

Accepted Manuscript

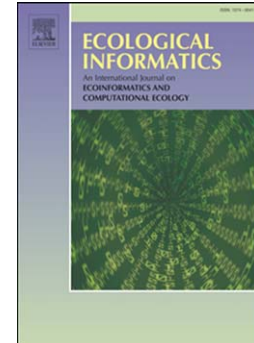
Supporting planning activities with the assessment and the prediction of urban sprawl using spatio-temporal analysis

Federico Amato, Piergiuseppe Pontrandolfi, Beniamino Murgante

PII: S1574-9541(15)00113-2
DOI: doi: [10.1016/j.ecoinf.2015.07.004](https://doi.org/10.1016/j.ecoinf.2015.07.004)
Reference: ECOINF 590

To appear in: *Ecological Informatics*

Received date: 10 January 2015
Revised date: 19 June 2015
Accepted date: 16 July 2015



Please cite this article as: Amato, Federico, Pontrandolfi, Piergiuseppe, Murgante, Beniamino, Supporting planning activities with the assessment and the prediction of urban sprawl using spatio-temporal analysis, *Ecological Informatics* (2015), doi: [10.1016/j.ecoinf.2015.07.004](https://doi.org/10.1016/j.ecoinf.2015.07.004)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Supporting planning activities with the assessment and the prediction of urban sprawl using spatio-temporal analysis.

Federico Amato^a, Piergiuseppe Pontrandolfi^a, Beniamino Murgante^{a,1□}

^a School of Engineering, University of Basilicata, Viale dell'Ateneo Lucano 10, Potenza, 85100, Italy

ABSTRACT

The inestimable value of soil is exemplarily summarized in the definition provided by the European Union (2006), which considers it as "the upper layer of the earth's crust, formed by mineral particles, organic matter, water, air and living organisms".

The importance of soil protection is now universally recognized, but despite a lot of debates and principle's enunciation, in the last decades soil was consumed at a rate of 8 m² per second. The aim of this study is to propose a model which, on one side, is able to measure variations occurred in land use, and, therefore, to determine soil consumption, and, on the other side, is capable to predict future changes. Specifically, a simulation model has been proposed based on two methods: Joint information uncertainty and Weights of Evidence in order to analyse and predict new built-up areas. The proposed model has been applied to Pisticci Municipality in Basilicata region (Southern Italy). This area is a significant example, because of its high landscape value and, at the same time, of a lot of developing pressure due to touristic activities along the coastal zone.

Keywords

Urban planning, Soil Consumption, Urban sprawl, Built-up areas, Sustainability

1. INTRODUCTION

For more than a decade, the European Union has recognized soil as a common good and considers it as a finite resource with an inestimable value. Consequently, soil is strongly linked to agricultural and zoo-technical production, and therefore it intensely influences human nutrition.

The current gradual and steady world population growth is mainly due to the introduction of intensive farming technologies, which produced maximum exploitation of soil potential. The cultivation of a single plant species (monoculture), on one hand ensures a greater amount of food production, whilst, on the other hand has a high environmental cost, using at a high extent petroleum derivatives to move machinery, to fertilize and protect crops from pests. It started following the end of Second World War, and, together with the processes of market liberalization and globalization, it has led to a growth of food production by 140%, 200% and 280% in Africa, Latin America and Asia, respectively. Agricultural industrialization has produced two particularly effective consequences. The first one is related to occupation. The use of machinery for agricultural production has greatly reduced labour supply in the sector: in Europe 44% of the land is cultivated, but primary sector contributes only to 5.5% of employment.

The second effect is the abandonment of countrysides and the connected-urbanization process of rural population. In Italy, from 1951 to 1991 employees in agriculture passed from 44% to 9% of the population. This demographic phenomenon has developed in parallel with the expansion of cities and settlements.

For this reason, today the main threat to agri-food sector is represented by the expansion of urban areas, because it occurs mainly with great disadvantages for rural areas. This point has great importance, because a decrease in available fertile land means a weakening in productive potential of a country and an amplification of the dependence by food and forage, increasing transport and, consequently, pollution. Soil, however, is not only the place for agriculture. It is also the location of energy and matter exchanges with other environmental compartments.

It is an open system, and the main biogeochemical cycles pass through soil. Soil is actively involved in the hydrological cycle, because it intercepts most of the water derived from precipitation. Sliding surface is strongly influenced by soil use. Paved or built areas limit or eliminate soil absorption capacity by rainfall. In land use planning, it is important to consider water surface drainage, because it affects erosion and flooding. Carbon cycle is the second biogeochemical cycle where soil plays a crucial role. The greatest amount of carbon is not concentrated in the atmosphere, but in forests and soils. It is estimated that the amount of carbon dioxide contained in forest biomass and in forest humus is 1.5-4 times higher than carbon dioxide contained in the atmosphere, respectively (Zampogno and Cattaneo, 2012). Given the enormous amount of carbon stored in the soil, land use change can lead to a significant increase in CO₂ emissions in the atmosphere.

¹ * Corresponding author. Tel.: +393204238518; fax: +390971205125; e-mail: beniamino.murgante@unibas.it

Download English Version:

<https://daneshyari.com/en/article/6295773>

Download Persian Version:

<https://daneshyari.com/article/6295773>

[Daneshyari.com](https://daneshyari.com)