

To tree or not to tree? Integrating LCA and Ecosystem Services to evaluate the sustainability of phytoremediation

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Abstract:

Over the past 30-40 years, urban areas have experienced a considerable shift in their economic activity. Many industrial sites that were once part of the urban centre are abandoned (brownfields), stimulating active discussion on challenges and opportunities for reclamation and redevelopment of these areas. One of the main reasons for the lack of intervention are the high costs for conventional remediation techniques which are also associated with some important environmental disservices (i.e., SO_x, NO_x and VOC emission).

Nature-Based Solutions (NBS), including phytoremediation for urban brownfields, may promote urban renewal, while reducing pressure on surrounding greenfield areas.

Despite the high ecological and economical potential, due to some evident constraints (e.g., long operational time frame, plant tolerance to pollution) phytoremediation is still rarely applied on a large-scale. However, likewise other NBS phytoremediation may provide multiple benefits in the form of ecosystem services (ES), such as soil and air quality regulation, biomass supply, biodiversity, aesthetics, and human health. Unfortunately the assessment of ES related to phytoremediation is still incomplete and further research is needed in this regard. The assessment of ES is only partially covered by tools like Life Cycle Assessment (LCA), which provide data about the potential impacts of productions and services.

The primary objective of the project is to assess different phytoremediation techniques and their related ES using an LCA approach. This analysis will highlight the most adequate phytoremediation approach providing the most suited ES for a specific area, with a particular emphasis on soil remediation and biodiversity conservation. In addition, objective tools will be developed to support the fulfilment and validation of guidelines on the use of phytoremediation in urban areas, highlighting benefits and drawbacks of each possible applicable technique to the stakeholders involved. The final aim would be the efficient redevelopment of brownfields, endorsing policies for a sustainable management of these abandoned areas.