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Urban Forestry as Part of Green Cities: The Evidence from Research and Academy Areas

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Abstract

Currently there are more than 7 billion people living on Earth. In 2016, there were 512 cities with at least 1 million inhabitants globally. That means that the pressure on natural resources is increasing every day, especially because starting from 2008, share of urban population exceeds fifty percent. In order to improve the quality of life for city inhabitants and coming generations, cities are to become greener. Hence, the concept of urban forestry can be considered a part of sustainable green economy and green cities. Education and science are very important for sustainable development of urban forests. The paper investigates activities of educational and scientific organizations in the field of urban forests.

Keywords: green city, sustainability, forestry, urban forestry, research area, academy area.

1 INTRODUCTION

Generally, if we consider urban forestry to be a concept for urban living, it can play an essential role due to the fact that trees can cool air in urban areas, regulate water flow, absorb up to 150 kg of CO_2 per year, and affect mental and physical health of the population, especially children. Trees also increase urban biodiversity, and property value due to landscaping. At the same time, woods and trees have personal, local, community and cultural meanings, and are therefore important for the population [19]. Urban forests, as well as community Gardens, contribute to "psychosocial resilience after a disaster" [16] and walks in the forest help "enhance positive emotions [16]. Urban forestry, according to the Oxford dictionary, is “the science or practice of planting, managing, and caring for forests” [9] or “the art, science and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society (Helms, 1998). Community Gardens are reviewed by "as an important place to distress, share experiences, and gain community support" [17]. According to Gerhold [13], origins of urban forestry date back to 1792 when in Philadelphia, USA, citizens required having public trees planted, and in 1896, the city hired its first arborist as the Chief Forester.

In 1974 Professor Erik Jorgensen defined the term urban forestry as "a specialized branch of forestry that has in its objectives the cultivation and management of trees for their present and potential contribution to the physiological, sociological and economic well-being of urban society” (Jorgensen, 1974). Many researchers treat urban forests as a facility for the resistance of urban social–ecological systems and as objects for maintaining urban food security [4]. But although urban forests are recognized as essential for cities, generally, they are vulnerable because, according to Alberti et al. [1, 2], urban forests are affected by the environment which is constantly changing. Also, some scientists are sure that “the spatial distribution of urban greenness within a city is largely influenced by land use configuration and social factors” [10]. Though urban forests are recognized as essential for cities, they are generally vulnerable, because, according to Alberti et al. [2], urban forests are affected by the constantly changing environment. Preferences of the respondents increased along with increasing tree biodiversity levels in parks and wastelands, and the most diverse streetscape scene also received the highest mean rating [11]. In addition, urban forests "encourage social interaction and bonding such as central meeting and lunch places and communal working areas" [6]. So, research and academic areas investigate the modern problems of urban forestry together with the problems of green cities and sustainable development (Fig.1).

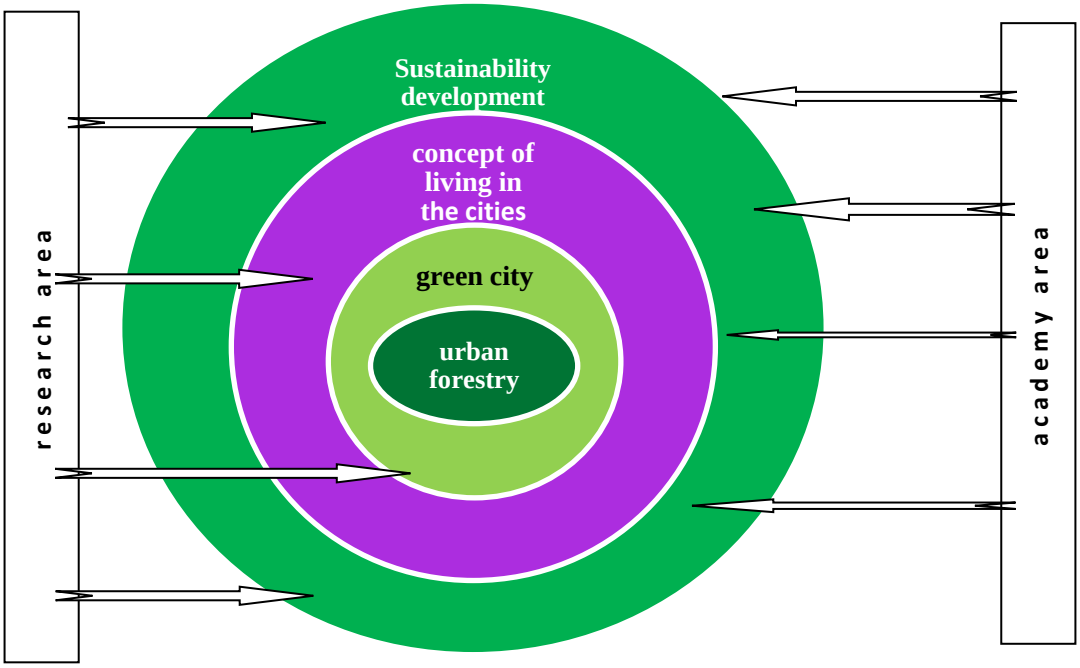

Fig.1.- Urban Forestry as a Part of Green Cities

Source: Authors

2 METHODOLOGY

2.1 Methods

The study is based on the method of bibliographic analysis of materials on the study and analysis of urban forestry, available in the scientific literature, as well as data on educational programs urban forestry, forestry, green city from the official websites of universities. The study uses a methodological approach that allows generating a conceptual model of the prevalence of urban forestry ideas in scientific research based on the selection of specific requirements from the organizational descriptions of bibliographic sources by keywords. As keywords, the words "urban forestry", "rainforest", "plantation", "bush" was used. The keyword "community Gardens" was not used in the research process because the peculiarities of growing urban forests and community Gardens are different. Based on statistical analysis of bibliographic sources in this article, a model of ranking of countries and universities by the criterion of the number of published scientific papers on urban forestry. The graphical method is used to display the results of statistical analysis of urban forestry universities localization in all major regions of the world: Northern America, Eurasia, Australia, Africa, and South America. Data from 563 urban forestry universities were used for analysis and graphical interpretation. The use of the graphical method allowed assessing the level of perception of the importance of urban forests for the human environment and the level of satisfaction of the population in urban forestry, through the number and concentration of urban forestry universities.

2.2 Data collection and analysis

The total number of analysed sources is 114,580 scientific publications. The statistical distribution of scientific articles on databases of citations and keywords are given in table 1.

Table 1. - Statistical database on scientific publications published in the period 1990-2017 retrieve from Scopus data base and WoS data base.

Keywords	Number of articles retrieve from Scopus data base	Number of articles retrieved from WoS data base	Total of the keywords
"urban forestry"	3 916	1135	5051
"rainforest"	10 708	13 284	23 992
"plantation"	30 756	30 898	61 654
"bush"	13 269	10614	23 883
Total of the data base	58 649	55 931	114 580

Source: Authors

3 ANALYSIS OF SCIENTIFIC PUBLICATIONS RELATED TO FORESTRY

The purpose of the paper is to analyse the number of publications for this application area for the period between 1990 and 2017; the type of documents referring to urban forestry, and select countries or regions involved in urban forestry research, and key urban forestry research institutions based on the number of publications. Authors used Scopus and Web of Sciences databases as a search engine. The issue the authors focus upon is the degree of urban forestry representation in discourse of scientific research. The history of European education in the fields of forestry and urban forestry is very long: Forestry Universities exists in all countries, and their history often exceeds two hundred years. Almost any European country has its own Forestry University, supplemented with urban forestry courses. Green economy is the basis of sustainable development. Forestry and especially urban forestry have an important part in green economy and balanced environment management. Importance of urban forestry also increases considering the global trend for urbanization. Science is very important for the development of urban cities because now ecological situation in the cities becomes more and more complicated.

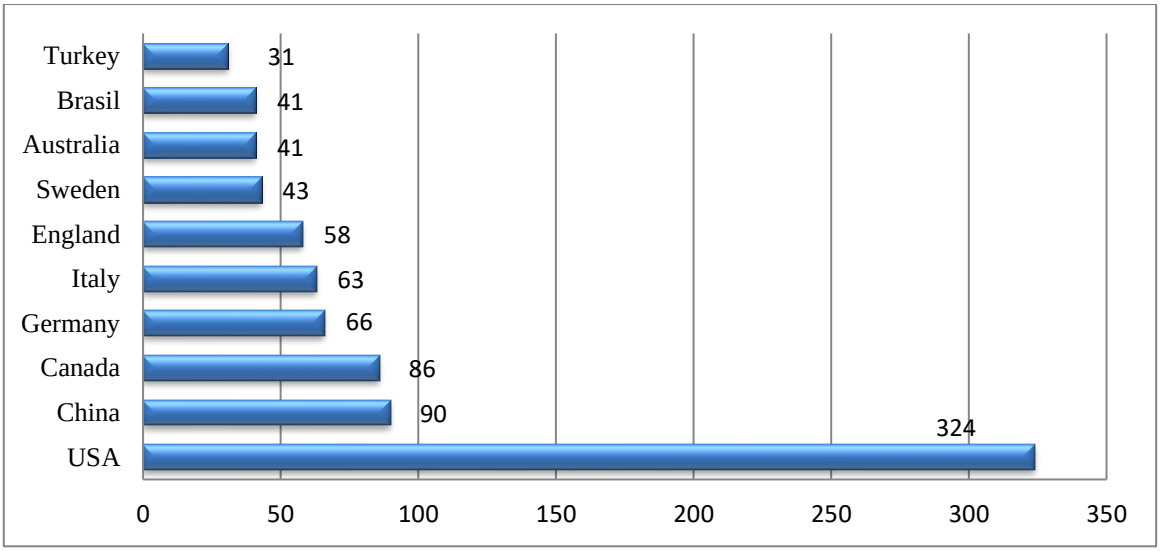

Fig. 2.- Urban forestry documents published around the World - top 10.
Source: Authors (2018) by Web of science Platform

Scientist research the ways of settling and preventing ecological problems in urban forests. The world leaders judging by the number of documents published globally according to Web of science data are

USA, China and Canada (Fig.1.). All these countries have large forest recourses (http://www.fao.org/home/en/).

World top rating by the number of documents devoted to Urban Forestry by Affiliation includes mostly universities (Fig.2). That demonstrates that academic society plays an important role in the development of urban forests.

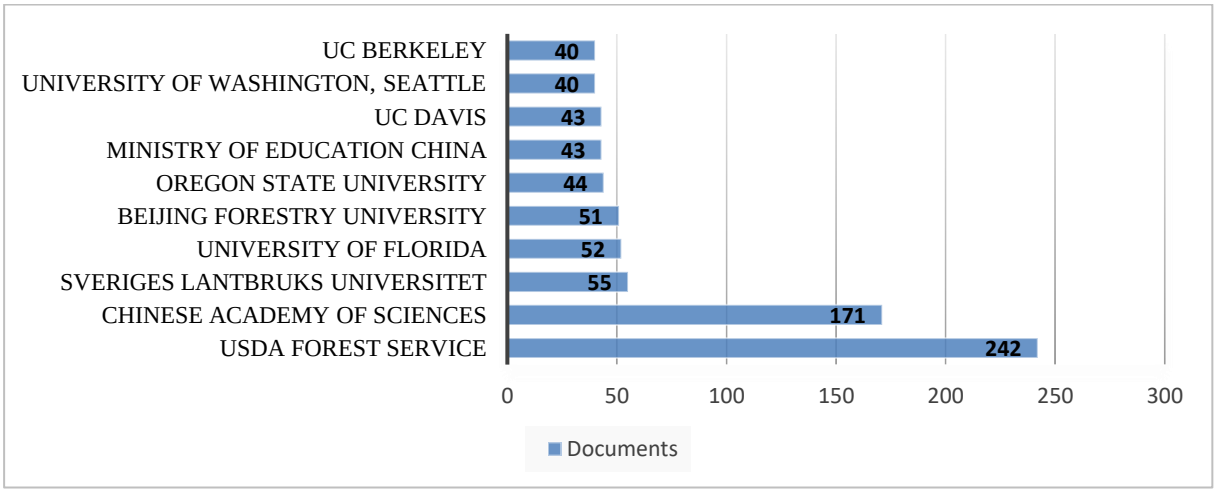

Fig. 3.- Number of documents in Urban Forestry by Affiliation– top 10.
Source: Authors (2018) by Web of science Platform

4 URBAN FORESTRY & EDUCATION

Usually all universities specializing in forestry have courses in urban forestry, gardening or landscaping because all this fields are very closely connected. Geography of urban forestry in the world is very extensive and it is possible to find schools providing education at different levels of urban forestry. These schools are in EU, Russia, America and Asia. Europe has a very long history of forestry and urban forestry. There is some professional association in these fields, but the most famous is the Conference of Deans and Directors of European Forestry Faculties and Schools. One can see that every European country has at least one forestry university, and courses in urban forestry especially related to landscaping. Urban forestry also has a long tradition in North America. The roots of urban forestry education reach back to 1907, when private companies started commercialization of urban forestry education [18]. According to [15], in the late 1960s and early 1970s forestry schools in the United States stared offering specialized urban forestry courses. A survey conducted in 1975 demonstrated that at that time Arboriculture programs were offered by 29 universities in the United States [17]. At that early stage, urban forestry programs already had developed curricula, options, specializations or tracks based on interdisciplinary support from other university departments, such as Regional and Urban Planning, Landscape Design, Business, Sociology, and the Humanities. A survey taken in 1990 demonstrated that 30 universities provided one or more undergraduate courses in this field [18].

5 RESULTS AND DISCUSSION

Figure 1 demonstrates the global top-10 of the countries having universities that specialize in forestry and urban forestry according to the number of papers published on these topics. The leading country in this regard is the United States. However, there is an interesting point - in terms of educational institutions number United States are immediately followed by Indonesia, India, and Brazil.

All of these countries are rich in forest recourses, and forests are important for their economies. Such a misbalance between the countries ranking by the number of publications and by the number of educational organization means that only USA is outside of the main trend when a country is a world leader in science and education in urban forestry, and at the same moment it is a country with developed economy. Other cases would need extended analysis. The concentration of forestry universities in the world shows that USA and Europe have big concentration of forestry universities. And it's confirmed by number analysis.

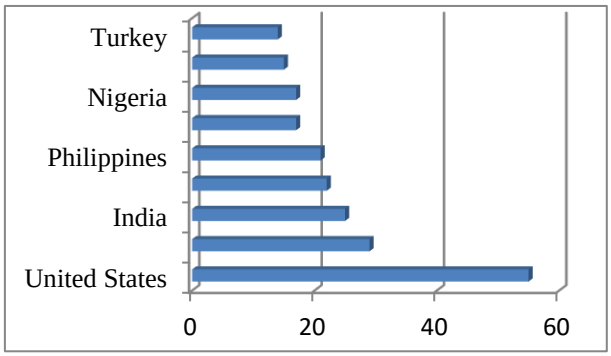

Fig.4.- Urban forestry universities around the World - top 10 countries
Source: Google Maps

6 CONCLUSION

The research of publications and the number of academic institutions demonstrates that the groups of top countries in the fields of science and education are different, except for USA, a global leader in urban forestry. Our conclusions correlate with world ranking of green countries including New York. Dual Citizen LLC came out with the 4th edition of the Global Green Economy Index, an in-depth look at how 60 countries and 70 cities are doing in developing more environmentally friendly economies, in terms of actual performance and in the way, experts perceive their performance. New York took the 7th place in this ranking (*Source*: https://www.ecowatch.com/top-10-greenest-cities-in-the-world-1881963132.html). Other countries from the top list of leaders in education and science need special case analysis and we will investigate it in the next articles. We supposed that such countries as China, Canada and Germany soon will improve their positions in world ranking in urban forestry education because their current scientific results create good basement for the development of educational programs. And our forecast about future of urban forest education is correlated with many global forecasts of global leading academic centres [1, 20].

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