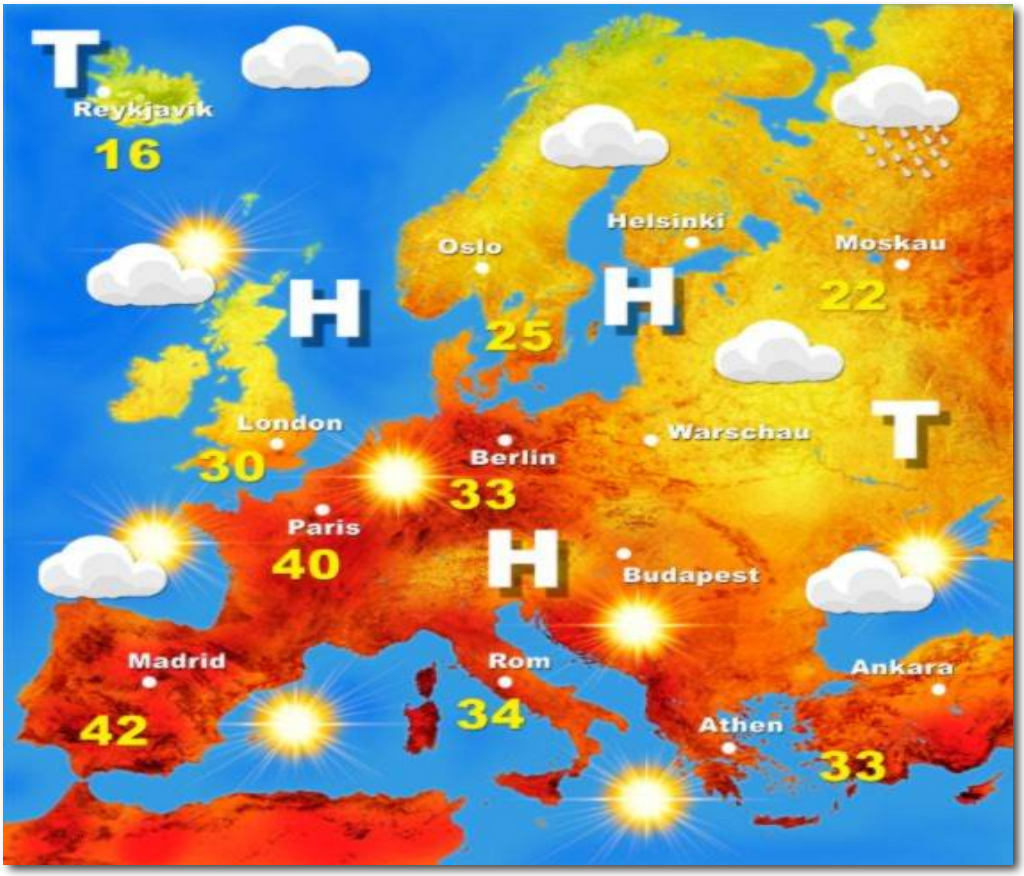
REGENERATION OF SOILS AND ECOSYSTEMS: THE OPPORTUNITY TO PREVENT CLIMATE CHANGE. BASIS FOR A NECESSARY CLIMATE AND AGRICULTURAL POLICY.

IN A NUTSHELL



International Year of the Soils
PARIS´ COP21 and beyond

A MATTER OF LIFE AS WE KNOW IT

We are probably at the most crucial crossroad of Humanity's history. We are changing the Earth's climate as a result of accelerated human-made Greenhouse Gases Emissions (GHG) and biodiversity loss, provoking other effects that increase the complexity of the problem and will multiply the speed with which we approach climate chaos.[1]

- USA´s Pentagon has cited Climate Change as national security risk and the UK Ministry of Foreign Affairs, Baroness Joyce Anelay, has recently said that Climate Change "must be taken as seriously as nuclear war" (http://www.csap.cam.ac.uk/projects/climate-change-risk-assessment/).

- Soil degradation and desertification are a main cause in conflicts and forced migration, as Syria´s civil war has demonstrated (http://www.theecologist.org/News/news_analysis/2871076/overgrazing_and_desertification_in_the_syrian_steppe_are_the_root_causes_of_war.html).

- According to a range of scientists, our current system of exploitation and consumption will only last between 50 and 60 years before Nature is no longer able to provide crucial services in terms of water, soil and air.[2]

- All efforts to date have involved reducing the direct emissions produced by our activities. This is not effective:

1. The atmosphere has an oversupply of GHG, and climate change is fully underway.
2. We entertain the hope - or illusion - that this will limit climate change, though no certainty exists on this point.[3]
3. The goal of an average increase of temperature not superior to 2°C might have been achieved after the World Summit (1992) or the arrival of a new millennium, but Climate Change is an accumulative issue.[4] *As a matter of fact, the European Commission believes that its proposals for Paris 2015 only provide a "good chance" that the average global temperature will not rise by over 2°C.*[5]
4. Eminent scientists state that an average increase of 2°C will cause *unsustainable damage*[6], and proposes reducing global emissions by 6% a year for 40 years. Other consider that they must be decreased by 10%[7] .
5. The political effort invested since 1992 is proving to be insufficient: the fact is that, year after year, global emissions are rising.
6. *The emissions are not only caused by our direct action, but are also – and perhaps primarily – the result of soil degradation* which emits carbon into the atmosphere, whereas it used to fertilise these soils.

- Achieving zero emissions would not prevent the potentially catastrophic consequences for life on Earth as we know it. At the current level of approximately 400 ppm of CO2 in the atmosphere, we have crossed the boundaries of the acceptable for human life as its now organised.[8]

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[1] Isaac Asimov:"Our angry earth" In Bibliography.
[2] Mercola, J: Carbon Sequestration- The Climate Change Solution That Virtually All Climate Activists Ignore. At http://www.iqfit.com/carbon-sequestration-the-climate-change-solution-that-virtually-all-climate-activists-ignore/ (2015)
[3] Rogelj, J., McCollum, D. L., O'Neill, B. C. & Riahi, K. 2020 emissions levels required to limit warming to below 2°C. Nat. Climate Change (2013).
[4] Anderson, K. More information can be found at http://kevinanderson.info/index.php
[5] European Commission: COMMINICATION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL. The Paris Protocol. (2015)
[6] Hansen, J: Assessing dangerous climate change En Plos One http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0081648 (Diciembre 2013).
[7] Anderson, K. Avoiding dangerous climate change demands de-growth strategies from wealthier nations. At http://kevinanderson.info/index.php
[8] Hansen, J: Target atmospheric CO2: Where should humanity aim? In *Open Atmospheric Science Journal* (2008).

- The situation would not improve in the event of a return to 350 ppm, which would only imply decelerating climate change to 1988's already alarming levels.[9]-[10]

- The effects will probably be irreversible if the concentration of GHGs does not return to preindustrial levels, that it, under 300 ppm.

Consequently, achieving this heroic objective requires not only ceasing to produce GHGs, but also removing over 100 gigatonnes (GT) of CO2 from the atmosphere.

- Climate Change has accelerated in recent years due to our intensive use of fossil fuels, but also because of the expansion of deserts, including "agricultural deserts." It is a fact that we are causing the soil degradation and increase of deserts, to the detriment of formerly fertile land.[11]

- As a result, even if the world were to achieve zero fossil fuel emissions overnight, *desertification would continue to accelerate, due to the soil's inability to store carbon and water. The climate would continue to change.*[12] This process of environmental destruction wiped out many civilisations, even before coal and oil were discovered.

- *Soil degradation and climate change are inseparable.* It is therefore almost pointless to be concerned solely with GHG emissions caused by burning fossil fuels and not by the loss of biodiversity and soil degradation. *It is impossible for the climate not to change, as it depends on the life of the planet.*[13]

- Soil degradation has been a well-known fact since the 1970s, when the then *European Economic Community* warned that "*the loss of productive soil is one of the most urgent and difficult problems facing the future of humanity*."[14]

- The crucial question is, how the Earth can return to storing the vast quantities of carbon that are currently in the atmosphere. It also needs to do so naturally, without risk, and affordably. The biological systems on land are capable of this (as do the oceans, though now reaching a saturation point).

This can only be done through an extensive global regeneration of soils and ecosystems.

Plant´s photosynthesis absorbs CO2 and deposits the excess in the soil when rich and fertile. If undisturbed it can stay there for millennia.

[9] Hansen, J Shabecoff :"Global Climate Changes as forecast by Goddard for Space Studies three-dimensional model". In *Journal of Geophisycal Resarch*. (1988).
[10] Shabecoff, P:Global Warming Has Begun, Experts Tells Senate. In the *New York Times* (1988).
[11] Savory, Allan. Holistiv Managment. In Bibliography
[12] Savory, Allan.: Holistic Managment. In Bibliography.
[13] James Lovelock: The ages of Gaia. In Bibliography.
[14] C.E.C 1977, in M. Nuti.. id

A double-edged sword and the potential co2 sequestration

- Soil contains the largest reserves of carbon in its terrestrial cycle. It is considered that the first meter of depth contains 1.500 Gigatons (1 GT = 1.000 million tons) of organic carbon[15], approximately double that in the atmosphere, while vegetation contains approximately 600 GT (270 GT in forests)[16].

- It has been calculated that every year the regenerative management of all the agricultural land would enable over 40% of annual emissions (21 GT) to be captured. If pasture land is added to this, another 71% (37 GT)[17] would be captured.

- We are therefore wielding a double-edged sword of massive proportions and potential consequences:

a. ***We still have a great potential to exacerbate the situation***, by releasing even more carbon into the atmosphere through our industrial "extractive" agriculture and ecosystem destruction.

b. ***There is considerable potential to resolve this dangerous situation*** efficiently, rapidly, simply, affordably and without risk – qualities that generally elude geoengineering projects.

- UNEP also reaches conclusions regarding industrial agriculture: it prevents the soil from fixing carbon. Indeed, soil can fix it in large quantities through organic matter that is rich in nutrients for vegetation, fertility and the movement of water.
- UNEP therefore proposes financial incentives and a global climate agreement that includes carbon credits for soil.

Industrial - chemical agriculture

- The use of chemicals inputs, deep tillage and monoculture degrades the soil and contaminates waters and produce.

- Degradation of soils and ecosystems mean:

* rain reduction in semi-dry zones ;

* degradation of animal and human health due to poison intake and reduced nutriens in food;

* decreased water retention, increased floods, landslides and droughts;

* increased erosion;

* increased vulnerability to Climate Change;

* decreased income for producers within time.

[15] Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. (2013). Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities.Rome, Italy: Food and Agriculture Organization of the United Nations.
[16] Id.
[17] Rodale Institute. In Bibliography.

- *The quantity of water that can be stored in healthy soil dwarfs the amount held in all the world's reservoirs.* This is closely linked to strategic security, in a world in which in the future wars are likely to be waged over water.

- The absorption capacity also contributes to minimising the frequency and severity of *droughts and floods and their effects, which are often caused by the soil degradation, rather than by changes in rainfall patterns.*[18]

Virtuous consequences

REGENERATION is a beneficial process for all parties concerned, as, in addition to reducing emissions from the Agricultural Sector and "putting back carbon where it belongs – in the earth", it involves:

- improved soil health, a foundation of life and therefore our existence;
- increased soil fertility, boosting production and its competitiveness sustainably over time;
- increased water retention capacity, reducing droughts and floods;
- improved water quality;
- eliminating or considerably reducing erosion;
- eliminating or considerably reducing salinisation;
- increased food security;
- a general improvement in the environment, including wildlife for which we are also responsible;
- lesser dependence on volatile input markets;
- increased income for better production and payment for environmental services;
- fixing and increase of rural population, thanks to the rise in income and reduction in costs;
- greater capacity for adapting to climate change.[19]-[20]

[18] "The water cycle". In Bibliography.
[19] Smith, P. et al. Greenhouse gas mitigation in agriculture. Philos. Trans. R. Soc. B Biol. Sci. (2008).
[20] UNCTAD (United Nations Conference on Trade and Development). Trade and Environment Review 2013, Wake up before it is too late: Make agriculture truly sustainable now for food security in a changing climate. (2013). In Bibliography.

URGENCY

- The majority of the european population expects action from political leaders beyond holding meetings and would welcome real solutions (reducing emissions is not enough).

- Many signs show the urgent need for regeneration:

  *Ecological-systemic

  "The increase in the acidity of oceans exacerbates climate change"

  "Phytoplankton is disappearing from the oceans, which are increasingly warm"

  "Permafrost is melting in Siberia"

  "Has the 6th Mass Extinction arrived?"

  "Possible modification of the Gulf Current"

  "Satellites reveal that vegetation across the world is transforming"

  "Humanity has overstepped four of the planet's nine limits"

  "In the event of an increase in the average of 2°C by 2100.."

  "Global carbon dioxide level just hit a disturbing new threshold"

  *Social perception

  *Businesses

  *Legal systems questioning

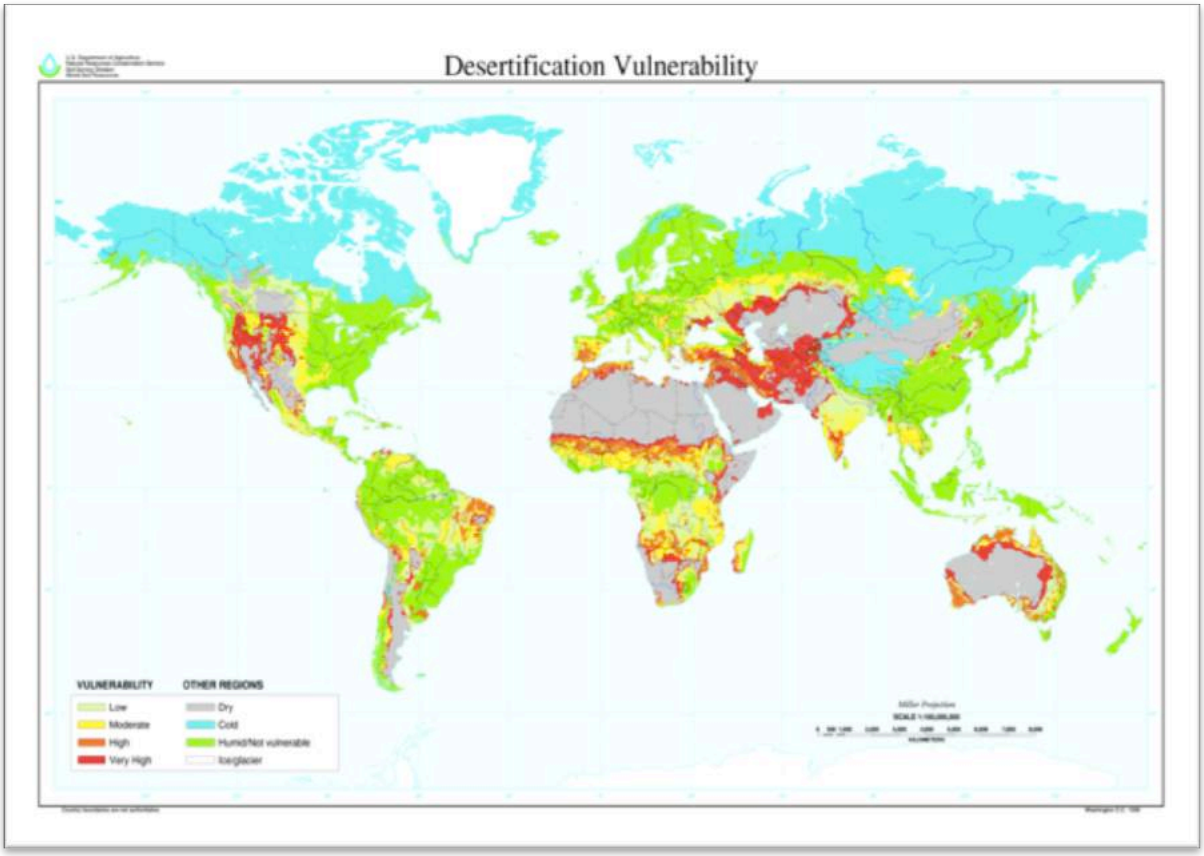
  *Catastrophic events and risk tendencies

"HOPE IN A CHANGING CLIMATE." SIGNIFICANT IMPROVEMENTS ALREADY UNDERWAY

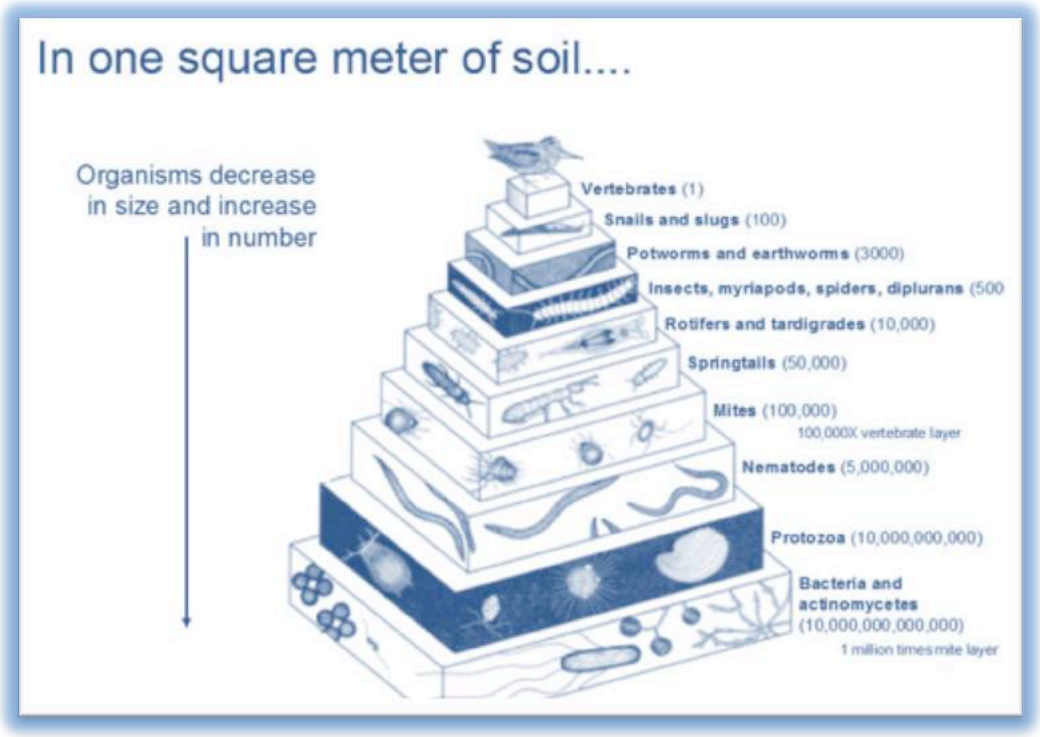
- Many initiatives have been already successfully implemented or are being started
  - *A) Loess Plateau in China"*[21].
  - *B) Regeneration programme of 1/6 of the land in Ethiopia*[22-23].
  - *C) Rehabilitation of the Rugezi Highland Wetlands in Rwanda*[24-25].
  - D) *Bonn Challenge*
  - E) 4%0 Initiative
  - F) *"A silent revolution is taking place in Africa"*[26].

- Lastly, the situation in Europe is not to be celebrated

The white paper can be found in four languages in
- ideaa.eu
- academia.edu
- regenerationinternational.org/the-science/

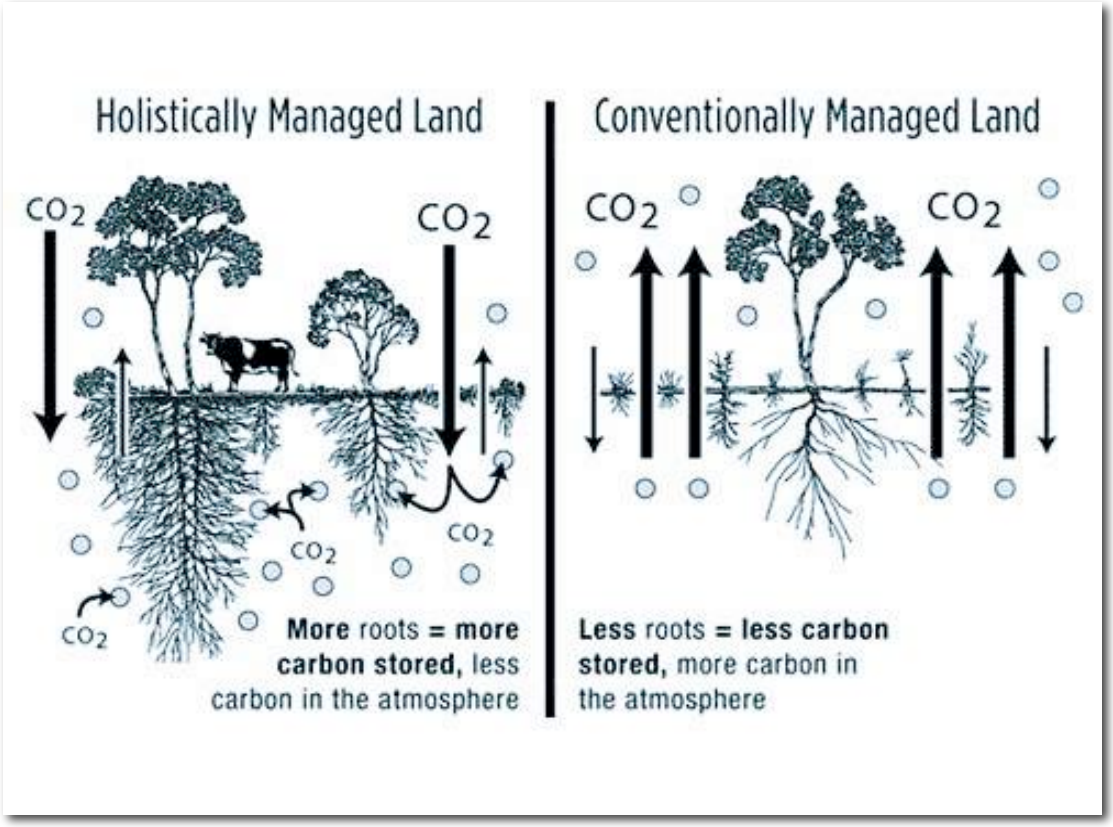


[21] Descripción de el proyecto en http://eempc.org/loess-plateau-watershed-rehabilitation-project/
[22] Vidal, J: Regreening program to restore one-sixth of Ethiopia's land
En http://www.theguardian.com/environment/2014/oct/30/regreening-program-to-restore-land-across-one-sixth-of-ethiopia
[23] IUCN: Forest Landscape Restoration in Ethiopia. En https://www.youtube.com/watch?v=hNGJxeGSHGY
[24] Descripción del proyecto: Restoration in Rwanda. http://eempc.org/restoration-in-rwanda/
[25] John D. Liu: Rwanda back to the garden. https://www.youtube.com/watch?v=CEDlf3M6Kho
[26] John Vidal: Regreening program to restore one – sixth of Ethiopia's land. En The Guardian.
http://www.theguardian.com/environment/2014/oct/30/regreening-program-to-restore-land-across-one-sixth-of-ethiopia (2014)



Carbon-poor soil after the rain (right).[27]

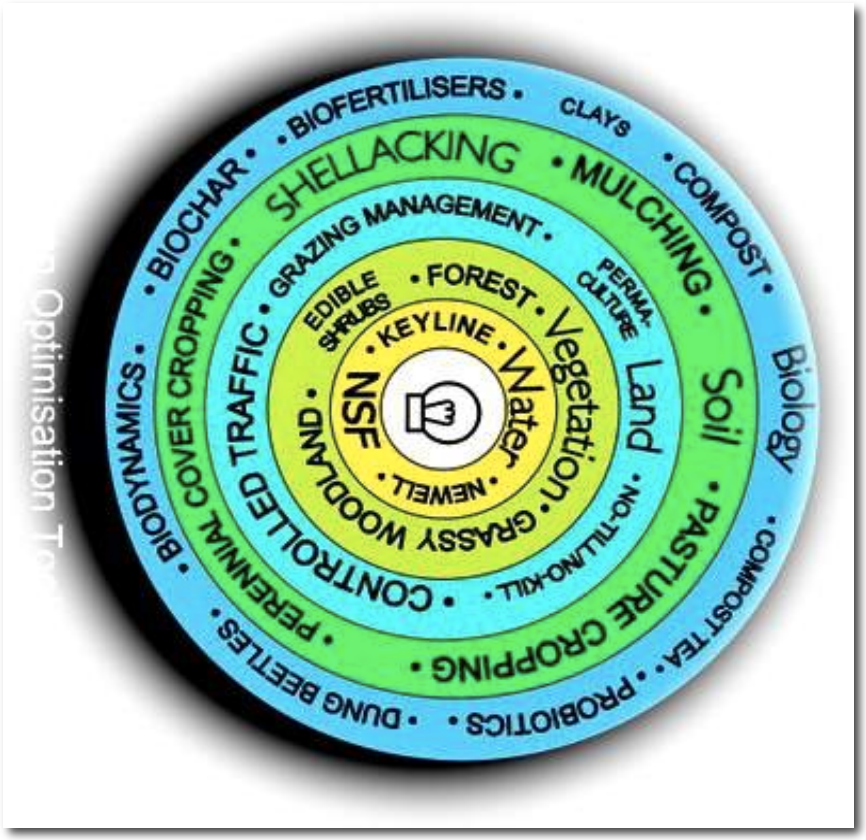
[27]Jones, C.E: Farming a climate change solution. At www.amazingcarbon.com (2009)



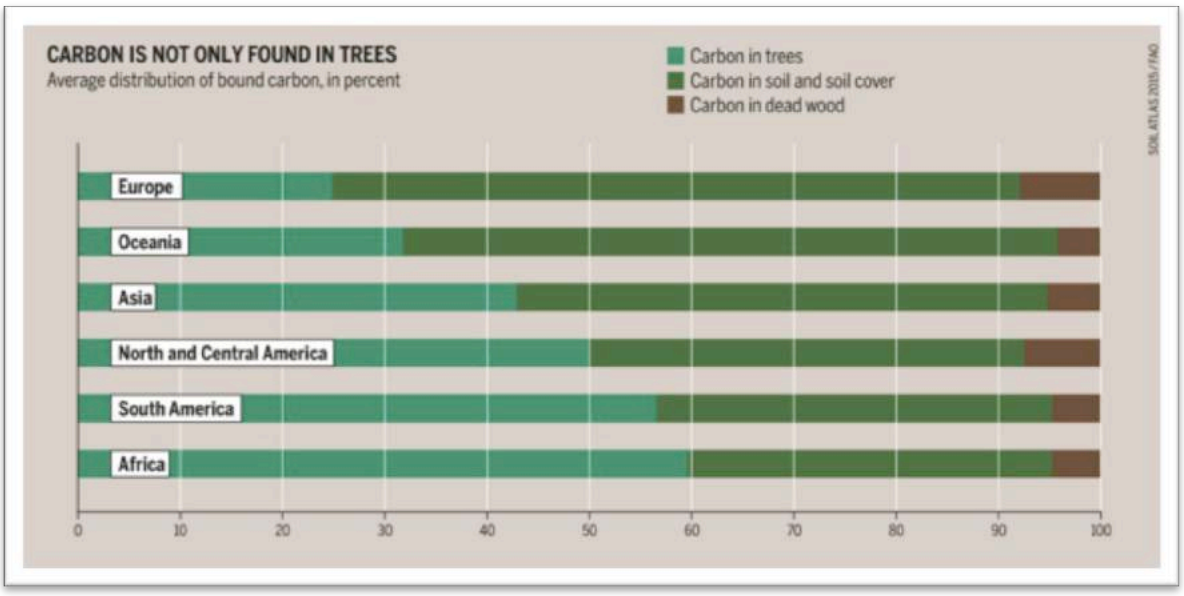
Organic roots and biodynamic roots

Permaculture design for soil regeneration and biodiversity

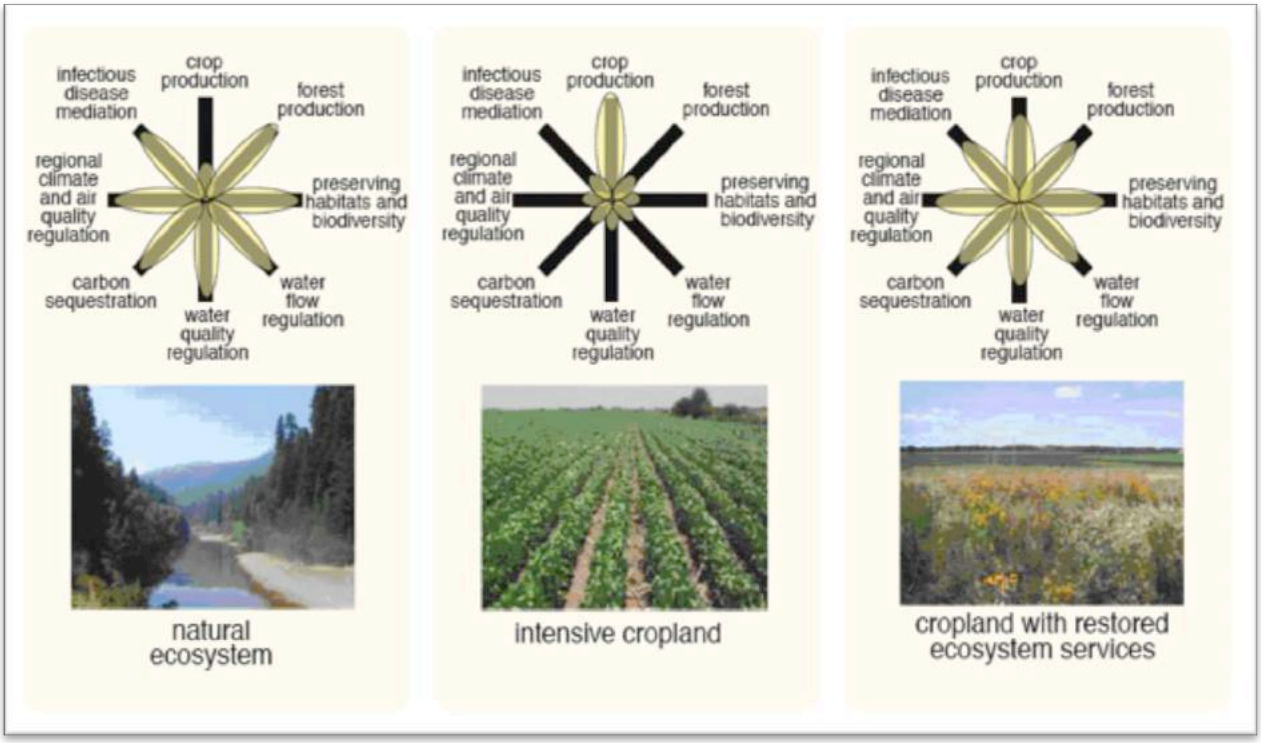
Holistically managed property and conventionally managed property



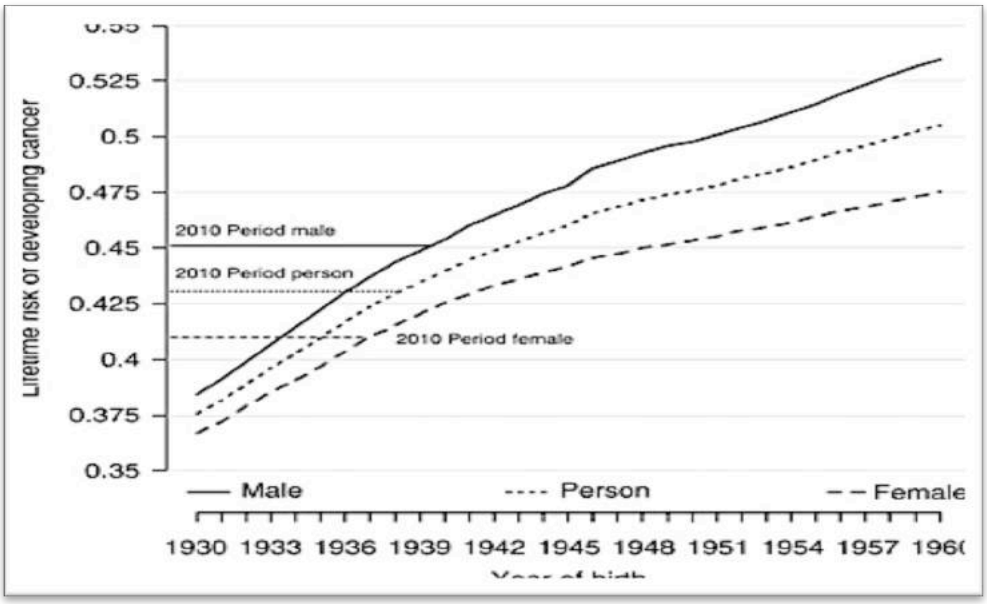
Soil carbon optimisation tools



Carbon is not only contained in trees: the light green band shows the carbon stored in trees; the dark green that in the soil and in its vegetation cover, and the brown that in dead wood.



Quality of ecosystemic services, based on soil use. (Environmental Protection Agency, United States). The first option is the natural system, which does not produce large harvests but is necessary because of its various ecosystemic services. The second option is unsatisfactory as it destroys everything except for, momentarily, production amounts. The third option combines production with regeneration, thus also providing ecosystemic services.

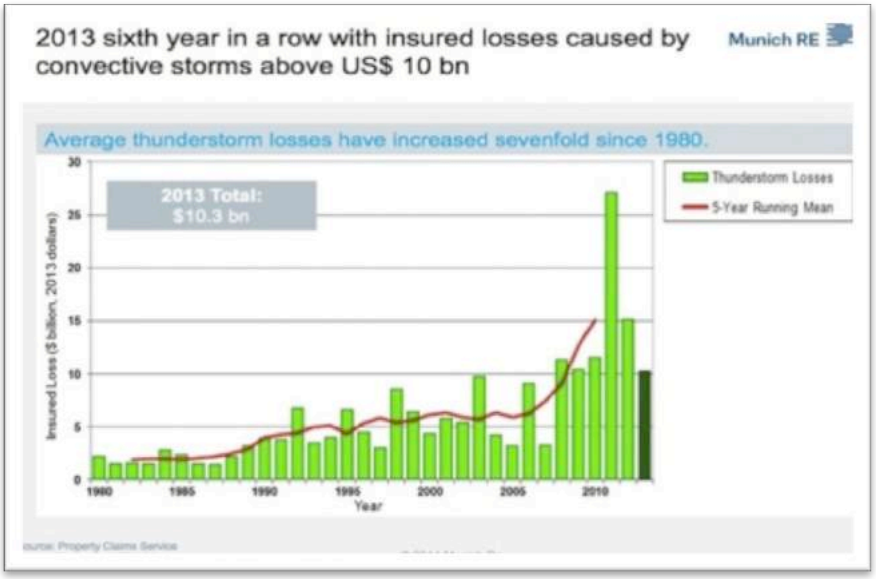


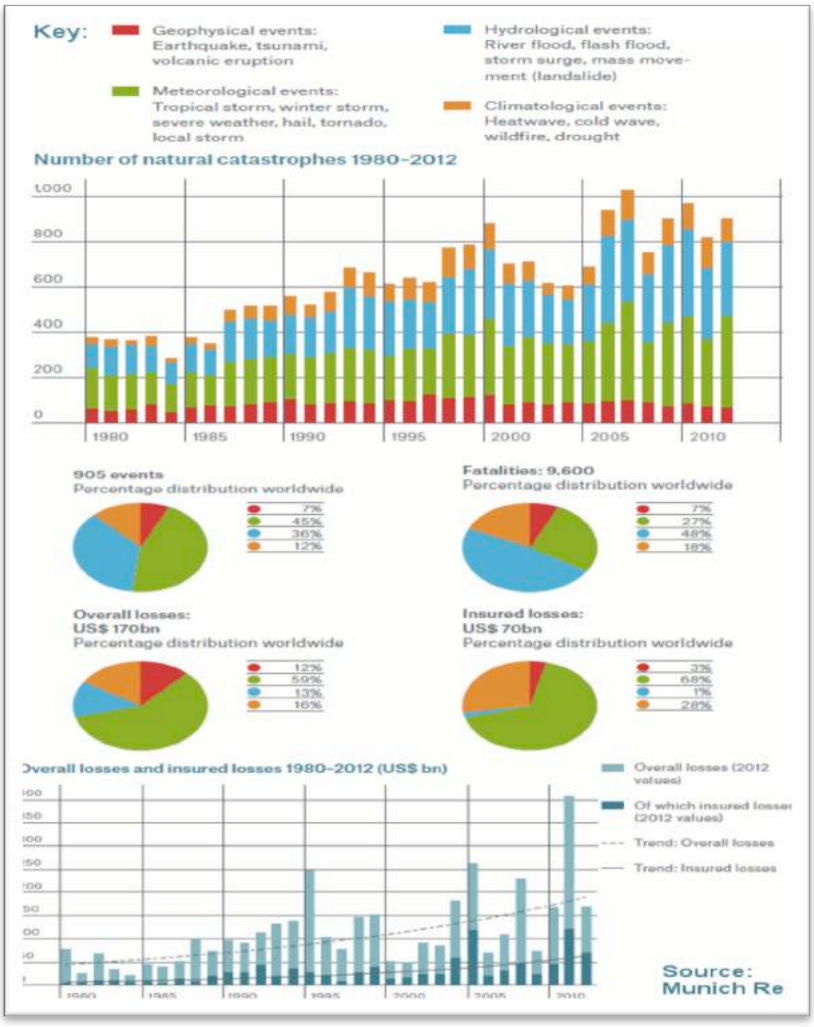
Variation in the risk of developing a cancer in the United Kingdom, by place of birth and gender.[28]

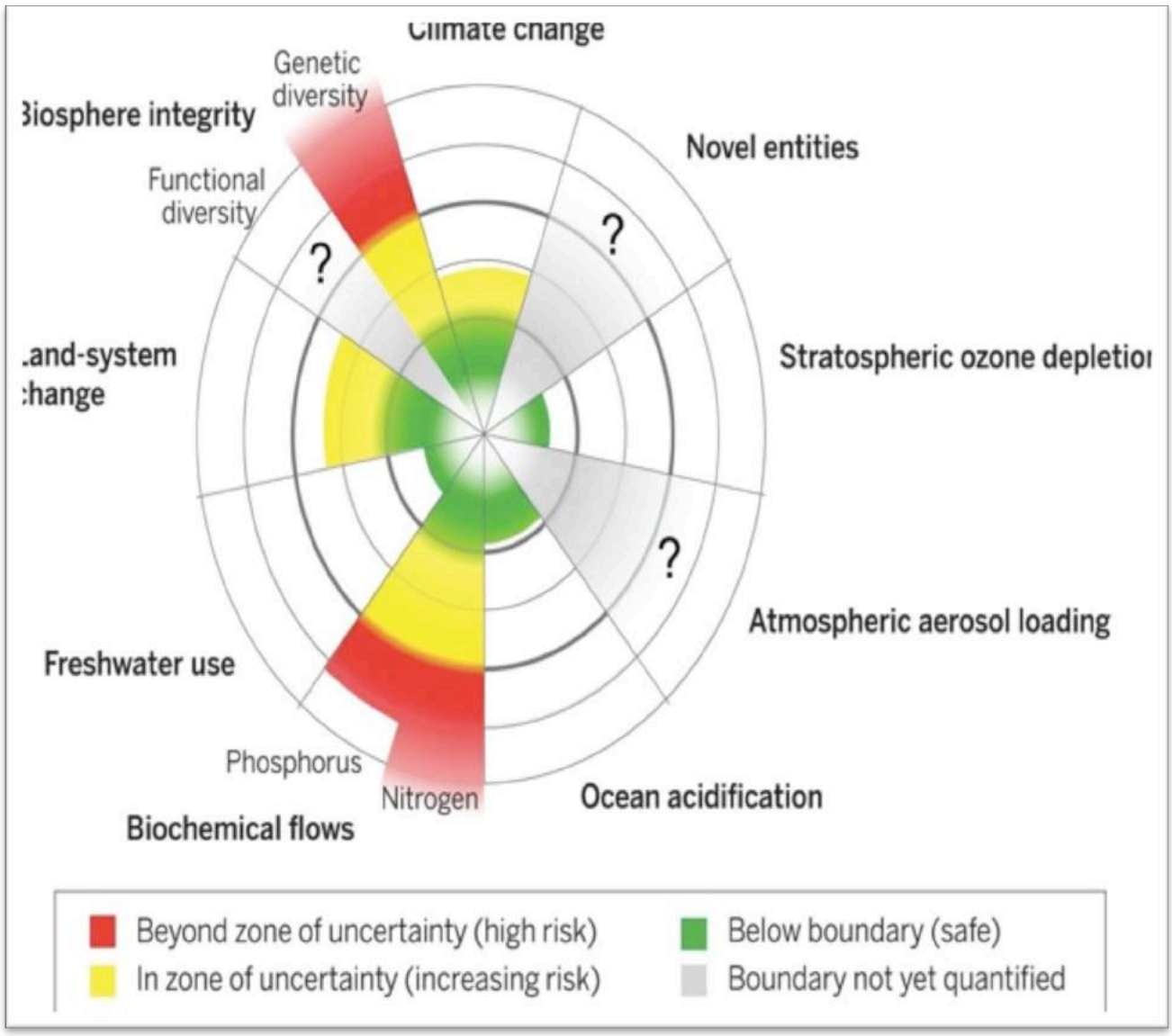
Mitigation opportunities worldwide.[29]

[28] Id.
[29] Climate Focus / CEA (California Environmental Associates). In Bibliography.

ECOSYSTEMIC URGENCY

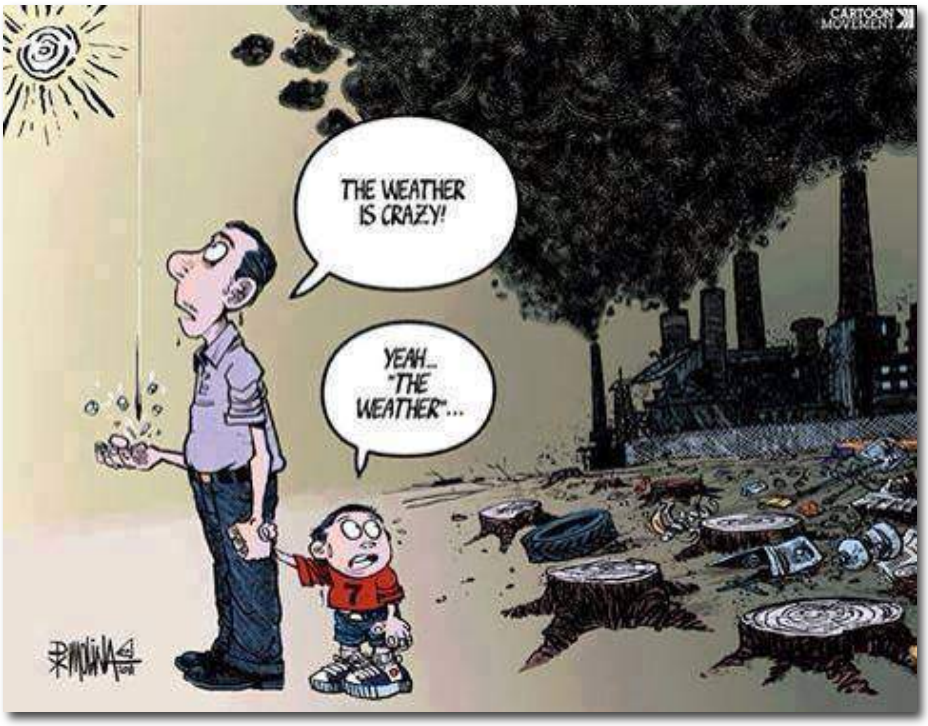




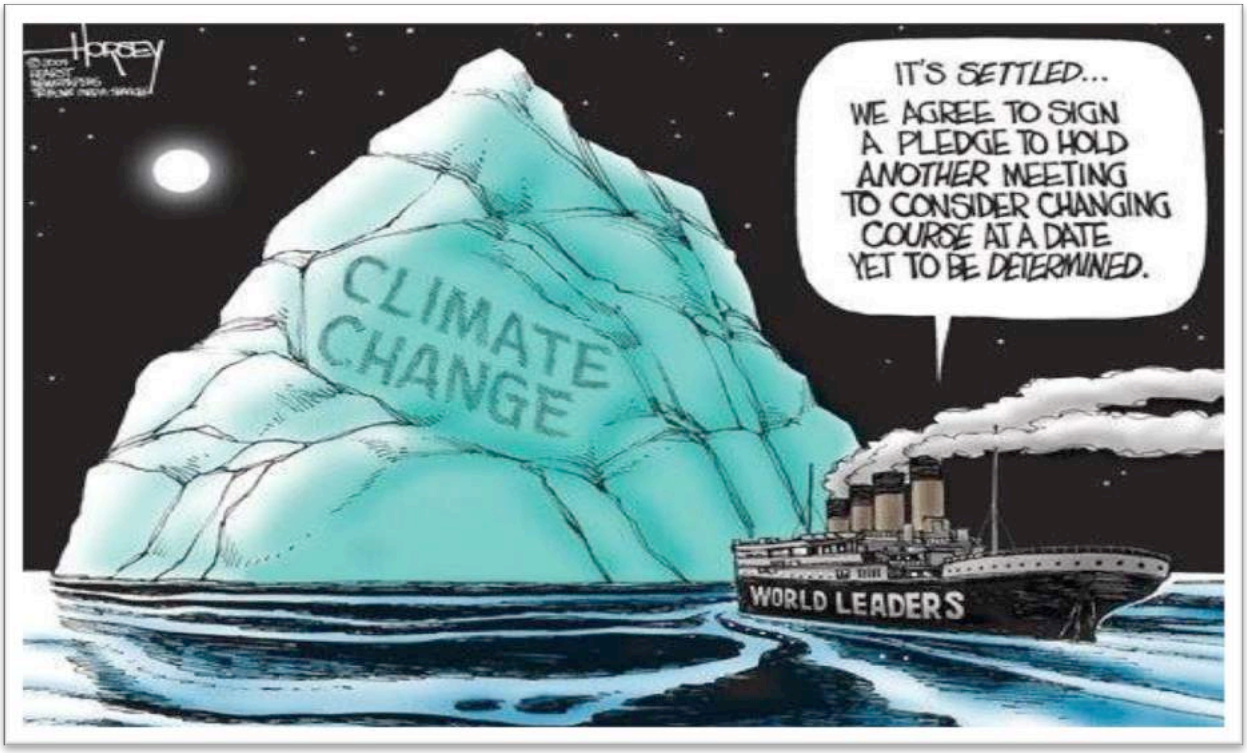


Current state of seven of the planet's limits. Green zone: safe. Yellow zone: uncertain (increasing risk). Red zone: high risk. Grey zone: not yet quantified.[30]

[30] Will Steffen et al: Planetary boundaries: Guiding human development on a changing planet. In *Science*, February 13, 2015 http://www.sciencemag.org/content/347/6223/1259855.figures-only. Stockholm Resilience Centre – *Sustainability Science for Biosphere Stewardship*. http://www.stockholmresilience.org



Social urgency

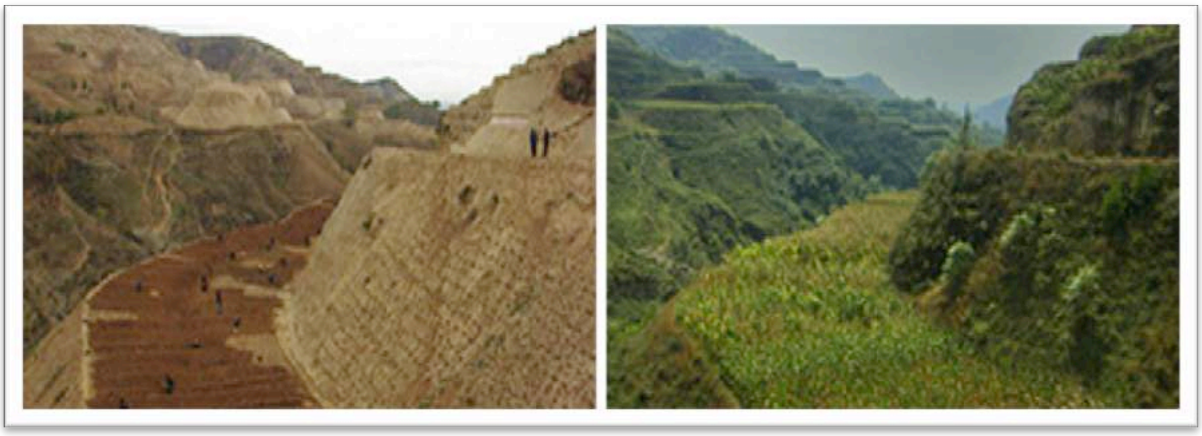



FIRE
WATER
RESPECT
PEOPLES CLIMATE MARCH

Economic and investment urgency

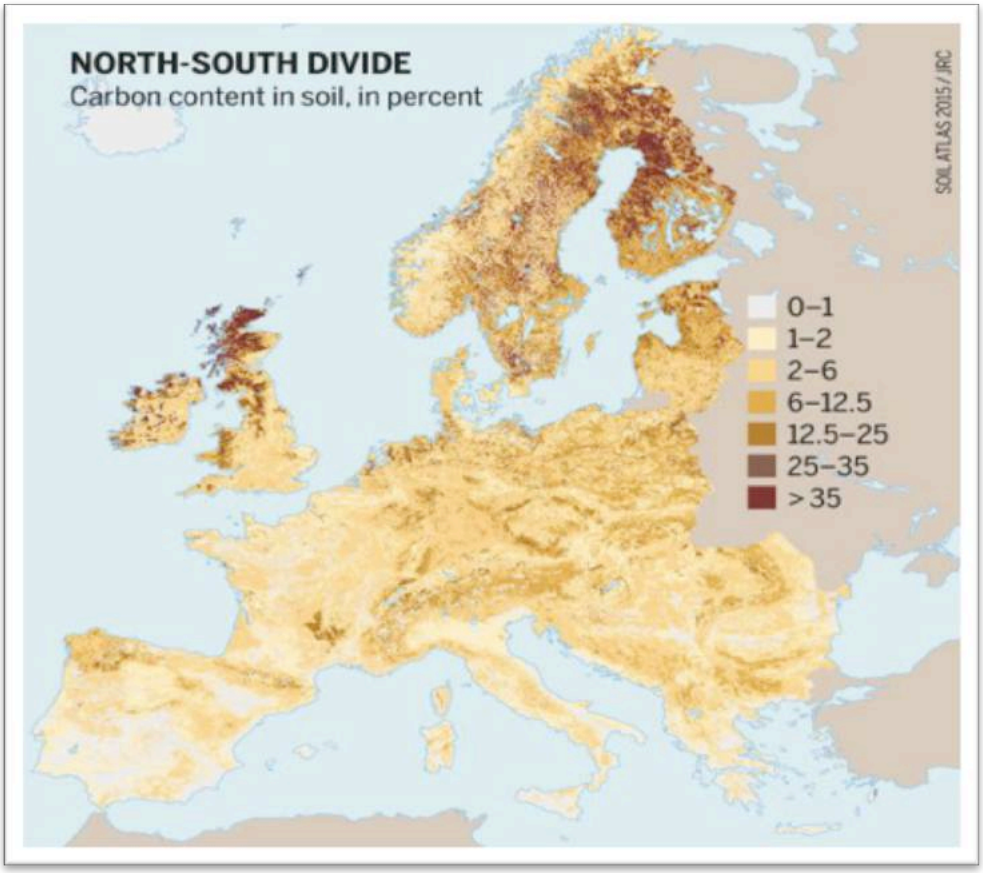
Current and future laws: urgent changes

"HOPE IN A CHANGING CLIMATE." SIGNIFICANT IMPROVEMENTS ALREADY UNDERWAY



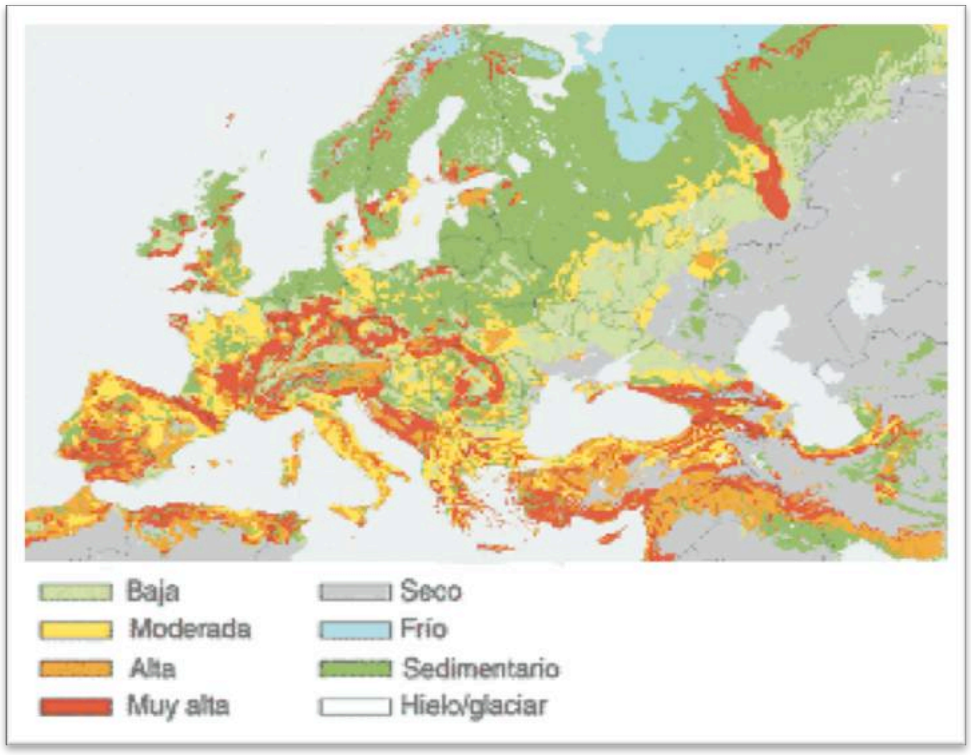
Zone of the Loess Plateau before and after the regeneration

EUROPE



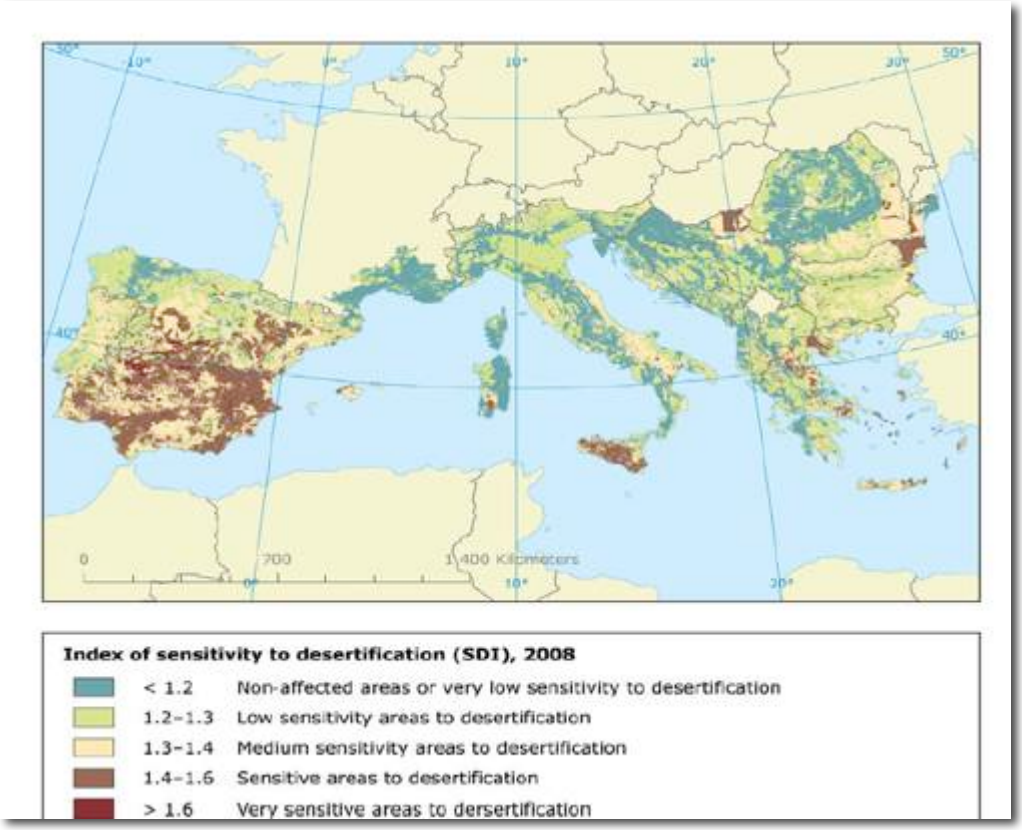
Map 1

Carbon content in European soils (Map 1[31]) and their degradation (Map 2[32]).
Note the coincidence of zones with the most severe erosion, with the exception of C.

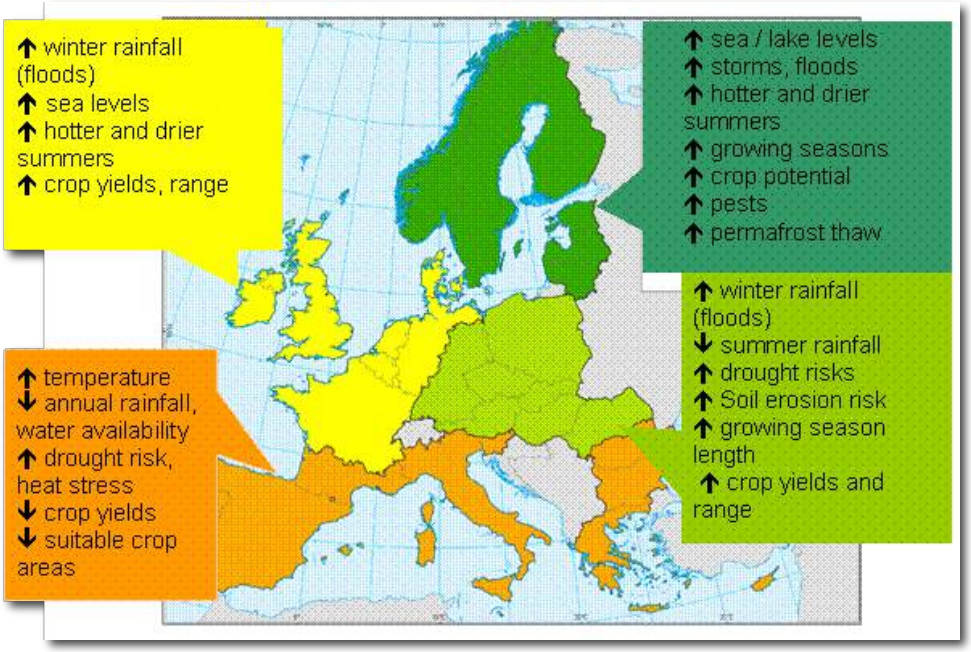


Map 2

[31] Source: Soil Atlas 2015 at http://globalsoilweek.org/soilatlas-2015
[32] Source: www.unep.org GEO3: Global Environment Outlook



Susceptibility to desertification in Europe[33]



Predicted impacts of climate change in different regions of the European Union.[34]

[33] Fuente: European Environmental Agency en http://www.eea.europa.eu/data-and-maps/figures/sensitivity-to-desertification-index-map
[34] Source: European Commission. Directorate General for Agriculture and Rural Development.