

Science for Environment Policy

Urban expansion can reduce food security

Urbanising arable land can have serious economic consequences as a result of the reduction in food production and loss of ecosystem services, according to recent research. The loss of 15 000 ha of productive soils during 2003-2008 on the Emilia-Romagna Plain in Italy cost approximately €19 million in carbon storage, €100 million in wheat production and €270 million in raw materials, the researchers estimate.

Reducing the amount of agricultural land can have serious consequences for food security, particularly in countries that already rely on imports, as it leaves nations vulnerable to food-price fluctuations in global markets. In addition, building on productive [soil](#) can prevent it delivering important ecosystem services, which are costly to replace.

To investigate the economic value of soil and the impacts of land-use change, the researchers used data from surveys of the Emilia-Romagna Plain in Italy from 2003 to 2008 to categorise land as 'agricultural', 'urban and industrial', 'wood, grassland and natural areas', or 'wetlands and rivers'. They then estimated the economic value of the soil based on its role as a carbon sink, a source of raw materials (such as clay or gravel), and its use for food production.

To simplify their analysis, the researchers assumed that all lost agricultural land had been used to grow wheat, the dominant crop in the region.

The analysis showed that around 15 000 ha of arable land were converted to urban areas between 2003 and 2008, leading to a loss of €100 million and a fall in wheat yields of 109 000 tonnes. The lost yield was equivalent to the daily calorie requirements of 425 000 people¹.

The expansion of urban and industrial areas also meant that 3.7 million tonnes of sequestered carbon were lost from soils in the region and 2.6 million tonnes of carbon were sequestered in newly built asphalt pavements and concrete structures (although the production of this asphalt and concrete emitted 0.14 million tonnes of carbon). In total, the loss of carbon from soil in the region was valued at €19 million.

A previous analysis by the Italian Land Reclamation Syndicate found that the costs of hydrological works – such as canals to aid drainage and reduce flood risk – built to accommodate [land-use](#) changes on the Emilia Romagna Plain were around €1 billion. Finally, raw materials extracted from the soil in the area were worth around €270 million between 2003 and 2008.

Furthermore, the researchers add that the study did not attempt to quantify some broader impacts, such as loss of biodiversity, health impacts or cultural losses (for instance through damage to archaeological sites).



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1. Based on 3 400 calories per kg of wheat, and a daily calorie requirement of 2 400 calories per person.