



XIII Congresso Nazionale SISEF
ALBERI-FORESTE-BIODIVERSITÀ
dal New Green Deal alla Farm to Fork Strategy

Orvieto (TR), 30 Maggio - 2 Giugno 2022

Palazzo dei Congressi

Abstract-book Comunicazioni Orali

(a cura di P. Paris, C. Calfapietra, R. Motta, D. Travaglini, G. Bucci)



Società Italiana di Selvicoltura ed Ecologia Forestale (SISEF)
<https://sisef.org>

Istituto di Ricerca sugli Ecosistemi Terrestri (IRET)
Consiglio Nazionale delle Ricerche (CNR)
<https://www.iret.cnr.it/it/>

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Sessione Parallela 14

“Foreste Urbane II”

Martedì 31 Maggio 2022 (16:30-18:30)

Sala Etrusca - Moderatore: Carlo Calfapietra (CNR-IRET, Porano, TR)

Martina Ristorini* ⁽¹⁾, Gabriele Guidolotti ⁽²⁾, Gregorio Sgrigna ⁽²⁾, Mais Jafari ⁽³⁾, Dagmar Knappe ⁽³⁾, Vittorio Garfi ⁽¹⁾, Chiara Baldacchini ⁽⁴⁾, Axel Timpe ⁽⁵⁾, Carlo Calfapietra ⁽²⁾

Nature-based solutions in post-industrial sites: integrated assessment of carbon and air quality related benefits of a recultivated landfill

The concept of Nature-based solutions, defined as “actions to protect, sustainably manage, and restore natural or modified ecosystems [...]”, is framed in the need for new and sustainable strategies for the improvement of air quality and climate change mitigation of urban environments. In this context, the recultivation and afforestation of post-industrial sites, such as abandoned landfills, is gaining more and more attention from stakeholders and scientists, with the aim to (i) neutralize the environmental risks associated to them and (ii) benefit from the provision of several ecosystem services (ES). Air pollution abatement is one of the best-known ES associated to NBS, thus being linked to the potential of plants to remove gaseous pollutants through stomatal uptake and PM through wet or dry deposition on their foliage. GHGs mitigation, atmospheric CO₂ sequestration and carbon storage in the biomass through the photosynthetic activity are other important regulating ESs connected to the NBS concept. For both ESs, species-specific characteristics such as leaf micro- and macro-morphology, leaf area index (LAI) and tree growth rate, are known to be able to influence the efficiency of the different species. This study is focused on the assessment of the atmospheric pollutants abatement and the carbon impact of a specific NBS, a recultivated landfill located in Dortmund (DE). Leaves from four tree species (*Acer campestre* L., *Betula pendula* Roth, *Carpinus betulus* L. and *Salix alba* L.) were collected and analysed by scanning electron microscopy combined with energy dispersed X-ray (SEM/EDX), to evaluate the PM abatement, through the physio-chemical characterization of leaf deposited particles. Then, the *i-Tree Eco* model, was applied to evaluate the pollutants removal and the carbon impact, through the modelling of carbon storage and gross sequestration of woody species located in this specific NBS. *S. alba* plants emerged as those having the major impact for the removal of both PM and gaseous atmospheric pollutants (O₃, SO₂, NO₂), as well as the best carbon impact, thus representing about 82% of the total NBS carbon storage. Modelled PM_{2.5} removal results were compared with the experimental and upscaled SEM/EDX ones; interestingly, the same species-specific trend was obtained through the two approaches, but an underestimation by the model was underlined, likely due to the lack of a species-specific characterization of PM deposition velocities. Results obtained in this study prove the efficiency of this large NBS (about 54 ha), and they also provide crucial information on the species-specific affinity towards the provision of these specific ESs. This information can be considered for the design of future NBSs, which need to be increasingly suitable and efficient in the improvement of urban air quality and climate change mitigation potential.

Parole chiave: nature-based solutions, ecosystem services, air quality, atmospheric particulate matter, carbon impact

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