



Urban forests: bioeconomy and added value

MIHAELA MIHAILOVA IAE

Bioeconomy and urban forest definition and theory

- ▶ The European Commission defines the bioeconomy as "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy (European Commission: 2019).
- ▶ The basic set of the Athens Charter is the definition of the the four functions - living, working, recreation and transport as "key" urban functions. Urban forest even if taking part of recreational zone as part of the four function, partake in other important roles in urban structures and added value for habitants.

Urban forest definition

- ▶ An urban forest is a forest or a collection of trees that grow within a city, town or a suburb. In a wider sense it may include any kind of vegetation growing in and around human settlements that includes: grass, flowers, trees, etc. Urban forests play an important role in the ecosystem of human habitats: they filter air, water, sunlight, provide shelter to animals and recreational area for people.
- ▶ An urban forest help the cities to create a microclimate that is closer to the natural climate surrounding the city.

City Profile Sofia, Bulgaria

- ▶ Sofia ranks 29th in the European Green City Index, with a score of 36.85 out of 100. The city is also located towards the bottom of the income scale in the index, a factor that appears to be correlated significantly with environmental performance.



Five criteria that show added value

- ▶ Social benefits Recreation opportunities, improvement of home and work environments, impact on physical and mental health. Cultural and historical values of green areas.
- ▶ Aesthetic and architectural benefits Landscape variation through different colors, textures, forms and densities of plants. Growth of trees, seasonal dynamics and experiencing nature. Defining open space, framing and screening views, landscaping building.
- ▶ Climatic and physical benefits Cooling, wind control, fine particles reduction from erosion, impact on urban climate through temperature and humidity control. Air pollution reduction, sound control, glare and reflection reduction, flood prevention and erosion control.
- ▶ Ecological benefits Biotopes for flora and fauna in urban environment, keeping a larger ecosystem that helps pest control. CO2 minimization.
- ▶ Economic benefits Value of market-priced benefits, less health cost for government (in social type of country with healthcare), increased property values, tourism

Social Benefits

- ▶ In a British study researchers analyzed the mental health effects of moving from less green urban residential areas to greener areas and vice versa (Alcock et al. 2014). The study found that people who moved to greener areas experienced overall improvements to their mental health while people who moved to less green areas experienced a temporary decline in mental health. And help improve attentional functioning ADD.
- ▶ Results showed “an increase in tree density of 1 standard deviation was associated with a 24-29% lower prevalence of asthma in young children” (Lovasi et al. 2008).

Ecological benefits

- ▶ A single mature tree can absorb carbon dioxide at a rate of 21.6 KG/year and release enough oxygen back into the atmosphere to support 2 human beings. Research has also shown a 60% reduction in particulates from exhaust fumes in tree lined streets. (Green Blue Urban, 2015).
- ▶ Sequester one ton of CO₂ per year at a cost of \$25 (44,75 BGN) /ton (Intergovernmental Panel on Climate Change).

Economic benefits

- ▶ By modifying local climate, urban forests can increase or decrease building energy use and simulated energy reductions caused by vegetation around individual buildings generally range from 5 to 15 percent for heating and 5 to 50 percent for cooling.
- ▶ A tree cooling effect is equivalent to 10 air conditioning units running 20 hours a day. An air-conditioned runs on 600 – 1500 kw/h for 12hours a day, the effect of trees around the building will save 19,06 lv /32,97 lv a month in the months of extreme cold and hot, depending on how much electricity it consumes. The calculations are made for both a low energy consuming air-conditioner 600 kw/h and a high consuming one. (calculated by the author). Annual savings created per tree would be broken down as follows: reduced cooling requirements in summer as a result of shade (37 percent); reduced cooling requirements in summer as a result of evapotranspiration-lowered air temperature (42 percent). Saving around 36,59 lv a winter and 41,54 lv a summer (for a 3 month period of using heating and cooling.

Economic benefits

- ▶ From the balance we can conclude that in the outskirts of Sofia per inhabitant (base of 1 188 692 inhabitants) there are an average of 48.3 m² of green areas, of which an average of 14.4 m² “Urban green areas” (parks and gardens for wide public use with forests).
- ▶ World health organization estimated that for every one unit investment in trees there is 7 units of benefit. For every 1 lev spent on trees, Sofia city would save 7 levs in healthcare, energy and environmental costs. (WHO 2018)

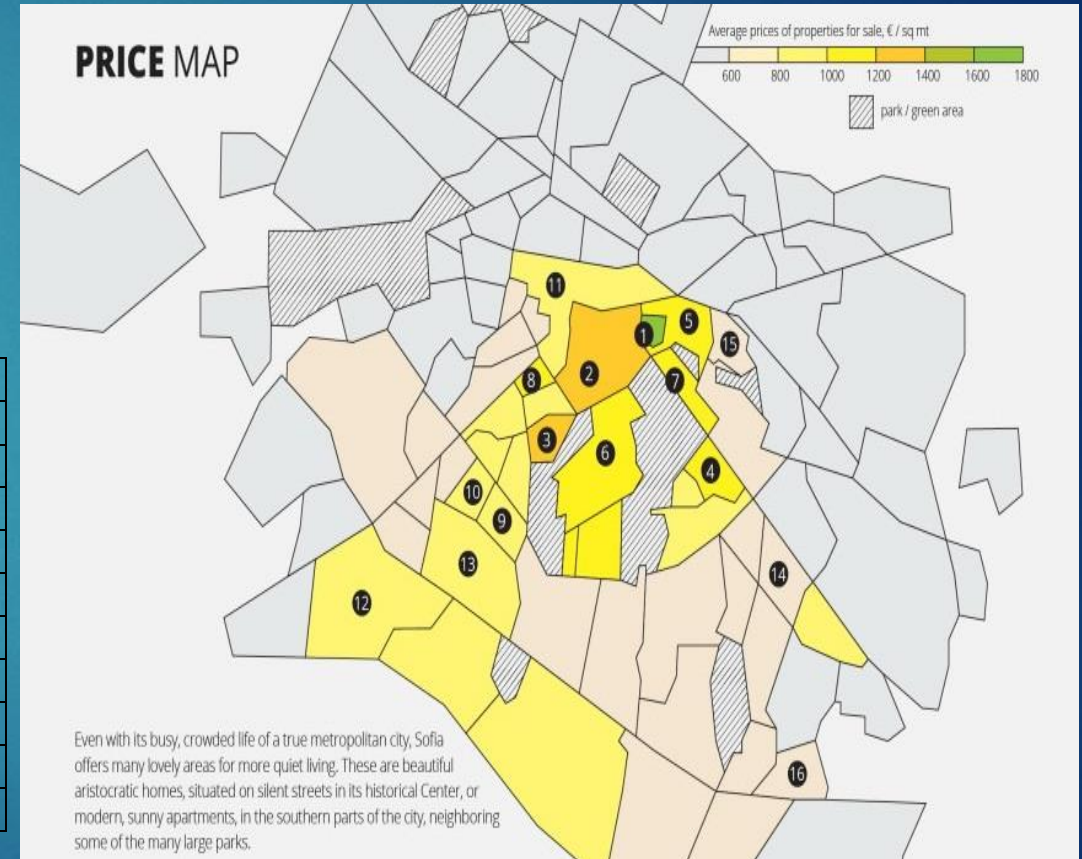
Economic benefits

- ▶ The biggest problem for heating and changing the microclimate of the city are roads. The roads in Sofia city have a combined length of 3400 km, the roads that are first class are the one that have little or none greenery or trees around them. The length of this roads class 1 is 428 km. Tall trees have to be planted 4 meters apart by law. That makes planting additional 1,712 trees possible or planting vertical garden. The benefits will be equal to 599 200 lev when investing 85 600.

Economic benefits

- ▶ A property with trees is valued 5% to 15% higher than a comparable lot with no trees (Center for Urban Forest Research).

No	Name of neighborhood	Price €/sq. m.	% Green from 100%
1	Doctor's garden	€ 1719	75% Green
2	Top Center	€ 1325	0 % Green
3	Ivan Vazov	€ 1246	100% Green
4	Iztok	€ 1163	100% Green
5	Oborishte	€ 1110	25% Green
6	Lozenets	€ 1097	50% Green
	Yvorov	€ 1078	75% Green
8	Medical Academy	€ 1045	100 % Green
9	Gotse Delchev	€ 912	50% Green
10	Borovo	€ 903	75% Green



Conclusion

- ▶ Sofia city even having big green parks and 48.3 m² per person green spaces can benefit greatly from new green life. A policy that helps green infrastructure and tree planting can make the city less polluted, with better climate and help lessen the money spend for health and mental care. Planting more trees can rise property values for neighborhoods. More outdoor spaces will benefit communities to be stronger and take better care of both the environment and human population.