

INTEGRATING HABITAT QUALITY INDEX TO SUPPORT URBAN DESIGN IN URBAN AREAS. The case of study Basse di Stura, Turin (Italy)

Original

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TERRITORIO E PRODUZIONE

INTEGRATING HABITAT QUALITY INDEX TO SUPPORT URBAN DESIGN IN URBAN AREAS

The case of study “Basse di Stura”, Turin (Italy)



Poster presentation at **ESP10 World Conference**
 10 years advancing ecosystem services science, policy and practice for a sustainable future



Venue of the ESP10 - 10 years advancing ecosystem services science, policy and practice for a sustainable future. Leibniz University in Hannover/Germany (ph: C. Giaimo).

Opening Day of the 10th ESP world conference on 21st of October at Leibniz University in Hannover/Germany (ph: www.franzbischof.de)

<https://www.espconference.org/esp10>

According to some activities conceived, financed and developed in the field of teaching (Design Workshop “Regenerating public space: standard, soil and ecosystem services”, an educational project promoted by the College of Planning and Design of the DIST-Polytechnic of Turin within the framework of the project of Excellence MIUR 2018-2022) and research (Eco-welfare and Intermunicipal governance: soil as an infrastructure for regenerating territories”, a multidisciplinary research co-funded by DIST Excellence Dept. of the Polytechnic of Turin in cooperation with a range of institutional and academic organizations) **Basse di Stura** was considered an interesting case to defining both operational methods to produce “new knowledge” in support of territorial governance processes aimed at limiting soil consumption (zero balance), and design methodologies for the public space as a strategic area for integrated policies of urban, ecological-landscape, historical-environmental and architectural regeneration of the contemporary city.

Basse di Stura is an area of 150 hectares located to the north-west on the edge of the densely settled system while forming a diaphragm with the north ring road of Turin. Despite the presence of partly abandoned industrial activities, here the Stura River once flowed in a typically agricultural landscape, which traces are still visible by the presence of some farmhouses disused and degraded and a residual cultivated landscape, which remained almost unchanged over time (even suffering the harmful effects of the surrounding activities). The General Land Use Plan classifies the area between urban and river parks.

The problem that the study wants to face is related to the awareness that within the challenges of the contemporary city, it’s crucial to define effective methodology and tools supporting urban regeneration. Above all, greening actions are a pillar for urban well-being as well as to face climate change. From a general large-scale perspective, the Habitat Quality of green urban areas is generally considered low, since the fragmentation has been accounted as the most threatening cause of ecological degradation. This is true to a certain extent since this approach is undoubtedly valid at the territorial level. Specifically, the study puts particular attention to public green areas, public spaces equipped as parks or gardens, for child play and leisure, urban forests and urban gardens, designed spaces organized according to the criterion of adequate accessibility and usability, ecological continuity, ecosystem functionality and the improvement of biodiversity also due to the reduction of heat islands.



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The case of study "Basse di Stura", Turin (Italy)

INTRODUCTION

The problem:
Within the challenges that the contemporary city has to face, it's crucial to define effective methodology and tools supporting urban regeneration. Above all, greening actions are a pillar for urban well-being as well as to face climate change from a general long-term perspective, the Habitat Quality of green urban areas is generally considered low, since the fragmentation has been recognized as the most threatening cause of ecological degradation. This is true to a certain extent since this approach is undoubtedly valid at the territorial level.


Research question:
The question is how the integration of updated and detailed indexes helps to provide better ES modeling outputs while furnishing input data. Notably, within the research, the table for the sensitivity of each LULC type to threats of the Habitat Quality model (InVEST) has been revised according to an analytical assessment of the NDVI index and compared to a "traditional" ones.

Case:
In this work, we used InVEST to define a detailed quantitative assessment of Habitat Quality in the city of Turin, following four general results, which evaluated the final range of values relevant for planning, looking at how the input data were used for Urban Design purposes with particular attention to public green areas, public spaces equipped as parks or gardens, for child play and leisure, urban forests and urban gardens, designed space or organized according to the criterion of adequate accessibility and visibility, ecological continuity, ecosystem functionality and the improvement of biodiversity also for the reduction of heat islands.

Case of Study:
Turin is located in the northwest part of Italy and is among the most populated municipalities of the Country. It is the fourth biggest city according to the national census 2016. It covers around 800 thousand citizens distributed in an administrative area that spans around 130 square kilometers. The city is placed at 200 meters above the sea level since it is developed at the foot of northern and western Alps, while in the east and south, the city is bordered by the Turin and Stura rivers. The morphology of the case is conditioned by the final evolution of the Po River and its tributaries. The town is heavily structured with a highly built-up area and a semi-urban pattern.

Case of Study:
Basse di Stura is an area of 150 hectares located to the north-west of Turin on the edge of the already artificial urban cells forming a diaphragm with the north-south road of Turin, despite the presence of partly abandoned industrial activities that have the potential to be reactivated. The area is characterized by the presence of some farmhouses and a residual cultivated landscape, which remained almost unchanged over time (even suffering the harmful effects of the surrounding activities). The General Land Use Plan classifies the area between urban and river parks.

WHAT?



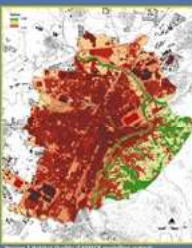

METHODOLOGY

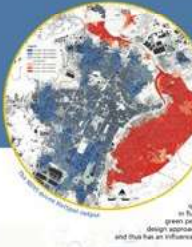

Using the NDVI index to weight the ecological quality of land uses that measure the quality of vegetation. Compared with the traditional scaling rate in urban areas, this index qualitatively describes the difference among green spaces independently from their size. A small patch of permeable green can provide optimal supporting services as well as an urban green dense area. Nonetheless, also the utilization of NDVI as a proxy of Habitat Quality has some limitations such as the determination of the registered value of riverbanks and peri-urban areas where no vegetation grows.

Traditional scaling by a proxy:
The HQ model expresses the ability of the landscape to provide ecosystem services for individual and population persistence. The final output is based on the presence of different land uses and the intensity of threats caused by each urban form. HQ is composed of a systems indicator, this allowed to use in a proxy of the ecological quality of the landscape. The HQ of the research LIFE SAM4CP has been compared with a new resulting output based on the integration of the NDVI index.

Comparing different outputs:
The left image represents the SAM4CP output. The right image is the NDVI-driven HQ output. A color scale is provided to indicate the range of values. In the first image (higher values) more areas are highlighted in red, indicating a higher level of ecological quality. In the right image, the color scale is inverted, indicating a higher level of ecological quality. The color scale is inverted, indicating a higher level of ecological quality.

HOW?






Results:
The NDVI-driven "revisited" urban region that even internal built-up dense areas has healthy vegetation inside. The dense built-up areas of the city are now well integrated with green spaces of trees and bushes, which are beautiful parks. Also, most areas in built-up areas are now well integrated with green spaces designed with green pedestrian corridors and boulevards designed with the ancient road design approach of the 19th century. This condition is "revisited" by the NDVI index and that has an influence on the new HQ output.

WHY?

GREEN ACTIONS FOR TURIN

Conclusions:
The northern part along the Stura stream, even if characterized by a mixed up production, industrial and logistic land use is among the most polluted areas of the city, with a high potential to support nature ecosystem services. The output is of significant interest since this result opens up a new utilization of HQ model and rural environment (with higher HQ values) but also to provide a clear internal differentiation of green parks, the improvement of the high quality of green spaces that positively influence their environment condition. The Basse di Stura study shows that the SAM4CP traditional modeling output is composed of areas that are far from representing a healthy urban site. On the contrary, the NDVI-driven output better addresses the need to recognize those areas with less-reusable soils but with the great potentiality to host green actions for human well-being in the city.





This study starts from some evidence delivered by the **Life SAM4CP Eu project** conduct with Stefano Salata and coordinated by prof. Carlo Alberto Barbieri and intends to compare the Life SAM4CP Habitat Quality ecosystem service model with a new modelling output based on the integration of the SAM4CP model with the NDVI index. Within the study, the sensitivity table of each LULC type to threats of the Habitat Quality model (InVEST), has been revised according to an analytical assessment of the NDVI index and compared to a "traditional" ones. We use the NDVI index as a proxy of Habitat Quality to weight the ecological quality of land uses; then we use the HQ ES as a proxy of the environment healthy. Results indicate that Habitat Quality index can be better modelled if NDVI is used as a proxy of habitat quality in urban areas, showing how the integration of information is crucial to obtain reliable decision making support system. The poster was made with the expert graphic contribution of Luisa Montobbio (Dist Department).

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