

Urban ecology

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CENTER FOR ECOLOGICAL- NOOSPHERE STUDIES NAS RA

Departments:

- Environmental geochemistry,
- GIS and Remote Sensing,
- Biochemistry,
- Bioenergy and Feed recourses,
- Informational-Analitical-Center for Risk Assessment of Food Chain,
- Radioecology



BIOCHEMISTRY DEPARTMENT CENS NAS RA

Main activities:

- Ecobiochemical assessment of urban plants,
- Urban greening,
- Phytoindication and phytomonitoring,
- Assessment of eco-toxicological risk and safety of vegetable-origin food.

BIOCHEMISTRY DEPARTMENT CENS NAS RA



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Development of cities:

-1st stage: 16-17 centuries, Citizens use local and feed resources, water and wind energy, horses and other domestic animals.

Environmental problems were: wastewater and infectious diseases.

- 2nd phases / up to 19 centuries. transport and roads are developing, heat energy is being used, cities and their population grow.

The impact on the environment is still insignificant,

-3th rounds: beginning of the 19th century. Industrial Revolution and a *dramatic increase in environmental impact*: The first urbanized country (1900) Great Britain.

Ecological peculiarities of the city.

There are active anthropogenic processes in it:

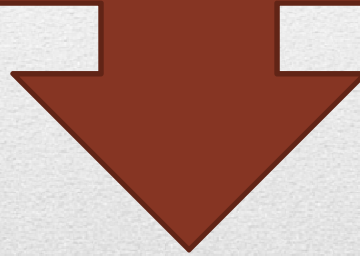
- industrial and economic activity,
- construction,
- the increasing number of vehicles,



all of which are permanent factors affecting urban environment as well as landscapes.

Urban environment devided

1. physical : abiotic,
2. biotics,
3. artificial technical and
4. artifical spiritual, cultural, socio-psychological environments.



All these ingredients are interrelated

Ecological problems:

1. Landscape degradation due to the terrain and geological structure, surface and ground water content, climate, soil cover and vegetation are changed under the tens of hundreds of meters, tunnels, subway stations, cables etc;

2. Economic problems related to large amounts of natural resources, their processing and toxic residues;

3. Antropoecological problems related to the health of the urban population

Phytoremediation is defined as:

Use of higher plants
to remove pollutants from the environment
or to render them harmless

Salt et al. 1998. Ann. Rev. Plant Physiol. & Mol. Biol.

'Phytoremediation' derives from a Greek word '**phyto**' meaning 'plant', and Latin word '**remedium**' which means a tool against negative impact

So, PHYTOREMEDIATION, restore
environmental balance through use of plants

Phytoremediation refers



brown fields



urban areas

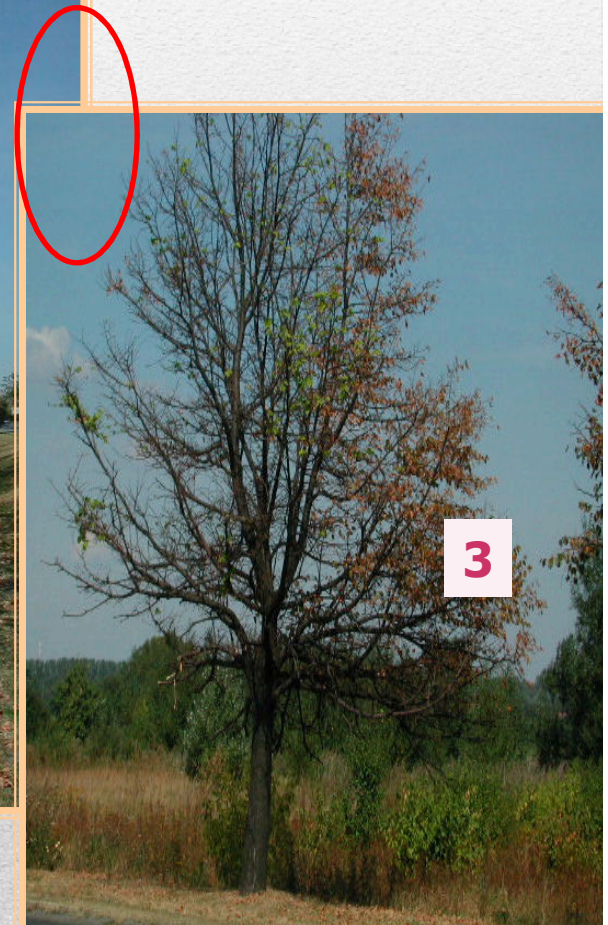


indoor

Pollutants in urban areas:

- ✓ Particulate matters ($10\mu\text{m}$, $2.5\mu\text{m}$ and $0.2\mu\text{m}$)
- ✓ Gases (NO_2 , NO , CO , O_3)
- ✓ Heavy metals (Pb , Cd , Mn , Zn)
- ✓ Polycyclic aromatic hydrocarbons (PAHs)
- ✓ Chlorinated biphenols (PCB)
- ✓ Noble metals (Pt , Pd , Rh)
- ✓ Salinity (de-icing salt, over 90 % NaCl)

Effect of de-icing salt during winter on trees,
pictures taken: June 2006 (1), and August 2006 (2,3.)





Some species tolerate air pollutants better than others

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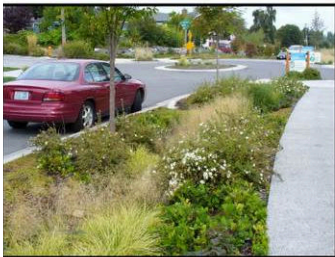
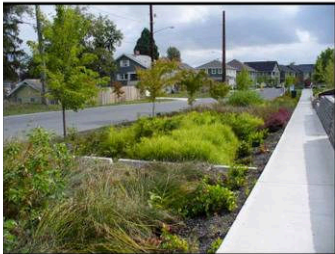


INTRODUCTION

Nature based solution



Urban greening





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STUDY AREA: YEREVAN



Biochemistry
Department

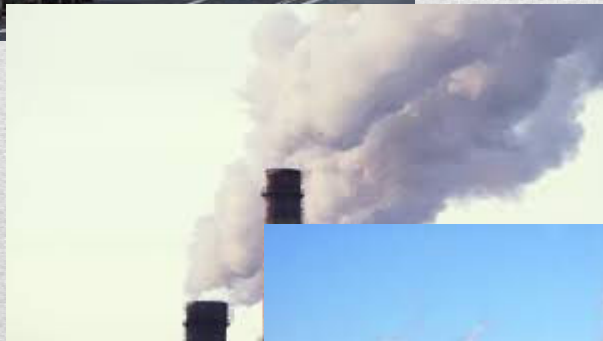
Yeravan - Armenia's capital

Population: 1,068 mil.

Total area: 223 sq. km

Total area of green spaces 6758.5 ha

Climate: sharply continental



**Republic of Armenia – a landlock country located
in the South Caucasus**



Negative impact on the Yerevan's environment are:

- Traffic,
- Industrial enterprises,
- Construction,
- Power and heat generating facilities,
- Housing and communal facilities.



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STUDIED OBJECT



10 Parks and Squares

The research period: 2007 - 2017.

The research goal: providing indicator parameters of ecological tolerance of trees and selection of tree species with phytofiltration properties appropriate for Yerevan greening.

The research was implemented by stages employing a complex method of ecological assessment of plants developed by us:

- Studying the biodiversity of urban plants,
- Plant condition assessment,
- Geochemical investigations,
- Selection of tolerant tree species for urban greening

20 Streets



Krakow 2019



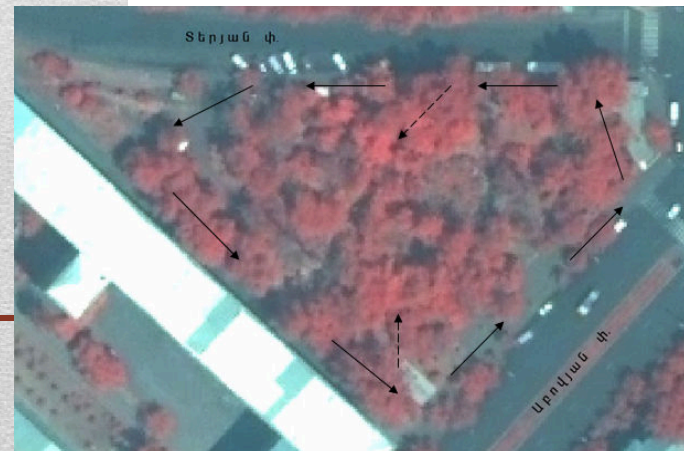
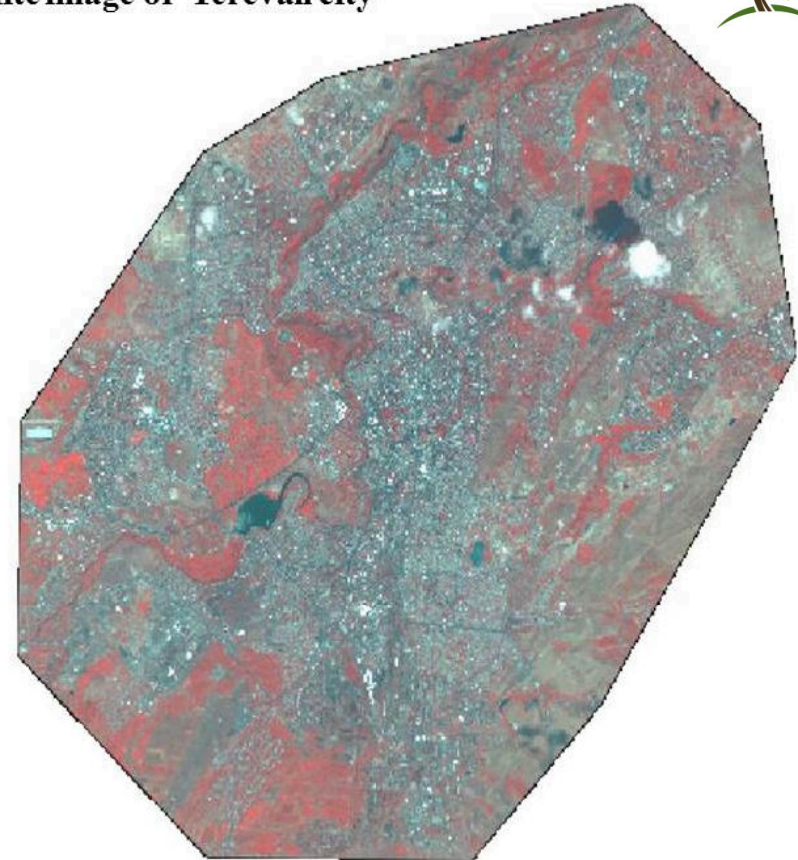
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REMOTE SENSING METHOD



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Satellite image of Yerevan city



Satellite images of parks and squares

Thank you

