Circular Economy Lab & Observatory

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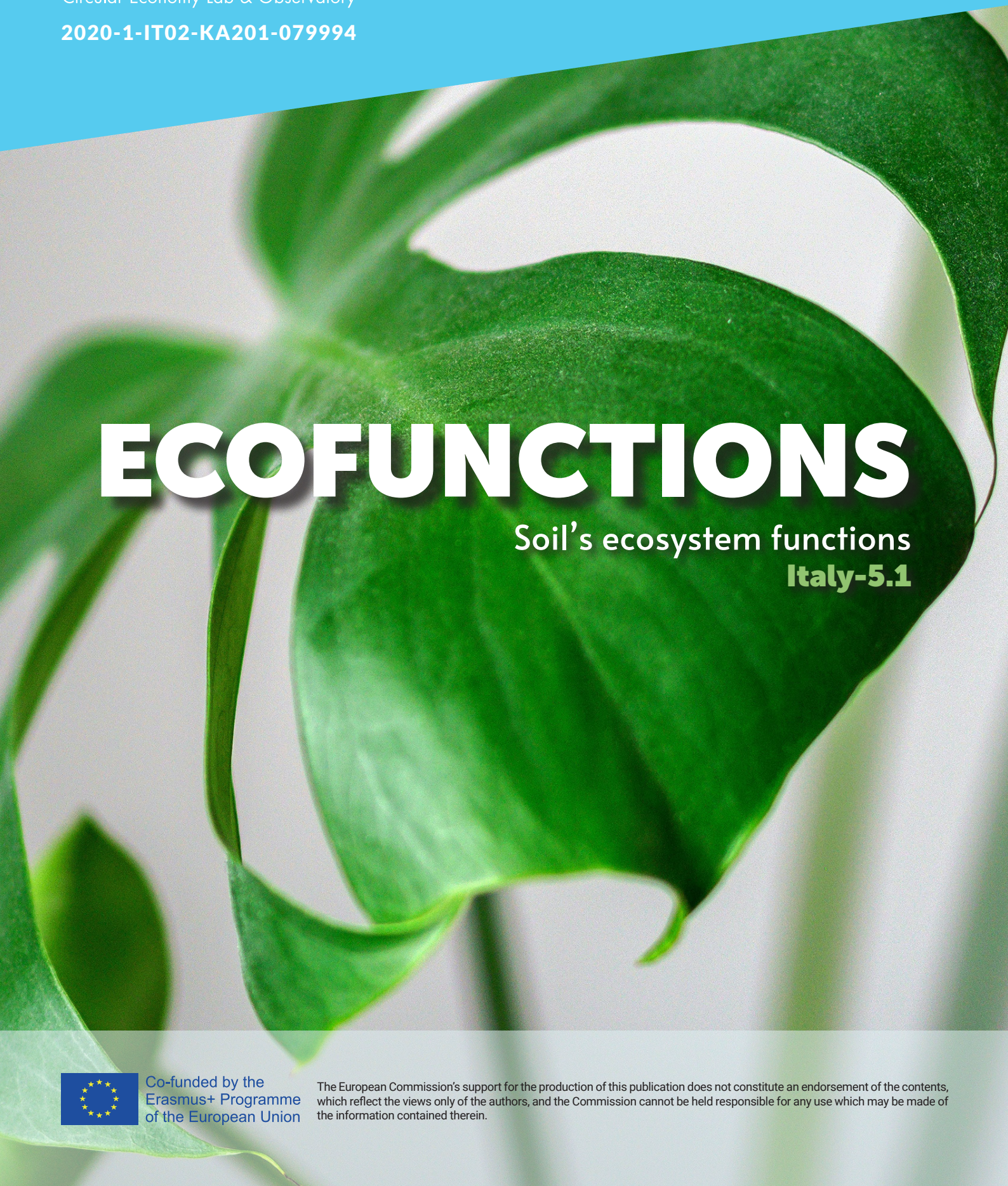

ECOFUNCTIONS

Soil's ecosystem functions

Italy-5.1

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Introduction;
The term "soil" refers to the upper part of the earth's crust composed of minerals such as clay and sand, humus, water, air and very small living organisms. In fact, in the soil there are many animal or vegetable organisms whose function we sometimes underestimate. These are: bacteria, algae, worms, fungi etc ... These organisms present in the soil decompose the organic matter, release nitrogen useful for nourishing the plants and crush the soil, making the soft clouds full of air and ready to accumulate water...

The best known among the annelids that populate the soil is the earthworm, responsible for the regeneration of the soil. There are numerous functions that can be performed thanks to the presence of the soil that covers the earth's crust: it serves for the production of food for both humans and animals, it is a source of energy and raw materials. It is the basis on which the woods, houses and infrastructures rest. It also performs intangible functions as a component of nature and the landscape.

Of course, these ecological and economic functions of the soil can only be realized if: the water balance and porosity are not compromised, the plants can develop roots, there is a balance between nutrients and the type and quantity of organisms living in the soil and the pollutant content remains at an acceptable level for all organisms living in that soil.

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Soil is a non-renewable resource, because the processes of formation and regeneration are very slow. Unfortunately, the soil is an inert substrate that reacts to external stimuli late: problems are identified only after a while, when it is often too late to be able to remedy. The soil is the point of arrival of pollutants; therefore chemical contamination is often irreversible and the full functionality of the soil can only be guaranteed by an intact structure. [1] It must be understood that the balance of the soil must be preserved in order to have a living and functioning ecosystem.

The demographic increase accompanied by a disorderly expansion of urban centers, industrial and infrastructural development, the extraction of raw materials, the development of intensive agricultural practices and the local effects of global climate change, have over time determined an unsustainable situation that has produced a series of soil degradation processes. With respect to these critical issues, the need arises to protect the soils and especially the ecosystems that populate it.

According to the most recent studies, we lose about 24 billion tons of fertile soil per year. Polluted and contaminated soil has implications for our food, the water we drink and the air we breathe.

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Without fertile soil, it is impossible to guarantee the life and well-being of human populations. Furthermore, through the washing away of the soil, the pollution is also transferred to the waterways and, through the rains, to the aquifers.
The scarcity of fertile soil alters entire ecosystems triggering a trend towards desertification.

Problem's description;
The soil in normal conditions, without significant alterations, provides humans with the ecosystem services necessary for their livelihood. These are various types of services, for example supply services for both food products and raw materials, climate regulation services, carbon capture and storage, erosion control, water quality regulation, protection of phenomena. extreme hydrologicals. Physical support services, organic matter decomposition and mineralization, species habitat, biodiversity conservation and recreational services.

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Despite the fundamental services it provides to ecosystems, soil is too often perceived only as a support to agricultural production or as a physical basis on which to develop human activities. [2] The pressures to which the soil is subjected are considerable: population growth accompanied by a disorderly expansion of urban centres, industrial and infrastructural development, the extraction of raw materials, the development of intensive agricultural practices and the local effects of climate change global, have over time resulted in an unsustainable situation that has produced a series of degradation processes of the soils.

With respect to these critical issues, the main threats that compromise their correct functionality have been explicitly identified in the past: erosion, organic matter decrease, deforestation, local contamination and widespread contamination, waterproofing, compaction, salinization, landslides and floods, loss of biodiversity. All this determines the deterioration of all the properties of the soil.

https://www.pexels.com/it-it Photo by Greta Hoffman

The numerous reports from the European Environment Agency and the Joint Research Center of the European Commission have for years highlighted problems of degradation, excessive exploitation and inadequate management of the soil.

The recent World Atlas of Desertification highlights how population growth and changes in our consumption habits create unprecedented pressures on the planet's natural resources: over 75% of the earth's surface is already degraded and this percentage could reach 90% in 2050.

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For the European Union, the economic cost of this degradation is estimated in the order of tens of billions of euros per year. [3] The provision of ecosystem services is essential to meet the needs of society (just think of food, drinking water, energy production or infrastructure) and to overcome crucial challenges such as mitigation and adaptation to climate change, migration or population growth. Soil is at the heart of these challenges and best practice strategies can only be met with soils in good health.

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Possible solutions;
In the European Union, the protection of the environment, and consequently of the soil, has been the subject of discussions for some time aimed at promoting sustainable development oriented towards the protection of natural resources. to be understood and recognized and international initiatives have intensified the awareness process. Physical and chemical deterioration is not always irreversible, it can only be remedied with great efforts.

Therefore the precautionary principle has the highest priority in soil protection. A drastic change in the production model or a ban on widespread practices would be needed. There are organic fertilisers that do not harm the environment because they use natural components. The same thing can be done using biological pesticides. Good practices such as the proper recycling of waste, the purification of waste, the use of renewable energy and organic farming, would contribute significantly to keeping the earth's soil free from pollution.

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Without forgetting the improvement of the purification of sewer networks, wastewater and industrial discharges that end up in nature. Pollution has increased in recent decades due to extreme industrialization and urban development, the main solutions should focus precisely on these factors.

Recycling should be a fundamental basis for taking care of the planet. Prefer glass products, which require little time to dissolve, over plastic products, which are the main pollutant in the soil. Use reusable containers such as cotton bags, paper bags and other easily decomposable organic materials. Improving the quality of life in large urban centres. Consolidate the public transport system, also introducing limits on the use of private cars.

Soil bioremediation is a process that seeks to restore polluted ecosystems using living organisms such as bacteria, plants and fungi. Its application is becoming broad, with interesting results. Another necessary condition is that the contaminants to be removed are physically and chemically accessible.

The use of microorganisms can be carried out for the decontamination of organic compounds, for the evaluation of toxicity, and the transformation or decomposition of contaminants with high reaction rates.

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The second line of this type of techniques is that of phytoremediation, that is, the use of plants particularly suitable for growing on contaminated soils. Contaminants can be stabilised, decomposed directly in the soil, or absorbed by the roots and translocated and stored in the aerial organs of plants. If the contaminants are just above the legal limits it is a very appropriate technique. Otherwise, more crop cycles must be envisaged, or alternatively the site must be made safe.

To be able to contribute to soil restoration, we could follow some simple rules: Engage with separate waste collection. Never skimp on recycling materials. Preferably use biodegradable containers. The accumulation of residues, such as plastics, require many years or decades of degradation. Limit the use of chemicals in agriculture and use only organic fertilisers. The products can be found in garden shops.

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Fighting air and water pollution, following an eco-respectful style. Encourage the use of individual total oxidation purification plants or other types of similarly effective plants for the disposal of civil wastewater. Avoid the release of unauthorised waste into the environment. Do not throw organic waste but keep it for compost.

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Conclusions;
Everything we eat and drink comes from nature, but pollutants can get into our food and water and cause us to develop diseases or malformations. Soil just like water just like water and air is an essential element for life on Earth.

In fact, plants sink their roots in the soil, from which they draw nourishment. Protecting the environment is important because resources such as air, water, plant species and animal species are not inexhaustible, but often, and unfortunately, have been considered as such. Soil regeneration processes are rare, complex and require considerable amounts of energy and long times to restore the intrinsic conditions of the soil before its waterproofing.

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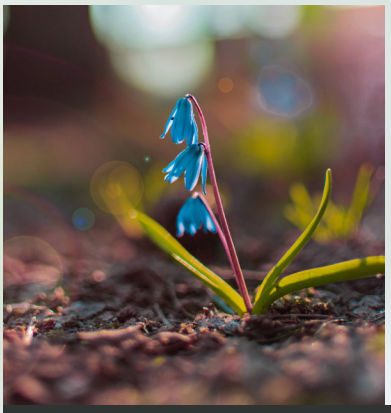
In any case, all regeneration practices must have as their primary objective that of restoring the general capacity of the soils of a given area so that they can adequately perform their functions, or at least most of them. All this, starting with an assessment that takes into account the different characteristics of the lost soil and the functions that need to be restored in the area, and with the aim of compensating for the degradation caused by the existing projects.

Practising compensation in terms of urban planning, therefore, cannot be taken for granted. Today conditions seem to have changed and a new sensitivity has emerged among institutions, professionals and citizens, but making culture on the value of the soil remains a necessary and still urgent objective, due to the environmental, economic and democratic participation implications that revolve around the use of the territory.



Only a public opinion aware of the richness and fragility of the soil, and its value as a common good, can give sufficient strength to institutional policies and create a counterweight to the economic interest to build where it is simpler – that is, in agricultural or natural spaces. – instead of regenerating existing buildings. We need a framework law to protect and sustainably manage the soil where ecosystem services exist. It is necessary to legislate by recognizing in the definition of soil its role as an environmental resource (as much as water and air).

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But legislating on the ground is very difficult ... there is agriculture, the environment, production activities, urban planning, landscape assets ... highly structured interests.

Perhaps a super partisan legislative effort is needed. The world of research must also do its part, giving priority to these issues, perhaps not always strategic, but with a great social and economic impact. Without this awareness we have already lost.

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