Climate, Forests, Ecosystem Services

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International Conference *Climate, Agriculture, Migrations*
CNR- Presidenza del Consiglio, Accademia dei Lincei, Roma 13 October 2017

Mediterranean forests: the most important ecological infrastructure of the region

- ✓ High **biological diversity**, 25,000 species of vascular plants
- ✓ Impacts on the most strategic resources: **water and soil**
- ✓ High relative importance of **non-wood products and non-market services**

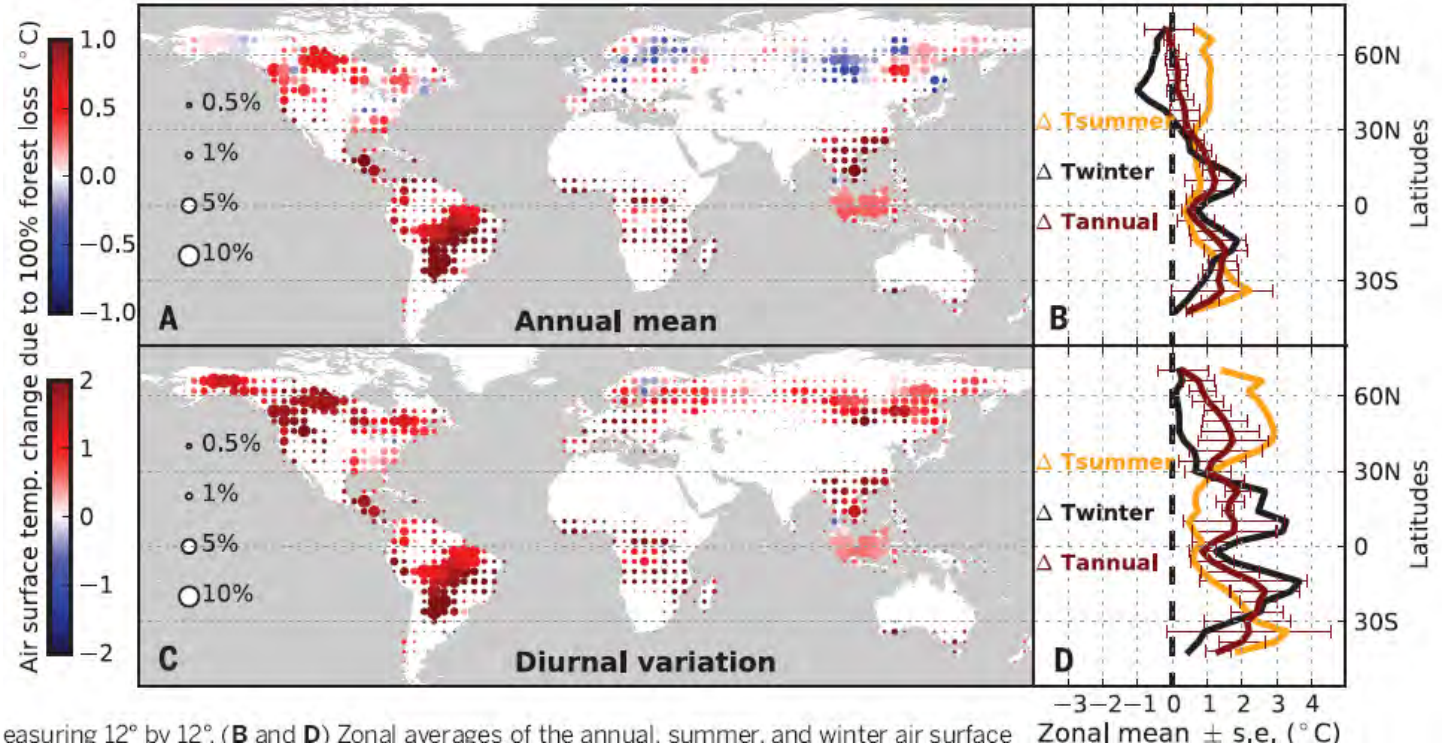
Forest abandonment vs. overexploitation

Impact of Climate change vs. Land use change

Relevant ecosystem services provided by Mediterranean forests & trees!

- ✓ Mitigation: forests sequester ca. 50 Mln ton C per year
- ✓ Water production: up to 75% of water from forest basins
- ✓ Soil protection from erosion and landslides
- ✓ Urban forests remove O_3 and $PM_{10,5}$ for better air quality
- ✓ Landscape, recreation, cultural services: 246 Mln tourists per year (most important industry in Mediterranean region)

Forests have relevant influence on local climate

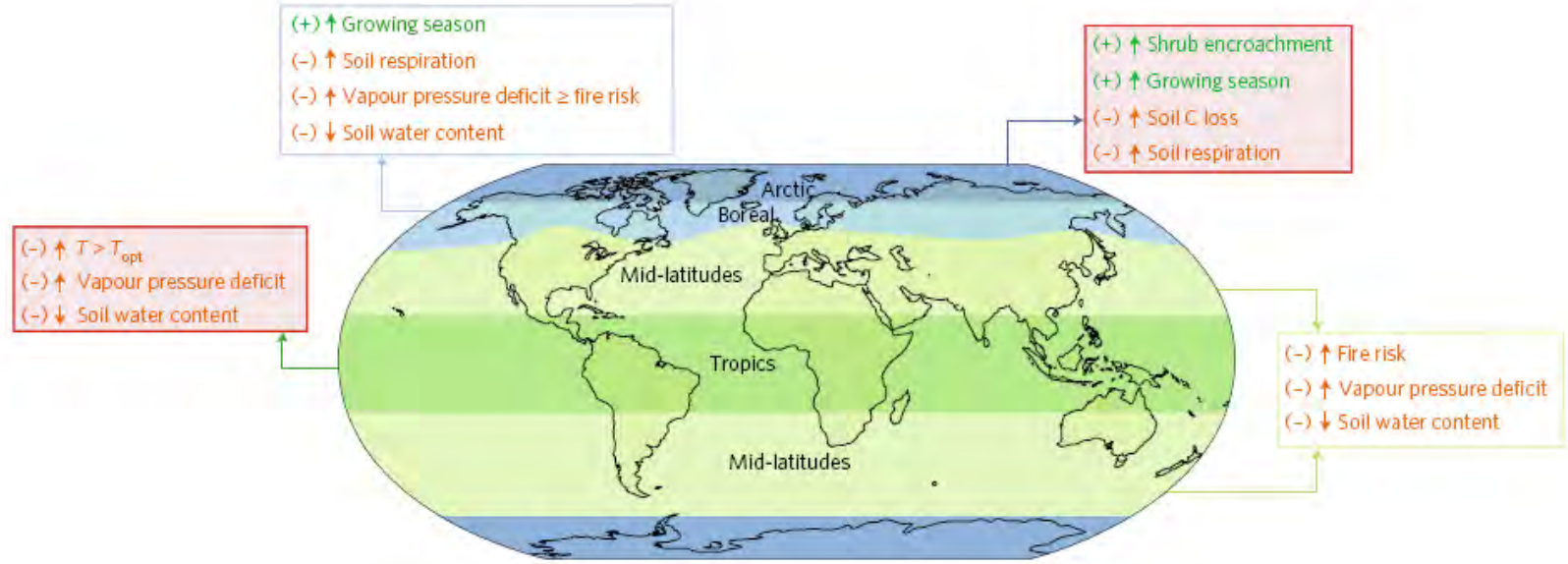


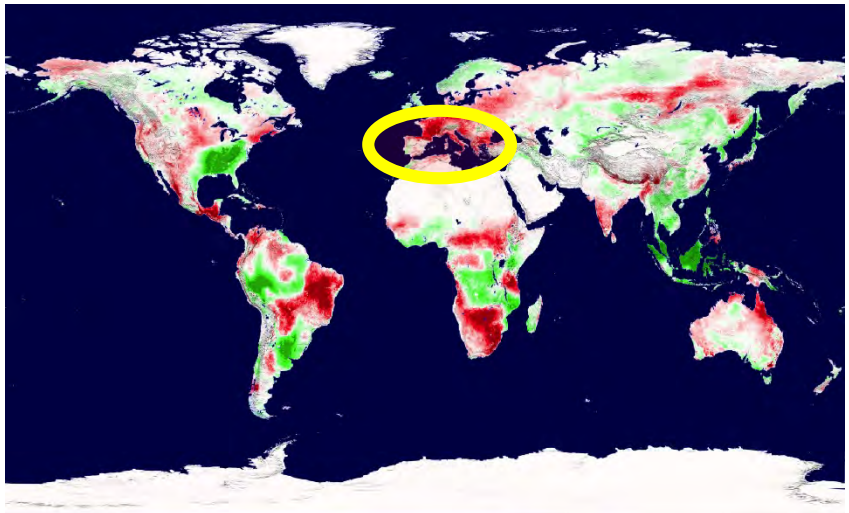
easuring 12° by 12°. (**B** and **D**) Zonal averages of the annual, summer, and winter air surface

In 2003–2012, forest cover loss caused a biophysical warming on land by about 18% (mainly in arid and semi-arid areas)

(Alkama & Cescatti, 2016)

But….high temperatures and drought by CC greatly impact on the role of forest as Carbon sink



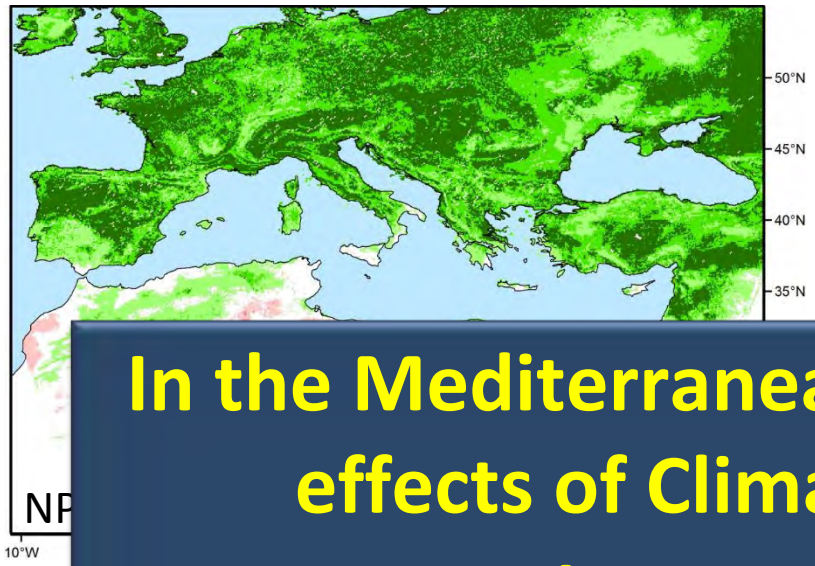


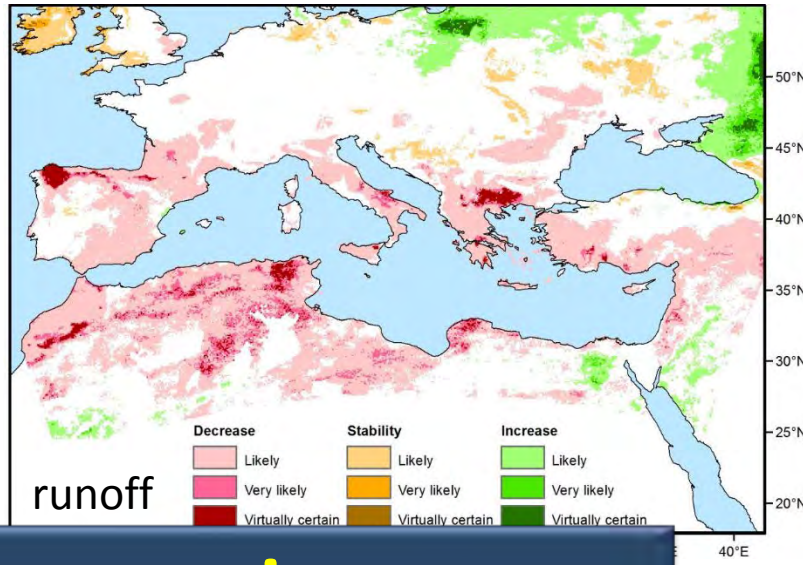
Shift from a period dominated by the positive effects of fertilization to a period characterized by negative impacts of climate change.

(Penuelas et al., 2017; Zhao & Running, 2010)

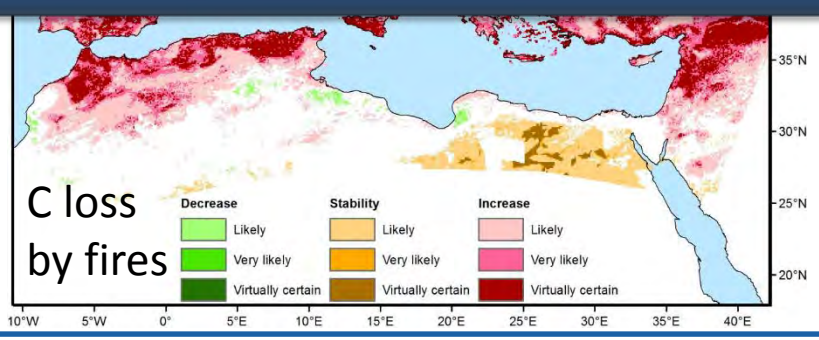
Likelihood of climate change impacts

- Ensemble of 20 LPJ simulations (A1B up to 2050)
- Adopting IPCC likelihood terminology



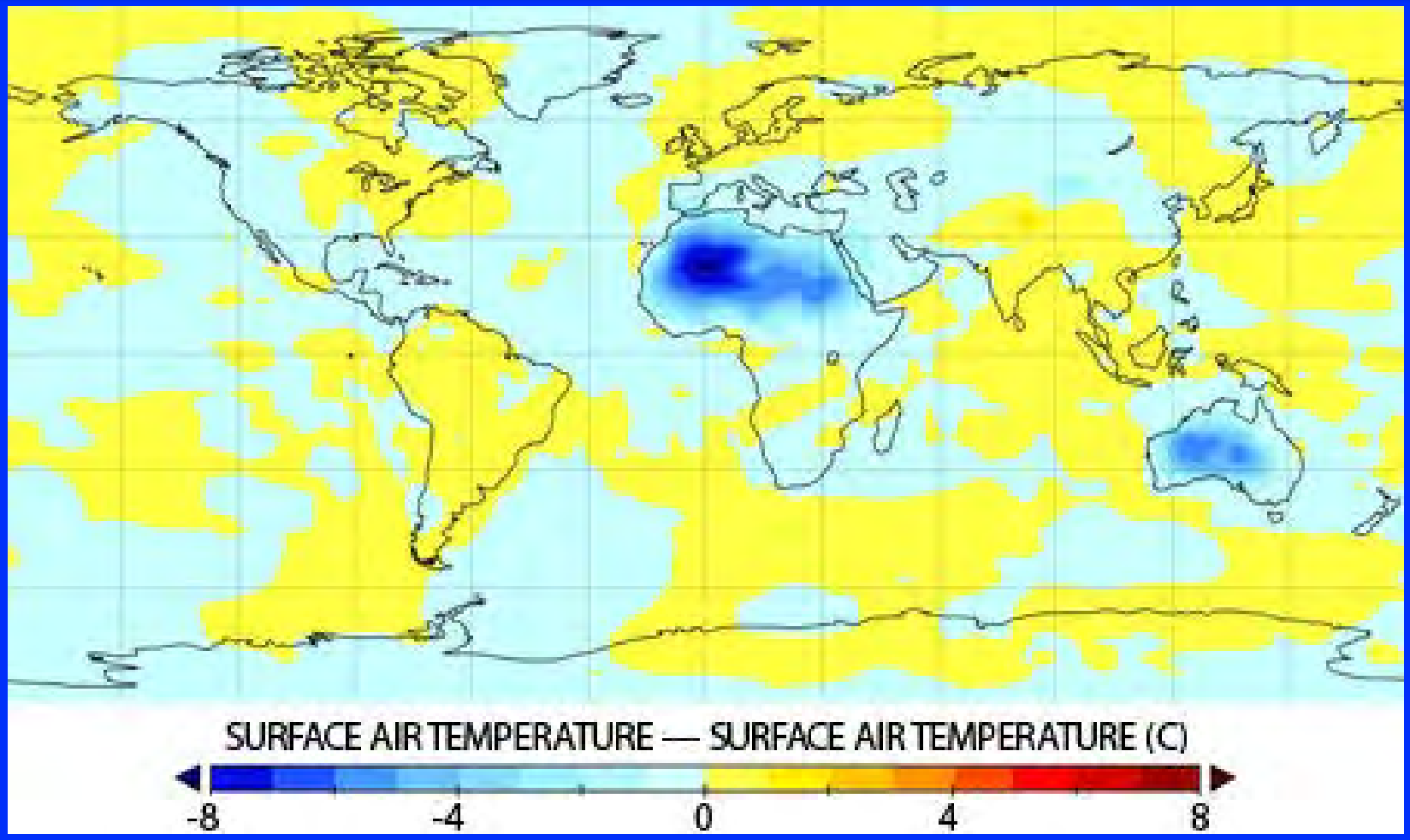


In the Mediterranean region most important effects of Climate Change expected on water scarcity and forest fires



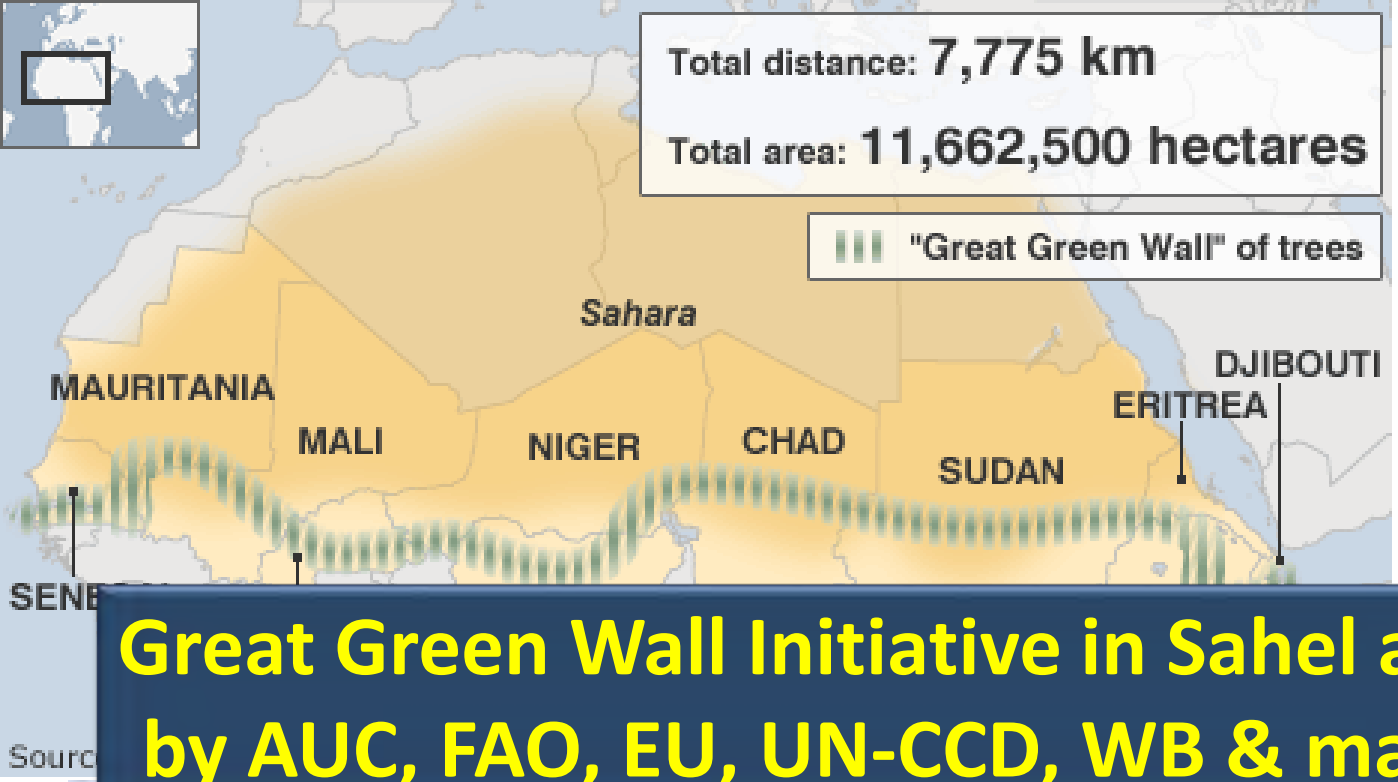
Santini M., Collalti A., Valentini R. (Regional Environmental Change, 2014)

Green dream (*ScienceNOW Daily News* 2009)
Green Great Wall (FAO 2015)

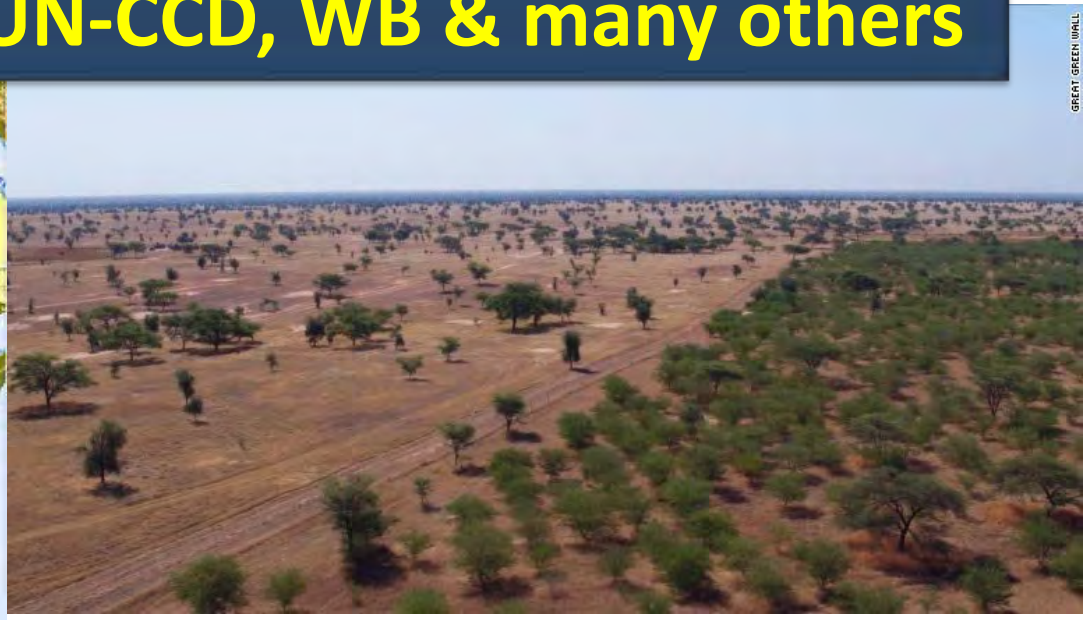


Geo-engineering: plantation and minimal irrigation of trees and forests may cause a positive impact on regional climate (-4°/-8°C on mean air temperatures)

(Ornstein *et al.*, *Climatic Change* 2009)



Great Green Wall Initiative in Sahel and Sahara by AUC, FAO, EU, UN-CCD, WB & many others



PHYTOTECHNOLOGIES IN SOUTH-MEDITERRANEAN (Algeria, Egypt, Morocco, Tunisia)

Phytotechnologies use trees and shrubs to restore degraded environments and resources (i.e. soil and water); financed by Italian Cooperation and Italian Ministry of Environment

Projects sponsors

Ministero dell'Ambiente e della Tutela del Territorio e del Mare

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Cooperazione Italiana allo Sviluppo
Ministero Affari Esteri

Scientific & technical partners

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In different sites, we developed an integrated approach to reduce water pollution (treating the waste water by constructed wetland) and to promote land rehabilitation (planting trees according to a multipurpose scheme and local needs).

Oasis of Brezina (Algeria)

Forest plantation with water flowing from phyto-remediation plant (*Cupressus sempervirens, Elaeagnus angustifolia , Medicago arborea*)

Thanks to you!

Acknowledgements

Paolo De Angelis, Università della Tuscia

Alberto Del Lungo, FAO

Alessio Collalti, CMCC

Mauro Centritto, CNR

Giorgio Matteucci, CNR

Mauro Maesano, CNR