

LAND TAKE AND SOIL ECOSYSTEM SERVICE LOSSES: SOME DATA FROM EMILIA-ROMAGNA

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ABSTRACT

Soil is a limited, non renewable and multi-functional resource that provides a range of ecosystem goods and services. The range of services provided by soils is much broader than the support to biomass production or the physical support to human activities.

Current and future demand of land for delivery of goods and services, for example food, biofuels and fibres, expansion of urban areas, is greater than the amount of soil surface available. In addition some of these processes, such as the land taken for the construction of residential, industrial or commercial districts, are increasingly competing with agricultural areas for production of food but also with land areas for nature conservation. The land take and the soil sealing processes have a deep impact on the capability of soil to deliver ecosystem services. In this paper we are describing the impact of land take on soil ecosystem service delivery in Emilia-Romagna. The research has been based on the comparison of land use at different dates (1976, 2003, and 2008), and on the assessment of the soil ecosystem services potential associate to different soil types.

INTRODUCTION

Soil is a multifunctional non-renewable resource. These concepts have been pointed out in the Thematic Strategy for Soil Protection (COM (2006) 231 final) (EC, 2006) through which the European Union has defined an action plan for soil conservation in Europe. The Communication of the Commission to the European Parliament and the Council "Towards a Thematic Strategy for Soil Protection" (COM (2002) 179 final) (EC, 2002) identifies the main eight soil degradation processes to which soils in the EU are confronted. These are erosion, organic matter decline, contamination, salinisation, compaction, soil biodiversity loss, sealing, landslides and flooding. As a result of urban sprawl and increasing land demand from many sectors of the economy, land take and more specifically soil sealing are becoming significantly more intense in the EU. The Soil Thematic Strategy lists a series of soil functions, or ecosystem

services, such as food production, biodiversity pool, carbon pool, biomass production, source of raw material, storing filtering and transforming nutrients, substances and water, physical and cultural environment for humans, archive of geological and archeological heritage. From a human perspective, biomass and food production can be considered among the most important soil ecosystem services. Agricultural zones and, to a lesser extent, forests and semi-natural and natural areas, are disappearing in favour of the development of artificial surfaces (EEA, 2011). The objective of this research is to assess the impact of Land Take processes between 1976, 2003 and 2008 in Emilia-Romagna, on the food production capability, considered as Provisioning Ecosystem Service. In this paper however, we will present the results deriving from the analysis of the 2003-2008 period.

MATERIALS AND METHODS

The estimate of land take between 1976, 2003, 2008 was realized on the base of the Land Use maps produced by Regione Emilia-Romagna. The land use changes considered in this research, causing land take on agricultural land, have been all the conversion from agricultural areas to artificial areas, sensu Corine nomenclature. The estimate of the loss of Potential Agricultural Production Capability (PAPC), was calculated using the average winter wheat yields (2001-2010) data for the main physiographic areas of Emilia-Romagna Region. The calculations were performed on the base of the equation [1]:

$$\text{Phys_PAPClosses} = \text{ALT_Phys} * \text{WWAY_Phys} \quad [1]$$

where:

Phys_PAPClosses = Losses of Potential Agricultural Production Capability (in tonnes of winter wheat)
ALT_Phys = Land Take of agricultural area for Physiographic Unit (ha)

WWAY_Phys = Winter Wheat Average Yields area for Physiographic Unit (t ha-1)

RESULTS AND DISCUSSION

Data on Land Use change in Emilia-Romagna, between 2003 and 2008 are shown in figure 1. During this period the rate of agricultural area losses was higher than 9 ha d⁻¹, comparable to the rate of the previous period (1976-2003).

The impact of this process on the production capability of the agricultural sector has been calculated using winter wheat as model crop. The synthesis of the data produced in this analysis are reported in table 1.

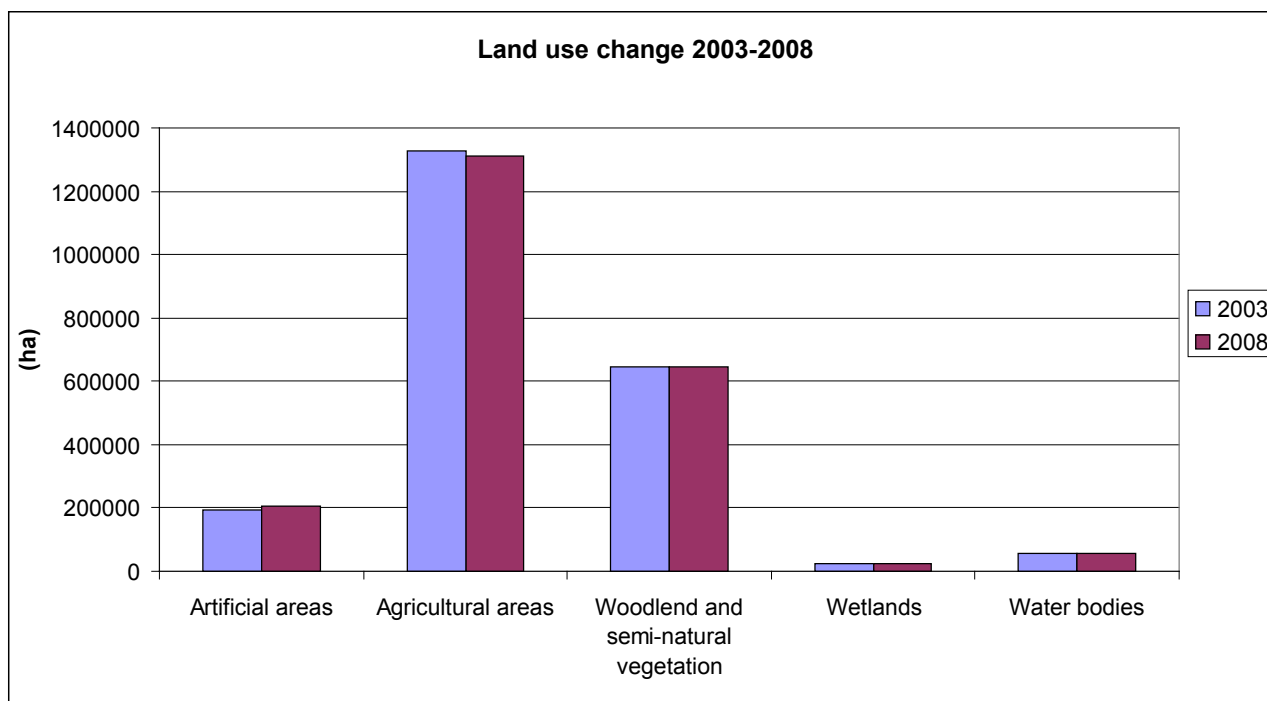


Figure 1 – Land Use Change in Emilia-Romagna between 2003 and 2008.

The consequences of 5 years land take on one of the most important ecosystem service, the provision of food, has been estimated in 100,000 tonnes of wheat, equivalent to more than 1% of the total PAPC of the region. Soil sealing and land take are having impacts also on other soil ecosystem services, such as the capacity of storing and regulating water flow, supporting biodiversity, etc. The more comprehensive evaluation of impacts of land take on these other ecosystem services will be further developed in the prosecution of this research.

Table 1: Land take and losses of PAPC in Emilia-Romagna between 2003-2008.

	Plain	Hills and Mountains
Land take (ha)	13357	1799
Average yield (t ha ⁻¹)	68,5	44,9
Yield loss (t)	91547	8070

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