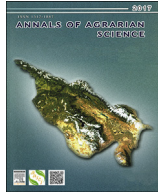




Contents lists available at ScienceDirect

Annals of Agrarian Science

journal homepage: <http://www.journals.elsevier.com/annals-of-agrarian-science>

Urban forests and green spaces of Tbilisi and ecological problems of the city



T.K. Patarkalashvili

Technical University of Georgia, The Center for Studying Productive Forces and Natural Resources of Georgia, 69, M. Kostava Str., Tbilisi, 0175 Georgia

ARTICLE INFO

Article history:

Received 20 January 2017

Accepted 22 March 2017

Available online 10 May 2017

Keywords:

Urban forests

Green space

Pollution

Contaminants

Vehicle

ABSTRACT

The increase in urbanization is the most dramatic factor in today's world and it did not passed round Tbilisi, the capital of Georgia, too. Since the sixties of the 20th century the population of the city nearly doubled and today is about 1.3–1.4 million. Many problems that may not have been so evident in the past, became obvious and dramatic today. These problems concern urban forests and green spaces of the city because they shrank considerably and as the result, deteriorated ecological situation. Today, their role in improvement of city climate is little. In the Soviet period the main polluters of the air considered factories and plants, but today, after breaking of the Soviet Union and closing or destruction of all factories and plants, the increasing number of light vehicles, especially outdated once, manufactured before 1999(67%) are the main source of pollution(80%). The article highlights the historical development of Tbilisi urban forests and green spaces and outlines some challenges and prospects of ecological condition of the city.

© 2017 Agricultural University of Georgia. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

According to many scientists' definition urban forests are the forests and forest-like vegetation in and peripheral urban environment that appear in different compositions. They can be isolated trees in the streets and squares. They can be found in lanes, parks and gardens, in arboretums and of cause in forest stands. All these trees, bushes and other vegetation form a kind of plant network-the urban forest. Therefore urban forest is the sum of total green tissue [1–3].

Urban forestry has been recognized as a discipline within forestry profession since the early 1970s. From that moment on much attention has been paid to this field of forestry, especially in the USA, Canada and European countries. Today this list is enlarged by developing countries [4,5].

In the early and middle ages people, especially the nobility, used forests for hunting and in times of wars the forests served as a kind of economic reserve and hiding place. From the late middle ages the attitude towards forests changed. It was especially noted with early urbanization period. The industrial revolution brought with it the deterioration of the healthy living environment in the cities. More

urban green spaces were needed.

After world war II, the demand for recreational facilities of forests grew even bigger, while the amount of spare time and mobility of people increased. Many large parks were created in the capitals of European and north American countries. The significant part of these parks consisted of forest-like vegetation. But today, many people dislike the artificial nature of the city parks and other recreational facilities. They want a more natural, more spontaneous and less human-shaped landscapes. This shift of demands to a more or less natural environment requires new efforts from city planners in cooperation with foresters and urban planners.

Functions of urban forests

The list of goods and services that urban forests and green spaces provide are impressive. Urban green vegetation help to keep cities cool, act as natural filters and noise absorbers. Urban forests improve microclimates and protect and make better the quality of natural resources, including soil, water, vegetation and wildlife. Trees contribute significantly to the aesthetic appeal of city dwellers, helping them to maintain psychological and mental equilibrium. Green urban spaces fulfill a role of psychological, social and cultural needs of city residents. People simply feel better living near green spaces [6–8].

The trees in the parks or the forest outside the city remind us of

E-mail address: Tamaz_41@mail.ru.

Peer review under responsibility of Journal Annals of Agrarian Science.

the changing seasons. Trees are a symbol of nature and life in the often harsh city environment. They have an informative and symbolic function. The trees in urban atmosphere are perceived to be a decorative element. Part of the information is the increasing awareness of the important role that nature still plays in our industrialized world. Education will help people to realize and appreciate the importance of urban forests they play in our life [9–11]. Besides these important functions urban forests house an important microfauna. They are a refuge for small animals like squirrels and birds and therefore they are often presented until they die. [12–14]. Urban trees and other vegetation mitigate air pollution by absorbing gaseous compounds and intercepting airborne particulates matter. Urban forests influence on daily and seasonal temperature fluctuations, wind speed and frost protection. Trees and other urban forest vegetation facilitate soil water infiltration and lower surface runoff. They are important mediator in urban hydrological cycles [15,16].

As a result of the predominance of concrete buildings, asphalt and metal, as well as, the concentration of transport systems and industrial activities in and around urban areas, the median temperature in cities is higher, the air is drier and often polluted, rainfalls are less efficiently absorbed and environment is generally noisier than in a rural settings [17,18].

One of the major problems in urban areas is air quality. Plants help to remove pollutants from air, absorbing by the leaves or the soil surface, deposition of particulates and aerosols on leaf surface. Trees absorb sulfur dioxide. Soil absorbs gaseous pollutants, including carbon monoxide, sulfur dioxide, nitrogen oxides, ozone and hydrocarbons. Trees intercept dust and mask fumes and disagreeable odors by replacing them with more pleasing scents or by absorbing them. Trees also help to increase the relative humidity of urban air through evapotranspiration [19,20].

Tbilisi urban forests through history

Legends and historical documents affirm that the place where Tbilisi, the capital of Georgia, was founded more than 15 centuries ago, have been covered by thick forests [21], [22]. According to the legend, king of Georgia, Vakhtang Gorgasali, liked hunting in these forests and the town was founded by him in that period. In early and middle centuries, in the process of constant invasions from neighboring countries, the great part of the forests have been destructed or burned, because people used forests for shelter and nutrition. Destruction continued in next centuries too, especially at the early stage of capitalism development, when demand on wood materials increased. Extensive exploitation of forests continued after world war II, as there was deficit on energy sources and wood materials [23,24].

After such destructive and barbarous exploitation of Tbilisi and its outskirt forests, today we have degraded forest stands of the 4th-5th generation with reduced growth capacity [25–27]. The following species grow in these forests: georgian oak tree (*Quercus Iberica Stev.*), horn-beam (*Carpinus Caucasica A. Gossk.*), maple trees (*Acer Campestre L.*, *Acer Platanoides L.*, *Acer Laetum. L.*), elm-trees (*Ulmus Foliacea Gilib.*, *Ulmus Scabra Mill.*), Ash-trees (*Fraxinus Excelsior L.*), and oriental horn-bean (*Carpinus Orientalis*). The undergrowth is presented by hazel-nut (*Corylus Avelana L.*), hawthorns (*Crataegus Pentagina W. et K.*, *Crataegus Orientalis Pall. et M.B.*), cornelian cherry-tree (*Cornus Mas L.*), barberry (*Barberis Vulgaris Z.*) [28–30].

In the low terraces of Mtkvari river, dividing the town to parts, grow flood-land forests that are presented by poplars (*Populus Nigra L.*, *Populus Pyramidalis Auet.Cauc.*), willows (*Salix Caprea.L.*, *Salix Alba L.*), elm-tree (*Ulmus Foliacea Gilib.*), mulberries (*Morus Alba L.*, *Morus Nigra L.*), oak-tree (*Quercus Longipes Stev.*). In

undergrowth there grow hawthorn (*Crataegus Orientalis Pall. et M.B.*), sea-buck thorn (*Hippophae Rhamnoides L.*), tamarisk (*Tamarix Ramosissima Ledeh.*)

Today, the remained urban forests are growing mainly on the right bank of river Mtkvari. Several years ago the near-by villages of the city: Kojori, Kiketi, Betania, Tsavkisi, Tabakhmela, Tskneti, Digomi, Mukhatgverdi, Tsodoreti, bevreti, Lisi, Mskhaldidi have been included into Tbilisi territory with their forest lands. So, the city urban natural forests have been enlarged. There are deciduous, as well as, coniferous forests [26,27]. Deciduous forests consist of georgian oak-tree (*Quercus Iberica Stev.*), maple trees (*Acer Platanoides L.*, *Acer Laetum L.*) horn beam (*Carpinus Caucasica A. Gossk.*), elm-trees (*Ulmus Foliacea Gilib.*, *Ulmus Scabra Mill.*), ash-trees (*Fraxinus Excelsior L.*), oriental horn-beam (*Carpinus Orientalis*). In undergrowth: hazel-nut (*Corilus Avelana L.*), hawthorns (*Crataegus Pentagina W. et K.*, *Crataegus Orientalis Pall. et M.B.*) and barberry (*Barberis Vulgaris Z.*). Coniferous forests are mostly artificial and presented by pine trees (*Pinus Nigra and pinus Eldatica*) [28–30].

The mountain slopes where forests have been destructed through historical process now are covered by steppe vegetation of thorny weeds, consisted mainly of beard grass (*Andropogon Ishaemum*). The steppe vegetation as a rule grow in dry conditions on mountain slopes of the left bank of the river Mtkvari, though their growth is observed on the right side mountains too. The steppe vegetation sometimes is spread up to 750–800 m. elevation.

According to the historians [21,22], there were many gardens, fountains and other green spaces in old Tbilisi in 18th century. They belonged to Georgian kings and noblemen. In 1795 the most part of Tbilisi gardens and historical monuments have been destroyed and burned by Persian invader Agha Mohammad Khan. The mountains around the city were deforested and exposed to erosion. A few gardens have been saved. One of them, king George XII garden, for example, was saved in rather shrank form (now the Palace of Youth). The Russian governor in Georgia, general Tsitsianov restored the garden and from that time on it belonged to the Russian governors [31].

At the beginning of the 19th century, the city authorities began developing the city centre and in this process many gardens and green spaces were sold to private developers for construction. In 1830–1840s, immigrant Iranian Shiite leader, Agha-Mir Fatakhim laid a park (4.3ha) in Didube district of the city. The reduced part of the park came to our days. Several thousand trees and bushes of different species have been planted in the park, but only little amount of them remained with changed and reduced assortment of species. Besides, some 50 years ago, in the process of building embankment road near Mtkvari river, part of the park's territory was cut off.

In 1865 was laid so-called “Alexander's park” in the centre of the town on Rustaveli avenue.

The park occupied about 5ha territory and was designed by French gardener Sharer [31]. The park was very popular among city dwellers. In 1899 by initiative of doctor Khudadov, forest plantation of deciduous species was created on 92ha in Nadzaladevi district of the town.

In the Soviet period several parks have been laid. In 1938 was opened, “Mtatsminda park” (195ha).

In 1947–1950 “Vake park” was laid (120). It is one of the favorite parks of the citizens. Some smaller parks have been created in different parts of the city, namely: former “Kirov park” in 1934 on 5ha, “Kikvidze park” (6ha), in 1939 and so called “Red park” in Saburtalo district (18ha) in 1957, botanical gardens (161ha) in 1845. Besides these parks in the outskirts of the city there are: Tbilisi national park (24328ha), Krtsanisi park (1104ha) and arboretum (300ha) [26,27,32–34].

Download English Version:

<https://daneshyari.com/en/article/7228655>

Download Persian Version:

<https://daneshyari.com/article/7228655>

[Daneshyari.com](https://daneshyari.com)