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A complex approach to the development of green infrastructure of Armenia's cities

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Abstract

This research was designed to develop a complex program of scientifically grounded greening of Armenia's cities and her capital – Yerevan – with a view of assuring ecological tolerance, longevity and a functional use of urban plants. It comprised a study of levels and character of pollution of different environmental compartments, examination of condition of plants and determination of species composition of urban trees and their ecological tolerance.

A complex urban greening program prepared by us in the result of this research allows to efficiently manage the quality of urban environment as proved on the example of Yerevan.

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1. Introduction

Today, dramatically increasing levels of manmade loads on environment make it essential to properly manage the urban greening issue, solution of which requires a complex, scientifically sound approach. It is known that urban plants play a recreational, aesthetic and extremely important sanitary and hygienic function reducing levels of environmental pollution dust, gas, heavy metal pollution of urban environment [6-8, 12-13, 16]. However, under the impact of a number of factors including that produced by different toxicants, condition of urban plants steadily deteriorates in form of weakening and untimely aging, deformation and necrosis of their vegetative organs, growing

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vulnerability to diseases and pests. This all inevitably brings to reduction of green areas in cities^[9, 12, 17, 24, 30]. So, to maintain urban plants, it is essential to develop assortment of ecologically tolerant park and street tree and shrub species taking into consideration their decorativeness and longevity, specificities and functional predestination of sites, natural and climatic conditions, character and levels of environmental pollution.

Recent years have been marked by sharp reduction of both green spaces and species diversity in assortment of urban plants in Armenia’s cities and particularly Yerevan- her capital^[10-11]. These processes are determined by mismanaged cutouts and site development, high levels of environmental pollution with different toxicants, poor soil fertility, expansion of asphalt- and concrete-paved areas, piled debris and domestic garbage and so on.

A geochemical survey of the site implemented in the frames of this research showed presence of different toxicants in Yerevan soils and atmosphere. It should be mentioned that for years the city has been exposed to heavy vehicular and dust load, priority pollutants of environmental compartments being heavy metals, and that chlorine compounds, too, are detected in plants and soils of several districts of the city ^[18-21, 27-28, 31].

Such a situation urges to develop a proper strategic and complex approach to management of the issue that would help build ecologically favorable living environment for urban population.

The proposed complex approach includes

- Functional zonation of sites using satellite images,
- Geochemical survey of study sites,
- Assessment of existing plants,
- Studying dust- and gas- accumulation properties of urban plants,
- Compilation and complex analysis of a database.

The goal of this research was to develop a complex, scientifically sound greening program for Armenia’s cities and particularly Yerevan in order to assure ecological tolerance, longevity and a functional use of green plantations.

To develop a research program, we selected the Abovyan Square -one of green recreation spots and study sites in Yerevan.

2. Research Material and Methods.

2.1. Study site

The study site is located in the heart of the city and has been under increasing vehicular impact. Despite its small area (0,8 hectares), the Square is notable for wide diversity of plant species. The Square is surrounded by three

streets: Teryan Street - from the north, Abovyan Street- from southeast, and a beltway with a bus stop in the corner of a crossroad - from the northwest. To the southwest the Square borders on the National Agrarian University of Armenia (NAU) (Fig.1).



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