey was designed to reach a wide audience and potential beneficiaries of Uforest. The survey was designed to take about 15 minutes to complete. The design process of the survey included various rounds of feedback acquisition from project partners. The survey was disseminated through different formal and informal channels from May to June 2021. It was linked to the Uforest website, and the dissemination channels included the Uforest project partner mailing list, existing mailing lists of previous projects (e.g. CONEXUS, CLEARING HOUSE, GREEN4C, ECOSTAR, Connecting Nature), the European Forest Institute dissemination list (including EFUF), or social media pages of partners institutions (e.g. CREAF, Etifor, EFI, EFIMed, Trinity College Dublin, NBSInstitute). The survey was voluntary and anonymous and the data was analysed in an aggregated way. The data was collected and stored by CREAF, the lead partner for WP3 of the Uforest project. The final database was shared in the Uforest shared folders.

The TNA survey was structured in four parts: (1) Personal info and background, (2) Cross-cutting skills and issues, (3) Technical and specific skills, and (4) Training needs. It included 22 questions, including a few open-ended questions. The open-ended questions were designed to help us get the respondents perspective in their own words, instead of just including pre-defined answer options.

The survey was created and distributed using the EU Survey platform. According to its structure, the survey was included in the category of recommended small surveys (below 25 questions), with a fast loading time for end users. This type of shorter survey is generally recommended also to get feedback from larger audiences.

Before launching the survey, eight partners from different countries tested it and sent feedback. The aim was to detect possible errors and to check for clarity.

In order to increase the number of respondents and to assure participation from various countries, the TNA was translated into seven more languages, using English as the pivotal language: Spanish, Catalan, Italian, Romanian, German, French and Dutch. In each case, automatic translation offered by the EU survey was checked and improved by various partners who are native speakers of the aforementioned languages.

2.3 Storytelling

A transversal ***storytelling*** approach accompanied the whole process related to the TNA survey. The survey implementation process comprised of these actions:

a. use dissemination material to raise awareness and engage stakeholders (blog posts, designing key messages, tweets, local TV short notice; **ANNEX 1**);

b. active integration of the key messages set up by communication officers into existing networks and communication channels; the key messages were mainly based on Uforest Communication Plan;

c. quick feed-back to any enquiry related to Uforest training and TNA survey.

Some examples of key messages used to increase participation to the survey as well asraise awareness on Uforest training and multidisciplinary views were: "Uforest wants to train ambassadors to fill cities with trees", "trees as an orchestra", "multi-tasker trees", "a survey looking for people who dream of making a difference in their environment, their country and their planet through nature-based solutions."

2.4 Interviews

Four key partners, well-known scientists and entrepreneurs in the field of UF, were interviewed during May-June 2021 (Table 1, for the interviews, see ANNEX 2). The interviews were structured based on achieving the following main objectives:

▶ understanding new learning needs in the fields of NBS and UF: challenges and approaches in urban forests planning and management;

▶ identifying possible key actors (research, business, networks, alliances, initiatives) for UF training in order to better tailor the educational offer;

▶ fostering knowledge among university-business-local authorities to promote innovation in UF.

Table 1. Contact details and expertise of the key actors interviewed

Name	Organization and contact	Research field and expertise	Website link to the interviews
Cecil Konijnendijk	Nature Based Solutions Institute nbsi.eu	Head of NBSI institute Professor (urban forestry) Program Director, Master of Urban Forestry Leadership Project Coordinator GREENSURGE (FP7 EU project 2013-2017) Leader in Urban forestry research and education Expertise in urban forestry, NBS, leadership, communication	bit.ly/uforest-tna
Rik De Vreese	EFI clearinghouseproject.eu	Senior Researcher Professor Project coordinator CLEARING HOUSE (H2020 project) Expertise in urban forestry, ecosystem services, NBS, H2020 projects management	
Nadina Galle	Green City Watch www.greencitywatch.org	Entrepreneur and expert in ecological engineering, machine learning techniques, and remote sensing Co-founder Green City Watch	
Joan Pino	CREAF www.creaf.cat	Head of CREAF Professor (ecology) Autonomous University of Barcelona, Spain Expertise in ecology, botany, ecosystem services assessment, teaching, teams management	

For each interview, we designed a personalized list of questions (ANNEX 2).

3. RESULTS

3.1 Urban forest stakeholders identification and prioritization

Transversal to stakeholders impacted by urban forests, the **_enabling environment_** supports addressing the key issues and challenges related to UF (Salbitano et al. 2016): governance; policy; legal framework; and planning, design and management. In our case, various media channels are also key for community engagement, dissemination and communication of urban forest benefits in terms of ecosystem services and NBS.

Based on literature and projects review, a list of stakeholder groups involved in UF and relevant for Uforest was developed. Uforest aims to positively impact individuals, groups, and organisations through the project's process and outputs, both directly and indirectly. The list below is adapted from Carter (1995), with additions from literature (Salbitano et al. 2016, Sténs et al. 2016, Konijnendijk van den Bosch et al. 2017) and EU projects review (see ANNEX 3).

Urban citizens

► individuals, residents of all ages;
► visitors/tourists.

Communities (local groups of residents)

► groups related to local schools;
► environmental groups;
► harvesters of tree products;
► neighborhood organizations;
► forest owners near urbanizing areas;
► owners of private gardens, parks and urban forests;
► creating their own initiative related to urban green/trees;
► scouts.

Academic institutions

► schools;
► universities (ba and bsc, ma and msc, phd, researchers and professors);
► other research bodies.

Professionals

► professionals in green infrastructure (planning, design and management), e.g. urban foresters, arborists, agronomists, landscape architects, urban planners and civil engineers, private tree growers, nature therapists, foresters (both rural and urban), ecologists, horticulturists etc.;
► professionals trained for, and working in other fields, e.g. computer science, engineering, architecture, arts, law, health, etc.

Businesses

► business sector (specific to uforest thematic areas): e.g. landscape gardening companies, arborists, urbanists and landscape designers, owners/managers of private tree nurseries.

Environmental NGOs and CSOs

► within the fields of e.g., wildlife, nature conservation, environmental education, communication,

architecture, education, eco-tourism, therapeutic forests, suppliers of free trees samples.

Municipalities

► parks and garden managers;
► arboriculturists;
► town/urban planners;
► landscape architects;
► legal advisors;
► mayors and city leaders;
► policymakers;
► waste managers;
► transportation planners;
► environmental protection departments;
► public works departments;
► hospitals and public health departments.

Metropolitan/Provincial/State Departments

► forestry;
► horticulture;
► agriculture;
► highway/roads;
► irrigation;
► environmental;
► public health;
► territorial planning;
► protected areas.

Institutions

► international institutions and agencies (e.g. fao, un-habitat, unep, undp, who, iclei).

Networks and projects

► local, eu or international projects related to trees and urban forests;
► thematic networks on urban forests and related issues among cities (e.g. cities4forests, the tree cities of the word);
► local and international students' association (e.g. international forestry students' association, ifsa).

Stakeholders prioritization identified as strategic actors the members of the ongoing local and EU projects and networks, the respondents of the survey who gave contact details and showed high interest in receiving training on UF and Uforest partners and their networks. The complete database was shared on Uforest folders.

3.2 Beneficiary Training Needs Assessment Survey

3.2.1 Personal info and background

Part A provided general information on respondents and it also included typical demographic questions.

Age distribution is reported in Figure 3. More than 65% of answers corresponded to ages between 25 and 49. The highest frequency of respondents was related to age groups of 25-29 and 40-44, with 36 respondents for each group. Out of 246 respondents, 16% belong to age groups of 18-29 years. 23% of respondents were age groups above 50 years.
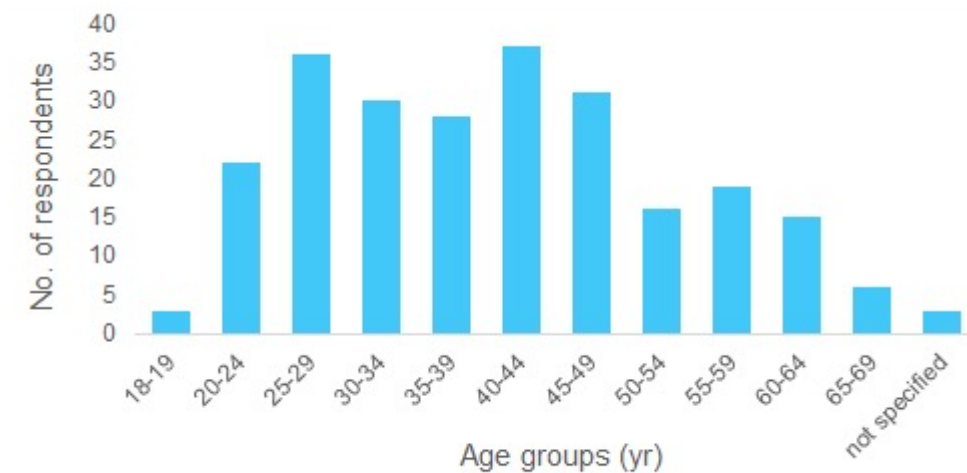
Figure 3. Age distribution of respondents

Answers relating to gender corresponded to 142 answers for male (representing 57.7% from the total respondents) and 100 from female (40.7%). Four respondents (1.6%) preferred not to specify their gender (Figure 4).
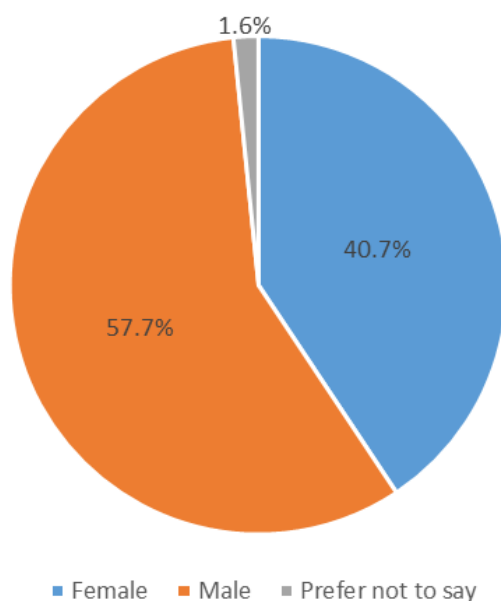
Figure 4. Gender distribution

Respondents indicated 27 different nationalities from four different continents (Africa, America, Asia and Europe). EU countries dominated the sample, representing 90% of the total, with answers from Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Portugal, Romania, Slovenia, and Spain. Spain and Italy were the two most represented countries: altogether they cover about 73% of total respondents. Apart from the European countries, nations from other continents (Africa, America and Asia) cover 6% of total respondents. Four percent of the respondents preferred not to indicate their nationality.

Regarding **current position** of respondents, 21% were students, while other positions represented 76.8% of the total answers (Figure 5).
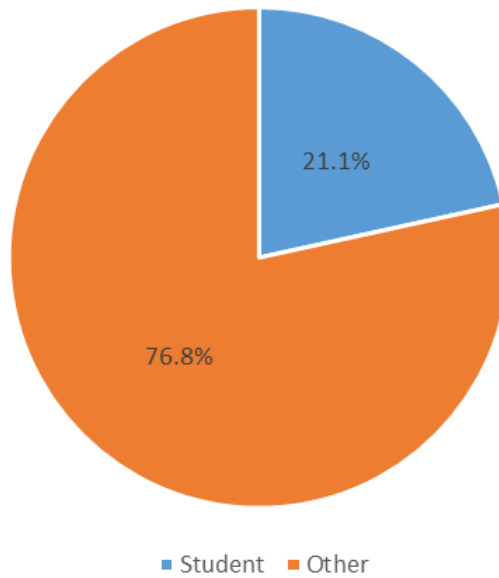
Figure 5. Current position of respondents expressed in percentage

As regards the current academic status/position held by respondents (Figure 6), a high number of respondents reported a Master of Science (MSc) degree (37.8%). The other answers showed a balance among undergraduate degrees (i.e. Bachelor (BSc or BA) or equivalent) (18%), and PhD's (19%).
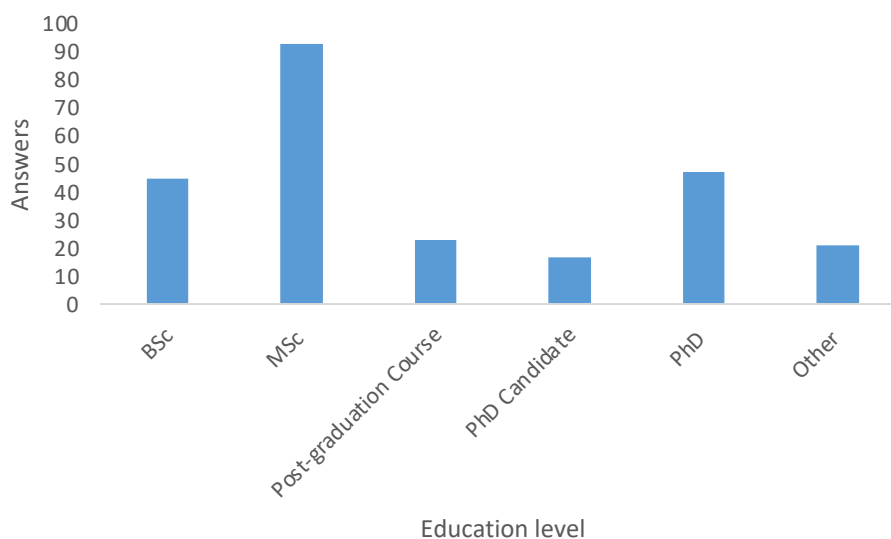
Figure 6. Education level of respondents

Regarding the **type of organization** (multiple options) where the respondents were working at the time of the survey **(Figure 7)**, most of the answers indicated Academia/Research/Teaching (39.8%), with similar percentages for the other sectors (public administration, private sector, sole traders or NGOs). Finally, 7.3% responded "other".
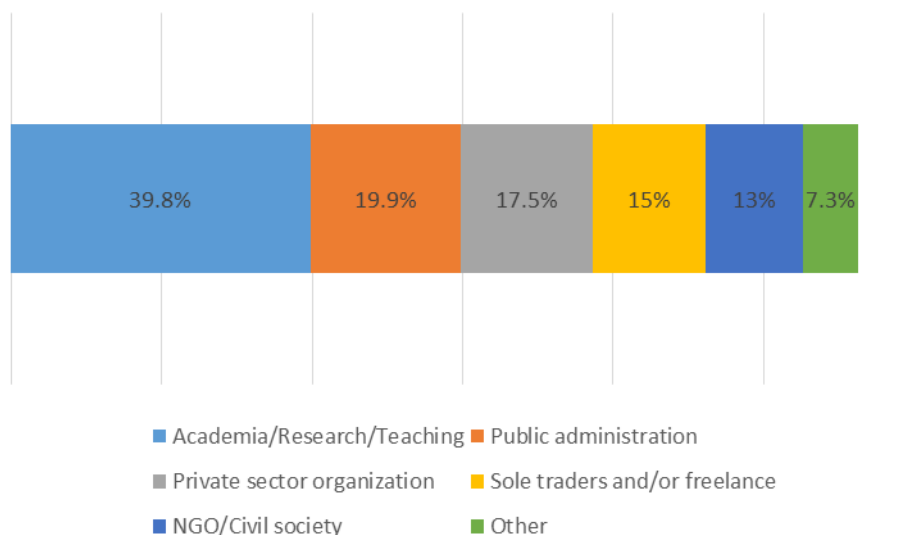

Figure 7. Type of organization

Respondents represented a total number of 42 institutions from different European countries and a few non-European countries. A list of the represented institutions is reported in Table 2 below. However, the question related to institution name was optional, so the table below does not reflect the entire panel of respondents.

Table 2. List of mentioned institutions among survey respondents

Institution name
AGRESTA S. COOP.
Ajuntament de Palma
Amics del Parc Dalmau de Calella
Associació Gestió Natural
CESIF
CREAF
Czech University of Life Sciences
Environmental Protection Agency
Faculty of Geo-information Science and Earth Observation, University of Twente
Guru Gobind Singh Indraprastha University, New Delhi
Institut Rubió i Tudurí
Institute of forestry
Ipc groen te schaarsbergen
IPC Groene Ruimte, pilot European Tree Manager , ETM
LIFE ADAPT (UNIVERSIDAD CORDOBA)
LUT University - Circular Economy
Ministry of Environment Waters and Forests

Politecnico di Milano
Slovenia Forest Service
Societat catalana d'educació ambiental
Southern University and A and M College
The Arctic University of Norway
Trinity College Dublin
Uned
UNIR
Universidad de Sevilla
Universidad de Valladolid, Master en gestión forestal basada en Ciencia de Datos.
Universidad de Zaragoza
Universidad Internacional Iberoamericana (UNINI,Mex.)
Università degli Studi della Tuscia
Università degli Studi di Milano
Università di Padova
Universitat Autònoma de Barcelona (UAB)
Universitat de Barcelona (UB)
Universitat de Girona
Universitat Politècnica de Catalunya
Universitat Pompeu Fabra-Barcelona School of Management
University of Copenhagen
University of Eastern Finland, Joensuu, Finland
UPV/EHU
Urbanism department at polytechnic university of Valencia (UPV)
USC
USC-EPS

Part B compiled information on respondents' backgrounds and helped identify the existing knowledge or knowledge gaps related to innovative concepts in UF.

According to the results, respondents' backgrounds are mainly related to Other fields (37.4%), Ecology (30%) and Forestry (26%), whereas, Urban planning (20.7%), Urban forestry (18.7%) an Arboriculture (17%) were those backgrounds less represented (Figure 8).

Forestry 26% | Urban forestry 18.7% | Arboriculture 17.1% | Landscape architecture 11.4% | Urban planning 20.7% | Ecology 30.1% | Other 37.4% | No Answer 2%

■ Forestry   ■ Urban forestry   ■ Arboriculture   ■ Landscape architecture
■ Urban planning   ■ Ecology   ■ Other   ■ No Answer
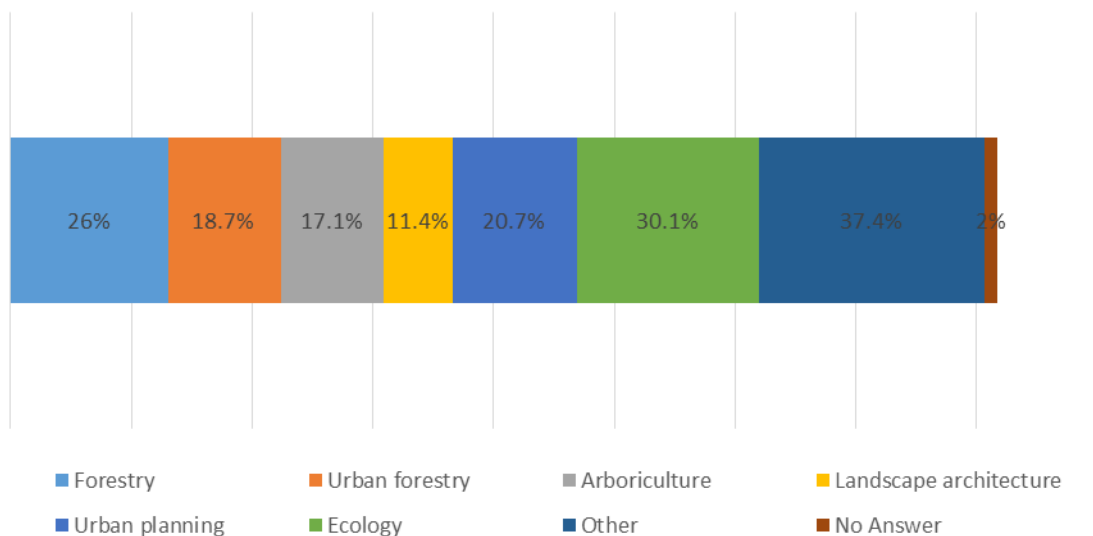
Figure 8. Educational/professional background of the respondents

When requested to indicate their **familiarity with some key topics** (see Figure 9 for these topics) to be addressed by the Uforest project, different respondent profiles emerge. The answers were rated according to the Likert scale (from 1 to 5, where 1= not familiar at all; 5 = very familiar; in this case, 3 is considered a neutral response).

A Top 2 block score was calculated as the percent of respondents that chose either of the top two questions (corresponding to "very familiar" and "familiar"; Figure 9). The following concepts were rated as "familiar" or "very familiar" by more than half of the respondents: nature conservation, biodiversity, NBS, climate change mitigation/adaptation, ecosystem restoration, green and resilient cities, ecosystem services, ecosystem-based approach, sustainable forest management, forest ecology, innovation, and urban and landscape planning. These results reflect the importance and visibility that both ecosystem services and NBS gained in the last years in various fields. On the other hand, a Bottom 2 block was also calculated, aggregating the two negative responses from the Likert scale. The results showed less familiarity related to entrepreneurship, marketing, UF, urban design, socio-economics, environmental justice, and emerging technologies and artificial intelligence. Related to the last concept, almost 50% of respondents declared to be not familiar at all or poorly familiar with the emerging technologies and artificial intelligence.
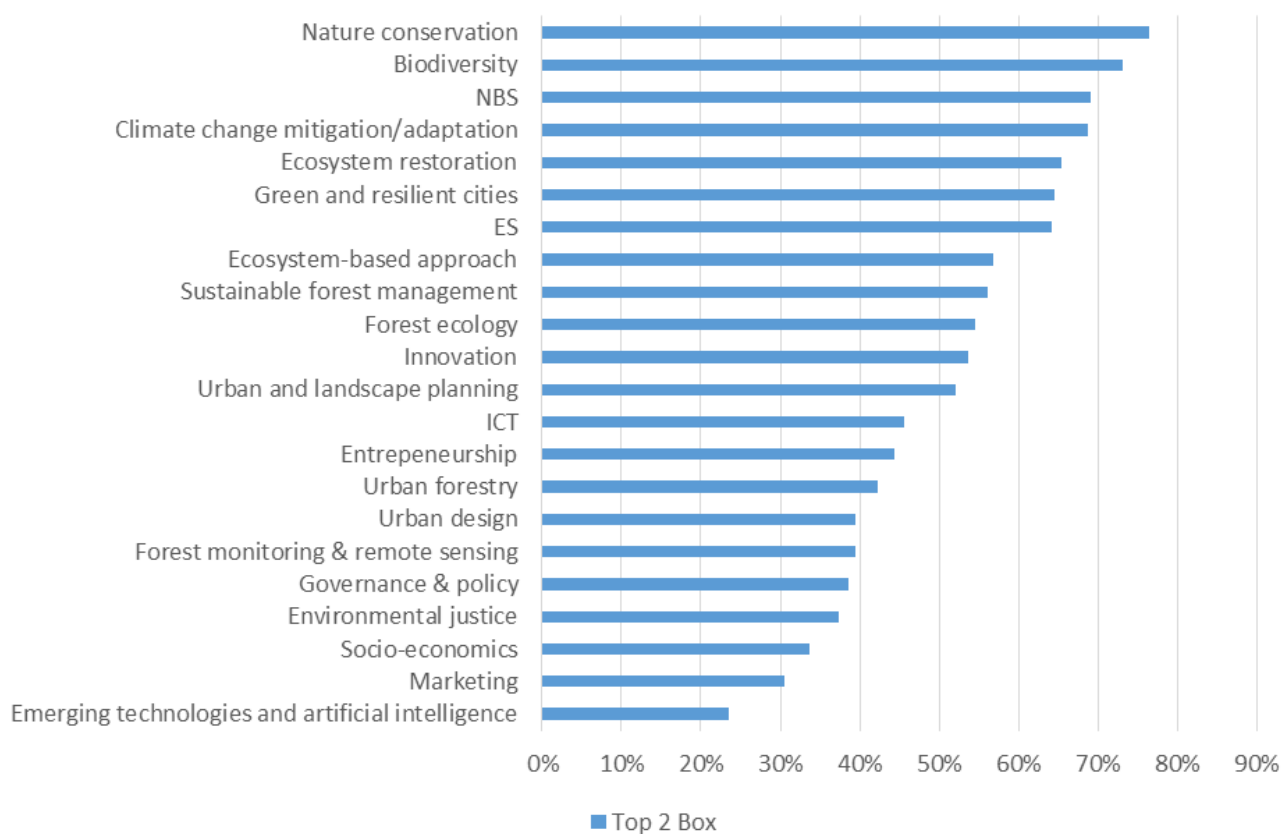
Figure 9. Familiarity with key topics

In order to double-check respondents' stated familiarity with some concepts, they were asked to indicate the definitions for "urban forests", "urban forests stakeholders", and "innovation", using multiple choice questions.

Most of the answers acknowledged the definition of urban forests and considered that urban forests include street trees, any green spaces with trees, urban parks, vertical forests, urban green spaces, peri-urban forests and woodland and community gardens (Table 3). Less than 34% considered the inclusion of pocket parks under the concept of urban forests. Perhaps surprisingly, other land cover and green typologies were also considered as urban forests, such as tree plantations (37.8%), wetlands (32.5%), or outdoor sport facilities (17.8%). Despite the lack of familiarity with the concept of urban forests, only 2% of the respondents indicated that they did´t heard about it.

Table 3. Number and percentages of concepts quoted as part of the urban forest definition (multiple option question)

Urban forests include		Answers	Ratio
Street trees		132	53.66%
Any green spaces with trees		181	73.58%
Urban parks		197	80.08%
Vertical forests		116	47.15%
Pocket parks		84	34.15%
Urban green spaces		162	65.85%
Peri-urban forests and woodland		178	72.36%
Tree plantations		93	37.8%
Private gardens		92	37.4%
Cemeteries		74	30.08%
Community gardens		125	50.81%
Outdoor sports facilities		44	17.89%
Wetlands		80	32.52%
I don´t know		5	2.03%

Regarding urban forest stakeholders and actors, the highest ratio (more than 70%) was obtained for answers considering citizens, municipalities, and residents from the nearby areas among the main stakeholders (Table 4). Only 32.5% of the respondents considered the business sector among urban forests stakeholders and actors.

Table 4. Percentage and number of times a typology of stakeholder is cited as related to urban forests

Urban forests stakeholders and actors		Answers	Ratio
The visitors of urban forests		133	54.07%
Residents from the nearby areas		175	71.14%
Citizens in general		201	81.71%
Governmental bodies		119	48.37%
Municipalities		192	78.05%
Business sector		80	32.52%
Associations and non-governmental groups (incl. civil society organisations and resident groups)		157	63.82%
Foresters		114	46.34%
Landscape designers		151	61.38%
Researchers		128	52.03%
I don´t know		1	0.41%
Other		20	8.13%

More than 50% of the answers considered innovation capacity as "The development and implementation of new or improved products (goods or services) or processes in the for-profit or not-for-profit sectors" (Table 5). However, the other answers obtained more balanced responses, ranging between 32-39%.

Table 5. Most selected definition of innovation capacity in UF

Innovation capacity		Answers	Ratio
The implementation of a new or improved product (good or service) or process, a marketing method, an organizational method in business practices, workplace organization or external relations		83	33.74%
The identification, development and implementation of new or improved technologies to address specific problems and needs of business (i.e. for-profit) activities		79	32.11%
The research on and development of patentable new solutions in terms of products, service and processes		96	39.02%
The development and implementation of new or improved products (goods or services) or processes in the for-profit or not-for-profit sectors		138	56.1%
Thinking and acting outside the comfort zone		95	38.62%
I don´t know		9	3.66%

3.2.2 Cross-cutting skills and issues

Entrepreneurship was considered by 77.6% of the respondents as the capacity of "Converting an innovative idea into a business model or project opportunity". Less respondents (23.6%) associated entrepreneurship with "impact" (social and environmental). This question allowed for selecting up to 3 answer options (Table 6).

Table 6. Most selected definitions of entrepreneurship

Entrepreneurship		Answers	Ratio
Creating a new organization		40	16.26%
Successfully managing a for profit organization		54	21.95%
Converting an innovative idea into a business model or project opportunity		191	77.64%
Taking risks in business or other professional activities		79	32.11%
Business with positive social impact		58	23.58%
Business with positive environmental impact		58	23.58%
Other		6	2.44%
I don´t know		4	1.63%

With reference to the importance of selected key-factors in characterising the concept of an entrepreneur (Table 7), most respondents agreed that these factors - i.e. risk taking, innovation, investment, sustainability and profit-making - are relevant. All factors but sustainability were indicated as relevant (4) or very relevant (5) by more than 60% of the answers, with innovation (72%) and risk taking (68%) being the most preferred ones. Less than 50% of respondents believe sustainability is a key factor characterising the concept of entrepreneur.

Table 7. Number of answers related to key-factors characterizing the concept of entrepreneur

Taking risks		Answers	Ratio
1		11	4.47%
2		11	4.47%
3		43	17.48%
4		104	42.28%
5		77	31.3%

The following skills were considered less covered by present or past education of respondents: leadership and management, business modelling, financial planning, social business, entrepreneurship, networking, confidence, cooperative leadership, societal impact, storytelling, cutting-edge technologies, IT, marketing and communication strategies (Table 8). All these skills were marked by less than 15% of the respondents as part of their education. Critical thinking or the abilities to work in interdisciplinary or cross-sectoral teams were the highest rated, selected by 57% and 47% of the respondents, respectively.

Table 8. Number of answers related to the main skills covered by respondents' present or past education

Education skills		Answers	Ratio
Leadership and management		27	10.98%
Business management		43	17.48%
Business modelling		4	1.63%
Financial planning		10	4.07%
Social business		15	6.1%
Entrepreneurship		30	12.2%
Networking		34	13.82%
Confidence		23	9.35%
Critical thinking		140	56.91%
Planning and development		95	38.62%
Project management / coordination		95	38.62%
Cooperative leadership		24	9.76%
Societal impact		35	14.23%
Storytelling		25	10.16%
Abilities to work in interdisciplinary or cross-sectoral teams		116	47.15%
Cutting-edge technologies		14	5.69%
IT		24	9.76%
Arboriculture (tree identification, tree planting, tree pruning, pest control etc.)		90	36.59%
Marketing and communication strategies		19	7.72%
Development of soft skills (team work, communication abilities, creativity etc.)		97	39.43%
Other		9	3.66%
No relevant courses attended		6	2.44%

3.2.3 Technical and specific skills

The highest rating related to **five key topics for future professional careers** was a combination of emerging, traditional, but also multidisciplinary topics within the field of UF: NBS (46%), Biodiversity conservation (39%), Urban forest and green space planning (30%), Climate change (25%), and Urbanism and urban design (24%). The lowest ratio was for Supply chain and market analysis (1%), followed by Corporate Social Responsibility in forestry (e.g. forest certification) (4%) and Architecture (3%). The percentages corresponding to each topic are represented in Figure 9.

Topic	Percentage
Nature-based solutions	46%
Biodiversity conservation	39%
Urban forest or green space planning	30%
Climate change and adaptation policies/tools	25%
Urbanism and urban design	24%
Urban forest or green space management	22%
Human health and well-being	21%
Forest ecology	20%
Project development and management	20%
GIS mapping and Remote Sensing	20%
Innovative teaching and learning	19%
Silviculture and forest management	17%
Community engagement and collaborative approaches	17%
Forest monitoring	14%
Citizens science	14%
Governance of natural resources	12%
Forest policy	12%
Arboriculture	11%
Environmental economics	11%
Forest pests control	7%
Communication and information technologies	7%
Biomass and renewable energies	7%
Food security	6%
Risk management	5%
Other	4%
Corporate Social Responsibility in forestry (e.g. forest...	4%
Architecture	3%
Supply chain and market analysis	1%

Figure 9. Key topics for future professional careers

The respondents were also given the possibility to specify, through an open-ended question, which **additional topics** they consider **relevant in UF**, in case these were not listed before. In addition, 73 relevant suggestions were given, highlighting the importance of considering arts, education, "forest pedagogy" or participatory processes. Urban regeneration, inclusion and nature equity, renaturing cities, mobility or public health were also emphasized in relation to career development and field of interest. The importance of urban flora also emerged, as respondents considered the integration of urban medicinal plants, knowledge of urban native flora and invasive alien species as interesting. Urban agriculture (i.e. permaculture, food sovereignty, apiculture), communication, circular economy and law were the other mentioned fields. Emerging topics, such as Internet of things, data science or augmented reality were also considered of interest for career development. A summary with the suggested topics of interest is clustered and presented in Table 9.

Table 9. List of additional topics of interests cited by respondents

Additional topics considered relevant to career development and field of interest
Accessibility
Agriculture; Apiculture; Pollinators; Permaculture; Chestnut growing; Plant nursery production
Art
Artificial Intelligence and Data Science
Artificial or augmented reality and intelligence
Biodiversity recovery; Ecological restoration
Bioeconomy and forestry circular economy
Climate change and its effects on forestry ecosystems; Politics/Tools of mitigating climate change
Communication and environmental education; Communication related to urban forests; Sharing knowledge; Citizens awareness; Citizens participation
Relationships forests surveillance and environmental education
CSR/ ESG finance and reporting
Data analysis related to public health
Development of ecological material for low cost houses
Ecosystem Services; Carbon sequestration
Environmental justice, participatory processes; Green equity; Nature equity/ universal design planning/ accessible nature public use or intersectionality nature access; Inclusive urban design; Food sovereignty
Environmental law; Forestry law; Legal protection of trees and urban green areas
Environmental valuation
Green infrastructure planning; Ecosystem service management; Multi-functional use of land
Identity, territory, mobility
Innovations in nature based resource management and governance
Innovative tools for environmental and trees monitoring
Internet of things, artificial intelligence
Knowledge and data on of native flora, invasive alien species, urban medicinal plants, singular trees
Landscape architecture
Paying for ES; Carbon Compensation & offsetting
Pedagogy related to urban forests and biodiversity for infants (schools); Forest pedagogy; Environmental education; Training for urban forestry domain
Projects related to nature for personal and professional development; Professional networks; Research project development and implementation
Rewilding, renaturing cities
Social impact, social innovation and research; Social economy; Social cohesion; Urban regeneration
Sustainability, sustainable development, ecological economics
Synergies urban, peri-urban and rural
Systemic and context thinking; Futurist thinking
Urban ecology; Urban soils, tree roots and relationship with ecosystem services and human health and wellbeing; Sustainable management of urban meadows; Urban waters management

Respondents were then requested to perform a self-assessment of their skill levels with regard to professional activities linked to different concepts in UF (Figure 10). Skill levels range between 1 (i.e. very low) and 5 (very high), with 3 considered neutral (Likert scale). Identifying ES, assessing the recreational use of urban forests, or engaging stakeholders were highly rated. The lowest skill levels were reported for market strategies for trading ES, assessing alternative forest management scenarios to deliver ES or to adapt to climate change, or estimating the potential of NTFP.

Identifying appropriate urban forest management practices to improve forest adaptation to climate change
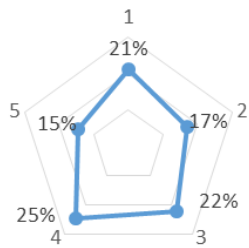
Assessing the recreational use of urban forests
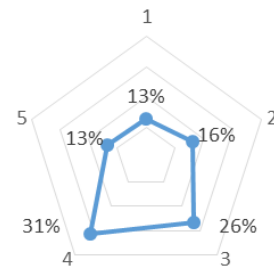
Assessing stakeholders' needs related to urban forests
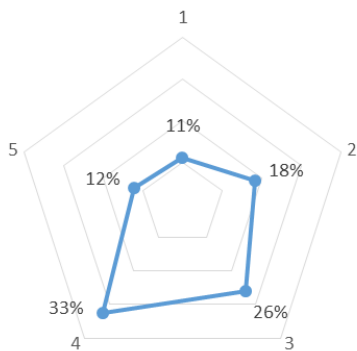
Engaging key stakeholders in a participatory way
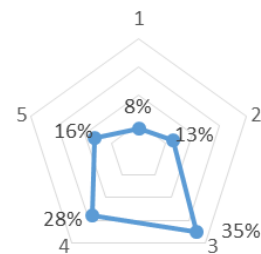
Identifying appropriate forest management operations to manage ecosystem services
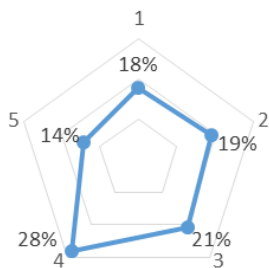
Estimating potential NTFP production by a forest/area
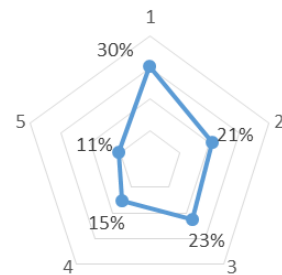
Designing a communication strategy for an urban forestry project
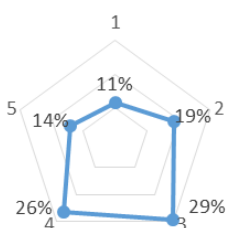
Facilitating networking of key-actors for developing forest-related services
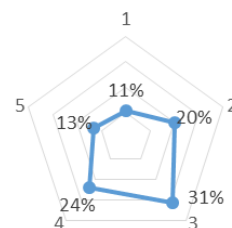
Identifying locally important ecosystem services
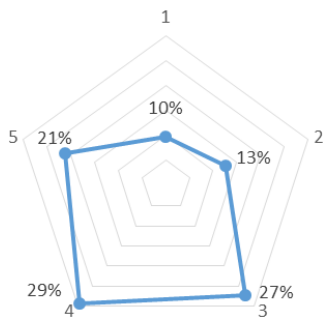
Assessing alternative forest management scenarios in terms of ecosystem service delivery
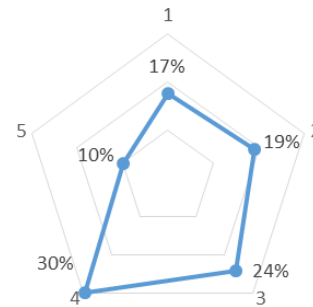
Developing marketing strategies for trading ecosystem services from a forest
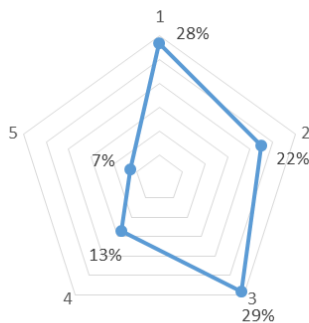
Figure 10. Skills levels related to professional activities (5 levels Likert scale; 1 very low, 5 very high)

3.2.4 Training needs

With regards to potential preferred course selection (where respondents can choose maximum three options) results are shown in Table 10 (with the training courses in rows).

Climate change adaptation was the most selected topic (184 answers), followed by Biodiversity conservation (181 answers) and Urban ecology (157 answers). A more in-depth analysis, however, seems to indicate a more nuanced situation, with different topics emerging as relevant with regard to different areas. In particular, interest for Urban design and architecture (highly related to a training course on Urban and landscape planning, with 50 answers, but also to Urban ecology) or Management practices (in relation to Biodiversity conservation or Arboriculture) prevailed. GIS&RS/Mapping tools, Biophysical assessment and management practices were the most important choices in relation to training on Biodiversity conservation.

In general, preferences were given for the following transversal related areas (columns): Urban design and architecture, Management practices, and GIS&RS/mapping tools. The highest interest was related to urban design and architecture (n= 248). Bio-physical assessment and socio-economics were also rated by more than 160 respondents.

The respondents had the possibility to propose other training courses of their preference, if this option was not mentioned in the previous question. Only six respondents mentioned other training typologies, such as: "Urban forests and education", "Chestnut growing", "Culture of urban sustainability", "Economic management of an urban forestry project", "NBS", "Remote sensing, including drones" and "Tree selection for urban forestry".

Table 10. Frequencies of the preferred topics and related areas

Training course/ Related areas	GIS&RS/ Mapping tools	Bio-physical assessment	Management practices	Socio-economics	Entrepre-neurship	Urban design and architecture	CIT	Total answers
Biodiversity conservation	**33**	**36**	**41**	18	14	22	17	**181**
Urban ecology	**23**	**22**	**31**	17	14	**39**	11	**157**
Forest ecology	21	21	23	10	7	7	5	94
Urban forests health	14	12	18	4	7	7	5	67
Arboriculture and urban forest management	22	17	**42**	14	11	31	11	148
Climate change adaptation	**28**	22	**33**	28	15	**34**	24	**184**
ES provided by UF	20	22	29	18	8	20	13	130
NTFP	4	6	13	6	7	9	6	51
Urban and landscape planning	20	15	20	16	10	**50**	12	143
Human health and well-being	5	11	9	17	7	13	9	71
Policy, governance and regulatory issues	6	4	16	18	9	16	13	82
Total	**196**	188	**275**	166	109	**248**	126	

Motivations for attending training courses on UF (Figure 11) are mainly related to creating positive environmental impact (65%), gaining interdisciplinary knowledge (54%), creating positive social impact (52%), or achieving a healthy city (52%). Boosting one's career and improving soft skills are other important motivations, rated above 30%. Other motivations seem to play a less relevant role, such as improving social status (7%), other reasons (4%), or continuing family tradition/business (3%).

Motivation for attending courses

To create positive environmental impact	65%
To gain interdisciplinary knowledge	54%
To create positive social impact	52%
To achieve a healthy city	52%
To boost your career/career advancement	50%
To plan and manage urban forestry projects	39%
To improve my soft skills (i.e....	30%
To become more entrepreneurial	17%
To help you starting your own...	15%
To increase my leadership skills	13%
To improve your standard of living	11%
To improve your social status	7%
Other	4%
To continue your family tradition/business	3%

Figure 11. Motivations for attending training courses on UF

In relation to **training approaches** and type of courses preferred by respondents, the respondents were asked to select among 1 and 3 choices. About 47% of them would like to be offered field visits and analysis of case studies. A number of specific seminars by academic and non-academic experts was the second best-preferred option), followed by a short intensive course (Figure 12). Full academic online courses (22%) or blended courses (19%) were supported by less respondents. Other types of training were less supported, with vocational training courses and full academic face to face courses showing the lowest interest (rated below 7%). The results clearly show the preference for practical and face-to-face training. Interestingly, instead of full academic face-to-face course, shorter trainings, with field visits and specific targeted seminars are better rated among respondents.

The training approach preferred for a training course in the future

Training approach	%
Field visits and analysis of case studies	47%
A number of specific seminars by…	35%
Short (i.e. max 1 week) intensive course	30%
Full academic online course	22%
Full academic blended course (online +…	19%
Development of your own case…	18%
Technical workshops	17%
Specific webinars	15%
Internship program	15%
Participation to…	14%
Postgraduate course on urban forest	14%
Vocational training course	7%
Full academic face-to-face course	6%
Other	1%

Figure 12. Training approaches and type of courses preferred

The final question of the survey was open ended and asked respondents to give any additional comments they consider useful/relevant for the survey. Even if in general, the open questions included in multilingual surveys are difficult to analyze, it was considered relevant to give voice to the participants and let them express freely their views, without being conditioned by any question or suggested answer. In general, respondents expressed their interest in UF and NBS training and found the survey useful. Other suggestions were related to work schedule concerns or emphasized the importance of acknowledging this type of training. The 21 suggestions are listed in ANNEX 4.

4. CONCLUSIONS

The survey provided an overview of the existing demand on training needs that promote innovation and entrepreneurship in UF and the delivery of NBS. Overall, **the results highlighted UF as an interdisciplinary field**, situated at the crossroads between art, culture, education, social inclusion, economics, science and technology.

These findings are in line with some of Uforest expected outputs and impacts:

▶ increased employability and new professional paths for young researchers and professionals in the fields of UF

▶ increased soft and multidisciplinary skills and competences, through practical training, competitions and EU mobility

▶ more practice and policy driven research activities; increased capacity, awareness, participation and understanding in urban planning for a better urban environment.

▶ increased EU social and environmental policy targets reached through social inclusion and UF planning

The following highlights some more specific conclusions drawn from the results, as well as some of the limitations of this assessment.

In order to increase the number of respondents and assure representation from various countries, the survey was translated into 8 EU languages, corresponding to the Uforest partners' mother tongue languages. However, this effort did not assure representative answers from different countries, as the responses from Spain (in both Spanish and Catalan languages) and Italy were the most abundant. One of the reasons for less respondents from other EU countries might be related to the reduction in the number of students replying, as semesters were already finished in many places by the time the survey took place.

One important conclusion resulting from the application of aspects of the methodology, was in the effectiveness of the storytelling approach applied by the partner 5 (CREAF). The survey was accompanied by a story about trees (i.e. in the case of Spain). In the case of Spain, after publishing the post on the blog, the participation jumped from 20 to 100 respondents in about a week. Collaboration with other projects where Uforest partners were involved, also helped to increase the motivation for answering the survey (such as posting it on the <u>Connecting Nature website</u>, EFIMED newsletter, IFSA channels, or disseminating it through NBSI, AGRESTA, ETIFOR, EFI or EFUF channels). Storytelling proved to be a powerful communication tool, which engaged and raised awareness among stakeholders, fostering emotional connections and building a credible history around a concept (urban forests and their benefits, in this case). Largely used by large corporations or TED speakers (Callahan 2016), this concept is still under-explored by scientific community. A high-quality storytelling strategy also helped to align multi and interdisciplinary perspectives, making people understand and care about the urban forests.

Profiles of respondents

With more than 240 answers, mostly from Europe, the age of respondents was mainly grouped between 20-49 years. These results reflect the interest at various educational levels (i.e. students and post-graduate), but also from professionals. According to respondents 'organization type, the highest number of respondents (40%) belong to Academia/Research/Teaching.

Familiarity with themes and gaps

Survey of familiarity with various key concepts (i.e. UF, urban planning, NBS or entrepreneurship, among others) showed that respondents know well or very well concepts such as ecosystem services, green and resilient cities, NBS, ecosystem restoration, biodiversity climate change mitigation/adaptation or nature conservation (with a Top 2 Box score higher than 60%). **Moreover, more than a half of the respondents consider NBS a key topic in their professional career.** In case of "urban forestry" concepts, the answers are more balanced, as more than a half of respondents are not so familiar with this concept. This is also reflected by the question related to defining the urban forests, as some confusions were reflected when answering.

Only 42% of respondents were familiar or very familiar with this concept. On the other hand, respondents are more familiar with other concepts related to forests in general, such as forest ecology or sustainable forest management. Important knowledge gaps are related to transversal concepts, especially to socio-economy, urban design and artificial intelligence. Very little or little familiarity was noted especially for marketing, socio-economics, urban design, environmental justice, emerging technologies and artificial intelligence, governance and policy.

Other knowledge gaps, in terms of less perceived abilities on specific experiences, are related especially to estimating the potential NTFP production by a forest/area, assessing alternative forest management scenarios in terms of ecosystem service delivery or developing marketing strategies for trading ES. Gaps related to NTFP production of a forest/area might be connected with the need for more knowledge on urban food forests and knowledge related to this forest typology. Valuation of UF-related ES, such as the recreational use of urban forests, stakeholders' needs or engaging key stakeholders in participatory processes also obtained balanced results. About a half of respondents declared less familiarity with these concepts. These findings provided interesting results, somehow contradicting the answers showing strong familiarity with the concepts of ES. These results might indicate that even if the perceived familiarity with certain terminology is high, implementing, deploying or assessing certain concepts could offer a different perspective. Overall, **these results pointed out the need to clearly communicate certain key definitions and concepts related to UF** (beginning with the concept of 'urban forest').

Skills and training needs

The **TNA identified a high demand for developing skills related to economics** (leadership and management, business modelling, financial planning, entrepreneurship), **social landscape** (cooperative leadership, societal impact, social business), **and communication and information technologies** (storytelling, cutting-edge technologies, IT, marketing and communication strategies, networking). These findings show the increased need for training and for developing curricula, knowledge and skills on urban forests, as acknowledged and further developed in Uforest.

The open ended question related to additional topics considered relevant in UF and the professional career offered interesting findings. They shifted our focus to the knowledge we didn't yet have, allowing us to better draw on the collective knowledge of people. Arts, urban forest pedagogy, permaculture, social impact, environmental law or economic management of an UF project emerged. Some concepts already perceived as being very little or little familiar also emerged (artificial intelligence, governance and policy). **These findings confirmed the creative potential of UF, and the needs for interdisciplinary views when building more sustainable, livable and inclusive cities**.

The survey also provides interesting information regarding teaching approaches and methods to be preferred for training activities. **Most of the answers indicated preferences for field visits and analysis of case studies and specific seminars by both academic and non-academic experts**. In any case, whether it is a full academic course or a short and intense one, respondents tend to agree on the opportunity to combine different training tools, although less preferences were given for these types of training.

Results indicate (a) **the needs for presential training** (reflecting an interesting post-pandemics era in the field of education and training) and (b) that an alternative approach could consist **of complementing existing university courses with dedicated training sessions**, less demanding in terms of time and more focused on relevant and specific issues. These findings also suggest that besides receiving an appropriate theoretical background, **respondents would like to see how these issues could be implemented in practice** and to meet real cases and both academic and non-academics having experience and working in the UF sector. Transversal concepts perceived as relevant, but of little familiarity, should be also considered as potentially relevant topics for training, to improve both perceived knowledge gaps, soft and technical/professional skills.

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ANNEX 1 – STORYTELLING - POST UFOREST AND TNA ON CREAF´S BLOG

UFOREST WANTS TO TRAIN AMBASSADORS TO FILL CITIES WITH TREES

Author: Florencia Florido, CREAF

Published in English, Catalan and Spanish on CREAF´s blog, on May 31, 2021
http://blog.creaf.cat/en/noticies-en/uforest-wants-train-ambassadors-fill-cities-trees

Through the Erasmus+ UForest project, CREAF is opening a survey aimed at people interested in promoting change in cities and filling them with trees and urban greenery. The survey will be used to create a custom-made training program.

Write a book, have a child… Traditionally, popular wisdom has encouraged us to immortalize our own self. However, planting a tree is one of those significant actions that allow us to transcend as a community.

'What? I live in a city! Where am I going to plant trees? That's exactly where: in cities, in your city. We need you because we want to train as many ambassadors as possible to turn our towns from gray to green. Through the Erasmus+ UForest project, CREAF has launched a survey looking for driven people who dream of making a difference in their environment, their country and their planet through nature-based solutions. If you believe you're one of them, please take a moment to answer this survey and share with us your training needs about urban forestry. It's open until 15th June! UFOREST will use your answers to create training programs tailored to you. What do you say? Are you in?

"This training program aims to provide tools to foster change and empower people from diverse knowledge areas that are linked to the transformative power of city forests," said Corina Basnou, CREAF's Uforest project coordinator.

Doctors, urban planners, lawyers, business people or artists. Everybody is welcome!

Forests make a positive impact on the planet on so many levels. That's a fact. And a tree is like an orchestra, a first-class multitasker that filters the air and enriches the soil, mitigates floods, cools and beautifies its surroundings, favors biodiversity and improves our physical and emotional health. The same happens with people; the role of urban forests and green covers is not just a gardening issue. Greener cities affect and improve society's quality of life. For this reason, we are looking for multidisciplinary ambassadors who may come from one of these seven knowledge groups:

- ▶ urban planning and geography;
- ▶ biology and ecology;
- ▶ technology;
- ▶ law;
- ▶ health;
- ▶ business and tourism;
- ▶ communication and art.

URBAN PLANNING AND GEOGRAPHY

Urban forests are essential to improving degraded land and to promoting sustainable urban transformations. This is a major challenge for those disciplines that study **urban and environmental planning**. As an example, urban forests and green covers act as climatic shelters and may be a solution to our planet's need to adapt to the current environmental crisis.

BIOLOGY AND ECOLOGY

Those knowledge areas that focus on the **biodiversity and ecosystems conservation and management** in the face of climate change are key players in creating urban forests. Such disciplines have an expertise in ecological connectivity and biodiversity within green cities, as well as in biological and human health responses to environmental changes.

TECHNOLOGY

When engineering knowledge and environmental sciences meet, urban forest systems thrive. Biological and environmental technology and geospatial data analysis can be applied to a wide range of areas, such as ecological economy and urban planning, public health, degraded lands, atmospheric CO_2, the hydrological cycle, or soil, air and water pollutants.

LAW

Sustainable development should take part within a legal framework and be included in urban foresting projects. Environmental law studies ecological thinking and the relationship between human beings and nature. Thus, it sets the guidelines for a smart urban planning that is framed within the human right to a healthy environment and to green spaces.

HEALTH

Health professionals must be included in the development of policies that maintain, protect and promote health. Such policies include urban forestry as an innovative way of improving health and as an experimental field for studying the impact of different types of forests on health variables and public health management.

BUSINESS AND TOURISM

Economically, green spaces favor the emergence of new and sustainable business models. In particular, as an important part of city beautification, urban forests help develop a sustainable tourism industry based on the preservation of the urban, natural heritage.

COMMUNICATION AND ART

Linking all disciplines, communication and art bring coherence and sensitivity to urban forest projects and channel their social and environmental impact. On the other hand, informative and artistic messages foster changes in people's perceptions and attitudes, promote citizen participation and inspire innovative solutions.

Like the tree, are you a multitasker, too? Join us!

UFOREST. Your urban forest.

CLICK HERE TO TAKE THE SURVEY

[SHORT VIDEO OF CITY FORESTS AND TREES]

Uforest in local media (Betevé, Barcelona TV)

Author: Manel Cascante (Betevé)

https://beteve.cat/medi-ambient/enverdir-barcelona-iniciatives-ciutadanes/

ANNEX 2- PERSONALIZED QUESTIONS FOR EACH INTERVIEWEE

Joan Pino (original version, in Catalan)

Des del punt de vista biològic i en relació amb la biodiversitat de fauna i flora que acompanyaria l'augment de la massa forestal urbana, com es beneficiarien les ciutats amb la incorporació de l'UF?

Els ciutadans, les administracions locals i el teixit empresarial coneixen aquests beneficis o pensen que conviure amb altres espècies d'animals (fora dels coloms, paneroles, ratolins a què estan acostumats) és més aviat un problema que una oportunitat?

Els professionals de les diverses disciplines que participen dels projectes de reverdiment de les ciutats estan suficientment preparats per afrontar els reptes específics dels boscos urbans? Quines necessitats de formació específica caldria abordar? Hi ha enriquiment transdisciplinàri?

Quin són els reptes de la planificació urbana en relació amb la introducció de boscos urbans en ciutats molt dures i que gairebé no en tenen arbres ni espais verds? Econòmicament, els costos d'assumir el reverdiment són assumibles o s'hauria de fer un plantejament innovador?

Ens podria donar exemples d'iniciatives innovadores en relació amb les NBS i l'UF (ex. formació, participació ciutadana, emprenedoria, polítiques públiques, etc.)?

Cecil Konijnendijk

In your experience as professor of UF, what were the most frequent learning needs & challenges you encountered?

Have you identified any new training fields or approaches that haven't been fully covered yet as regards NBS and UF (e.g., environmental law for urban environments; economic & social issues related to gentrification & poverty; citizen engagement, etc.)?

Are there any fears or uncertainties that could prevent UF from becoming a reality in dense and highly "concreted" (gray) cities? Why is it that many cities lack sufficient trees and canopy? Is it because there's lack of space? Because these require maintenance?

In your opinion, what would an inspirational, innovative and successful example of UF promotion look like? What are the key aspects we should be looking for in an educator, an entrepreneur, a policy maker, a citizen initiative? Could you give us some examples?

How do you think we could best encourage knowledge exchange

Rik de Vreese

From your point of view, what are the most basic training needs you think need to be addressed as regards NBS and UF? What are the disciplines that should further develop this approach to be able to tackle urban challenges (e.g., environmental law for urban environments, policy-making, etc.)?

How could we tackle UF from a transdisciplinary point of view that includes citizens' opinions and takes into consideration their fears and uncertainties (e.g.: about accessibility & transport, dendrophobia, etc.)?

Is UF economically viable in large, dense cities with a high percentage of concrete? Are urban planners and local authorities up-to-date with innovative solutions?

In your opinion, what would an inspirational, innovative and successful example of UF promotion look like? What are the key aspects we should be looking for in an educator, an entrepreneur, a policy maker, a citizen initiative? Could you give us some examples you might know of?

How do you think we could best encourage knowledge exchange on UF and its benefits between universities, businesses, authorities and citizens?

Nadina Galle

As an ecological engineer, do you think urban planners and local authorities are up-to-date with innovative NBS and UF? Could you provide some examples you might know of?

Are there any knowledge fields that are not being taken into consideration when planning UF projects (i.e. social sciences, health sciences)? Or are they fully represented in the same way as Urbanism or Biology?

Is it economically viable to digitalize an UF? Thinking about extremely gray cities with low budgets, is there a minimum percentage that would make noticeable changes and thus foster more investment in digital greenifying (mapping, IA, digital sensors, high resolution satellite images, etc.)?

How could we tackle UF from a transdisciplinary point of view that includes citizens' opinions and takes into consideration their fears and uncertainties (e.g.: about accessibility & transport, dendrophobia, etc.)?

Do you think UF public communication is focusing its efforts on the visible portion of forests (i.e., green covers) but not addressing life under our feet or the biochemical connections that are invisible to the naked eye?

ANNEX 3 - LIST OF ONGOING PROJECTS, INITIATIVES, FUNDING TYPE AND WEB DETAILS

Projects, initiatives and knowledge hubs (ongoing)	Funding	Web page
GREEN4C - Alliance on Interdisciplinary Learning and Entrepreneurial skills in Green for Health and Social Inclusion	Erasmus +	http://www.green4c.eu/
CLEARING HOUSE - Collaborative Learning in Research, Information-sharing and Governance on How Urban forest-based solutions support Sino-European urban futures	H2020	http://clearinghouseproject.eu
Cuenca Urban Forest Innovation Lab	Urban Innovative Actions. The Urban Lab of Europe	https://www.uia-initiative.eu/en/uia-cities/cuenca
SINCERE – Spurring Innovations for forest eCosystem sERvices in Europe	H2020	http://sincereforests.eu
Connecting Nature	H2020	www.connectingnature.eu
ReNature	H2020	http://renature-project.eu
Forestami	National Funding (Italy)	
THINKNATURE	H2020	https://platform.think-nature.eu/
EdiCitNET	H2020	
ProGIreg	H2020	https://progireg.eu/
URBiNAT	H2020	https://urbinat.eu/
GrowGreen	H2020	https://growgreenproject.eu/
URBAN GreenUP	H2020	https://www.urbangreenup.eu/
NATURA	National Science Foundation	https://natura-net.org/about
The Nature of Cities	Public Charity	https://www.thenatureofcities.com/
IUCN Urban Nature Alliance	IUCN	https://iucnurbanalliance.org/
UNALAB	H2020	https://unalab.eu/en
VARCITIES	H2020	https://www.varcities.eu/
REGREEN	H2020	https://www.regreen-project.eu/
CONEXUS	H2020	https://www.conexusnbs.com/
SMURBS	H2020	https://smurbs.eu/
GREENLULUS	H2020 & ERC	http://www.bcnuej.org/projects/greenlulus/
Nature4Cities	H2020	https://www.nature4cities.eu/
EO4SD-URBAN	ESA	https://eo4sd-urban.info/
EO4CBI	ESA	https://eo4society.esa.int/projects/due-innovator-iii-eo4cbi-earth-observation-for-city-biodiversity-index/

ANNEX 4 - LIST OF ADDITIONAL COMMENTS AND SUGGESTIONS RECEIVED FROM THE RESPONDENTS

► How to create an "ecosystem" of professionals of UF, NBS etc

► Training that should allow respecting job schedule (in Catalan)

► Training courses acknowledged by the official Education Departments/Ministries would facilitate the participation of teachers. Many schools have forests! (in Catalan)

► Great need for the development of master's programs in Flanders with regard to ecology, climate change, design of green-blue infrastructures at the interface between engineering and landscape architecture (in Dutch)

► How important it is for the social awareness of forests in a particular country. Access to forest areas according to legal possibilities and attitude towards (private / public) forest ownership

► It was very useful

► It would be important to clarify to participants what would be the expected minimum entry requirements and opportunities for progression. Also, forestry has professional minimum acceptable qualifications in order to practice in most European countries. Important to clarify to participants whether successful completion confers professional license to practice or not.

► I have a small business related to projects of social inclusion (related to sustainable development) (in Catalan)

► Communication is always very important in all fields, especially when our work has an impact on everyone's life (in Italian)

► The survey was interesting, but too large and complex. However, I'm interested in this field. Thank you (in Catalan)

► Your survey is too long and too detailed. I think you would get more considered responses if there was less detail

► I think the survey is too complex in relation to questions typologies and diversity of options

► Audio and video material related to practical training (in Spanish)

► I'd like to collaborate or be part of a multidisciplinary team working with urban forests in Mediterranean areas, which will be the most affected by climate change in the next 30 years (in Spanish)

► I'm an arborist and I'm teaching gardening. I will graduate Environmental Sciences next year (in Spanish)

► Very interested in this type of training (in Catalan)

► Multi-disciplinary network engagement

► I´m not interested in changing my job (in Italian)

► I graduated Biology and Master in Water management (in Spanish)

► I suggest to also consider the concept of ecological footprint (in Italian)

► Please have in mind when scheduling the training for the people who are working. For example, in case of field study visits, consider it during late afternoon (in Catalan)

► Value learning (in French)

Uforest is a three-year Knowledge Alliance project co-funded by the Erasmus+ Programme of the European Commission. The project and alliance aim at promoting Europe's innovation capacity among universities, cities and businesses to deliver a new approach to Urban Forestry.

For further information

info@uforest.eu

www.uforest.eu