



the soil: an ecosystem to save

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de-sealing

«Freeing the soil from asphalt and cement is like taking the chains off a slave. You take the pressure off, you restore freedom and you can hear it breathe. Soil, like people, needs air. When free, soil filters water and evapotranspires, it reboots the ecosystem.

'Look, see the root collars on those three cedars? They look like they are twenty centimetres above the ground. Those twenty centimetres show where the scarified asphalt used to be. On the other hand, the depression is more marked because buildings with foundations and sub-foundations were completely demolished. [...] We will be putting down topsoil, fertile soil, to even off the ground level and restore the ecosystem functions', explains Massimo Lepore, architect at the TAM Associati Studio». 1 (La Nuova Ecologia, no. 07/2020)

We are in San Lazzaro di Savena, where the most advanced stage of de-sealing experimentation carried out by the SOS4Life project is currently underway with the requalification of the "Caselle" area, previously designated for municipal warehousing and waste storage facilities for the Waste Recycling Centre. The work will involve the construction of three new buildings that will occupy less than half of the previously sealed surface area, thanks to backfilling and topsoil and an urban regeneration project carried out by Alce Nero, a leader in the organic food sector.

But this is not the only case being realised by the project; similar work is also underway in Forlì, in the area in front of the San Domenico Museums, where the area originally occupied by the museums' car park is being transformed with the creation of a new urban lawn area, cycle and pedestrian paths and tree planting, as well as in Carpi, where work is being carried out on a tree-lined avenue with a paved strip being turned over to greenery while the cycle path will be repaved, only this time using permeable materials.

In line with the guidelines set at European level - no net land take by 2050 - the SOS4LIFE project offers administrations tools and work experience for measuring the loss of ecosystem services offered by the soil and for monitoring land take and soil sealing, while at the same time it offers citizens learning tools for understanding the importance of soil in the quality of life for people and communities.



www.sos4life.it

soil consumption

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«Land and soil are vital European resources and the basis for much of our continent's development. But in recent decades, our land take for urbanisation and infrastructure has grown at more than twice the rate of the population increase, a trend that is clearly unsustainable in the longer term.» (European Commission)

When man applies an 'artificial' cover over natural or agricultural soil, mostly for housing and infrastructural purposes, it constitutes 'soil consumption'. The most recognisable and widespread form of soil consumption occurs whenever a permanent covering of asphalt or concrete is applied over the soil as these materials totally or partially compromise vital soil functions, with direct consequences, including risks of flooding and water shortages, increased global warming and loss of biodiversity.

Despite the European Commission having established that European policies must set a target of no net land take by 2050 and reduce the average consumption rate to 800 km2/year in the period 2000-2020 (in the previous decade it had been 1,200 km2/year), there is still no shared awareness of the contribution soil makes, not only to the well-being of residents but also to possible adaptation to the current climate crisis and its mitigation. In most cases, soil is perceived simply as a support platform or as a waste product to be disposed of once removed from its original position.

For many years, soil consumption has been a very significant issue also in Italy; in fact, the country is one of the European countries at the top of the land take table. And unfortunately, it doesn't seem to be stopping. According to the latest report published by ISPRA (Italy's Higher Institute for Environmental Protection and Research), another 60 km2 of land were consumed in 2019, an average of about 16 hectares per day, or 2 square meters every second.

All this to the detriment, unfortunately, of the best agricultural soils in the country and in regions already heavily compromised by soil consumption, such as Veneto (+785 ha), Apulia (+625 ha), Sicily (+611 ha) and Emilia-Romagna (+404 ha). This means that nationally, 7.1% of land is consumed (9.12% if you only consider those areas where building is actually possible), equal to 355 m2/inhabitant, for a total of 2,139,786 ha.

What makes this scenario even more disconcerting, is the absence of a direct relationship between the increase in soil consumption and population growth. In fact, land continues to be consumed even when the population isn't growing and therefore there are no needs relating to housing and services.

The SOS4Life project has demonstrated the absence of this relationship also for the municipalities that are partners in the project, thanks to the study and measurement of the sealed territory of these three municipalities in an



List of local data on soil consumption and identification of methods for its measurement, monitoring and representation.

Soil consumption, sealed surfaces, current state of buildable areas and redevelopable brownfield sites in Forlì, Carpi and San Lazzaro.



Stefano Bazzocchi, Municipality of Forlì

«Reconstructing the historical evolution of soil consumption at municipal level was important for understanding the dynamics and impacts. It has allowed us to quantify the urbanised areas from the end of the 19th century to present day. In Forlì, city expansion together with the growth of scattered residential areas and built-up areas in rural zones, have overall consumed more than 24% of the municipal territory, with a very marked increase in the second half of the 1900s. 14% of the municipal area is sealed.»

«The profound change in the economic model, oriented towards sustainability and a circular economy, requires actions and tools that overcome the ideological contrast between growth and sustainability. In this perspective, for urban regeneration we need rules that allow us to transform our cities, adapting them to the new needs of private and collective living, through legislation that makes it possible to demolish what is old and degraded in favour of a process of replacement and regeneration of existing cities, aimed at reaching no net land take by 2050, as also proposed by Regional Law 24/2017.»

«Soil is 'the living skin of the earth' and by consuming it, an extremely precious resource is lost. It's damn important because it does things, it performs functions. It hosts the largest biodiversity on earth, provides almost all of our food, collects and purifies water, conserves our historical and archaeological heritage, stores the carbon that would otherwise increase the greenhouse effect and houses the infrastructures in which we live. In healthy soil, all these functions coexist and reciprocally enhance one another, except for the last one. Sealing excludes all the others: it does not allow plants to grow, water to infiltrate, life to develop.»

historical period going from the mid-1800s to present day. An analysis that has made it possible to estimate the economic and environmental impacts resulting from soil consumption, including, for example, the loss of agricultural production.

FORLÌ LOSS OF PRODUCTIVITY DUE TO SOIL CONSUMPTION



Stefano Betti, ANCE Emilia-Romagna



Francesco Malucelli ARPAE













Evaluation of ecosystem services and estimation of the economic and environmental impacts resulting from soil consumption in the partner municipalities.

Guidelines for the evaluation of the ecosystem services of soils in urban areas and tangible actions.

Standards, guidelines, best practices, case studies on soil consumption limitation and resilience.

«Lack of awareness about the role of soil in the ecosystem and the economy as well as about possible negative impacts of land take, especially in the medium to long term and considering the expected effects of climate change, has been identified by many observers as one of the major obstacles to more sustainable land planning policies and land use.» (European Commission)

Integrating the concept of protecting the soil and its functions in spatial planning is not yet a sufficiently widespread practice because, despite scientific evidence, there is still a lack of adequate awareness of the consequences related to soil degradation. Taking into account the quality of soil in spatial planning and avoiding new constructions on soils of greater value is a responsibility that must first of all be undertaken by the competent authorities at national, regional and local level, by professionals who deal with spatial planning and land use management and by all economic parties involved. But citizens need to understand these aspects too.

To understand the importance of soil and its role in maintaining a balanced and healthy ecosystem, it is necessary to understand what its ecosystem services are (i.e. the processes through which natural ecosystems meet the needs of human beings and contribute to their well-being), to know the peculiar characteristics soils have in the environment in which one lives or works, and also to have information on the technical and scientific tools that can be deployed to safeguard soil in terms of quantity and quality.

A large part of the study and analysis activities carried out by SOS4Life at the beginning of its journey were dedicated to this aspect, starting out by sharing a common tool for measuring and monitoring soil consumption and ecosystem services lost in the territories of its Partner municipalities and arriving at a direct dialogue with the main implementers of best practices in those European regions that already use monitoring and spatial planning tools capable of taking into account the quality of the soil and directing new construction sites towards soils of lesser value.

Of particular importance in this sense, is the definition of two concepts: that of 'soil consumption' for which SOS4life borrowed the terminology used by ISPRA in the 2014 update of its report on soil consumption in Italy, which considers soil consumption as the variation between a non-artificial cover (unused soil) and an artificial cover (consumed soil), including surfaces transformed in rural areas, or transformed public-private green areas in urban zones; and that of 'soil sealing', meaning the permanent covering of the soil with artificial construction materials, also in agricultural and natural areas.



ECOSYSTEM SERVICES PROVIDED BY THE SOIL

In addition to air and water, Natural Capital is also made up of soil and its specific characteristics and qualities, such as depth, texture, organic matter content, content of fertile elements, bulk density, hydraulic conductivity. These specific characteristics are the basis of a series of processes - nutrient element cycle, water cycle, biological activity, structure formation, gas exchanges - through which soil is able to carry out essential functions such as microclimate regulation, carbon sequestration, establishment of a water reserve, supply of raw materials, food and fibres, thus contributing to providing the so-called 'ecosystem services'.

Ecosystem services are divided into 4 categories: 1) life support, because they host plants, animals and human activities; 2) supply, because they produce biomass and raw materials; 3) regulation of hydrological and biogeochemical cycles; 4) cultural values, as a historical-archaeological archive and a fundamental part of the landscape.

The functions performed by soil, and related ecosystem services, vary in space, based on the characteristics of the soils, and time, in relation to the conditions (climatic, managerial, etc.) of the context. Different soils provide 5 services which are different and/or vary in guality.

However, as shown by the high rate of soil consumption recorded in Italy and Europe, any attention given to soil in urban contexts is usually determined by its function as a support for urbanisation and road infrastructures, a function to which a mere market value is attributed and which is therefore strongly distorted by real estate dynamics. Using the market value as the sole parameter for assessing soils means a series of other costs of great importance for the well-being of the territories and communities that inhabit them are overlooked, first and foremost all those related to the loss of ecosystem services, but also those linked to housing dispersion (urban sprawl) and the environmental impacts felt outside the areas that are built on, such as pollution caused by traffic moving to and from built-up areas, the costs for avoiding or abating pollution due to production, or the dispersion of social relations... Alongside which we should consider the 'intangible' values linked to the soil, such as the health of citizens, spiritual values, environmental didactic functions and historical-landscape identity.

Thanks to a specific method based on the available soil data and Emilia-Romagna Region land-use indicators and cartography, updated in 2008 to a more detailed resolution, SOS4Life was able to define the ecosystem services provided by the soil for each individual area, producing for each partner Municipality the maps of the main ecosystem services rendered by the soil, evaluating the loss resulting from the consumption scenario hypothesised based on urban planning forecasts and measuring to what extent these ecosystem services are lost following urban transformations.

In the case of San Lazzaro di Savena, for example, the overlaying of the soil consumption maps and the ecosystem services maps made it possible to evaluate the impact of land consumption in terms of loss of ecosystem services, with particularly interesting (and worrying) results.





«The importance of having up-to-date, reliable and consistent data on soils became evident during the SOS4Life project, where the production of soil ecosystem services maps would not have been possible without the soil database that the Emilia-Romagna Region has been keeping since the 1970s. It is important that soil data, an environmental factor which is all too often overlooked, can be accessed and downloaded by everyone.»

Paola Tarocco Emilia-Romagna Region



«The study activity on the urban soils of Carpi was very interesting. It allowed us to deepen our knowledge of the different types of permeable areas in the city and in the peri-urban area. We have come to realise that in most cases even the permeable soils present in the city (parks, school playgrounds, private gardens and even simple flower beds) can provide some ecosystem services that contribute to improving the ability to adapt to climate change, mitigating urban heat island effects and extreme weather events.»

Norberto Carboni, Municipality of Carpi

Of the approximately 12 km2 of soil consumed, 78% affects high-quality soils, i.e. lowland soils which are deep and with excellent chemical-physical fertility characteristics, with a loss of about 40% of first-class soils and almost 18% of second-class soils, while the average loss of ecosystem services ranges from about 30% of production capacity to 18% of biodiversity support.

In terms of impact on ecosystem services, the trend is as shown in the figure 6 alongside, which shows the difference not only between the production capacities maintained by hill soils (blue) compared to those of the lowland soils (red), but above all the reduction in agricultural production and water reserve capacities between the potential of the soils, taking into account the physicalchemical characteristics show by the Emilia-Romagna Region databases, and what can be estimated today based on

the surface area consumed in 2017.



The same applies to Forlì, where the same calculation made it possible to estimate a loss of 4,200 hectares of highly productive soils (class 1 and 2), which, had they been used to grow corn, could have fed 90,000 people a vear.

Findings such as these are also fundamental in the evaluation of the 'ecological compensation' practices usually adopted to regenerate the ecological value lost due to urban transformation. An exemplary case is offered by the habit of 'compensating' for soil sealing with ancillary service works for the city and its inhabitants (e.g. cycle/ pedestrian paths, trees planting, etc.). Whereas real compensation should consist in the de-sealing of soil elsewhere or the remediation of soil compromised by human activity so that the soil thus regenerated can perform its multiple functions.

THE QUALITY OF **URBAN SOILS**

Urban soils perform the same functions as natural soil and can provide high-quality ecosystem services. However, the degree of 'disturbance' (or even pollution) to which they are subjected due to human activities and their level of sealing influence the quality of the environment and this must be known and taken into account during planning activities.

Surveying the soil, studying its functions and evaluating its ecosystem services can, in fact, provide urban planners with a tool for a conscious approach to planning.

The guidelines developed for evaluating the ecosystem services of soils in urban contexts constitute a tool for addressing the main dangers for soil functions in an urban area thanks to a methodology that envisages defining urban soil landscape units based on the type of natural soils under the urban fabric, urbanistic and soil sealing types and the free survey of unsealed soils.

The evaluation of the services provided by the soil and their overall quality should steer the choices of urban planners even in the presence of densification policies. If, in fact, urban densification may represent an alternative to urban sprawl, it is, however, true that the best soils should still be protected, through sustainable management of green areas and the maximum reduction of pressures on soil functions.





SAN LAZZARO DI SAVENA

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LOSS OF ECOSYSTEM SERVICES IN 2017

EXPERIENCES IN OTHER COUNTRIES

Of the European good practices, SOS4Life has taken a more detailed look at the experiences of Dresden and Stuttgart.

Already back 2002, as part of the national sustainability strategy, Germany set the target of reducing soil consumption to 30 hectares/ day by 2020, implementing a series of policies to achieve it and to ensure more sustainable management of the territory at a Stuttgart, on the other hand, faced local level.

buildina For each urban transformation, German nature conservation legislation imposed prior evaluation of the impacts on the ecosystem and landscape and the need to compensate for the impacts thus established.

In order to maintain soil consumption within the current limit of 40% of the municipal area and at the same time ensure sustainable urban development, Dresden, capital city of Saxony, has opted for redevelopment and reuse of areas that have already been urbanised. Going beyond the provisions set out in national regulations, it has also established, on a local level, the obligation to compensate for any expansion work through the de-sealing and re-naturalisation or

landscaping of another area. The compensatory interventions are carried out in Dresden with priority for areas identified in the landscape plan and with the aim of contributing to integrating and strengthening the existing ecological network. In this sense, the city has equipped itself with a soil quality map that limits the transformability of the most valuable soils.

with the exponential growth of urbanised territory which in 2000 reached 50%, decided, thanks to the mutual determination of its administrators and citizens to preserve and protect the soil.

It has therefore equipped itself with suitable planning and management tools, including a soil quality map. It established a municipal limit for annual soil consumption and has periodically monitored it to ensure it is not exceeded.

Similarly to Dresden, Stuttgart also favoured urban regeneration and provided for soil consumption compensation, quantifying it based on a soil quality index.

Lidia Castagnoli, Legambiente Emilia-Romagna

«Awareness of the economic value of soil ecosystem services can help policy makers make informed choices, but their monetisation also carries the risk of believing that soil is a 'security' in some ways comparable to others of a purely economic nature, when instead the integrity of natural resources should in no way be negotiable.»

Costanza Calzolari, CNR IBE

«A very important result of the project was to build a common language for urban planners, architects, planners, soil experts and scientists, based on shared knowledge and understanding of the central role played by soil and its functions inside and outside the urban space.»



«Limiting soil sealing always has priority over mitigation or compensation measures, since soil sealing is an almost irreversible process. [...] Such a policy strategy requires the full commitment of relevant government departments, not only those dealing with spatial planning and environmental protection. Experience shows that even indicative targets – like those set in Austria and Germany – can be useful tools for at least focusing the attention of decision and policy-makers on the importance of using land and soil sustainably.» (European Commission)

8 The principle to be followed for soil protection can be summarised as "less and better", i.e. less sealing and better planning. In fact, limiting soil sealing is always a priority over mitigation or compensation measures, since soil consumption is pretty much an irreversible process.

Soil sealing can be limited in two ways: by reducing the amount of land occupied, i.e. by reducing the speed at which agricultural land and natural areas are transformed into residential or commercial settlements; or continuing to seal only land that has already been built on, such as brownfield sites or abandoned areas. This is why territories most affected by land take and soil sealing must be able to control and assess their losses and implement appropriate measures to protect their soil.

Unfortunately, there is still no European Directive to protect this resource, and the National Bill on the reduction of soil consumption lies on a Parliamentary shelf somewhere without any certain forecast as to when it might be approved, proving yet again that the sustainable use of land remains an objective which is still secondary to other interests.

However, local administrations can already decide to protect the land of their territories both in terms of quantity and guality, by reducing urban sprawl in favour of the 'compact city', avoiding the need to sacrifice green areas and encouraging urban regeneration.

It is often taken for granted that recovery costs are higher than those of building from scratch, and this will certainly be true until economic incentives are adopted to encourage the letting of uninhabited houses and building regeneration. However, administrators and planners must also include in their assessments the indirect costs of soil consumption, and on this basis make building choices aimed at protecting the soil and reducing its consumption, using adequate information, measurement and monitoring tools.



Guidelines for the revision of planning residues. WebGIS consultation and query procedures manual

REVIEW OF URBANISED TERRITORY

To limit soil consumption, SOS4Life has envisaged the development of guidelines for reviewing planning residues, i.e. urban planning forecasts still to be implemented.

The case investigated is the Municipality of San Lazzaro di Savena where, amongst planning residues, only 12 building lots yet to be developed, external to detailed plans, were identified. However, due to possible 'acquired rights' it is not certain as to whether or not these can actually be saved.

Local administrators, however, can deploy another action to curb soil consumption: revision of the Urbanised Territory (U.T.) perimeter. A reduction of the U.T. can, in fact, return very significant results in terms of curbing soil consumption, not only because a perimetered area as such always generates expectations of expansion, but above all when the urban planning law of Emilia-Romagna LR 24/2017 is considered which sets a maximum limit for soil consumption at 3% of the U.T. surface area.

Applying this approach to the case of San Lazzaro, which considers U.T. as the area where not only is there continuity of built-up areas but also an adequate supply of services as the basis of a social life, it turns out that of the 25 areas thus classified by the Municipal Structural Plan, only 9 can actually be confirmed as such. Based on the Regional Law, for San Lazzaro this means an effective saving on future soil consumption of approximately 45,000 m2.



INFORMATION SYSTEM FOR MONITORING SOIL **CONSUMPTION**

To limit soil consumption, not only must political decision-makers, technicians and operators in the sector be fully aware of what soil sealing means, but they also need the necessary tools to measure the level of land take and periodically monitor any variations.

To do this, the SOS4LIFE project has created an information system that makes it possible to properly organise, consult and query the available data.

For this purpose, starting from the definitions of soil consumption and soil sealing provided within the scope of the project, a series of priority indicators to be measured and monitored has been identified. The data going into the information system was obtained from the three partner municipalities by analyzing the state of urbanisation in their territories starting from the urban planning tools in force.

Through a data exchange model shared between the project partners, an integrated and shared information system has been created throughout these territories, where the information content has been extended, in a less detailed and updated way, to the entire regional territory, making use of the available land use database with adequate detail.

The information system has been supplemented with maps of ecosystem services and summary maps on the quality of soils which, in addition to informing us 9 on the greater or lesser value of certain portions of land, can also provide effective support when a choice must be made that involves soil consumption. In other words, they can guide us in evaluating alternatives so as not to consume the best soils.

The information system can be updated both with new data provided by the individual municipalities and from the updates in the land use map periodically arranged by the Emilia-Romagna Region.



Stefano Olivucci, Emilia-Romagna Region «The information on monitoring soil consumption and sealing can be consulted via geographic web applications that make it possible to thematize the data, compare it with thematic maps and interrogate the database, extracting reports and downloading monitoring data.»



«Where signifi cant eff ects are unavoidable, mitigation measures can often minimise the negative impacts, although it has to be recognised that building on an area of land will inevitably aff ect the ability of the soil at that location to perform its full range of functions.» (European Commission)

In cities, soils perform the same functions as natural soil and contribute to the provision of ecosystem services: they store carbon, regulate the microclimate, regulate water flows, offer support, water reserves and nutrients to vegetation and support biodiversity. However, they are continuously being modified by man, who bends them to his own needs and purposes, considering them a "neutral" surface on which to carry out his activities.

This is why, when we are looking at a construction project, it is essential to ensure that soil sealing complies with sustainability criteria, first of all avoiding any unnecessary damage to soils that are not directly affected by the construction activities, such as, for example, land used as gardens or public green areas.

To 'mitigate' (lower) the impact of soil sealing processes in urbanised areas, multiple tools are available. Permeable materials and surfaces, green infrastructures (a network of high-quality green spaces connected functionally) and systems for collecting rainwater, are some of the most widespread and effective.

Solutions for permeable surfaces can, in fact, help preserve some key functions of the soil by reducing surface runoff, increasing rainwater infiltration and contributing to connectivity between the ground and underlying soil. Doing so reduces the risks of flooding and water erosion.

Thanks to the ability of vegetation to absorb less heat than conventional materials (e.g. asphalt), and to lower the surrounding air temperature, green infrastructures are one of the most effective tools to reduce the heat island effect in cities, conserve or even increase soil infiltration potential, and reduce the energy demand for air-conditioning. Without forgetting the social benefits, such as the revitalisation of some neighbourhoods and the increase in recreational spaces.

Finally, rainwater collection systems, the creation of floodable basins or other temporary water retention systems, offer further advantages. In addition to reducing runoff, avoiding serious damage in the event of particularly heavy rains, they reduce the amount of water destined to end up in the collection systems, thus favouring evapotranspiration and the biodiversity in the location while reducing the heat island effect in summer.

Evaluation of current ecosystem services and mapping of urban soils in the town of Carpi.

Guidelines to improve resilience to climate changes in urban regeneration interventions

CARPI CASE STUDY

In cities, soil is usually considered secondary to vegetation. The method developed for the assessment of ecosystem services of soils in urban areas has therefore been applied to the case of Carpi to quantify the contribution of soils in mitigation (why it is necessary to preserve/improve/manage urban soils) regarding greenhouse gas emissions, abatement of pollutants, mitigation of heat islands and control of water flows.

In Carpi it was found that the contribution of the soils in public green areas in terms of a capacity to store organic carbon and therefore CO2, is almost double that observed on average in agricultural soils in the area (80 against 43 Mg/ ha), and equivalent to an amount of CO2 emitted per capita per year by 7,892 Italian citizens. In terms of its ability to regulate water flows and retain water useful for plants, the amount of water potentially stored in the soils was the equivalent of approximately 24 Olympicsized swimming pools, 2,500m3. Furthermore, it is important to note that some urban soils with a sealing level of less than 60% provide ecosystem services of even higher value than the average observed for peri-urban and enclosed agricultural soils.

Furthermore, the method made it possible to demonstrate how the succinct soil quality index can be used to steer planning towards criteria for safeguarding higher quality soils.



«Il suolo è una risorsa non rinnovabile: una volta perso, lo è per sempre. Inserire nella Soil is a non-renewable resource: once lost, it is lost forever. Including mitigation elements in urban space planning such as rain gardens, green walls and roofs and green infrastructures, is certainly important, but much more important and effective in terms of mitigation is to maintain (or restore), in situ, soils of good quality that are able to perform their functions in the best possible way, not least that of providing adequate support, water and nutrients for vegetation.»

CLIMATE ADAPTATION AND URBAN REGENERATION

surface (source: World Forum Urban Forest 2018) and are home to 54% of all humans, but emit 75% of pollution and greenhouse gases. They are therefore the main culprits in terms of polluting emissions and climate-altering emissions of anthropogenic origin, and at the same time, they are the first victims of the adverse effects caused by these emissions.

The high concentration of people and activities, and the high degree of artificialisation in their structure, make cities very vulnerable, in particular when it comes to rises in urban temperatures ('heat island' effect), and for exposure to extreme weather phenomena resulting in floods, deluges and inundations.

In addressing the climate crisis and managing adaptation processes, cities will play a central role. Urban planning policies must therefore primarily address the regeneration of cities, and urban regeneration cannot fail to integrate into its implementation precise objectives of climate change mitigation and adaptation. The pursuit of these objectives goes through an approach based on the reintroduction of nature in the city, to improve the social-environmental

Cities occupy only 3% of the Earth's quality and the livability of the urban context. These are complex solutions which require the joint contribution of numerous actors and competencies for which, as yet, there is not enough widespread experience.

> Theguidelinesonurbanregeneration are a guideline document aimed at public administrations and professionals working in the urban planning sectors, which addresses the issues of resilience and urban regeneration processes on an urban and project scale, with particular focus on solutions based on nature that can be put into practice to 'free' the soil of cities through green and blue infrastructures and the use of vegetation in hostile environments. The sheets illustrate different solutions with a series of images, technical drawings and texts and an indication as to the intervention and maintenance costs.

> A second volume is dedicated to the analysis and filing of case studies: twenty selected experiences from among the most significant (mostly European) on the topics of urban desealing and climate adaptation by applying nature-based measures.

Luisa Ravanello, ARPAE

«Nature is the best 'technology' we have to respond to the challenge that the climate crisis poses to our cities. Urban regeneration through green and blue infrastructures allows us to simultaneously respond to the needs of climate adaptation and the demand for livable, comfortable, safe spaces for rest, play, sport and the social interaction of people.»

Fabrizio Ungaro, CNR IBE







Guidelines for the removal. management and reapplication of topsoil.

«It is essential to limit soil sealing as far as possible and to mitigate its negative consequences. Only where this is not possible is 'compensation' considered. Compensation is in quotation marks here because it can be somewhat misleading. It should not be understood to mean that sealing can be exactly compensated by doing 'something else, somewhere else'...». (European Commission)

Since soil formation is a very slow process, and once sealed its functions are practically completely or largely lost, full compensation of the effects caused by sealing and the loss of ecosystem services is not possible. Soil

functions depend on the land and site hosting that soil, and compensating for its loss would mean being able to recover the global capacity of the soils in a given area so that they can perform their functions. In other words, 'compensation' should be equivalent and linked to the ecosystem functions that have been lost.

This is why compensation - however useful and in some cases necessary - should be considered a last resort solution in soil consumption management and should only be used where limitation and mitigation solutions are not practicable.

In any case, all compensation practices must have the primary objective of restoring the overall capacity of the soils of a given area so that they can adequately perform their functions, or at least a large part of them. All this must start with an evaluation that takes into account the different characteristics of the lost soil and the functions that must be restored in the area, also with the aim of compensating for the degradation caused by existing projects.

Implementing compensation in terms of urban planning, therefore, is not something which can be taken for granted. Among the most important methods, the following should be mentioned:

- 1. the reuse of arable soil excavated when sealing an area so it can be exploited elsewhere. In this case, the arable soil removed to prepare the site for constructing a building or a road can be reused in another location to create an environment conducive to germination and plant growth, or to improve poor quality soil where the host soil has suitable physical, chemical and biological characteristics;
- 2. the de-sealing of a cemented area to offset the sealing of another area. Examples are the three cases of desealing carried out by SOS4Life, which have restored green areas previously covered by asphalt and buildings.

GUIDELINES ON THE REUSE OF TOPSOIL

provide technical indications so that the soils excavated during the execution of building or infrastructural works, based on their intrinsic qualities and correct management in all construction site stages, can be fully reused in situ or areas intended for urban regeneration interventions, public spaces, naturalistic or rural areas.

This method of re-use permits conservation of the soil resource and an increase in the environmental sustainability of the projects themselves, implementing full and effective compensation also of the soil ecosystem services.

The guidelines contain practical indications that have arisen from the experiences of countries where the reconstruction of soils is a practice required by law, as is the case in Switzerland. The methods of excavation, storage and restoration were then calibrated based on what is possible according to the national legislation (Presidential Decree 120/17 and Legislative Decree 152/06), making use of the

The guidelines created by SOS4Life experience of the municipal and regional technicians who made up the workgroup.

> The guidelines support the use of cartographic tools produced by the Region and available to the public on regional portals, aimed on the one hand at enhancing understanding of the 'soil' matrix and on the other at simplifying the approach for technicians who are not soil experts but who deal with it in various ways.

The publication is intended for those authorities in charge of managing and planning urban territory and sector technicians and has among its objectives that of supporting administrations in the management of virtuous circular economy cycles that see good quality soils reused within short distances and preferably within the same municipal area. The proposal of operational tools such as platforms for by-

products (which in some regional realities are already sponsored by ANCE Veneto) contributes to the application of this practice



Nazaria Marchi, Emilia-Romagna Region

«Every effort must be made to contain soil consumption: some actions are simpler, others more complex and difficult to put into practice but only if we as technicians begin to include them in our work tools, each within our own competences, have we any hope of making some virtuous practices germinate that one day will become common practice and help us achieve our goal.»



«In order to promote de-sealing operations and make them increasingly more widespread, especially when they involve private entities, the public must know how to exercise a role of effective steering and control, but above all, efforts must be made to spread greater awareness and a new culture among economic operators, professionals, and the public administration itself.»

Anna Maria Tudisco, Municipality of San Lazzaro di Savena

NO NET LAND TAKE

The concept of 'no net land take' assumes a balance between soil consumption and the de-sealing of an area currently sealed that must be restored to a green area or for agricultural use.

A compensatory system for soil consumption is therefore based on the availability of a stock of sealed areas to be de-sealed. It is therefore essential to identify and map areas which can potentially be allocated to de-sealing operations and to update the relative database.

Compensatory interventions must however respond to priorities established by the Administration in order to implement a broader strategy for urban and ecologicalenvironmental quality, of which the quantitative compensation for the consumption of new soil will only be a partial response.

In fact, the de-sealing and restoration intervention will not be able to restore all the ecosystem functions that have been lost with the sealing of that soil, because the damage created by the urbanisation ¹³ of a soil is not only quantitative but also qualitative. That is, it depends on the quality of the transformed soil because not all soils are the same.

To implement a compensation system, it is necessary to define who will carry out the work, estimate the costs, establish operating procedures to guarantee correct execution and recognise the possibility of registering and exchanging surface credits acquired through de-sealing operations.

Forlì



San Lazzaro di Savena



Carpi



Forlì - From the parking lot to the "Museum Garden"

The aim of the project is the regualification and development of part of the area in front of the San Domenico Museums complex, home to the Civic Art Gallery and temporary exhibitions, by replacing the entire parking area with a public green area that will link up with adjacent roads, restoring the ground level of the historic buildings, reminiscent of the lost gardens.

A first stage of the intervention, co-financed with state and municipal funding and with the contribution of the Forlì Cassa dei Risparmi Foundation, sees the demolition and removal of the paving and structures of the current openair car park (about 6,500m2) up to the underlying permeable stratum, with an increase in the permeable surface from the current 6% to over 70%. Restoration of the green area will follow by replacing the soil and topsoil. The area will be grassed and planted with trees and equipped with urban furniture and cycle-pedestrian paths.

The green area will increase by 4,500m2, helping to implement the provision of green areas and public spaces at the service of the historic city centre and improving the resilience to climate change in this part of the city.

San Lazzaro di Savena - The Savena river returns to the city: the work by Alce Nero and the new riverside park

This intervention involves the portion of the "Caselle" business park occupied by municipal warehouses, yards and waste storage areas used by the municipal waste disposal centre, which for a long time has been considered a critical issue because it separated the Savena river and its natural landscape from the city.

First characterised by large asphalted surfaces, the area will see the construction of three circular buildings by Alce Nero, the Italian leader in organic food, and integration between the private and public green areas of the River Park in a new logic of openness and accessibility of spaces that the private sector is making available to the city.

The intervention has already seen the demolition of existing buildings, structures and paving for a total of 8,000 m3 of buildings, and over 13,000 m2 of paving, as well as the environmental remediation of the area. Soon, however, work will start to backfill the area with biologically active agricultural land in order to restore the level vacated by a depth of approximately 30 cm of asphalt and other removed materials and to surround the new buildings with a park open to the city in continuity with the Riverside Park.

After the construction of the new buildings at Alce Nero, the area will benefit from an increase of over 6,700 m2 of permeable surface, which will be an increase from 24% of the total before work began, to approximately 63%.

Carpi - Requalification of Viale Carducci

This intervention involves de-sealing a large strip of land on the west side of Viale Carducci. It is an avenue lined with trees on both sides, about 800 meters long, located on the edge of the historic town centre of Carpi, built along the route of the old city walls.

Currently the surface of the avenue is almost entirely paved except for the tree trunks that protrude from the asphalt. The removal of the asphalt surface concerns both the space under the trees and the adjacent cycle path.

The entire strip below the trees (1,670 m2) will be restored to greenery with topsoil and the planting of shrubs with the function of a long 'rain garden', while the cycle path will be repaved using permeable materials.

The goal is to create a real green urban infrastructure, which reconnects the historic urban core and its first expansion. But the aim is also to improve climate adaptation by favouring better runoff and partial infiltration of water, thanks to the de-sealing and creation of a long permeable area.

The area of intervention is approximately 3,625 m2, of which only 162 m2 are currently permeable. At the end of the intervention, the percentage of permeable surface will go from 4% to 46%.





Travelling Photo Exhibition "A treasure of soil" Educational kit "A treasure of soil" Video "A question of soil" Video "Mini videos on soil"



been built on. To describe the benefits that soil brings to man, verbs were chosen that refer to care, protection, well-being. Essential functions for the survival of the species that inhabit the planet, to which man has not paid the necessary attention and which must instead become the reference point for common attention.

To fill the gap in educational paths dedicated to the soil and its environmental and social value, particular attention was also paid to schools and teachers, for whom an educational kit was created illustrating the ecosystem functions of soil and to sharing the research and demonstration work carried out within the project. A tool which was also accompanied by the production of a video specifically aimed at children focused on an encounter between a worried, environmentally-conscious citizen and a cow.

In doing so, by narrating the benefits enjoyed by human beings when the soil is intact and of quality, and vice versa of the degradation to which the environment is condemned when the soil is consumed irresponsibly, future generations of citizens, technicians and political decision-makers will be able to draw fundamental elements for reflection and become guardians of the planet and all forms of life which inhabit it.



Mauro Solmi, Industrial Technical Institute "IIS F. Corni" (Modena, Italy) ecosystems.»



Caterina Bortolani, Scientific high school "A. Tassoni" (Modena, Italy)

Lorenzo Frattini, Legambiente Emilia-Romagna «The policies for soil protection arrived late compared to those of other environmental matrices and are not yet completed. And the transformation of the soil has long been a subject of the exclusive prerogative of technicians and administrations, due to its technical and regulatory complexity. Reasons which have limited the acquisition of awareness and involvement of citizens. What is needed, therefore, is everyone's commitment to spreading the culture of soil and curbing its consumption. The idea that everyone can do something must become widespreadly acknowledged, as is already the case when it comes to not wasting water or recycling household waste.»

«Lack of awareness about the role of soil in the ecosystem and the economy, as well as about possible negative impacts of land take, especially in the medium to long term and considering the expected effects of climate change, has been identified by many observers as one of the major obstacles to more sustainable land planning policies and land use.» (European Commission)

Soil is a finite and non-renewable asset that generates a long and extraordinary series of services of collective value: hydro-regulation of rainwater, support for ecosystems and biodiversity, agricultural production capacity, beauty

and historical memory. An extraordinary capital that should not be spoilt. However, until recent years soil was treated as an infinite asset, and its protection received little attention, both from a regulatory point of view and as a theme of environmental education. This is demonstrated by the exasperated rate of agricultural soil consumption that we witnessed until a decade ago, which involved political decision-makers, planners and economic actors, but also citizens and their private choices.

Today, conditions seem to have changed and a new sensitivity has emerged among institutions, professionals and citizens, but turning the value of soil into a culture remains a necessary and still urgent objective, due to the environmental, economic and democratic participation implications that revolve around land use.

Only a public opinion aware of the wealth and fragility of the soil, and its value as a common asset can give sufficient strength to institutional policies and create a counterweight to the economic interest to build wherever it is simpler - that is, in agricultural or natural spaces. - instead of regenerating existing buildings.

It is also necessary for practical options to become a part of our common understanding; that from sealing soil it is also possible to go back, by de-sealing both public spaces and home gardens; that cities must change appearance with 'green and blue infrastructures' needed to adapt to climate change. Therefore, it is necessary to work to disseminate the necessary technical baggage and the "toolbox" for technicians and urban planners, while at the same time building adequate awareness among citizens.

To spread and share this new sensitivity, SOS4Life has carried out numerous activities, including a travelling photo exhibition entitled "A treasure of soil" that has travelled to various locations and various contexts - schools, universities, public spaces frequented by professionals in the sector and ordinary citizens - as an informative and educational tool to make people reflect on the importance of preserving the soil and regenerating what has already

«Soil is the indispensable support for all types of vegetation and an indispensable resource for life, increasingly limited and threatened by urbanisation, pollution and climate change. In Earth Sciences and Biology, in the Technical Institutes, a specific study on soil provides students with critical reflection on global and local environmental problems and allows them to acquire deeper knowledge on the interactions between the biotic and abiotic components which shape

«Despite knowing that it is an essential resource for life, soil is a topic which is often overlooked in school courses. Unexpectedly, the meeting with SOS4life aroused curiosity and questions from the students even in the discussions which were continued at class level. At a time when even recent school directives seem to realise the importance of environmental education, initiatives like this can certainly contribute to a reflection that can and must involve more disciplines, and therefore lead students to understand the complexity of the environmental system.»



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Regione Emilia-Romagna

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Quotes taken from: "Guidelines on best practice to limit, mitigate or compensate for soil sealing", European Commission, 2012





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