

Assessing ecosystem services to address climate change: a case study in the Municipality of Sassari (Italy)

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Introduction

Urban green spaces (UGS) deliver a wide range of ecosystem services (ESs), which are relevant to mitigation and adaptation to climate change. This study focuses on two ESs provided by vegetation in the municipality of Sassari (Italy): (i) greenhouse gas sequestration and (ii) mitigation of heat island effect. We aim at supporting municipalities similar to Sassari with a methodological approach able to provide them with a rough assessment of ESs by using free data.

Methodology

We suggest and apply two indicators in the municipality of Sassari (Figure 1): (i) increased carbon storage in forests and (ii) Heat Island Mitigation Index (HIMI) (Table 1).

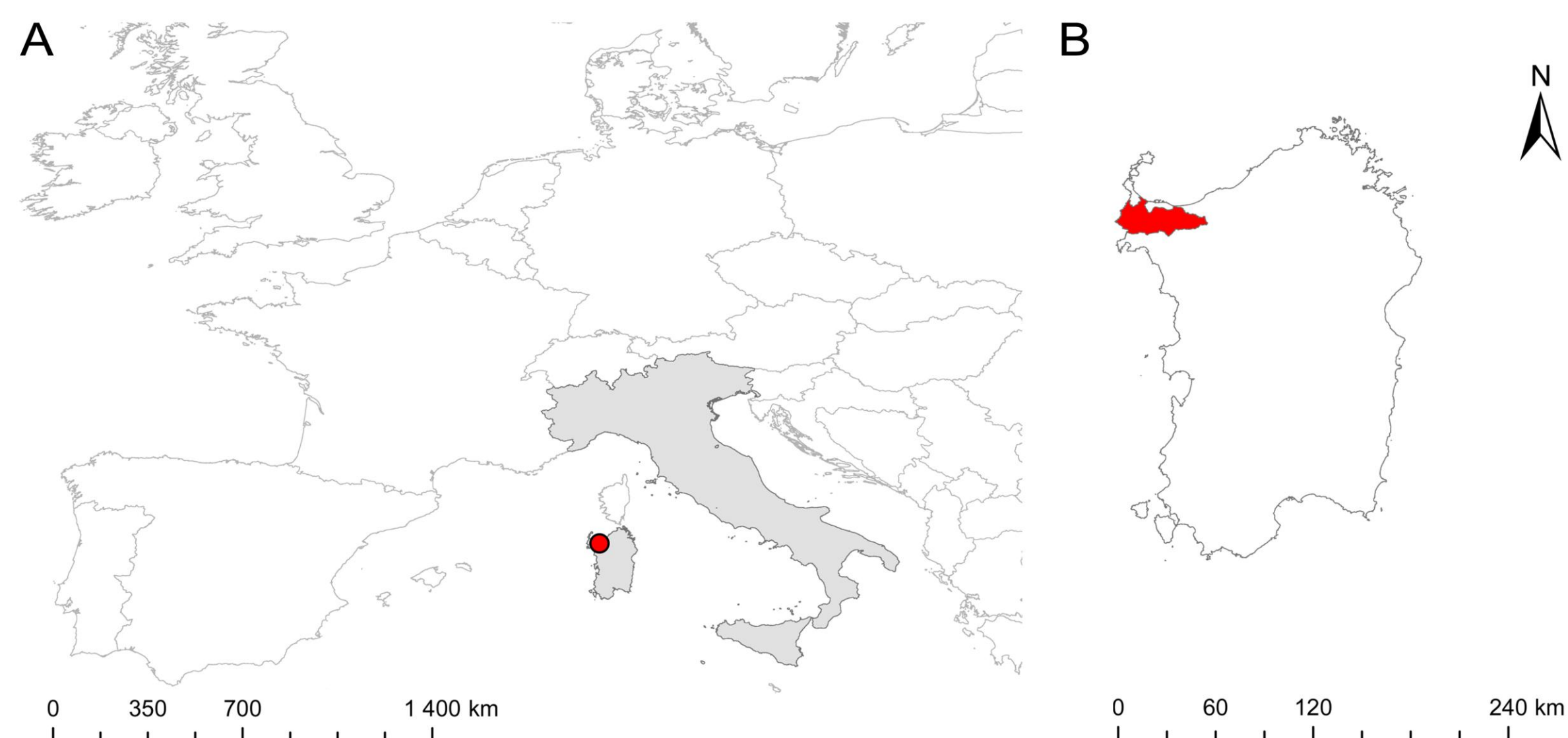


Figure 1. Source: De Montis A, Ledda A, Serra V, Manunta A, Calia G. Urban Green Spaces and Climate Changes: Assessing Ecosystem Services for the Municipality of Sassari (Italy). Land. 2025; 14(6):1308. <https://doi.org/10.3390/land14061308>

N	Ecosystem Services (ESs)	Indicators	
		CICES Code	Description
ES1	Greenhouse gas sequestration by terrestrial ecosystems	2.2.6.1	Increased carbon storage in forests
ES2	Mitigating the heat island effect through vegetation	2.2.6.2	Heat Island Mitigation Index, HIMI (based on the Normalized Difference Vegetation Index, NDVI)

Table 1. Source: De Montis A, Ledda A, Serra V, Manunta A, Calia G. Urban Green Spaces and Climate Changes: Assessing Ecosystem Services for the Municipality of Sassari (Italy). Land. 2025; 14(6):1308. <https://doi.org/10.3390/land14061308>

Results and conclusions

We found that the potential amount of carbon storage is about 42,000 t (Table 2).

Classes	Surface Area (ha)	Carbon Stored per Unit Area (t · ha ⁻¹)	Carbon Stored (t)	Carbon Stored in Percentage
Non-photosynthetic areas	248	0.00	0.00	0.00%
Low canopy cover	880	6.90	5525.04	13.14%
High canopy cover	1706	21.40	36,527.66	86.86%
Total	2836		42,052.70	100.00%

Table 2. Source: De Montis A, Ledda A, Serra V, Manunta A, Calia G. Urban Green Spaces and Climate Changes: Assessing Ecosystem Services for the Municipality of Sassari (Italy). Land. 2025; 14(6):1308. <https://doi.org/10.3390/land14061308>

We found HIMI = 67.73% for the homogeneous territorial areas and 14.80% for the peri-urban and urban context.

The methodological approach adopted in this study contributes to integrating the quantitative assessment of ESs in municipal planning tools and roughly assessing the need for operational climate adaptation and mitigation measures.

More details in: De Montis A, Ledda A, Serra V, Manunta A, Calia G. Urban Green Spaces and Climate Changes: Assessing Ecosystem Services for the Municipality of Sassari (Italy). Land. 2025; 14(6):1308. <https://doi.org/10.3390/land14061308>

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