POLICY BRIEFING

Agroecological Urbanism policy briefing series

No. 2 - December 2024

POLICY HIGHLIGHTS

INCLUDE SOIL PROTECTION STRATEGIES IN LAND USE AND PLANNING POLICY

Include strategies in urban land use and planning policies that ensure the protection of soils and the remediation, depollution, and regeneration of contaminated urban soils.

EMBRACE SOIL CARE PRACTICES THROUGH URBAN WASTE MANAGEMENT

Embrace soil care practices to rebuild safe urban topsoils fit for food growing, including through sourcing and utilising local organic waste material in the urban context.

EMPOWER COMMUNITIES ENGAGED IN SOIL REMEDIATION

Learn from and empower communities active in soil care to amplify their reach and enable solidarity between consumers and producers, including vulnerable communities and marginalised growers, in urban soil remediation.

PROTECT AGRICULTURAL LAND USE IN URBAN AND PERI-URBAN SOILS

Protect agricultural land use in urban and peri-urban areas from the degradation or destruction of soils under the pressure of urbanisation, as key to local green and blue infrastructure networks, climate action plans and sustainable food planning.

SOIL NEXUS: Urban soil care for food production, community greenspace, and environmental resilience

Global urbanisation is leading to the degradation of living soils, with substantial and direct impacts on climate, biodiversity, food security, and human health. Urban land use policies are beginning to address soil protection. However, they rarely address the depollution and remediation of urban soils and the revitalisation of the agricultural socio-economic fabric, both essential to recover and maintain healthy soils. Instead polluted soils are often managed through further soil sealing (i.e. covering with a plastic 'geotextile' layer to isolate it and adding new soil on top). As alternatives, emerging urban communities of practice are currently experimenting with integrated and holistic practices of soil care, such as sourcing urban organic waste streams (food waste, leaves, grass clippings, waste from breweries, ecological paperboard packaging, etc.) for topsoil regeneration or using nature-based approaches (e.g. bioremediation) for the depollution of topsoils. Such practices urgently need enabling and adequate policy frameworks to be mainstreamed and aligned with related policies regarding climate action, green/blue infrastructure and urban food policy plans.

Cities have been historically established in close proximity to fertile soils with good water sources. Recent, and often uncontrolled, urban growth has, however, led to a massive process of sealing, pollution, and degradation of high quality soils and nearby waterways. The UNCCD 2017 Global Outlook report estimated that 30 million ha of cropland globally were located in areas that are expected to be urbanised by 2030. In a context of global climate change with adverse weather events becoming more common, biodiversity loss, rising fossil fuel prices, and food insecurity, keeping soils healthy and agriculture vibrant and sustainable have emerged as increasingly important issues in policy agendas in urban areas. Soil degradation has strong impacts on several different areas of common interest for local authorities, such as water, human health, climate change, nature and biodiversity protection, and food safety. The reconnection of local material flows (especially water and organic matter) with urban soils is a central element for circular economy approaches to sustainable urban metabolisms. However, soil protection and regeneration are hardly addressed in urban policies, and specific policies for this purpose are advocated but rarely enabled in practice.

1. Three policy windows for urban soil care

The remediation, protection, and reactivation of urban and peri-urban agricultural soils for agroecological food production are key for building resilient cities. This policy brief offers a range of practices involved in urban soil remediation under the broad label of soil care, enabled by the emergence of a growing community of practice mobilising around soil for the benefit of both human and non-human life (plants, animals, fungi, microorganisms, etc). There are important priorities in current urban policy agendas which are closely related

to soils, but in which an integrated understanding of soil care is still to be developed through specific policy tools and actions. Some of the areas most directly linked to urban and peri-urban soils are climate action, food policy, and green and blue infrastructure. Building on our research, we illustrate these three policy windows below.

1.1 Soil and climate action

The maintenance of healthy, sustainable, and fertile soils needs to be a key tool in local climate action plans. Release of carbon from soil has become a major contributor to climate change, and organic farming and agroecological practices can provide an important and effective strategy for carbon sequestration, by reducing, for example, the amount of soil tillage and regenerating vital soil organisms, such as mycorrhizae, that support plant growth. Reversing the pollution and sealing of abandoned commercial and/or industrial urban soils through re-naturalisation (returning to green functions) and the introduction of sustainable farming will improve urban resilience to climate change by enhancing the circular flows and soil sequestration of carbon.
Local urban composting and/or pyrolysis of food and other organic waste for agricultural use can return carbon to urban soils and reduce carbon emissions required for the production of synthetic fertilisers (e.g. ammonium nitrates). At the same time, this will improve urban food security and generate added value by sustainably increasing agricultural productivity. For example, using compost produced from urban organic waste instead of synthetic nitrogen fertilisers can reduce greenhouse gas emissions by about 33 %.This reduction could go up to 90% if we consider methane emissions that would be produced when putting food waste in untreated landfills (Piacentini and Vega 2017).

Picture 1: exploring mycorrhizal and plants interactions in living soils (London 2019)

1.2 Soils and food policies

Urban dependence on global distribution chains has emerged as a major threat to providing good food, especially fresh and sustainably grown vegetables to urban dwellers, and thus is a threat to urban food security. Cities are champions of developing sustainable and healthy food policies, but are not addressing the need to strengthen local production capacity, especially in light of climate change adaptation strategies.

Urban and peri-urban gardening and horticulture has emerged worldwide as a key tool for both improving food security and strengthening the local capacity of communities to maintain sustainable and adequate livelihoods. However, healthy and fertile soils are scarce and under threat in urban settings, with the greatest farmland loss happening in urban fringes. Thus, there is a strong need for protecting current agricultural soils and regenerating degraded, polluted, and sealed soils for both community gardening and professional urban agriculture. This offers the additional opportunity of converting urban organic waste from being a problem to an urban resource. Here, public-community partnerships will play a key role in ensuring an efficient use of public resources to address food insecurity with maximum effectiveness.

1.3. Soils and green and blue infrastructure

Both climate action and food security policies must be addressed within an integrated, place-based approach to urban (agroecological) re-design to improve overall urban resilience. Beside the provision of healthy food, healthy soils are key in sustaining a rich vegetation network connecting different ecosystems providing climate regulation, carbon sequestration, flood prevention, water quality improvement, biodiversity and landscape conservation, and human health benefits through air quality improvement and provision of an attractive environment for open-air, physical activities. Healthy soils are a key element of the local green and blue infrastructure networks in urban settings, which will serve as the physical basis for strong and adequate climate action, aquifer protection, and food security policies. Restoring mixed landscapes of agriculture and wild vegetation and associated biodiversity, and de-sealing and remediating abandoned urban industrial or commercial soils will strengthen ecosystem health and related ‘services’. A landscape mosaic combining agricultural, forest and built-up urban spaces is key for building resilient cities. Such a resilient landscape mosaic is also crucial for both mitigation and adaptation to climate change (including flood risks and other possible events related to climate change) and provides sustainable and healthy food for local communities.

2. An integrated approach to urban soil care: challenges and actions

Introducing soil care policies in the current local policy agenda for climate action, food security and green and blue infrastructures becomes a cross-cutting element to strengthen urban resilience through a holistic, agroecological approach. Such an approach can be deployed through four main fields of local-policy-specific action: 1) soil remediation and decontamination, 2) community engagement, 3) protecting and reactivating agricultural soils, and 4) soil governance. We describe their main features in the following sections, supported by some ongoing, international examples.

2.1 Remediation and decontamination

A specific opportunity for policy integration emerges in connecting solid waste management, water treatment, and soil remediation. Decontamination of soils in urban areas is typically driven by new uses that require the removal or sealing of contaminants. The high cost of decontamination is a driver for more economically rewarding forms of use, as is the case in many brownfield redevelopment projects (e.g. speculative regeneration). Here, typical strategies for soil restoration include expensive approaches based on importing soils from elsewhere. However, there is a broad range of possible uses for urban soils that require less intensive forms of cleaning and may include the many benefits that green spaces and rebuilt living soils may offer. Remediation processes offer the opportunity to restore urban soils through non-invasive, nature-based processes, enabling direct planting into damaged soils. Another approach is opening and regenerating previously sealed soils.
For example, *CiDéSol* in Brussels (Belgium) is a co-creative, transdisciplinary project using myco- and phytoremediation to depollute urban soils for urban agriculture: it tries to reduce the public investment spent on waste management and processing by redirecting public spending towards green investment and job creation. They create an enabling environment for urban growers by investing in a decommodified process of nutrient cycling, making the access to organic matter free for urban growers whose activities are recognised as a socially and ecologically sustainable form of soil care. *Sous les pavés* in Montréal (Canada), and *Less Beton* in Brussels (Belgium) are citizen-led initiatives focussed on softening and restoring paved soils to plant vegetables.

Challenges:

- Lack of quality control of waste streams at source
- Poor water quality as a source of soil contamination
- Loss of skills and knowledge amongst urban growers and public authorities on soil health and nature-based restoration techniques, including application of organic matter through on-site composting and specific bioremediation techniques for depollution (e.g. use of biochar, phyto- and mycoremediation)
- Inadequate methods for risk assessment including lack of systematic testing of soil quality and soil improvement, together with interpretation of the results

Actions:

- Set policy targets and develop guidance to limit soil sealing and promote softening (rendering sealed soils more porous) and link these actions with soil regeneration
- Provide decentralised and spatially differentiated composting infrastructure in close collaboration with end users concerned with the quality of the compost
- Select the most appropriate waste processing practices, involving different communities and offering a wide range of organic material in different settings (inner city situations vs. peri urban conditions; on farm composting vs community composting schemes; anaerobic digestion vs. in-vessel composting for disease control)
- Develop a shared infrastructure / testing spaces / training
- Set a target for recycling of unpolluted excavated soil from building sites
- Combine cultivation with nature-based water treatment

2.2 Intergenerational and intercultural community engagement

Urban communities generally live in a state of disconnection from the soil. There are, however, notable exceptions of specific communities mobilised around soil care for a multiplicity of reasons. Some are interested in soil cultivation, local food production, and sustainability issues; some are working around soil care and more than human solidarities; others are linking soil care to questions of land rights, and spatial and environmental justice. Here, working examples at different scales include the Soil Regeneration Project in Singapore, the Global Gardens project in Cardiff (Wales), and Recovery and Regeneration work by the Old Havana Association and other local community organisations in Havana (Cuba). The 'care' dimension is a common thread in urban communities of practice engaging with soil, which allows for the development of intersecting urban policies linking various social and environmental objectives rather than playing them off against each other: combining action around food security and urban growing initiatives, building solidarities across the urban-rural divide, and empowering vulnerable communities.

Challenges:

- The limited possibilities to engage in growing activities in an urban environment
- The lack of resources and skills in urban communities regarding soil care
- Adequate tools to manage risk in local communities
- Administrative constraints sych as heavy, inflexible bureaucracy, or inadequate capacity to implement or enforce legislation

Actions:

- Support and promote land-based community kitchens that tackle food poverty and promote soil health through the building of solidarities between peri-urban local farmers and precarized urban communities (e.g. Granville Community Kitchen in London (UK).
- Establish local resource centres for local growers, including support in risk management (i.e. access to free soil assessment and interpretation).
- Establish a network of excellence of practitioners and ambassadors for sustainable soil management, including regenerative and organic agriculture, to support wider community engagement and emerging initiatives. Organise community buy-in to soil remediation initiatives of urban grassroots groups working toward environmental justice, more than human solidarities, and food sovereignty.

Picture 2: Speeding grass composting with cow's rumen recovered from the meat industry, Rosario (Argentina), 2019

2.3 Protecting and reactivating the agricultural use of soils in urban planning and redevelopment

Urban and peri-urban agricultural land provide a wide range of ecosystem benefits, including food production, local economy reactivation, biodiversity protection, public health, opportunities for ecological re-skilling, and open-air activities. Sustainable and localised food systems - for which the agricultural use of peri-urban land is central - have been highlighted as a core tool for both mitigation of and adaptation to climate change in urban areas. The protection and reactivation of agricultural soils is therefore at the core of sustainable food systems and should be considered a key element of local green and blue infrastructure networks. However, the protection and reactivation of agricultural use of soils is lacking in many urban planning and redevelopment policies and practices: there is evidence that many municipalities are directly contributing to the loss of urban and peri-urban agricultural land by directly converting public farmland into biodiversity preservation sites or through selling off for development and other uses (Vandermaelen et al 2023). Additionally, low profitability of farming activity has led to a significant decrease in small agricultural holdings. The contrast between the importance of access to land and the scarcity of available land becomes more pronounced in highly populated areas where land prices are high. The reactivation of agriculture in metropolitan areas – e.g. on urban green belts or underused agricultural lands - can be promoted through explicit and comprehensive planning and policy approaches to sustainability transitions, including the promotion of local markets and public food procurement programmes, participatory processes of extension, and reactivation of the social fabric of the farming sector (e.g. the agroecological dynamization strategy 'Mans a l'Horta' in Valencia, Spain)[(1)].

Challenges:

- Lack of food planning and soil health knowledge among civil servants in local municipalities
- Lack of a dedicated zoning typology for agroecological functions within traditional urban zoning plans, alongside 'blue' and 'green' infrastructure, to build resilient cities
- Lack of political prioritisation and ambitions for transition processes to sustainable agroecological farming practices and sustainable urbanisation
- Existing political agreements (e.g. Milan Urban Food Policy Pact) are non-binding and hence often lack political and financial resource commitments.

Actions:

- Incorporate soil experts and food planners in council teams, to integrate a soil perspective in land use planning, including the protection of soils and the agroecosystem-based cultivation of soils. Reground urbanisation in an understanding and development of a geography of farming (i.e. soil-care centred mode of urbanisation called 'agroecological urbanism', see Deh-Tor 2017 and Tornaghi and Dehaene 2021)
- Integrate land use policies and land planning tools (e.g. Rosario and Barcelona), such as giving environmental protection and/or specific protection to metropolitan agricultural areas, both for market-oriented agriculture and for community or private gardening (including banning agrochemicals in proximity to urbanised areas given their risks being the main reason to segregate agricultural and urban land uses, and offering municipality-led coaching to farmers to encourage agroecological transitions)[(2)]
- Adopt fiscal measures to regulate and promote affordable house and land prices for farmers and support farming income (i.e. in France), appreciating the societal (ecological and health) benefits of local and agroecological farming practices
- Implement land market measures, such as giving priority to sustainable agriculture entrepreneurships or public/community infrastructures (e.g. community gardens) for accessing or buying land (i.e. 'Foncier' law in France)
- Actively protect publicly-owned land. Local governments can buy land to keep the ecosystem services they provide through sustainable agriculture (i.e. like in Mouans-Sartoux, France, to supply public cantines). They can also reverse projects of urbanisation on publicly-owned land, especially when such projects have not yet been developed, or with appropriate reconversions of uses (i.e. in Detroit)
- Agroecological redesign of large-scale metropolitan areas (e.g. Rosario greenbelt, Argentina) to improve ecological connectivity and ecosystem services of sustainable and healthy soils [(3)]
- Engage in public-community partnerships to promote sustainable farming and keep soils and water healthy

2.4 An enabling environment for urban and peri-urban (agricultural) soil governance

Urbanisation plays an important role in the systematic degradation of soils and soil biodiversity through land use change and soil sealing, overexploitation, contamination, introduction of invasive alien species and climate change. Alternative urbanisms, such as the agroecological urbanism framework (DehTor 2017, Tornaghi and Dehaene 2021), could play an equally systematic role in soil remediation, complementing the ambitions of 'net zero land consumption' that are finding their way into land use planning goals (i.e. the EU net zero land take by 2030 policy). This requires the replacement of disabling urban conditions contributing to the disregard of soil – the lack of access to land, to skills and to knowledge - with enabling policies that create favourable circumstances for communities caring for the soil, engaging in de-sealing, soil remediation, decontamination, regenerative farming, permaculture etc. Central in this urgently needed approach is the embracing of agroecological values, where soil biodiversity and soil health are cherished simultaneously for human, animal and plant health, where multicultural and transdisciplinary knowledge practices are valued, and where indigenous cosmologies and spiritual approaches are respected. As an already implemented example for this approach, the municipality of Rosario in Argentina is demonstrating how an enabling and coordinated municipal approach can promote large scale rebuilding of topsoils as part of its urban agriculture programme, making systematic use of carbon rich organic matter from urban waste streams.

Challenges:

- Soil sealing, degradation and pollution in urban and peri-urban areas are related to a wide range of socio-economic processes, and therefore responsibilities are spread over different administrative levels and policies at different levels.
- Effective implementation of landuse policies requires the commitment of community actors who privately own land, therefore there is a need to increase awareness about sustainable land and soil use.

Actions:

- Recognise bottom-up communities-led soil protection and restoration projects, and provide appropriate support in the local administration
- Integrate soil care in municipal/regional circular economy and climate action plans for short food supply chains, nutrient and waste cycling
- Coordinate municipal departments in the development of regulations and strategies for urban and peri-urban agricultural land, to produce cross-cutting and coordinated lines of action (e.g. Rosario, Argentina)
- Bring together different actors and administrations at *different territorial scales*, through bodies for the coordination of multi-stakeholder and multi-level policies for soil protection (e.g. see the 'metropolitan council of the farmland of Valencia', Spain)[(4)]
- Follow international guidance, such as the ones contained in the FAO Voluntary Guidance for Sustainable Soil Management, or in the Land and Soil in Europe report of the European Environment Agency, and monitor state of the art research which provides updates on fast evolving understanding of soil biodiversity and appropriate soil management.

NOTES

(1) Valencia, Spain, has also promoted soil-care centred policies through the promotion of local agroecological farming strategies. "Mans a l'Horta, Local Agroecological Dynamisation in the city of València (Spain)" has been a two years lasting (2018-2019) Participatory Action-Research project, promoted by València City Council, to promote agroecological transitions with conventional, professional farmers within the city. It has strengthened the local, social agricultural fabric, created short food supply chains, developed new regulatory tools to facilitate urban agriculture, developed on-field participatory trials and research on agroecological farming practices, and intervened on the land property market.

(2) Barcelona's experience in protecting land for farming can be a valuable learning experience. "Agricultural Park of Baix Llobregat (Barcelona)" emerged from local farmers' unions demands since the '90s, in 2006 were created the Consortium of the Park, bringing together Regional, Province and 14 municipal Authorities. Through regulations, it protects 3.348,02 ha of agricultural land within the Metropolitan Area of Barcelona, enhancing agricultural production and marketing and promoting the transition to agroecological farming practices. https://parcs.diba.cat/es/web/baixllobregat

(3) Rosario, Argentina, has developed a number of policies, programmes, and inter-departmental collaboration promoting soil-care enabling policy environments, and particularly promoting agroecology as a public policy. Some details on their experience can be found here:
- https://www.rosario.gob.ar/inicio/produccion-sustentable-de-alimentos-cinturon-verde;
- https://datos.rosario.gob.ar/ambiente/proyecto-cinturon-verde

(4) The "Metropolitan Council of l'Horta de València (Spain)" was created in 2019 to protect, reactivate, and promote transitions to sustainability in agricultural land of València's Metropolitan Area (54 municipalities, 1,5 M people, and 12.000 ha of traditional irrigated land), as part of its green infrastructure network. It brings together regional, provincial and local authorities, and private and social stakeholders in order to develop the aims of the Law of Horta de València (2018), which includes protection of traditional agricultural landscape, a new regulatory framework for protecting agricultural uses of land, reversing industrial and commercial abandoned land into agricultural land, and a complete set of actions to reactivate agricultural uses through sustainable farming and the strengthening of local markets. https://politicaterritorial.gva.es/es/web/planificacion-territorial-e-infraestructura-verde/ley-huerta-de-valencia

Glossary

Agroecology = a paradigm for agriculture and food systems that is simultaneously: (a) the application of ecological principles to food and farming systems that emerge from specific socioecological and cultural contexts in place-based territories; and (b) a social and political process that centres the knowledge and agency of Indigenous peoples and peasants in determining agri-food system policy and practice." (Pimbert, M.P., Moeller, N.I., Singh, J., and Anderson, C.R.(2021) "Agroecology." In *Oxford Research Encyclopaedia of Anthropology*. Oxford University Press.

Agroecological Urbanism = a place-based approach to urbanisation and urban planning, centred around the values of agroecology, soil care, resource sovereignty and planetary health, and integrating the needs of both, farmers and consumers, when shaping land, food, waste, and urban infrastructure policies.

Biochar = a type of charcoal produced by the process of pyrolysis specifically for incorporation into soil to sequester carbon and enhance soil fertility (see also: pyrolysis).

Composting = an aerobic (in the presence of oxygen) process for facilitating the decomposition of organic material to produce a stable product that can be used as a soil fertiliser/amendment. Usually the process is self heating which sanitises the product although in many countries waste food and animal by-products must be composted in enclosed vessels (in the absence of air) rather than in the open in order to prevent the possible spread of diseases.

Anaerobic digestion = biological processing of organic material in the absence of oxygen to produce methane as a fuel gas and 'digestate' - a liquid slurry rich in plant nutrients. It is particularly suited to the treatment of food waste.

Blue and green infrastructure = is the ensemble of green spaces (parks, playgrounds, forests) and water spaces (rivers, lakes, reservoirs, streams) that are part of a landscape. They can be either natural or artificial. The term 'infrastructure' highlights their role in urbanisation to provide useful functions to human settlements, for example recreation, biodiversity preservation, floods prevention, climate change mitigation, air, soil and water quality, etc. While agroecological and farming activities can offer many of these functions, they are currently most commonly not accounted as green infrastructure.

Landscape mosaic = landscape characterised by a high diversity and intermingling of different functions such as agriculture, forests, water basins, urban spaces

Mycoremediation = see 'soil de-pollution' and 'soil remediation'

Mycorrhizae = a specific group of soil organisms (fungi), living as a network that enable the exchange and transformation of nutrients between plants and other organisms, and enable different soil components (aggregates) to bind together

Phytoremediation = see 'soil de-pollution' and 'soil remediation'

Precarized communities = communities rendered economically precarious and vulnerable by capitalist exploitation

Pyrolysis = a process to produce biochar and charcoal by heating organic matter such as wood in a setting with reduced oxygen. This minimises the amount of carbon dioxide lost to the atmosphere and converts the carbon to a very stable form, essentially locking it up. This process can address the circular economy by utilising waste in the production of biochar.

Soil de-pollution = a process of decontamination and 'cleaning' of polluted soils. This can be done in a range of ways, for example through growing bacteria or fungi that consume and transform pollutants (mycoremediation), or through growing plant species (phytoremediation, bioremediation) that absorb pollutants such as heavy metals from the soil (the plants would then have to be disposed of in a safe way)

Soil de-sealing = is the process of reversing soil sealing by removing impermeable soil covering and either substituting it with permeable cover (softening), or regenerating the old soil underneath or bringing in new substrate materials or unwanted soil from elsewhere in the attempt to recover all or part of the ecological soil functions

Soil remediation (including mycoremediation, phytoremediation) = a process to return soils to healthy and thriving conditions, by either removing pollutants or improving fertility through adding organic matter, or a combination of both (see also 'soil de-pollution')

Soil sealing = the covering of soil with an impermeable surface such as concrete or asphalt, usually as part of road, house or other urban development. Soil sealing is usually equivalent to permanent soil loss, for its inability to perform ecological functions such as food production, flood prevention and/or harbouring biodiversity.

Picture 3 – composting organic matter, Organic Lea, London

References

C.M. DEH-TOR (2017), "From Agriculture in the City to an Agroecological Urbanism: The transformative pathway of urban (political) agroecology", in RUAF Urban Agriculture Magazine, special issue on "Urban Agroecology", RUAF, No. 33, pp. 8-10.

European Environment Agency (2019) Land and Soil report.

Piacentini Rubén D. and Vega M. (2017) "Comparative Analysis of the Possibility to Use Urban Organic Waste for Compost or Biogas Productions. Application to Rosario City, Argentina", in *Institute of Physics (IOP, Great Britain) Conference Series: Materials Science and Engineering*. 245, 052029

Tornaghi C. and Dehaene M. (2021), *Resourcing an agroecological urbanism. Political, transformational and territorial dimensions,* London: Routledge

UN-FAO (2017) Voluntary Guidance on Sustainable Soil Management, Rome

Vandermaelen H., Dehaene M., Tornaghi C. Vanempten E. Verhoeve A. (2023),"Public land for urban food policy? A critical data-analysis of public land transactions in the Ghent city region (Belgium)", in the journal *European Planning Studies,* Vol. 31, No. 8, pp. 1693–1714

Additional resources

On soil care-, soil protection- and soil regeneration-centred urbanisation and policies:

www.agroecologicalurbanism.org (2023) a multimedia online incubator for an agroecological urbanism

Strategic plan for building healthy and carbon-rich soils, by the federation of voluntary private and public stakeholders within the framework of the Paris-Lima Action Plan (PLAP): http://www.4p1000.org (see also Farm Carbon Toolkit).

On bio- and phyto-remediation of contaminated soils:

Mahar A., Wang P., Ali A., Awasthi M. K., Lahori A. H., Wang Q., Li R., Zhang Z. (2016), Challenges and opportunities in the phytoremediation of heavy metals contaminated soils: A review, Ecotoxicology and Environmental Safety, Vol. 126, Pp. 111-121

Yadav K.K., Gupta N. Kumar A., Reece L. M., Singh N., Rezania S., Khan S. A. (2018), Mechanistic understanding and holistic approach of phytoremediation: A review on application and future prospects, Ecological Engineering, Vol. 120, pp. 274-298

On fertility regeneration through composting:

Lim S. L., Lee L. H., Wu T. Y. (2016), Sustainability of using composting and vermicomposting technologies for organic solid waste biotransformation: recent overview, greenhouse gases emissions and economic analysis, *Journal of Cleaner Production*, Vol. 111, Part A, pp. 262-278.

https://friendsoftheearth.eu/publication/separate-collection-the-path-to-composting/ (Spain)

http://soilregenerationproject.com (Singapore)

On the link between water quality and healthy soils

Zimnicki T., Boring T., Evenson G., Kalcic M., Karlen D. K., Wilson R. S., Zhang Y., Blesh J. (2020), On Quantifying Water Quality Benefits of Healthy Soils, BioScience, Vol. 70 (4), pp. 343–352

IOWA Stormwater Education Project: Healthy Soil Healthy Streams Soil Quality Restoration Explainer Video

On Farmers in the watershed: see here (New York City) and here (Paris)

On green-blue infrastructure and ecosystem services

Smith P., Keesstra S. D., Silver Whendee L. and Adhya Tapan K. (2021) The role of soils in delivering Nature's Contributions to People. In *Phil. Trans. R. Soc.* B376:20200169

Lovell S.T., Taylor J.R. (2013), Supplying urban ecosystem services through multifunctional green infrastructure in the United States. *Landscape Ecol* 28, pp. 1447–1463

Lovell, S.T., Taylor, J.R. (2021), Urban agroforestry as a strategy for aligning agroecology with resilience planning initiatives, in: Tornaghi C. and Dehaene M. (2021), Resourcing an Agroecological Urbanism. London: Routledge; pp. 101-122.

Corresponding authors

Michiel Dehaene, michiel.dehaene@ugent.be, Department of Architecture and Urban Planning, Ghent University, Belgium;

Daniel Lopez Garcia, daniel.lopez@cchs.csic.es, Institute for Economics, Geography, and Demography, Spanish National Research Council (CSIC), Spain;

Jana Fried, jana.fried@coventry.ac.uk , Centre for Agroecology, Water and Resilience, Coventry University, UK;

Chiara Tornaghi, chiara.tornaghi@coventry.ac.uk, Centre for Agroecology, Water and Resilience, Coventry University, UK;

Francis Rayns, ab5438@coventry.ac.uk, Centre for Agroecology, Water and Resilience, Coventry University, UK

Valentine Cadieux, kvcadieux01@hamline.edu, Hamline University and Twin Cities Agricultural Land Trust, MN.

Other authors

Hari Byles and Shumaisa Khan, Compost Mentis, London, UK

Kim Graham and Mark Walton, Shared Assets, London, UK

Ruben Piacentini, Telma Scarpeci, **Laura Bracalenti**, Rosario National University Argentina

Raul Terrile, Nicolas Paz, Nahuel Martinez, Municipality of Rosario, Argentina

Jennifer Nicklay, Twin Cities Agricultural Land Trust

Kevin Winter, University of Cape-Town, South Africa

Nuria Alonso, Network of cities for agroecology, Spain

Pamela Rice, United States Department of Agriculture

Sue Charlesworth, Centre for Agroecology, Water and Resilience, Coventry University, UK

Javier Rojo, Eva Bockova, Quantum Waste, London, UK

Funding

The content of this brief is based on research results from the international project **SOIL NEXUS**, **funded by Future Earth** through the Pegasus 3 call (Nov 2020- Dec 2022).

Acknowledgments

We would like to thank all research partners to the projects linked to SOIL NEXUS – the JPI-Urban Europe projects "Urbanising in Place" and "WasteFewUll" – all the participants to the online webinars held during the Covid-19 pandemic, and all those who have read and commented on an earlier version of this brief, especially Said El Fadili and Cecilia Delgado.

Credits

All pictures belong to the authors. No part of this document was produced with AI.

DOI: https://doi.org/10.18552/CAWR/2024/0002 ISBN: 978-1-84600-129-1