

# Sustainable land use in the European Union

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## Introduction

Soil is defined as the top layer of the earth's crust. It is formed by mineral particles, organic matter, water, air and living organisms. In fact, soil is an extremely complex, variable and living medium. It can be considered essentially as a non-renewable resource since soil formation is an extremely slow process. Soil provides us with food, biomass and raw materials. It serves as a platform for human activities and landscape. It is also an archive of heritage and plays a central role as a habitat and gene pool. It stores, filters and transforms many substances, including water, nutrients and carbon. In fact, it is the biggest carbon store in the world. Soil is, however, increasingly degrading, both in the EU and at global level.

The degradation of soil seriously threatens its ability to provide the necessary functions for life, affecting its role for food production, climate change mitigation, biodiversity protection and the fight against desertification. It becomes more and more difficult for us to adapt to extreme weather patterns, be it a drought or a torrential rainfall, since soils with low organic matter and poor structure do not store water effectively. Furthermore, contaminated sites continue to pose serious risks if not identified and remediated.

Soil degradation also affects our economies, with costs estimated to be in the order of tens of billion euros<sup>1</sup>. A recent study<sup>2</sup> estimates the total cost of damage from 357 recorded floods in the EU over the 2002-2013 period at €150bn at least and suggests that investing in green infrastructure (e.g. restoring natural features to have less soil sealing) could help reduce such costs. Soil erosion is estimated to cost €53 million per year in the United Kingdom alone<sup>3</sup>. In Italy, damage caused by landslides and flooding has amounted to approximately one billion euros per year in the period 1951-2009<sup>4</sup>. Also, of greatest concern are the costs of desertification and the consequences for farming, the landscape and the whole economy.

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<sup>1</sup> SEC(2006) 620.

<sup>2</sup> T. Fenn, D. Fleet, L. Garrett, E. Daly, C. Elding, M. Hartman, J. Udo (February 2014): Study on Economic and Social Benefits of Environmental Protection and Resource Efficiency Related to the European Semester, Final Report to DG Environment.

<sup>3</sup> Safeguarding our Soils. A Strategy for England, DEFRA, 2009, p. 11.

<sup>4</sup> F. Trezzini, G. Giannella, T. Guida: Landslide and Flood: Economic and Social Impacts in Italy. In: C. Margottini, P. Canuti, K. Sassa (eds), 2013. Landslide Science and Practice. Springer, Berlin Heidelberg, Vol. 7, pp. 171-176.

Adding to the loss of soil quality, the ever ongoing pressure of urbanisation, infrastructure and industry is leading to substantial annual soil-sealing of agricultural land. Available data show that close to half of land take has come at the expense of arable farmland and permanent crops, nearly a third at the expense of pastures and mosaic farmland, and over 10% at the expense of forests and transitional woodland shrubs.

The continued unsustainable use of soils does not only compromise the Union's domestic and international biodiversity and climate change objectives, but is also adding more and more pressure on food security.

### **The inter-institutional debate**

In September 2006, following extensive stakeholders consultations subsequent to an initial Communication<sup>5</sup>, the Commission adopted a Thematic Strategy for Soil Protection<sup>6</sup>. The strategy included a proposal for a Soil Framework Directive<sup>7</sup>. These were deliverables stemming from the Sixth Environment Action Programme<sup>8</sup>.

Both the Soil Thematic Strategy and the Soil Framework Directive proposal originated from the need to ensure a sustainable use of soils. Their objective has been to protect soil resources in a comprehensive manner throughout the Union, against a background of increasing pressure on and degradation of this vital resource.

In 2007 the European Parliament adopted its first-reading opinion; the Committee of the Regions and the Economic and Social Committee delivered their opinions. As to the Council, despite very intensive discussions throughout a number of years led by many different Presidencies, it was not possible to gather a qualified majority of Member States in favour of a proposal for a Directive on soil protection.

Noting that the Commission's proposal had been pending for eight years during which time no effective action had resulted, in 2013 the Commission took the decision to withdraw its 2006 proposal in order to open the way for an alternative initiative.

### **The current approach to soil protection in the EU**

Soil is not subject to a comprehensive and coherent set of rules in the Union. Only a few EU Member States have specific soil legislation. Some soil protection aspects can be found scattered in the *acquis*, with different Community policies contributing varying degrees of mainly indirect protection of soils -- for example in areas such as water, waste, chemicals, industrial pollution prevention, nature protection and pesticides. Positive effects on agricultural soils are expected from Cross-compliance in the Common

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<sup>5</sup> Towards a Thematic Strategy for Soil Protection, COM(2002) 179.

<sup>6</sup> COM(2006) 231.

<sup>7</sup> COM(2006) 232. Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OJ L 143, 30.4.2004, p. 56–75).

<sup>8</sup> Decision of the European Parliament and the Council No 1600/2002/EC (OJ L 242, 10.9.2002, p. 1–15).

Agricultural Policy and more generally from the support measures under Rural Development.

However, because the objectives and scope of these different policies are limited and they aim to safeguard other environmental media, the rules in place do not cover all soils and address all threats to soil. As a result, even the full implementation of existing provisions will only yield fragmented and incomplete protection to soil. As we witness today, the current patchy approach, combined with national legislation which is mostly limited to contaminated sites, has not succeeded in preventing soil degradation across the Union and has, on the other side, created different national rules and conditions for economic operators in the internal market.

The 'paradox' and underlying problem with soil is that it is cross-cutting many policies (agriculture, forest, water, waste, industrial emissions, regional policies...) - but at the same time due to their 'invisibility' soils are not considered as a fragile and limited resource. Besides the lack of a comprehensive and integrative approach, sound soil management is very often not a political priority. Unlike air and water, soils are not considered a common good that needs to be protected which is linked to the question of ownership. Aspects of subsidiarity and sovereignty (of soils and land) are also very strong. The fragmented governance of soils is a problem for defining comprehensive policies. In addition the common lack of understanding of the role of soils and the lack of information (e.g. on soil biodiversity, on carbon stock in soils) make the definition of policy targets and monitoring difficult.

### Continuing degradation and its transboundary consequences

Although it may seem as though nothing is more stable than the ground under our feet, it is a fact that soil moves, and problems linked to soil degradation can be felt – and must be dealt with – well beyond the areas that are degraded.

As mentioned above, erosion, loss of organic matter, compaction, salinisation, landslides, contamination, sealing... have negative impacts on human health, natural ecosystems and climate, as well as on our economy. Not only does it come with high costs soil degradation has immense transboundary effects.

In addition, the reduction in environmental services as a result of a loss of soil in our territory must be compensated by increased pressures on remaining soils or on the soils of other territories.

The European Environment Agency's 2015 State of the Environment Report<sup>9</sup> gives a bleak outlook on European land resources and soil functions. According to the synthesis report, both for the 10 year trend and the 20+ year outlook '**deteriorating trends dominate**' – to stick to the wording of the SOER. This is also the message of a scientific assessment<sup>10</sup> published by the Commission's Joint Research Centre in 2012 which found that soil degradation has worsened in recent years.

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<sup>9</sup> <http://www.eea.europa.eu/soer/europe/soil>.

<sup>10</sup> [The State of Soil in Europe](#) - A contribution of the JRC to the European Environment Agency's Environment State and Outlook Report - SOER 2010, February 2012, EUR 25186 EN.

Land degradation in its various forms is a fundamental and persistent problem. The situation in Europe is mirrored and magnified in many parts of the world. It is also a global development issue, as soil degradation, poverty and migration are mutually reinforcing, but that is often largely ignored, because observed impacts are gradual from our perspective.

Well, what are the soil threats that we need to tackle?

- The **sealing of soil** (the permanent covering of soil with an impermeable material) and associated land take lead to the loss of important soil functions (such as water filtration and storage, and food production). Between 1990 and 2000, at least 275 hectares of soil were lost per day in the EU, amounting to 1,000 km<sup>2</sup> per year<sup>11</sup>. In the period 1990-2006, 19 Member States lost a potential agricultural production capability equivalent to a total of more than 6 million tonnes of wheat – enough for providing bread to 80 million people for a year. This is a significant figure, given that agricultural productivity increases are levelling off and to compensate for the loss of one hectare of fertile land in Europe, it would be necessary to bring into use an area up to ten times larger in another part of the world<sup>12</sup>. This has also a clear transboundary dimension, as the EU will be even more dependent in future on its finite soil resources, which comprise some of the most fertile soils in the world, and to their sustainable use<sup>13</sup>.
- A recent new model<sup>14</sup> of **soil erosion** by water constructed by the Joint Research Centre (JRC) of the Commission has estimated the surface area affected in EU-27 at 1.3 million km<sup>2</sup>. Almost 20% of these are subjected to a soil loss in excess of 10 tonnes per hectare per year. Erosion is not only a serious problem for soil functions, it also has an impact on the quality of freshwater, as it transfers nutrients, pesticides and soil particles to water bodies. There are about one hundred transboundary river basins in the EU, 25 of which have identified soil erosion linked to agriculture as a problem. For example, the Port of Rotterdam has to dredge every year between four and seven million cubic metres of sediments, a good half of which are brought down by the River Rhine as an effect of unsustainable soil erosion upstream. Addressing soil erosion will thus be a key contribution to achieving EU water objectives.
- Unsustainable soil management may lead to a **decline of soil organic matter**. This threatens soil fertility and thus Europe's agriculture and forestry production

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<sup>11</sup> <http://ec.europa.eu/environment/soil/sealing.htm>. In France, 24 square metres per second (interview to Fanny Dombre-Coste, President of the Observatoire national de la consommation des espaces agricoles (ONCEA), in *Le journal de l'environnement*, 19 April 2013); in Germany, more than 80 hectares per day (UBA, 2011 figure); in Italy, 8 square metres per second (M. Munafò (2013): *Il monitoraggio del consumo di suolo in Italia*, *Ideambiente* 62, pp. 20-31).

<sup>12</sup> C. Gardi, P. Panagos, M. Van Liedekerke, C. Bosco, D. De Broignez (2014): *Land Take and Food Security: Assessment of land take on the agricultural production in Europe*, *Journal of Environmental Planning and Management* (in press).

<sup>13</sup> To address one of the most urgent challenges - land take and soil sealing - the Commission published in 2012 non-binding Guidelines on best practice to limit, mitigate or compensate soil sealing (SWD(2012) 101 final/2)

<sup>14</sup> C. Bosco, D. de Rigo, O. Dewitte, J. Poesen, P. Panagos (2014): *Modelling Soil Erosion at European Scale: Towards Harmonization and Reproducibility*. *Natural Hazards and Earth System Sciences* (in review).

capacity. At the same time, a decline in humus has also a direct transboundary dimension because it contributes to exacerbating climate change. EU soils contain more than 70 billion tonnes of organic carbon – the equivalent to almost 50 times the EU's annual greenhouse gas emissions. In 2009, European cropland emitted an average of 0.45 tonnes of CO<sub>2</sub> per hectare (much of which resulted from land conversion)<sup>15</sup>. A statistical evaluation of the National Soil Inventory data of England and Wales in the period 1978-2003 showed that losses of soil carbon in the United Kingdom, and by inference in other temperate regions, are likely to have been offsetting absorption of carbon by terrestrial sinks<sup>16</sup>. A recent assessment of French soils observed declining carbon stocks in some clearly identified agricultural situations, most often due to changes in land uses or practices occurring over the last few decades<sup>17</sup>. The conversion of peatlands and their use is particularly worrying. For instance, although only 8% of farmland in Germany is on peatland, it is responsible for about 30% of the total greenhouse gas emissions of the whole farming sector<sup>18</sup>.

- As an extreme form of land degradation, **desertification** results in a serious impairment of all soil functions. Twelve Member States, including Portugal, have declared themselves affected by desertification under the United Nations Convention to Combat Desertification<sup>19</sup>.
- **Soil biodiversity** provides numerous essential services, including releasing nutrients in forms that can be used by plants and other organisms, purifying water by removing contaminants and pathogens, contributing to the composition of the atmosphere by participating in the carbon cycle, and providing a major source of genetic and chemical resources (e.g. antibiotics). An indicator-based map prepared by the JRC<sup>20</sup> shows that soil biodiversity is especially threatened in areas of high population density and/or intense agricultural activity. Biodiversity is a common concern across the EU and the Union as a whole has pledged to halt the loss of biodiversity by 2020<sup>21</sup>.
- **Landslides** are a major threat in mountainous and hilly areas across Europe (land abandonment being an aggravating factor), often producing serious impacts on population, property and infrastructure. Over 630,000 landslides are currently registered in national databases<sup>22</sup> and their frequency and impact are likely to increase due to extreme weather events caused by climate change.

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<sup>15</sup> <http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011>.

<sup>16</sup> P. H. Bellamy, P. J. Loveland, R. Ian Bradley, R. Murray Lark, G. J. D. Kirk (2005), Carbon losses from all soils across England and Wales 1978–2003, *Nature*, 437, 245-248.

<sup>17</sup> The state of the soils in France in 2011. A synthesis (2013), [http://www.gissol.fr/RESF/synthesis\\_BD.pdf](http://www.gissol.fr/RESF/synthesis_BD.pdf), p. 9.

<sup>18</sup> [http://ec.europa.eu/environment/soil/pdf/report\\_conf.pdf](http://ec.europa.eu/environment/soil/pdf/report_conf.pdf), p. 17.

<sup>19</sup> Bulgaria, Cyprus, Greece, Hungary, Italy, Latvia, Malta, Portugal, Romania, Slovakia, Slovenia and Spain.

<sup>20</sup> [http://eusoils.jrc.ec.europa.eu/library/maps/biodiversity\\_atlas/index.html](http://eusoils.jrc.ec.europa.eu/library/maps/biodiversity_atlas/index.html), p. 62-63.

<sup>21</sup> COM(2011) 244.

<sup>22</sup> M. Van Den Eeckhaut, J. Hervás: State of the art of national landslide databases in Europe and their potential for assessing landslide susceptibility, hazard and risk. *Geomorphology* 139-140 (2012) 545-558.

- It is difficult to quantify the full extent of local **soil contamination**, as the vast majority of Member States lack comprehensive inventories. A 2013 report<sup>23</sup> by the JRC based on national data found that there are an estimated 2.5 million potentially contaminated sites in Europe, where soil contamination is suspected and detailed investigations are needed. Of these, circa 115,000 sites have been identified as posing a significant risk to human health and the environment. Soil contamination can have transboundary consequences, for example when groundwater is affected, as shown in the Kempen area across Belgium, the Netherlands and Germany<sup>24</sup>. More generally, diffuse soil contamination may affect agricultural produce, as its quality is significantly dependent on soil characteristics. Only healthy, non-polluted soils can ensure the quality of products traded freely within the internal market, preventing health risks across boundaries.

### Political commitments and next steps

Whilst the Soil Thematic Strategy has helped raise the profile of these issues, there is still no systematic monitoring and protection of soil quality across Europe. This means that knowledge about the status and quality of soils remains fragmented and soil protection is not undertaken in an effective and coherent way in all Member States.

At international level soils gained momentum in particular in the context of sustainable development, food security, climate change and biodiversity commitments. The respective UN conventions are the 'Convention to combat Desertification', the 'Framework Convention on Climate Change' and the 'Convention on Biological Diversity'. Though soils are not specifically addressed they are a cross-cutting issue and to some extent they make the link between the conventions.

Moreover the UN General Plenary decided the creation of the 'Global Soil Partnership' in 2012. This instrument has been implemented by the Food and Agriculture Organisation with the objective *to improve governance of the limited soil resources of the planet in order to guarantee healthy and productive soils for a food secure world, as well as support other essential ecosystem services*<sup>25</sup>.

Furthermore, the outcome document "The Future We Want"<sup>26</sup> agreed at the United Nations Conference on Sustainable Development Rio de Janeiro in 2012 (Rio+20) underlines the *economic and social significance of good land management, including soil, particularly its contribution to economic growth, biodiversity, sustainable agriculture and food security, eradicating poverty, the empowerment of women, addressing climate change and improving water availability*<sup>27</sup>. It goes on to recognise

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<sup>23</sup> M. Van Liedekerke, G. Prokop, S. Rabl-Berger, M. Kibblewhite, G. Louwagie (2014): Progress in the Management of Contaminated Sites in Europe, EUR 26376.

<sup>24</sup> D. Geysen (2008): Brownfield management of the Kempen area. Presentation at the conference on Innovation for Sustainable Production, Bruges (Belgium), 22-25 April 2008.

<sup>25</sup> Hundred and Forty--fifth Session of the FAO Council, CL 145/LIM/7 Rev.1, December 2012.

<sup>26</sup> A/RES/66/288.

<sup>27</sup> Paragraph 205.

the need for urgent action to reverse land degradation and to *achieve a land-degradation neutral world in the context of sustainable development*<sup>28</sup>.

This has been carried on in the post 2015 agenda 'Transforming our world: the 2030 agenda for sustainable development' which is supposed to be formally endorsed by Heads of State at the United Nations Summit in September 2015. Soil is mentioned in four Sustainable Development Goals and targets<sup>29</sup>:

In particular, soil is mentioned in connection to

- ensuring food security through the implementation of resilient agricultural practices and progressively improving land and soil quality;
- reducing the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination;
- reducing the release of chemicals and waste to air, water and soil in order to minimize adverse impacts on human health and the environment; and
- combating desertification - restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

At the European level and in support of the RIO+20 plea, the Decision by the European Parliament and the Council on the "Seventh Environment Action Programme"<sup>30</sup> (7<sup>th</sup> EAP) provides that by 2020 *land is managed sustainably in the Union, soil is adequately protected and the remediation of contaminated sites is well underway*; and that this requires, in particular, *increasing efforts to reduce soil erosion and increase soil organic matter, to remediate contaminated sites and to enhance the integration of land use aspects into coordinated decision-making involving all relevant levels of government, supported by the adoption of targets on soil and on land as a resource, and land planning objectives*.

Additionally, the EAP states that "*The Union and its Member States should also reflect as soon as possible on how soil quality issues could be addressed using a targeted and proportionate risk-based approach within a binding legal framework*".

Against that background, the Commission has established an Expert Group<sup>31</sup>, to implement the soil protection provisions of the 7th EAP, allowing for a structured and formal dialogue. The group is composed by experts mandated by Member States to support the Commission.

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<sup>28</sup> Paragraph 206.

<sup>29</sup> <https://sustainabledevelopment.un.org/post2015/transformingourworld> – see 2.4, 3.9, 12.4 and 15.3

<sup>30</sup> Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

<sup>31</sup> <http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3336>

## Conclusion

European soils are an vital asset, and they will become an even stronger pillar for our well-being in the future – provided we allow for that. At the beginning of the 60'ies nearly half a hectare of arable land was available per head, at the beginning of this century it was less than a quarter of a hectare, and - according to FAO – it will halve again by the middle of this century.

Therefore, and in light of the rather bleak outlook given above, it is heartening that 2015 has been declared as the United Nations International Year of Soils. I do hope that this year will not only serve as a unique opportunity to raise awareness of the importance of soil and encourage action at all level for the next few months, but will stir a lasting debate, resulting in effective action at EU level also beyond 2015.

I wish to conclude this article with a quote of ecologist Aldo Leopold. Though referring to land it is valid for soil as well:

*We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.*