SOS4LIFE: Guidelines for the removal, management and re-use of topsoil at construction sites

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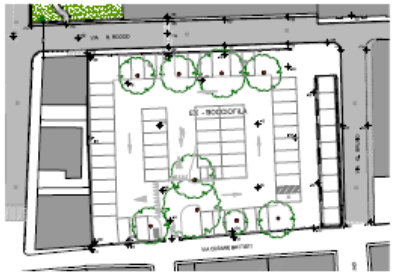
Actions B2 – Demonstration actions of de-sealing through soil reinstatement

B 2.4 Guidelines for the removal, management and re-use of topsoil at construction sites

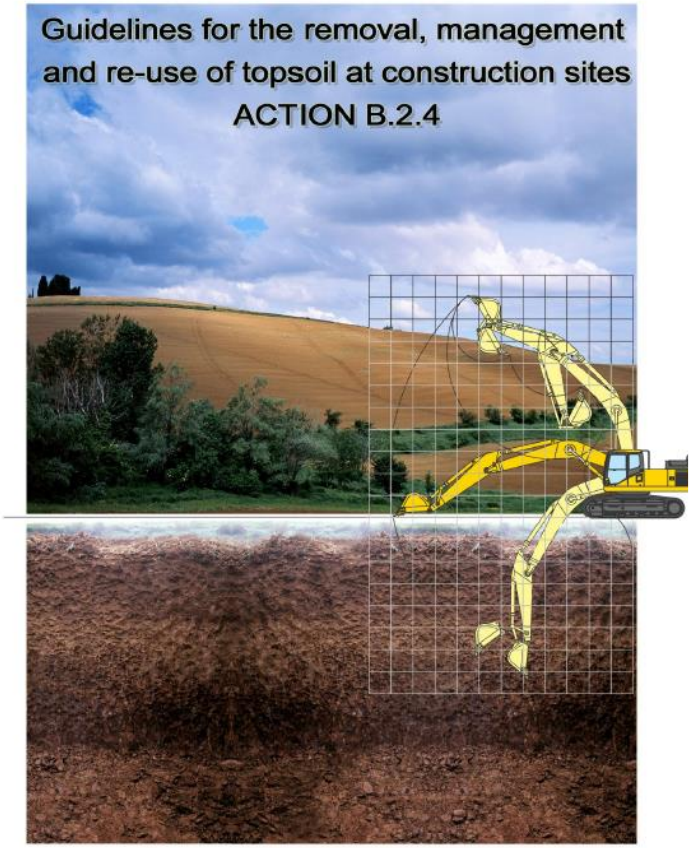
Forlì
6.500 mq



Carpi
2.200 mq

San Lazzaro di Savena
16.000 mq

Guidelines for the removal, management and re-use of topsoil at construction sites



LIFE15 ENV/IT/000225
Guidelines for the removal, management and re-use of topsoil at construction sites
ACTION B.2.4

Guidelines for the removal, management and re-use of topsoil at construction sites

This guidelines aim to:

1. Promote the **limitation of soil sealing** (as suggested by the EU Guidelines on best practice to limit, mitigate or compensate soil sealing, SWD\2012\101);

2. **Value soil** and facilitate its **reuse** in the production and management of excavation materials for building works and infrastructures in application of Presidential Decree 120/2017 and Directive 851/2018;

3. Create a **circular economy** within which soils excavated during the realization of construction works and infrastructures are re-used, within a short distances and preferably in the same municipality, in areas for urban re-use and regeneration, as defined by the art. 7, paragraph 4 of Regional Law 24/17;

4. Limit the use of soil improvers in urban green areas, use suitable plant species and ensure a better quality of the soil and of the site involved in the operations of reuse.

Guidelines for the removal, management and re-use of topsoil at construction sites

1. Analysis of best practices

The Netherlands, Belgium/Flanders, United Kingdom, Germany, Switzerland…

United Kingdom:

British standard 3882:1994 (revised in 2007). *Specifications for Topsoil*

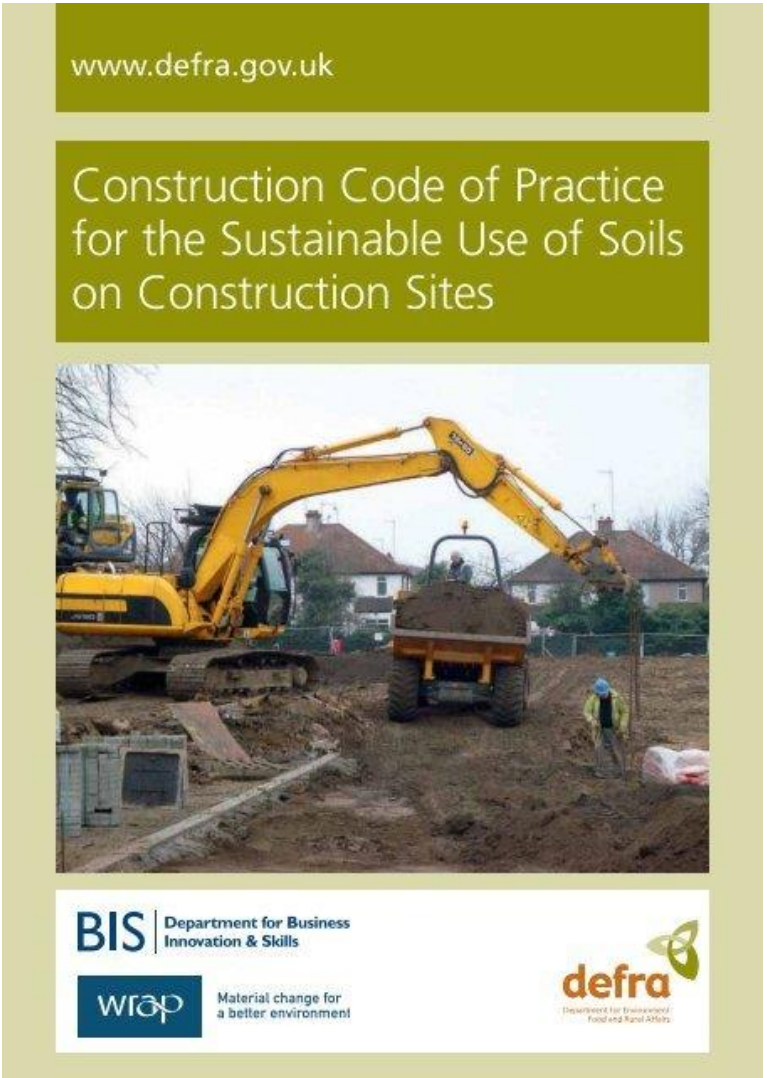
DEFRA,2009. *Construction code of practice for the sustainible use of soils on contruction sites*

Switzerland:

Federal Office for the Environment, Forests and Landscape (OFEF). Environmental Guide n.10., 2001. *Building Protecting soil* Environment-Execution, 2001. *Examination and recycling of earthworks*

FOEN, 2008. *For effective soil protection at construction site-directives and planning advice*

FOEN, 2015. *Soil and construction sites, state of technology and practice*

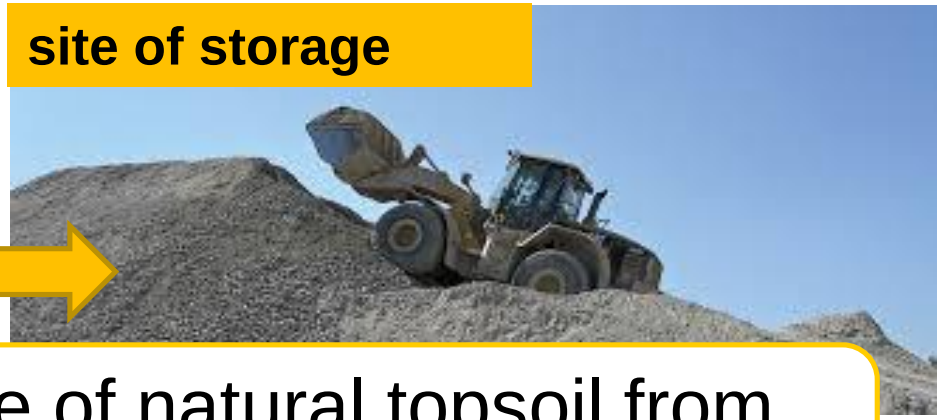


2. Analysis of the legislation regulating de-sealing

According to italian legislation an area of desealing is contemporary a *site of production* of material and a *site of destination* for material

site of production

site of storage



promote the re-use of natural topsoil from construction sites to cover de-sealing areas

site of production

site of destination

2. Analysis of the legislation regulating de-sealing

❑ THE CONCEPT OF SOIL

For the engineer it is a rock or a sediment to take account for the operations of earthmoving, foundation and construction

For the quarrier it is that diaphragm of material to be removed before beginning the exploitation of the quarry.

For the botanist and the naturalist: it is the support for plant and animal life.

For the farmer portion of land surface susceptible to exploitation in view of an animal or vegetable production.

For the pedologist, soil is the product of alteration, of the change and organization of the upper layers of the earth's crust, under the action of life, of the atmosphere and of the exchanges of energy manifested therein (Giordano, 1990) .

Soil is a 3D natural body, composed of mineral particles (sand, silt and clay), decomposed organic substances, living organisms, air and water. It is presented with thicknesses ranging from a few centimeters to a few meters, is organized in horizons or layers.

2. Analysis of the legislation regulating de-sealing

❑ THE CONCEPT OF SOIL

Soil profile

A horizon= soil upper layer with up to 30% of organic matter

B horizon= soil lower (or mineral) layer; it is structured and biologically active; it has a lower humus content and it hosts less roots than the A horizon

C horizon= bottom layer (parent material); almost rootless made up by non-structured sediments or rocks

Removed soil = excavation material

Topsoil (generally 5-30 deep): scarification of humus layer and soil removal

Subsoil
Removed
(if soil depth and quantity are enough, remove it and stock temporarily in layer of at least 50 cm)

Excavated material
Instruction (2)
The lower limit of soil excavation depends upon the goals of the re-use (depth of soil after restoration)

Excavated material

Excavation
In compliance with D.P.R. 13/06/2017, n. 120

Guideline application

Pedology	Construction site
A Horizon (organo-mineral)	Dirt / vegetable soil
B Horizon (mineral)	Dirt / inert soil
C Horizon	Digging material
Rock /sediment	Rock / sediment

2. Analysis of the legislation regulating de-sealing

❑ THE CONCEPT OF SOIL IN LEGISLATION

EU Waste Framework Directive 2008/98/CE, modified by DIR 2018/851/UE
Soil: *waste or by-product?*

Leg. Decree no.152/06	DPR no.120/17	RL 24/2017
Testo Unico Ambientale Parte seconda title I, item 5,par. 1,lett. v-quater	**Normativa ambientale sulla gestione delle terre e rocce da scavo** item.2 par1, lett. b)	**Disciplina regionale sulla tutela e l'uso del territorio** item. 1 par. 2 let. a)
The most superficial layer of the earth's crust located between the rocky substratum and the surface. The soil is made up of mineral components, organic matter, water, air and living organisms. The meaning of the term includes, in addition to the soil as previously defined, also the territory, the subsoil, the inhabited areas and infrastructures.	The most superficial layer of the earth's crust located between the rocky substratum and the surface. The soil is made up of mineral components, organic matter, water, air and living organisms, including the reporting materials matrix according to item 3, paragraph 1, of the decree-law of 25 January 2012, n. 2, converted, with amendments, by law March 24, 2012, n. 28.	**Common good** and **non-renewable resource** that performs functions and produces ecosystem services, also in relation to the prevention and mitigation of hydrogeological events and mitigation strategies and adaptation to climate change. RL 17/2017 ,art.5,comma 3; art.9,comma1, artt.12, 15, 20, 21 **urban regeneration , no net land take by 2050** (COM(2011)571

Guidelines for the removal, management and re-use of topsoil at construction sites

2. Soil as by-product-PRD no 120/2017

Definition according to PRD no.120/2017, Item 2, par.1, lett. c): *soil escavated within activities finalized to a construnction project*, which can be

- excavations in general (excavation, foundations, trenches);
- perforations, drilling, piling, consolidation;
- infrastructural works (tunnels, roads);
- soilremovals and ground levelling

Guidelines for the removal, management and re-use of topsoil at construction sites

Pedology	D.lgs 152/06- 2*	DPR 120/07**	LR 24/2017
A horizon (organo-mineral ~0-50 cm)	Superficial soil (0-1 m)	Superficial soil (0-1 m)	nd
B horizon (mineral~50-100 cm)			
C horizon (>100cm)	Deep soil > 1 m to groundwater level	Deep soil (1-2m)	
Rock /sediment	Underground	Excavation bottom	

The starting point in the Italian legislation is to distinguish whether the soil is to be considered as excavated soils and rocks (i.e. by-product) or as a waste.

ENVIRONMENTAL PREREQUISITES

Pollutant concentration < threshold values* or < natural background values

* Leg.Decree no.152/2006

TIME OF STORAGE

«big building sites»(>6000 m^3) subjected to IPPC/IED (Dir. 2010/75/UE) or EIA (Dir. 2014/52/UE) ≤ 2 years

«big building sites» not subjected to IPPC/IED or EIA ≤ 1,5 years

3. Soil characterization

If the topsoil material has the requisites of a by-product, its Intrinsic quality can be assessed (BS 3882:1994/Guidelines)

Premium grade topsoil *:* natural topsoil with **high intrinsic *fertility***, **loamy *texture*** and **good *structure***. This high quality may be unnecessary for the majority of topsoil applications where the other grades may be entirely satisfactory. *NOTE: if mishandled or badly stored, premium grade topsoil can change to one of the other grades*

General purpose grade topsoil*:* general purpose grade includes natural topsoil with **lower intrinsic quality then a premium grade** topsoil or **a premium grade topsoil that has deteriorated due to poor handling.**
NOTE: general purpose grade topsoil may require improvement by lime and/or fertilizer treatment.

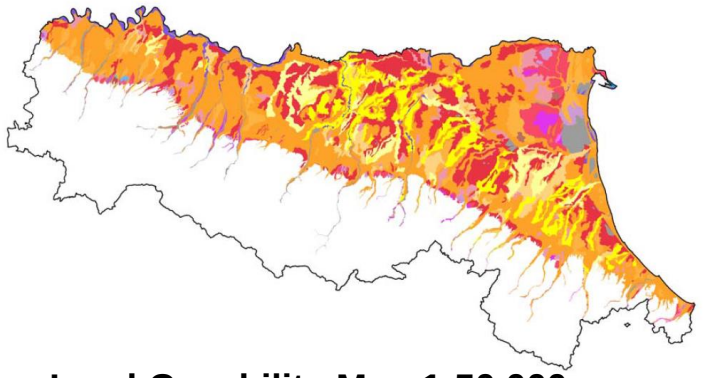
***Economic grade topsoil* :** This is derived from a topsoil of **lower intrinsic quality than general purpose grade topsoil** or a material, such as selected subsoil or friable mineral matter which is suitable for plant growth.
NOTE: Because of its possible origin, no minimum organic matter or plant nutrient status is specified for economy grade it will probably require fertilizing, manuring and careful husbandry (perhaps over a number of years) to achieve satisfactory productivity;

3. Soil characterization: Topsoil quality assessment

	Premium topsoil	General purpose grade topsoil	Economic grade topsoil	Determination
Textural classification	FLA (clay ≤ 27%), FA, FS, FAS, FL, F	SF, FS, F, FL, AS, FA, FLA (clay ≤ 35%), AL, A (silt MAX 50%)	SF, FS, F, FL, AS, FA, FLA (>35%), AL, A (silt MAX 50%)	D.M. 13/09/1999
Nutrient Content N (g/kg) P_2O_5 (mg/kg) K_2O (mg/kg)	N >0,5% P_2O_5 >23 mg/kg K_2O > 120 mg/kg	N >0,5% P_2O_5 >23 mg/kg K_2O > 120 mg/kg	nd	D.M. 13/09/1999
Organic Substance (CO*1,726)	≥ 2,5%	≥ 2%	< 2%	D.M. 13/09/1999

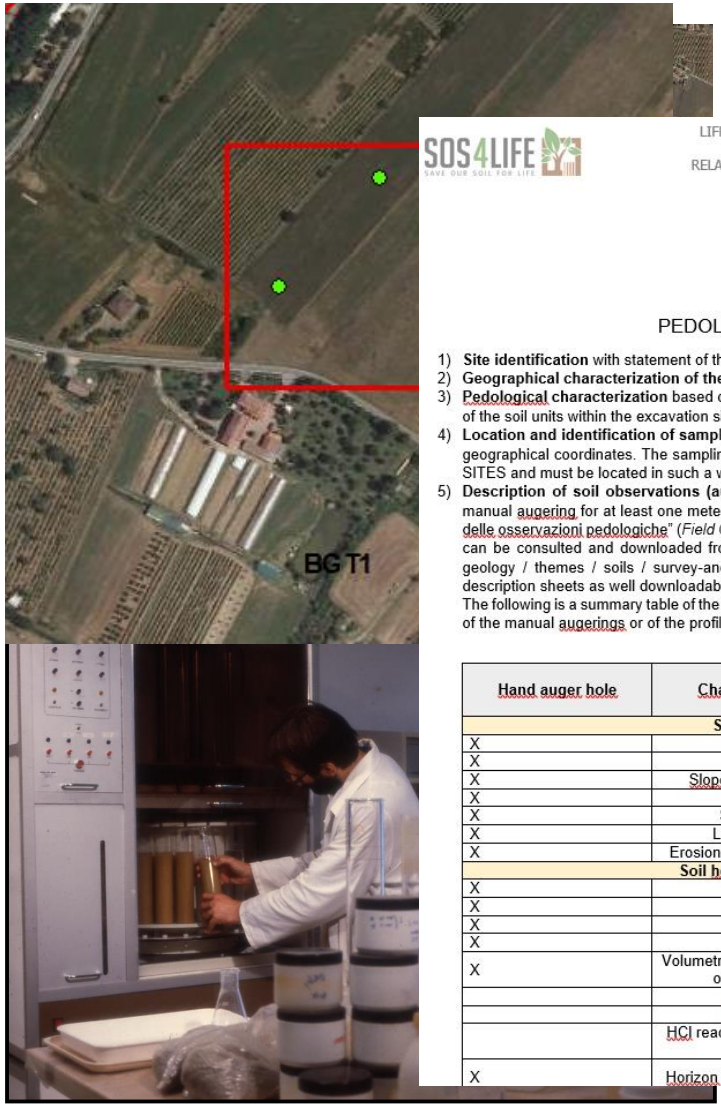
Land Capability

Topsoil Parameter	LCC Map
Texture	x
NPK content	x
Soil organic matter content	x
pH	-
ESP	-
CaCo3	-



Land Capability Map 1:50,000

3. Topsoil quality assessment



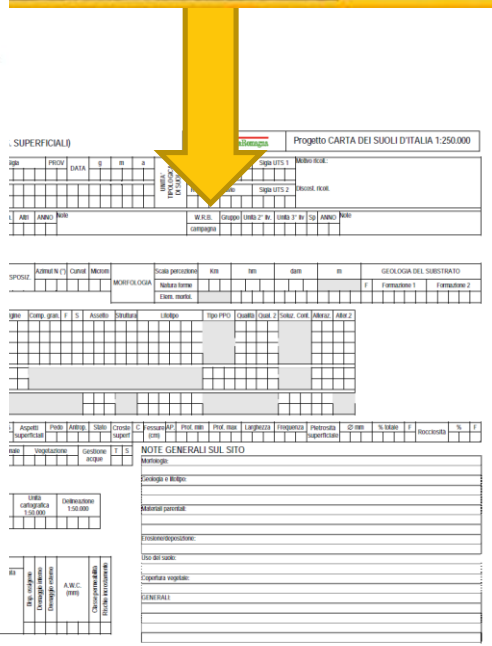
LIFE15 ENV/IT/000225
AZIONE B2.4
RELAZIONE PEDOLOGICA

+ANNEX 1

PEDOLOGICAL REPORT

1) **Site identification** with statement of the volume to be excavated.
2) **Geographical characterization of the survey area**.
3) **Pedological characterization** based on the 1:50.000 map of the soils of Emilia with description of the soil units within the excavation site http://geo.regione.emilia-romagna.it/cartpedo/.
4) **Location and identification of sampling sites on a cartographic basis** with indication of the geographical coordinates. The sampling sites must have a density of 1 per hectare for LARGE SITES and must be located in such a way as to homogeneously represent the area as a whole.
5) **Description of soil observations (auger hole or profile).** Each site must be described by manual augering for at least one meter depth using the "Guida di campagna per la descrizione delle osservazioni pedologiche" (*Field Guide for the description of pedological observations*) that can be consulted and downloaded from the site http: //ambiente.regione .emilia-romagna.it / geology / themes / soils / survey-and-cartography-of-the-soil # section and the appropriate description sheets as well downloadable from the same site.
The following is a summary table of the characters to be described with regard to the construction of the manual augerings or of the profiles subdivided into site, soil and horizons.

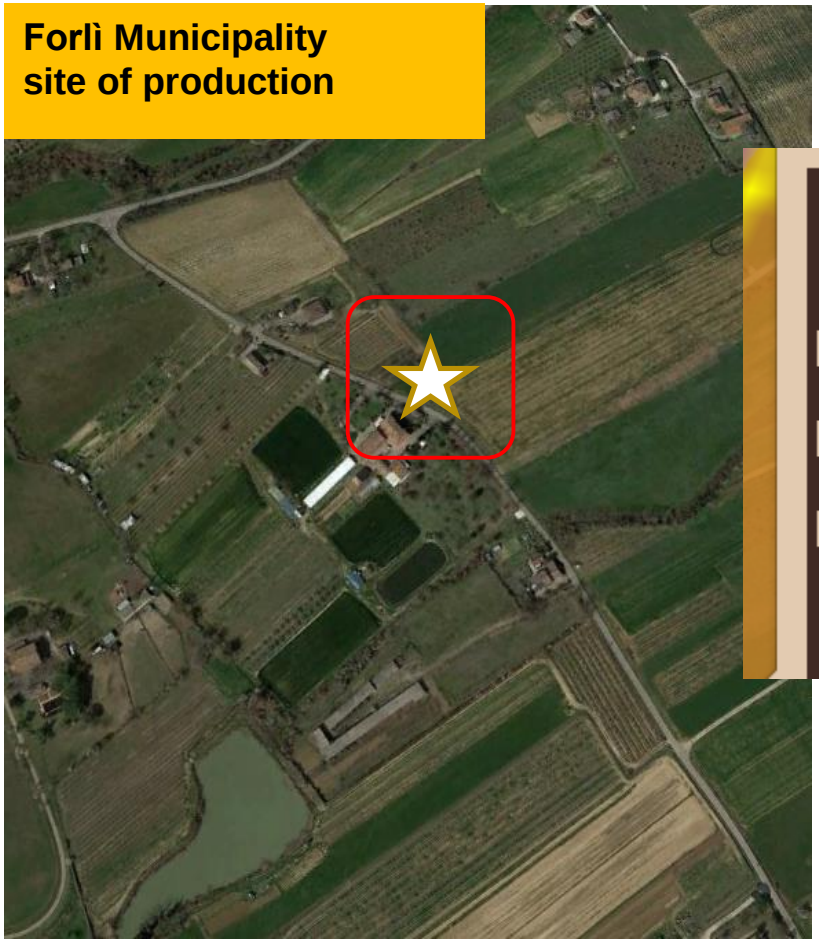
Hand auger hole	Characters to describe	Soil profile
	Site characteristics	
X	Coordinates	X
X	Date	X
X	Slope aspect and elevation	X
X	Morphology	X
X	Surface stoniness	X
X	Land use, soil cover	X
X	Erosion or other surface features	X
	Soil horizons characteristics	
X	Depth	X
X	Humidity	X
X	Color	X
X	Textural class	X
X	Volumetric content, form, and sizes of coarse fragments	X
	Structure degree	X
	Field pH	X
	HCl reaction for coarse fragments and fine earth	X
X	Horizon designation and sampling	X

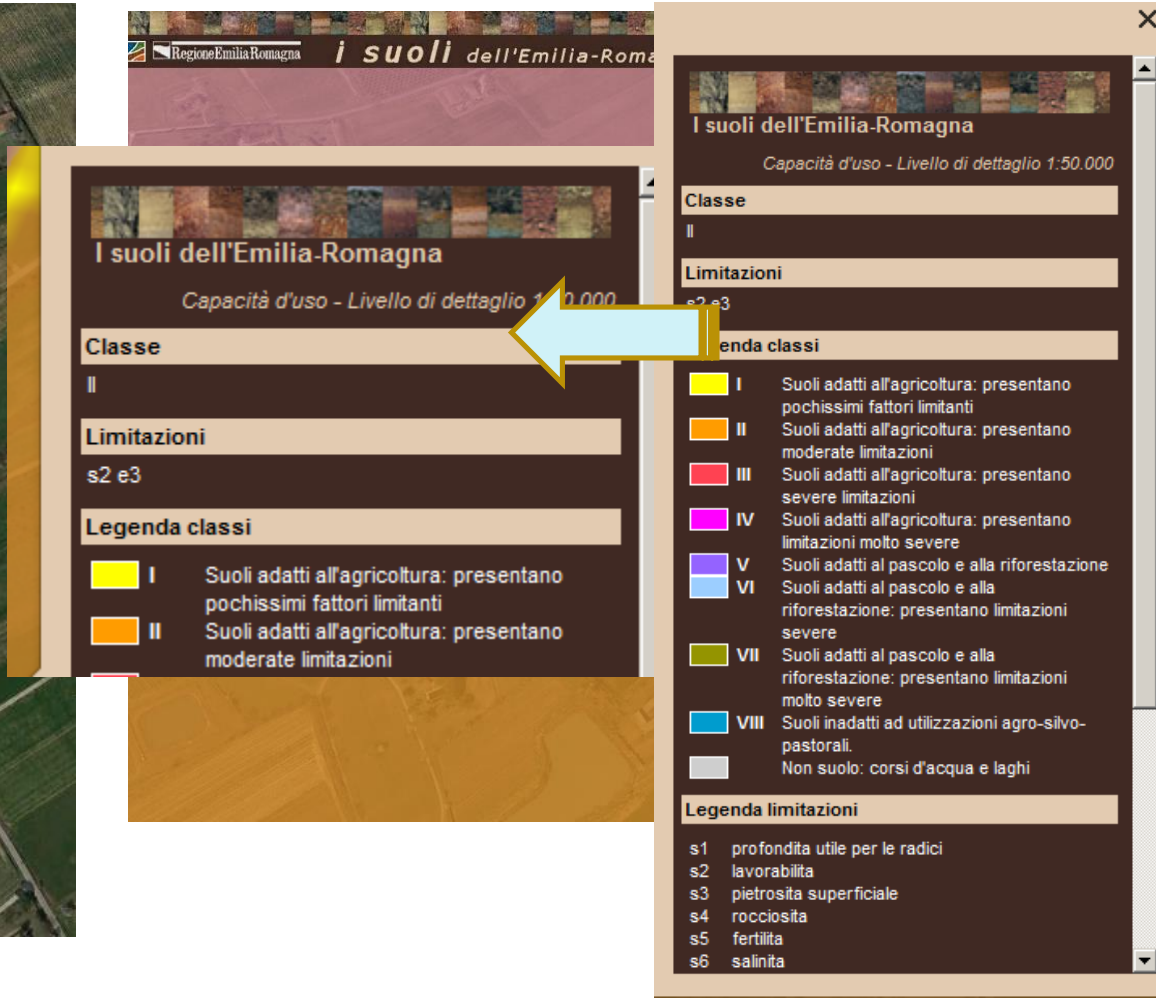


Documentation: **soil survey report** (big construction sites)

3. Topsoil quality assessment

Forlì Municipality
site of production





Documentation: **soil maps** (small construction sites)

3. Topsoil quality assessment and soil reuse

	Land Capability Map Classification	Quality class	Re-use in green urban areas	Re-use in green peri-urban, extra-urban and rural areas
Land Capability Map The "Land Capability Map" is a document evaluating the ability of the soils to produce normal crops and forest species for long periods of time, without the occurrence of soil degradation phenomena. Basic reference is the classification scheme Land Capability Classification of the U.S.D.A. (U.S., Klingebiel and Montgomery, 1961).https://datacatalog.regione.emilia-romagna.it/catalogCTA/ (portale minERva)	**I; I/II; I/II/III; I/III; II; II/I; II/I/III; II/III; II/III/IV; II/IV;**	Premium topsoil	- orchards, gardens, nurseries, parks; - urban flowerbeds; - Hanging gardens; - green industrial areas, crafts and fine green belts. Naturalistic and landscape works: - areas of absolute protection, respect and protection of water and water collection points (according to Legislative Decree 152/06 article 94) when the area is significant in terms of water flow and quality or areas of protection of waters with naturalistic purposes.	- agricultural areas with annual crops, gardens, nurseries, gardens, landscape restoration to recreational or natural areas with particularly demanding plants, or used for agricultural use with annual rotation; - green industrial areas, crafts and fine green belts. Naturalistic and landscape works: - areas of absolute protection, respect and protection of water and collection points (according to Legislative Decree 152/06 article 94) when the area is significant in terms of water flow and quality or areas of protection of waters with naturalistic purposes.

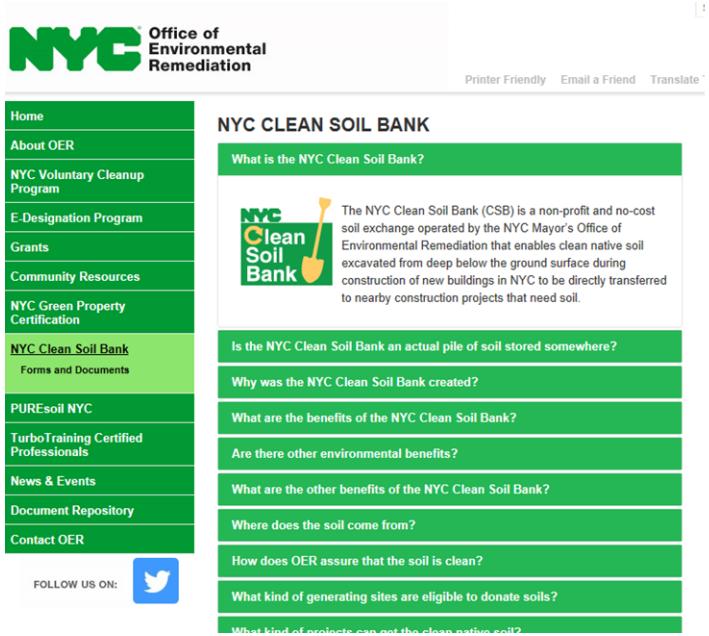




4. Soil supply and demand exchange and de-sealing

On a **regional scale** it is proposed to integrate the platform of the areas available for urban regeneration that the Municipalities must prepare according to the new urban planning legislation (Regional Law no 24/2017).

Within the platform, a register of de-sealing areas ready to receive soils should become available to the construction companies that therefore will be able to choose the destination sites on the basis of the specific characteristics of the soils produced.



5. Soil management plan: site of production

- Flexible work calendar;
- Minimization of occupied areas and measures to reduce soil damage;
- Preliminary grassing of the occupied surfaces;
- Choice of machines and escavation method;
- Accesses, runways and open spaces for temporary construction equipment;
- Temporary storage and care of removed materials

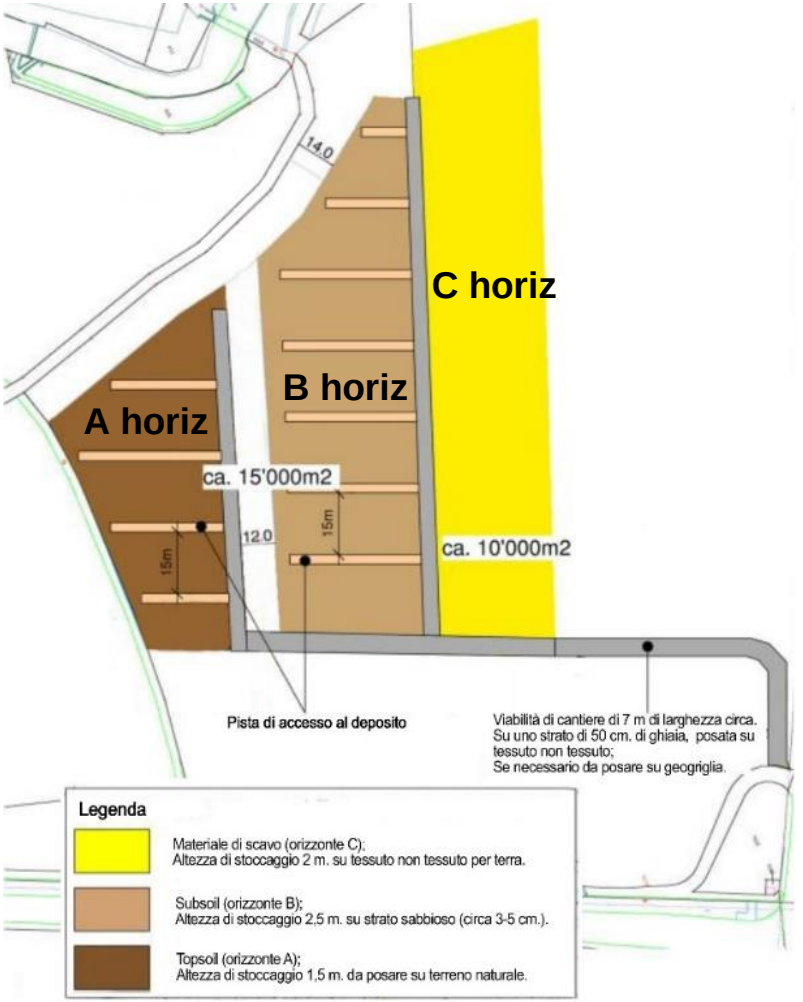
5. Soil management plan: site of storage

Storage areas, storage methods, height of topsoil / subsoil heaps to be stored and conditions for grassing and humidity control;

Heaps separated by horizons A and B, with adequate signs. Indication of type, quantity, origin, possible destination of use and date of deposit on the site;

Store topsoil in heaps not exceeding 2 m height; for storages with a duration of more than 2 years, weeding grass is recommended;

Use only the road network of the deposit indicated in the site management plan



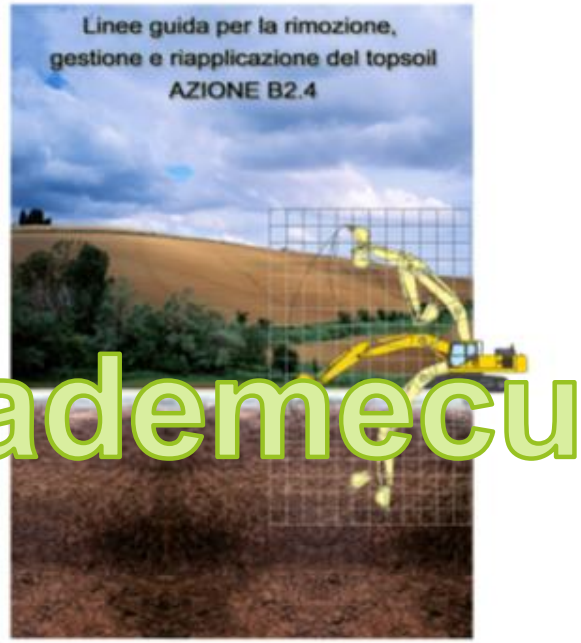
Example of Plan of the storage area

5. Soil management plan: site of destination

- Make sure that the receiving subsoil is loose, working it dry. Also ensure that there is adequa area, the continuity of the hydraulic conductivi l soil must always be guaranteed;

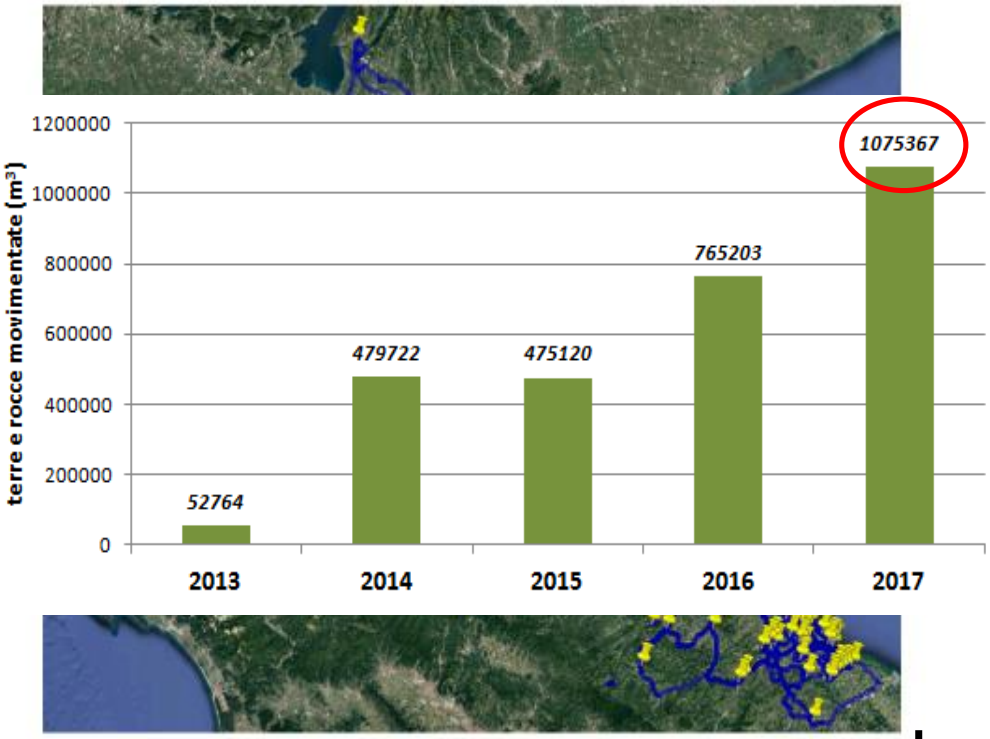
- Return the lower an tracked excavator all in one operation, in succes on of the slope. Transit of construction machir imed soil;

- After spreading, cul oving any stone and green it immediately, for the se plants with deep roots (alfalfa, purple clove te to plant for three consecutive years,



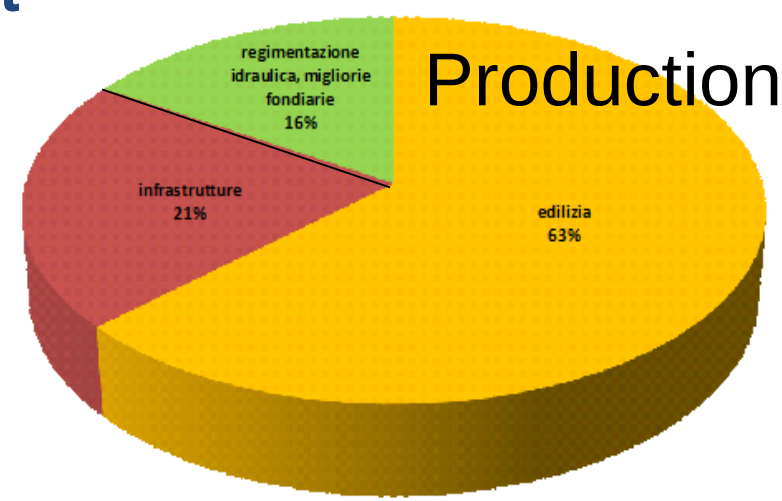
6. “Soil production”: State of the Art

Impact evaluation

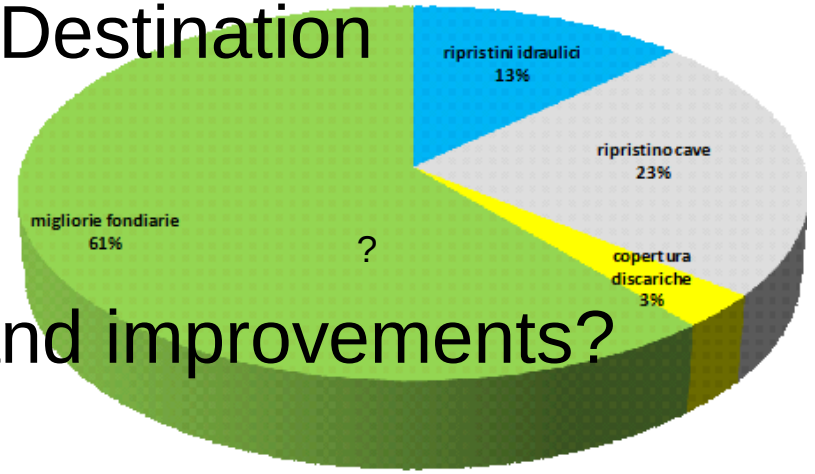


Regional scale

Production



Destination



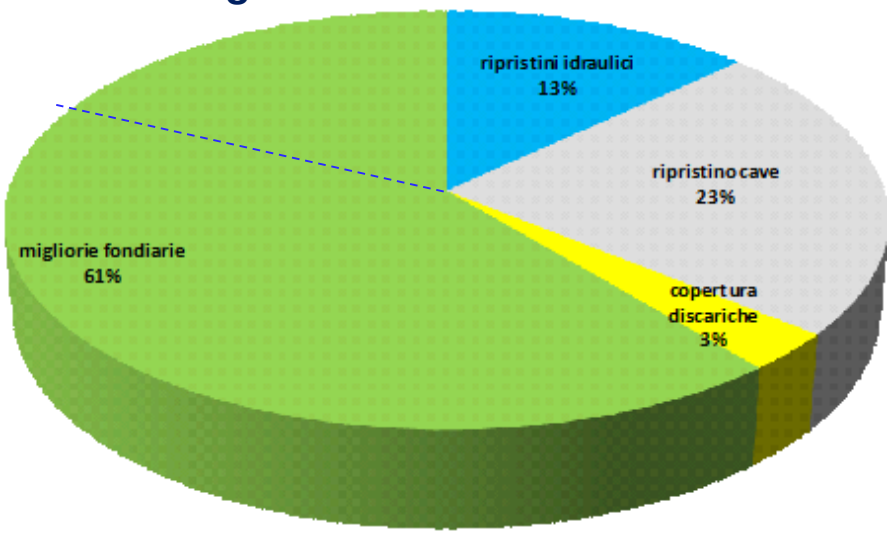
Land improvements?

Companies have to indicate the site of destination <u>before starting</u> works, if the timetable is not respected soils become a waste (code 170504) and the cost for disposal is 20 € per ton (in Emilia-Romagna Region).

5. “Soil production”: future trend

Municipal scale

urban regeneration



- Traceability of the soil at municipal level
- Saving time and money for companies for the certainty of soil dislocation, eliminating the risk of having to dispose them in landfill with an increase in costs (20 € per ton)
- Lower environmental impact
- New soils with a restoration of some ecosystem services

7. BEST PRACTICES

Evidence of success (results achieved)	The Guidelines have been used as measure of compensation and sustainability in Environmental Impact Evaluations of Emilia-Romagna Region (6 cases), and Technical Notes for excavation and digging. They were approved as official document to support urban planning in the three partners municipalities of the SOS4LIFE, and they are currently in use in the de-sealing area of the San Lazzaro di Savena Municipality
Challenges encountered	The main challenge is that the application of the guideline is on a voluntary and non-binding basis. It is up to the Municipalities the possibility of incorporating this text, wholly or in part, into the urban planning tool or as an ad hoc regulation, in order to make it binding. In the current edition, the guidelines are mostly referred to Emilia Romagna in terms of soil data and legislation.
Potential for learning or transfer	This urban planning operation, which the new regional law of Emilia-Romagna addressing the use of land (LR 24/2017) promotes as a measure of compensation for land take, falls within the application of environmental legislation on management of excavated soils and rocks (Presidential Decree 120/2017) and the one on waste (Legislative Decree 152/06). The text gives concrete form to legal concepts, with the aim of standardizing their practical implementation, allowing the adoption of flexible and adequate solutions.

PROGRESS
Interreg Europe

European Union
European Regional
Development Fund

Thank you!

www.sos4life.it

http://ambiente.regione.emilia-romagna.it/geologia/temi/suoli

Questions welcome

Project smedia