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More Nature in the City

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Abstract

According to projects and practices that the Italian botanists and ecologists are carrying out for bringing “*more nature in the city*”, new insights for a factual integration between ecological perspectives and more consolidated aesthetic and agronomic approaches to the sustainable planning and management of urban green areas are provided.

Keywords Ecosystem services, Human well-being, Green infrastructure, Urban green areas, Urban biodiversity.

Introduction

Biodiversity strategies are increasingly focused on ecosystems and their services (IPBES 2019). In Europe, the MAES (Mapping and Assessment of Ecosystems and their Services) process has been expressly designed for addressing these targets and also provides essential knowledge for the deployment of Green Infrastructure (GI). Actually, GI is defined as “*a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services*” that, on land, concerns rural as well as urban areas (EC 2013). Especially in cities, one of the main Ecosystem Services (ES) demands that GI is claimed to address is the improvement of citizen health with respect to environmental pollution. To this aim, the increase of vegetation cover has been prompted by the Italian Committee for Green Public Development as an effective solution to be adopted across Italian cities and metropolitan areas (CVP 2018). The vision of the Committee consists of three main actions: i) significantly improve the coverage of plant

communities, including woodlands but also shrublands and grasslands, ii) remove asphalt and concrete, in order to recover pervious surfaces, and iii) bring back forests to the cities. Forests were adopted as a benchmark because they represent complex systems, with a high species richness and marked structural, functional and temporal variability (Marchetti et al. 2010), just as complex, rich and variable are the urban green areas (FAO 2016). Consequently, in order to properly design and manage the urban green, a new and factual integration between ecological perspectives and more consolidated aesthetic and agronomic approaches is needed. Planning processes should increasingly become interdisciplinary and take into account important principles, such as a clear definition of the ES to be provided (e.g., improvement of air quality through PM removal) by “the right plant in the right place” (consistently with the potential vegetation of the site and with the varying performance of different species, e.g., deciduous vs evergreen ones) and avoiding potential disservices (e.g., those caused by the introduction of non-native species) (Celesti-Grapow and Blasi 2004). Knowledge on plant biology, auto- and syn-ecology, and on the varying performance of single taxa and communities in providing desired services should, therefore, be deepened and disseminated. The present work is aimed at facilitating this process, by showing to the international scientific community the more recent advances made by Italian botanists and ecologists in bringing “*more nature in the city*”.

More Nature in the City under a botanical and ecological perspective

A collection of different activities that are being carried out in Italy for promoting sustainable, effective and efficient improvement of urban green areas was made available by the symposium “More Nature in the City”, within the 115th Congress of the Italian Botanical Society (AA.VV. 2020). The present overview is based on the research keywords and concepts adopted in the 26 contributions to the symposium (Figure 1) and is organised around

the topics of Urban Biodiversity, Green Infrastructure and Ecosystem Services, and Human Health and Well-being (see the Appendix 1 in the Supplemental Materials).

Urban biodiversity

The topic of Urban Biodiversity was especially addressed in terms of native/non-native species, plant diversity - ecological functions - ecosystem services - human well-being chain, ecological connectivity and typology of green areas. The emerging issues relate to: (i) sustainable use of non-native trees and the need for global guidelines for enhancing their utility while reducing risks of invasion and damages (Brundu et al. 2020); (ii) identification of ecosystem services and disservices related to varying composition of street trees across different cities, including the cultural values facilitated by the reconnection between community gardens and the local territory, history and traditions (Caneva et al. 2020a); (iii) innovative ways of measuring the quality of life with respect to environmental and botanical features, such as the *sentiment analysis tool* (Ladle et al. 2016; Schwartz et al. 2019); (iv) the pivotal role that public green spaces, such as university and botanical gardens, tree-lines and residual natural forests, may exert in terms of native species conservation, ecological connectivity, natural and cultural heritage valorisation and citizen well-being (Bressan and Poldini 2007; Poldini 2016); (v) the contribution of micro-habitats, such as those joined to transportation networks, in guaranteeing refuge for native plant diversity (Plowes et al. 2007).

Green Infrastructure and Ecosystem Services

The topic of GI and ES was addressed in terms of biodiversity conservation and multi-disciplinary planning, urban forest restoration, compensation measures, green-grey solutions, and supply, flow, synergies and trade-offs of ES. Specifically, the contributions provided original hints on: (i) how to integrate floristic, vegetation and landscape scales approaches for

supporting biodiversity conservation in planning processes (Capotorti et al. 2017; Capotorti et al. 2019) and how to deploy multidisciplinary approaches for enhancing multi-functionality; (ii) methods for enhancing the success of forest restoration and promoting related investments by means of compensation measures; (iii) selection of suitable species and habitat templates for designing sustainable and efficient green roofs (Catalano et al. 2016; Catalano et al. 2018; Nardini et al. 2012; Oberndorfer et al. 2007); (iv) development and application of eco-physiology approaches for enhancing supply and flow of regulating ES, such as air and soil pollution removal, local climate regulation (Maragno et al. 2018), flooding prevention and carbon sequestration (Cristaldi et al. 2017; Manes et al. 2016; Pace et al. 2018); (v) development of urban green management strategies for supporting climate change adaptation and mitigation (Ferrini et al. 2020; Marando et al. 2019; Perini et al. 2017; Tsitsoni et al. 2015).

Human Health and Well-being

The topic of Human Health and Well-being was addressed in terms of synergic relationships between urban green and health, recreation, social cohesion, food security, as well as potential trade-offs in terms of health hazards or risk (Lorenzini 1999). Specific contributions relate to: (i) education of new generations to road safety and environmental and health culture by means of participative projects (Domina et al. 2020); (ii) tools for planning and management of historic gardens in order to combine aesthetic and religious values with educational fruition; (iii) models for improving social and environmental conditions by means of new technologies applied to urban farming (Braglia et al. 2016; Caneva et al. 2020b); (iv) formulation of reliable indicators for assessing and mitigating the allergenic potential of urban

green areas while valorising the phyto-resources for respiratory well-being (Cariñanos et al. 2014; Hruska 2003; Marinangeli and Fares 2020).

Concluding remarks

In keeping with the growing strategic attention to urban sustainability (UN Habitat 2019), an overview is provided on the more recent advances in scientific knowledge and implementation activities carried out by Italian botanists and ecologists. The report presents an inventory of research projects and good practices that is useful at a national level, but is also likely to be of interest to an international audience. Actually, by means of the varied contributions relating to urban biodiversity, GI planning, and ES and associated benefits to human health and well-being, it allows to move forward with respect to pilot studies, such as those developed within the framework of the European EnRoute (Enhancing Resilience of Urban Ecosystems through Green Infrastructure) Project (Maes et al. 2019). Many of the inputs are feeding the design of a national plan on GI, which is intended to combine ecoregional and local approaches (Blasi 2018) in order to activate urban resilience and respond to many of the challenges posed by the COVID-19 pandemic (e.g. by improving air quality in the cities). It is hoped that this plan will inspire a proper use of the Disaster Resilience and Recovery Fund towards the sustainable and inclusive growth prompted by the European Green Deal.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Fig. 1 Visual representation of text data (word cloud) based on the keywords and terms adopted in the 26 contributions to the symposium “More Nature in the City”, within the 115th Congress of the Italian Botanical Society.

