NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT IN FORESTRY *"Marin Drăcea"*

Sustainable forest soils approaches

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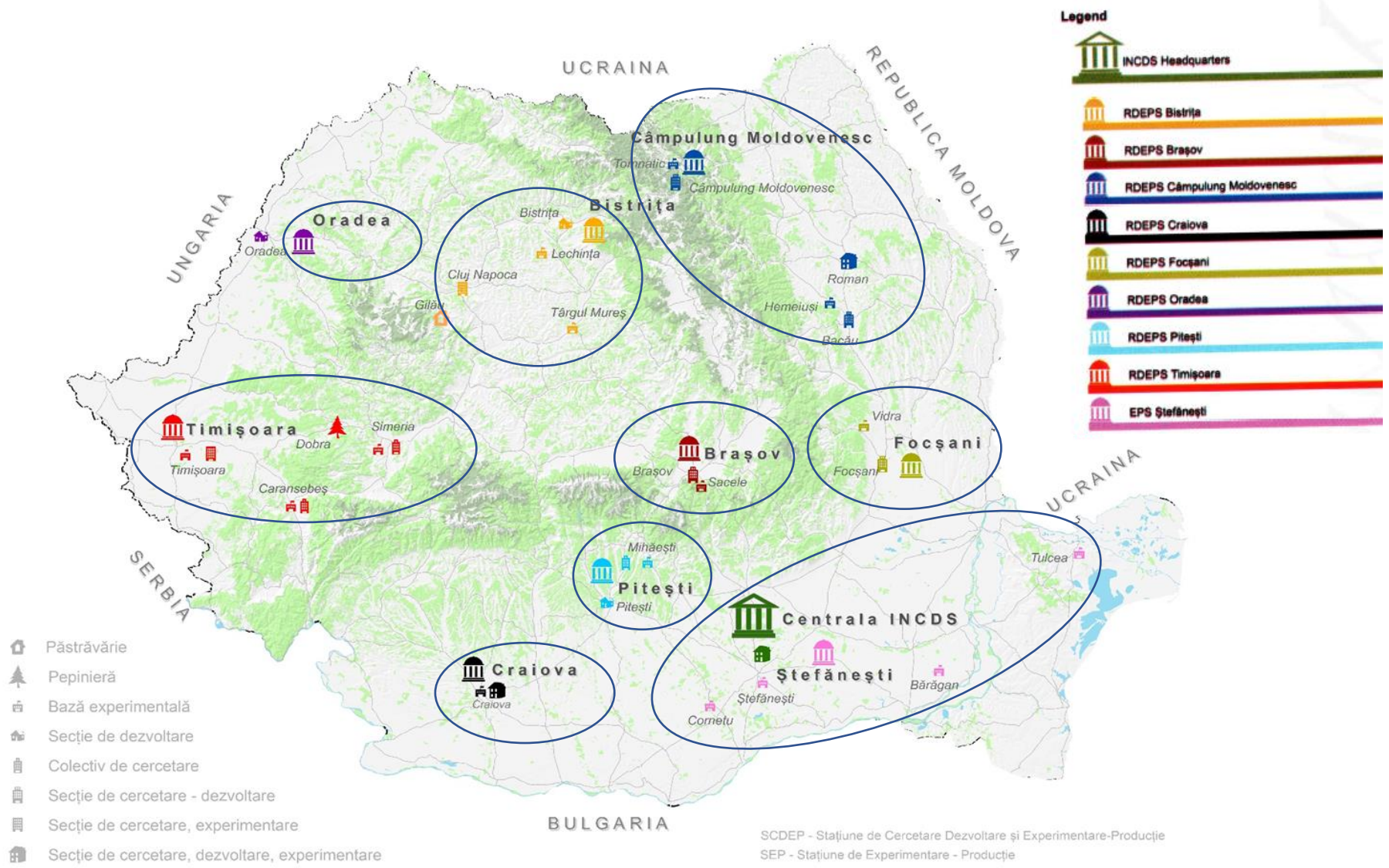
INCDS "*Marin Drăcea*": From past to present

1 INCDS – established in1933: Institute of Research and Experimentation in Forestry (ICEF)	The Ministry Council Journal no. 561/ 16 May 1933, registered in the Official Register Number 115/ 22 May 1933
2 Since 1974 – Forest research and Management Institute (ICAS)	Decree of the State Council no. 139/ 30 April 1974
3 In 1990 – was encompassed in the Autonomous Forest State Administration	Government Decision no. 1335/ 1990.
4 In 2015 – was reorganized as INCDS	Under the coordination of the National Research Authority (Government Decision no. 318/ 2015) Under the scientific coordination of the Academy of Agricultural and Forestry Sciences (ASAS) (Law no. 45/ 2008)

INCDS “Marin Drăcea” – Production stations



Field of activity, role and objectives of INCDS „Marin Drăcea”

- **Field of expertise:**

  7219 - *Research and development in other natural sciences and engineering*;

  0221 - *Forestry and other forestry activities*

- ***The priority field of smart specialization*** **–** **<u>Bioeconomy</u>**, *subdomain –Technologies for organic agriculture, agroecology and forestry (according to the National Strategy for Research and Innovation and Smart Specialisation SNCISI 2022 -2027).*

- **Main objective:** “*Increasing the capacity, quality and complexity of scientific research and technological development in forestry for the sustainable management of forests in the context of socio-economic and environmental changes at the national, European and international level*”.

- **Specific objectives:**

  a) Supporting the promotion of excellence in the activity of scientific research and technological development;

  b) Supporting technological transfer as a key element of intelligent specialisation for increasing the economic competitiveness of the forestry sector;

  c) Concentration of research and development activities in areas of public relevance's;

  d) Focusing efforts on the development of the digitization component.

INCDS „Marin Drăcea” structure

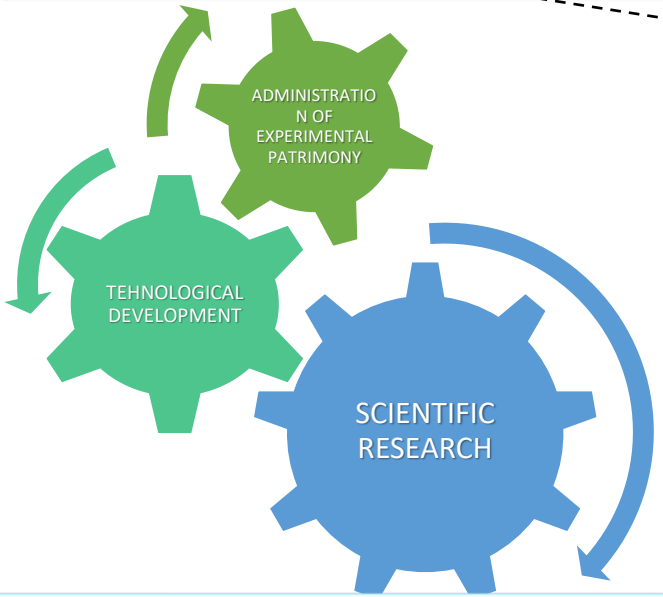
MINISTRY OF RESEARCH, INNOVATION AND DIGITALIZATION

MINISTRY OF ENVIRONMENT, WATER AND FORESTS

ACADEMY OF AGRICULTURAL AND FORESTRY SCIENCES *“Gheorghe Ionescu Șișești”*

Autonomous Forest State Administration - ROMSILVA

NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT IN FORESTRY “Marin Drăcea”



FORESTERS' ASSOCIATION FROM ROMANIA - ASFOR

ASSOCIATION OF FOREST ADMINISTRATORS - AAP

DEPARTMENTS, SERVICES, SECTIONS, LABORATORIES, EXPERIMENTAL POINTS

Institutional capacity: research and development facilities

Research-development-innovation infrastructure – membership of European and pan-European networks: ESFRI, ERIC/CERIC, ROAD MAP, etc

- INCDS – full member or cooperating with prestigious regional, European and international entities:
  - ✓ **IUFRO** - International Union of Forest Research Organizations
  - ✓ **ICP Forests –UN/ECE** - ICP Forests al Națiunilor Unite pentru Europa
  - ✓ **EUFORGEN** - European Forest Genetic Resources Programe
  - ✓ **JRC** - Joint Research Centre
  - ✓ **EFDAC** - European Forest Data Centre
  - ✓ **EUFGIS** - European Information System on Forest Genetic Resources
  - ✓ **LTER Europe, ILTER** - International Long Term Social and Ecological Research
  - ✓ **ENFIN** - European National Forest Inventory Network
  - ✓ **FTP -** Forest – Based Sector Technology Platform
  - ✓ **ERIC - LIFE WATCH Network**, Education Resources Information Center
  - ✓ **ICOS Romania** - Roadmapul național al infrastructurilor de cercetare din România
  - ✓ **SCAR FOREST -** Scientific Committee of Agricultural Research for Forest
  - ✓ **BIOEAST -** Central and Eastern European Initiative for Knowledge-based Agriculture, Aquaculture and Forestry in the Bioeconomy

INCDS research and development activities

SCIENTIFIC RESEARCH

- ★ E1 – Dendrometrics, forest management and monitoring
- ★ E2 – Forest ecology
- ★ E3 – Genetics and tree breeding
- ★ E4 – Game management and biology
- ★ E5 – Silvotehnics and ecological reconstruction
- ★ E6 – Forest protection
- ★ E7 – Forest eomatics

TECHNOLOGICAL DEVELOPMENT

- ★ Forest management
- ★ National Forest Inventory (NFI)
- ★ Torrential watershed management
- ★ Reconstruction of degraded lands
- ★ Designing forest shelterbelts

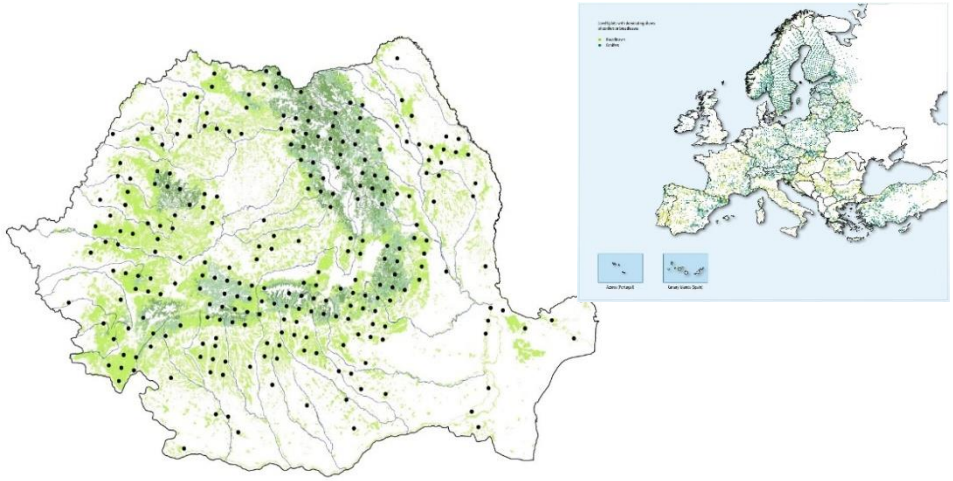
EXPERIMENTATION – PRODUCTION

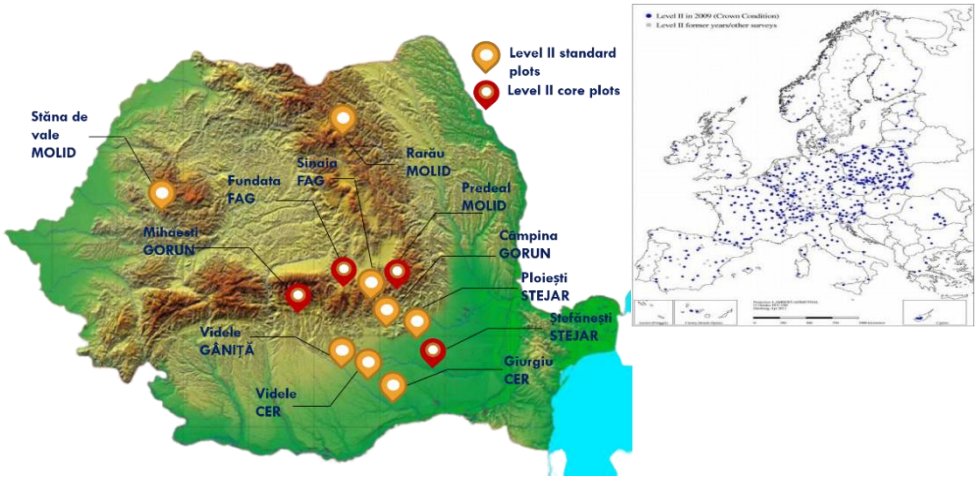
INCDS forest patrimony - ***„live laboratories"*** described in **„The Catalogue of experimental surfaces"** ale INCDS

- ★ Experimental points - 5
- ★ Arboretums – 5
- ★ Plantations – 3 (Larix, Pinus)
- ★ Forest nurseries – 7
- ★ Trout farms – 1
- ★ Experimental surfaces: over 200

Experimental plants/microproduction pilot plants/prototypes

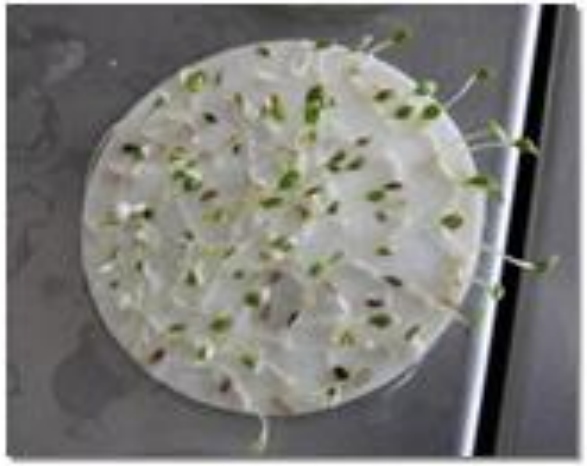
ICP Forests-Level II - core plots and LTER Europe





Accredited /non-accredited testing laboratories

Partially accredited laboratories – ISTA : Laboratory for the Analysis of Forest Seeds



Accredited /non-accredited testing laboratories

Non-accredited laboratories but inter-calibrated at European level (ICP- Forest Soil Analysis Laboratories, Tree Nutrition Laboratories, Laboratories for Analysis of Pollutants Deposits and Air Quality - O_3, NO_2, NH_3, SO_2)

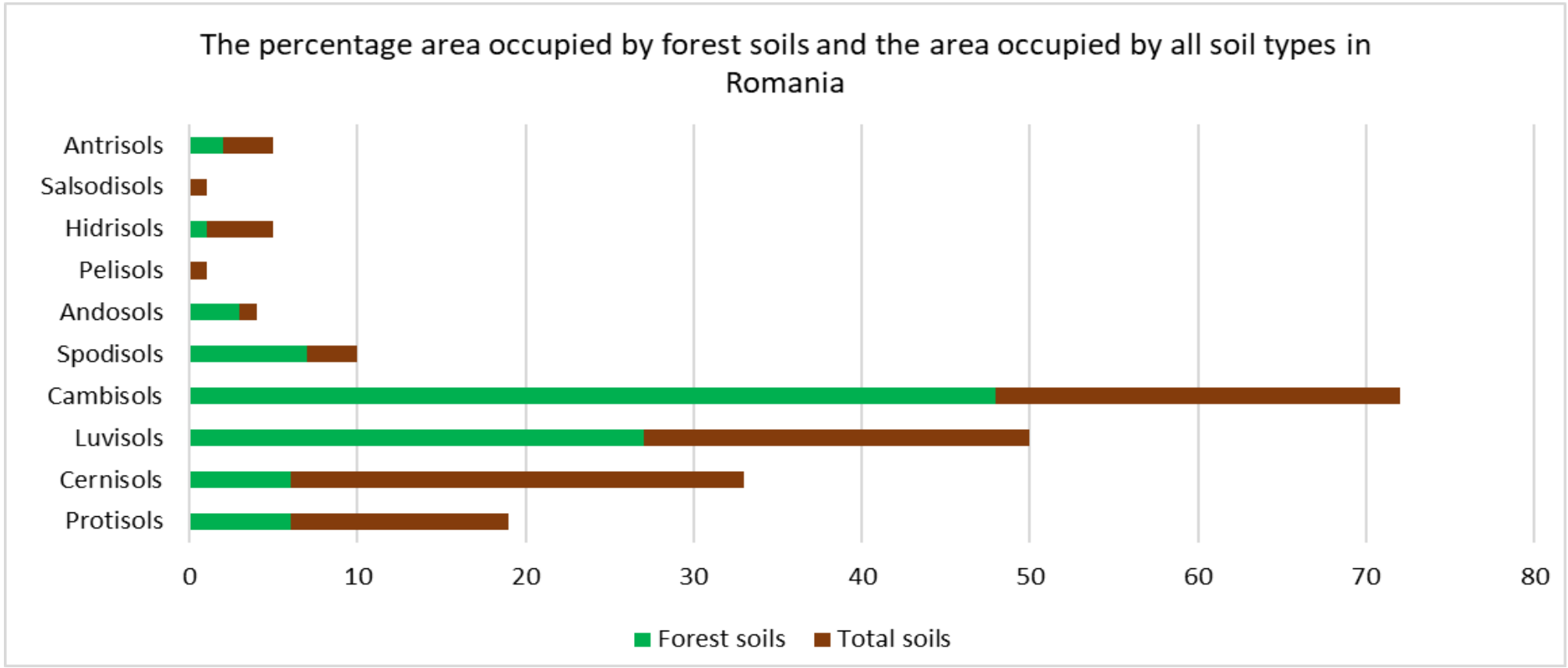
Laboratory for Analysis of Pollutants Deposits

The importance of forest soils

Forest soils have their own characteristics, the most important being:

- Contain organic matter that contributes to the formation of forest humus.
- Improve the process of transformation and migration of mineral substances.
- Contributes to the formation of soil structure and porosity through the root system.
- Contain a specific microflora and microfauna and are generally very acidic.
- Balanced content of nutrients.
- Provides important ecosystem services, namely :
  - Stores organic carbon
  - Provides a growing environment for trees
  - Improve water management
  - Contain archaeological and paleontological records
  - Restores degraded/abandoned lands
  - Contributes to habitat restoration

Distribution of forest soils



Erosion processes

- Soils from mature, consistent, healthy ecosystems, composed mainly of native species and not logged show lower erosion values.

Soil erosion on land without vegetation

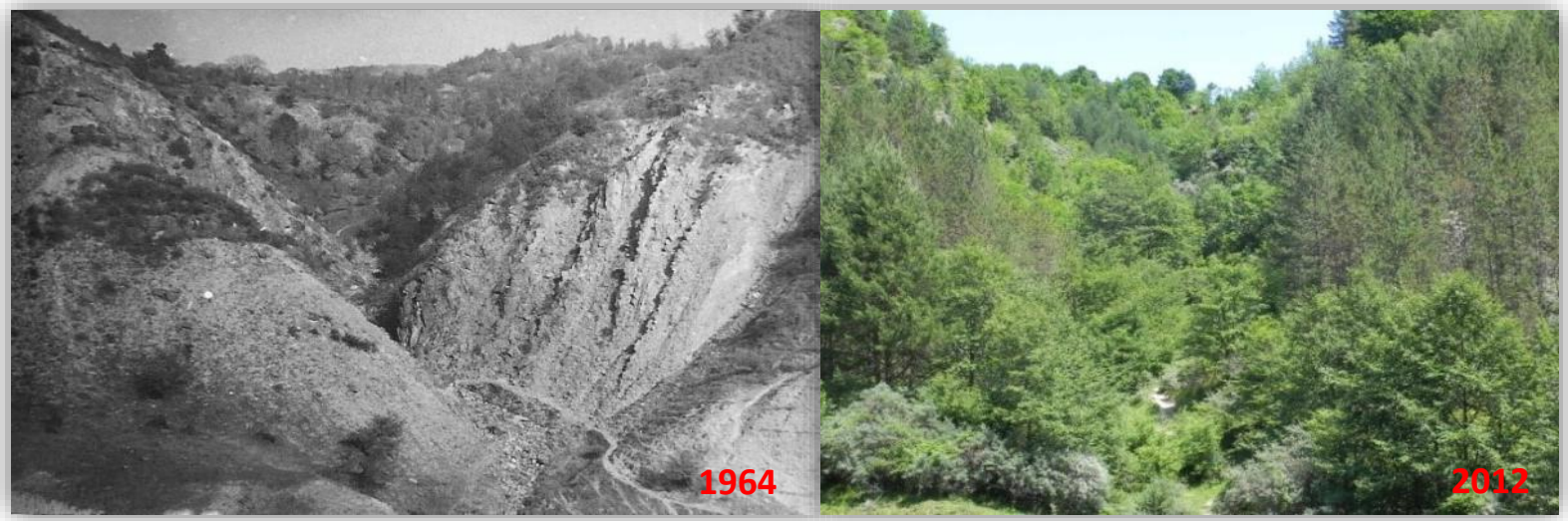
Land use	Erosion degree (%)
Gardens with tilled soil	80–90
Crops of sugar beet and maize	85
Crops of autumn grain	5–25
Crops of annual herbs	1–5
Crops of perennial grasses	0,5
In optimal structured forest	0,01

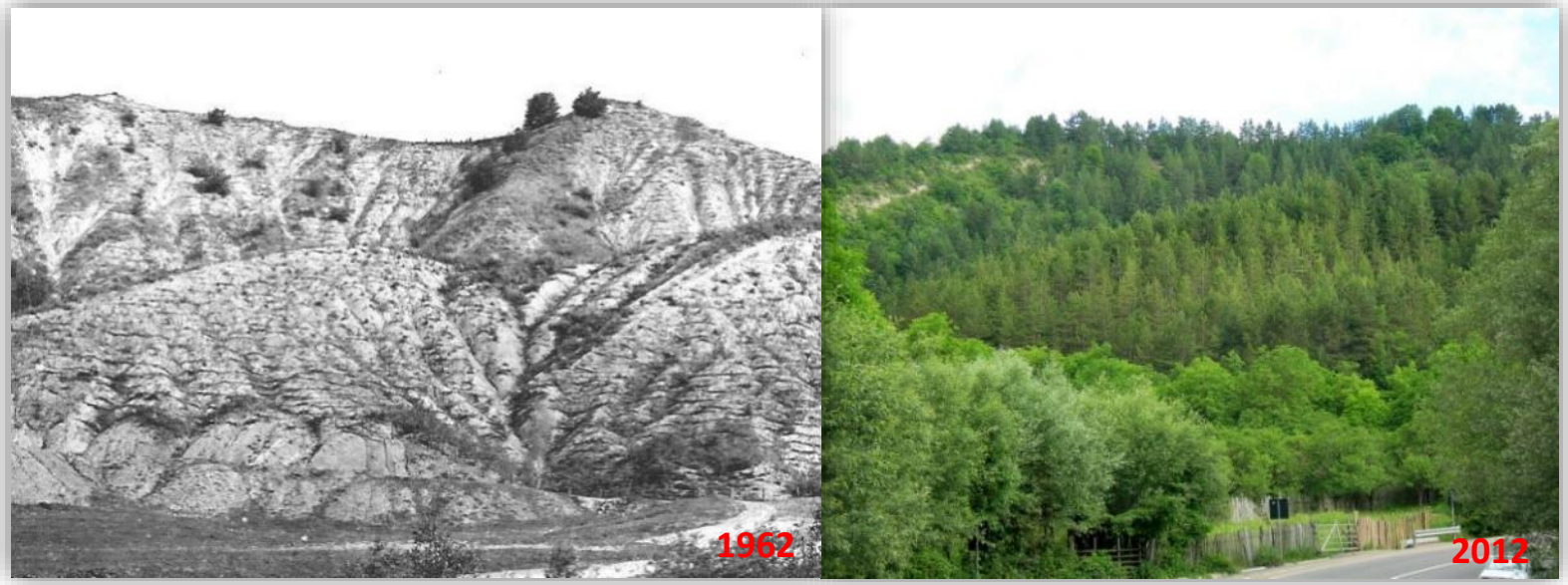
Soil erosion on land with uses other than forest

Land use	Erosion increased by...(ha)
natural or cultivated meadows	0.01–0.04
natural meadows degraded by abusive grazing	0.1–0.5
agricultural land cultivated with non-creeping plants	0.2–0.6
agricultural land cultivated with creeping plants (on slopes over 25%)	0.5–2.0
Land without vegetation, affected by depth erosion	1.0–5.0 (and over)

Afforestation of degraded lands

Afforestation of degraded lands

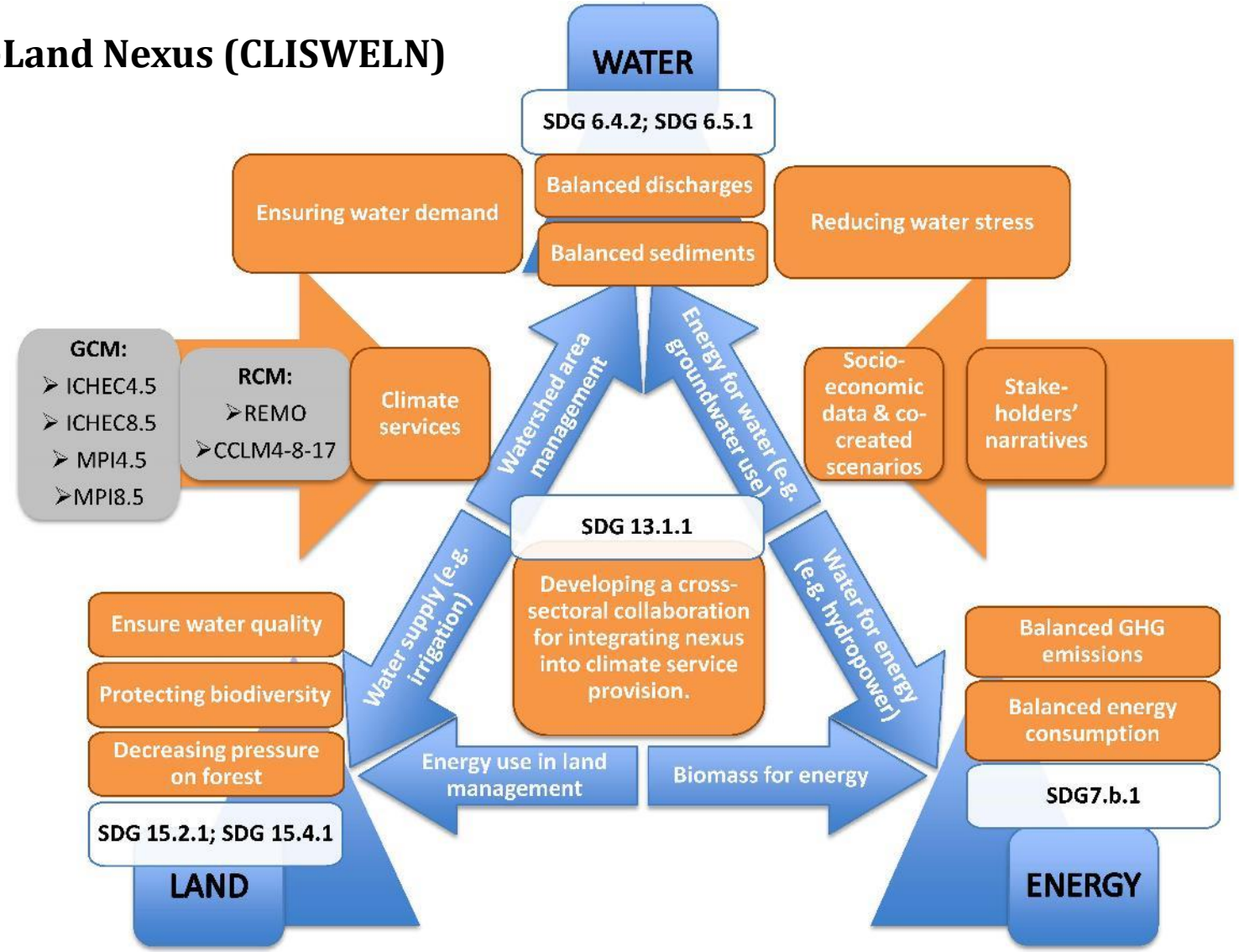




National and international projects

❑ Climate Services for the Water-Energy-Land Nexus (CLISWELN)

- Project duration: 2017−2021
- Funding: European Research Area for Climate Services (ERA4CS), ERA4CS an ERA-NET initiated by JPI Climate, and funded by DLR (DE), BMWFW (AT), MINECO (ES), UEFISCDI (RO) with co-funding by the European Union (Grant 863470)
- Project goal: enhance the existing portfolio of climate services with a conceptually and methodologically meaningful approach to the local resources (Water-Energy-Land-Food), from which coherent policies could be derived.



National and international projects

- Research infrastructure:

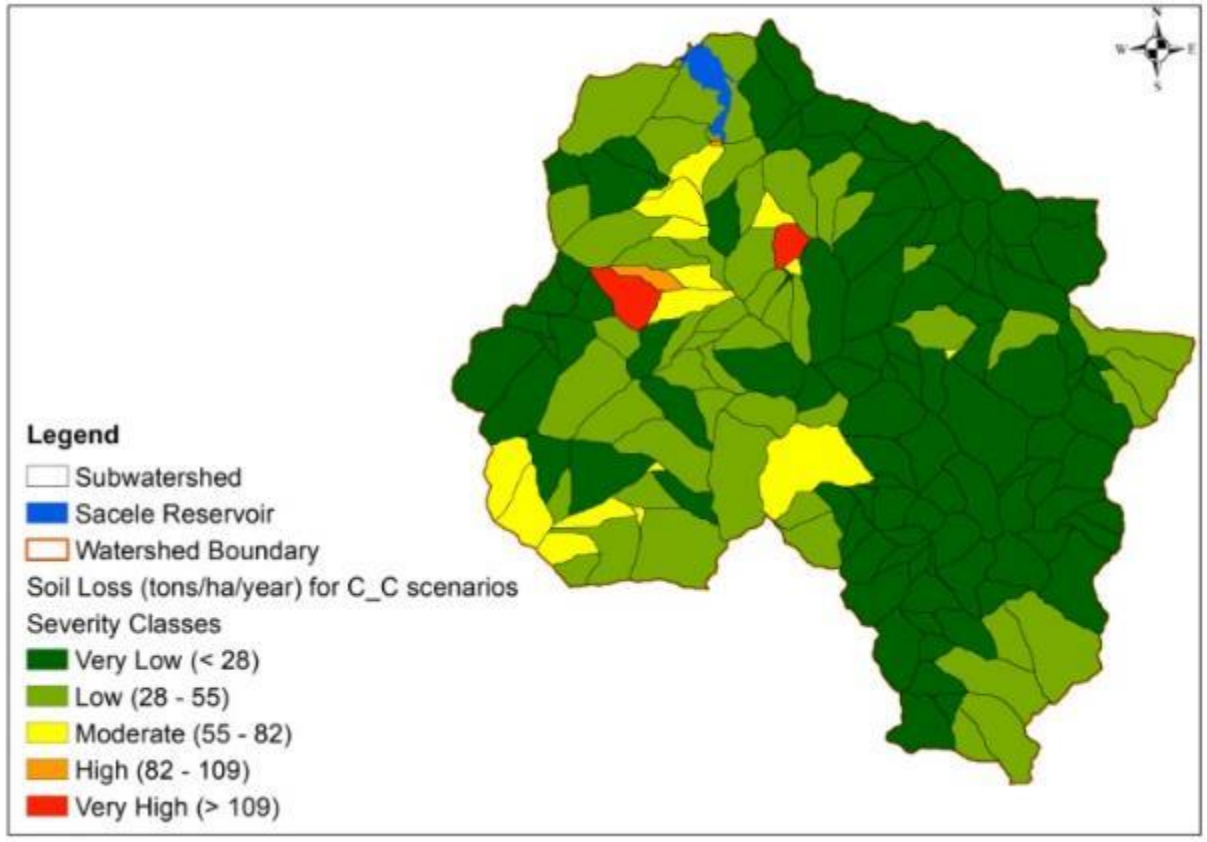
Weather Station Campbell Scientific CR1000

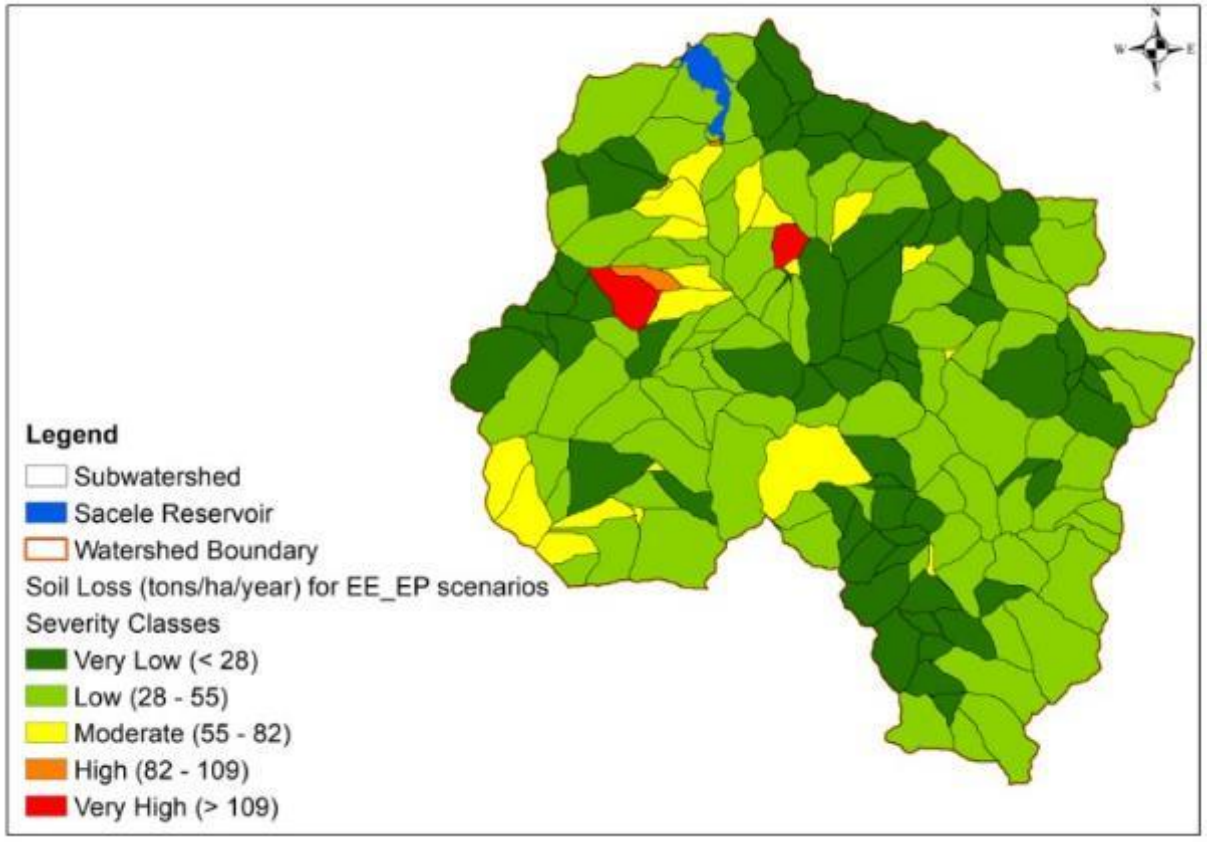
Rain gauges HOBO Data Loggers

Soil infiltrometer SATURO

National and international projects

- Soil erosion risk maps made for B.H. Tarlung in the 2020−2039 period under climate change scenarios coupled with land use change and forest management scenarios



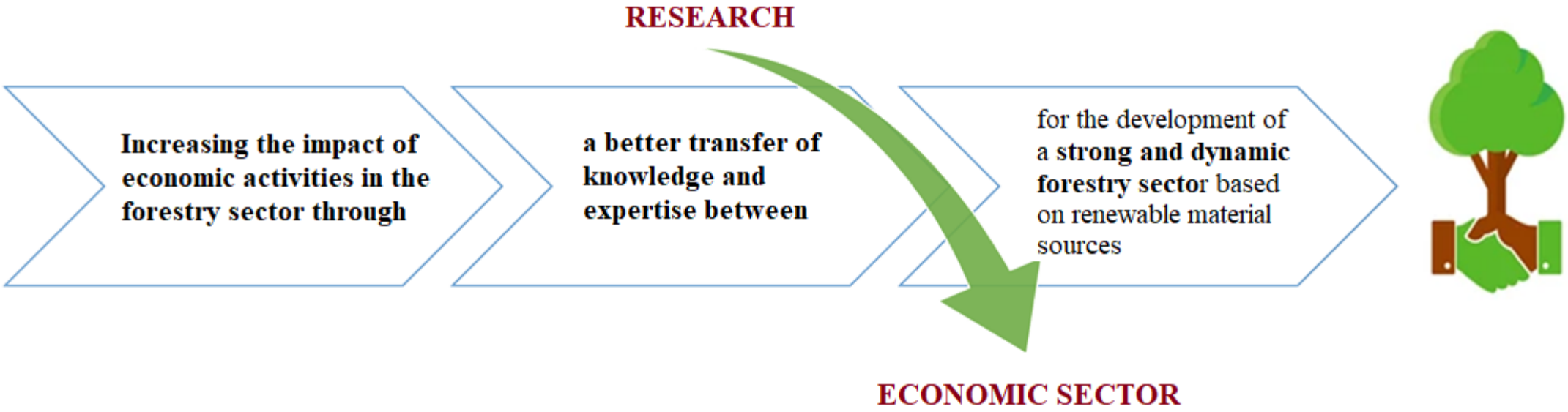


Tudose, N.C., *Cheval, S.,* ***Ungurean, C****., Broekman, A., Sanchez-Plaza, A., Cremades, R., Mitter, H., Kropf, B., Davidescu, Ș.O., Dincă, L., Cacovean, H.,* ***Marin, M.,*** *Miska, K., Pereira, P., 2022. Climate services for sustainable resource management: The water-energy-land nexus in the Tarlung river basin (Romania). Land Use Policy 119, https://doi.org/10.1016/j.landusepol.2022.106221*

National and international projects

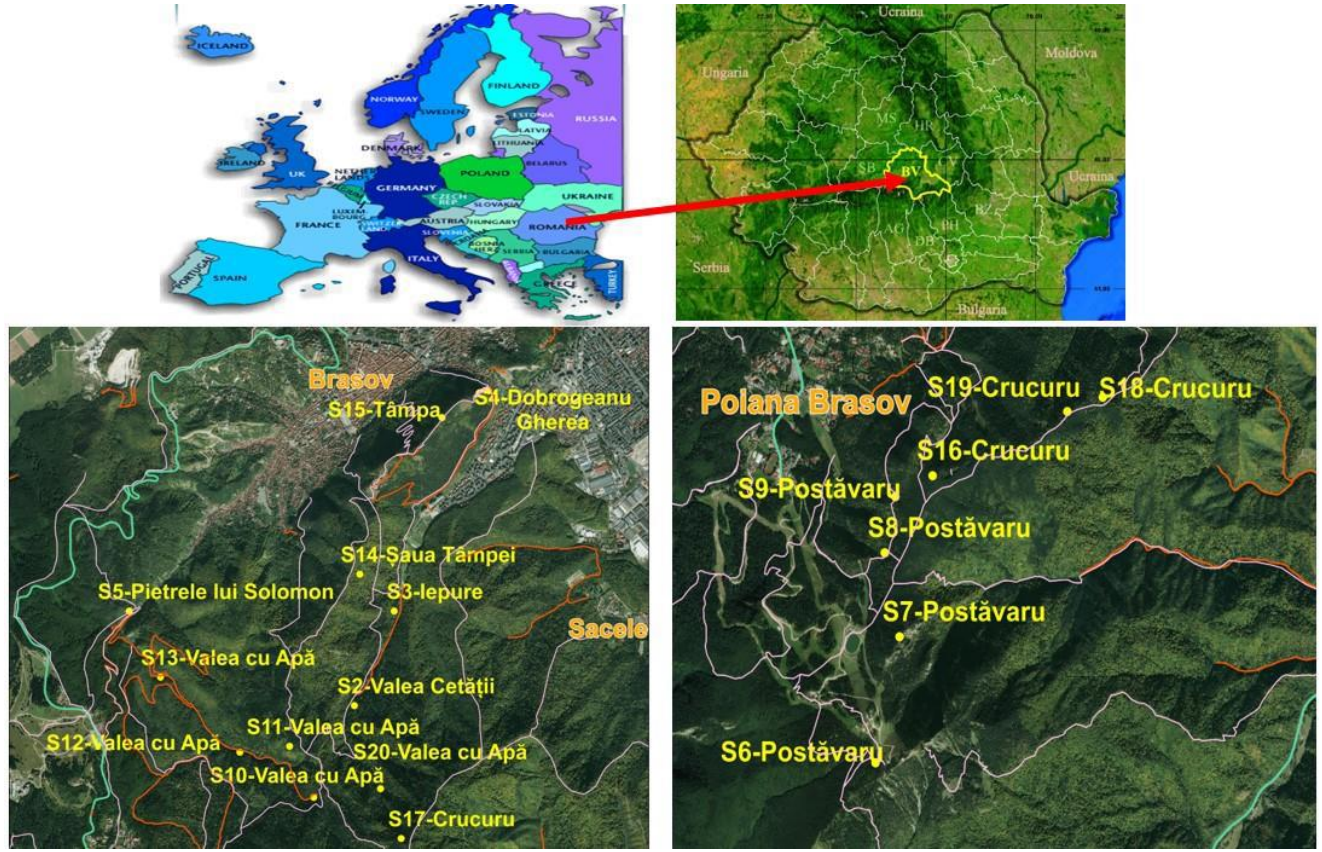
❑ **Increasing the economic competitiveness of the forestry sector and the quality of life through the transfer of knowledge, technology (CRESFORLIFE)**

- Project duration: 2016–2021
- Contract: POC_40_380, Co-financed from the European Regional Development Fund through the Competitiveness Operational Program 2014-2020
- Project objective:



National and international projects

- The favorability of orographic (altitude) and edaphic factors (reaction, base saturation degree, edaphic volume, potential global trophicity) for the main species that comprise urban forests from Brasov City



Enescu R., Vasile D., Dinca L., Davidescu S., Breaban I.G., 2022. The favorability of orographic and edaphic factors for the main species that comprise urban forests from Brasov City. Present Environment and Sustainable Development 16(1), DOI: https://doi.org/10.47743/pesd2022161011

National and international projects

- The favorability of orographic (altitude) and edaphic factors (reaction, base saturation degree, edaphic volume, potential global trophicity) for the main species that comprise urban forests from Brasov City

❖ NORWAY SPRUCE:

- Present in 17 out of the 20 experimental plots.
- Altitude: 10 out of the 17 plots are situated in the optimal area, while two plots are located at the tolerating limit.
- Soil reaction: 7 plots are located in the limit area, 3 plots are located under the inferior limit, and for 4 plots the soil reaction exceeds the superior limit.
- Edaphic volume: 4 plots are situated in a limitative area.
- Potential global trophicity: the majority of plots are situated in the suboptimal area, while 6 of them are in the optimum area.

❖ SILVER FIR:

- Present in 12 out of the 20 experimental plots.
- Altitude: plots are equally distributed on the three areas of ecological requirements, 4 plots in each area.
- Base saturation degree: 6 plots are situated in the optimum area and 6 plots in the suboptimal area.
- Soil reaction: 2 plots are at the tolerance limit, 2 are in the optimum area, while the majority are located in the suboptimal area.
- Overall, the most numerous plots with silver fir in their composition are located in the suboptimal area.

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National and international projects

- The favorability of orographic (altitude) and edaphic factors (reaction, base saturation degree, edaphic volume, potential global trophicity) for the main species that comprise urban forests from Brasov City

❖ COMMON BEECH:

- Present in 10 out of the 20 experimental plots.
- The majority are located in the optimum ecological area.
- Soil reaction: 1 plot is located in the tolerance limit.
- Edaphic volume: 1 plot is located in the limitative ecologic area.
- Soil trophicity: 2 plots are situated at the tolerance limit.

❖ SYCAMORE:

- Present in 5 out of the 20 experimental plots.
- Analysing all five studied characteristics, 1 plot is situated in the tolerance limit and only based on the reaction.

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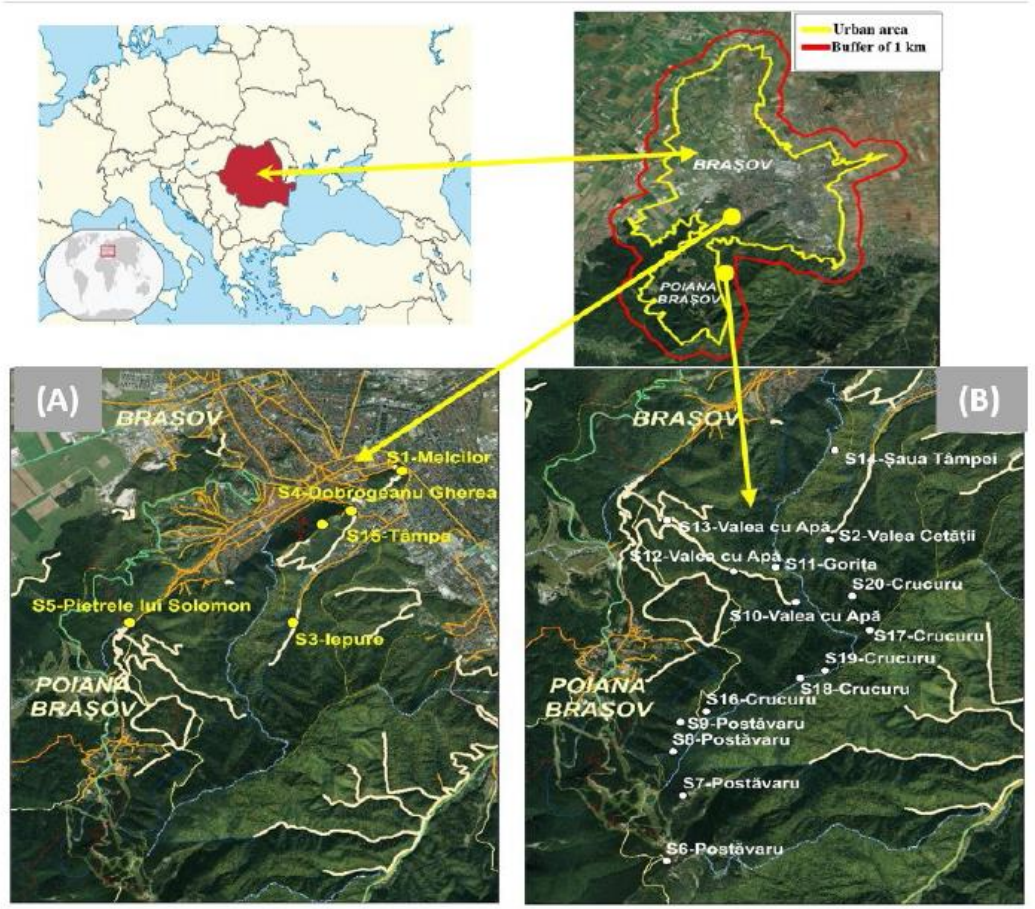
National and international projects

- Assessment of Soil Physical and Chemical Properties among Urban and Peri-Urban Forests: A Case Study from Metropolitan Area of Brasov



Enescu R.E., Dinca L., Zup M., Davidescu S., Vasile D., 2022. Assessment of Soil Physical and Chemical Properties among Urban and Peri-Urban Forests: A Case Study from Metropolitan Area of Brasov. Forests 2022, 13, 1070. https://doi.org/10.3390/f13071070

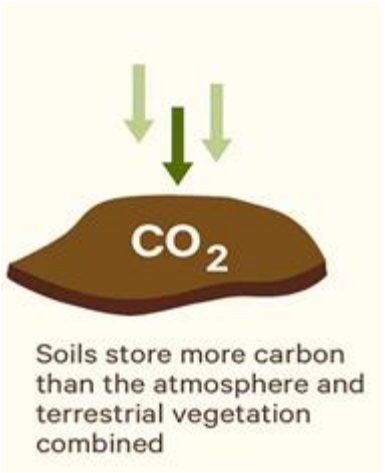
National and international projects

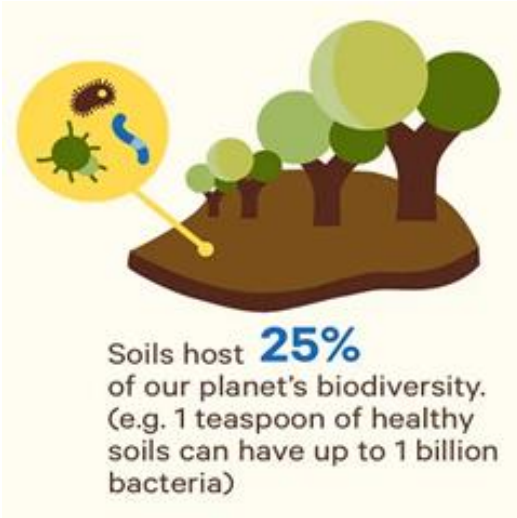
- Assessment of Soil Physical and Chemical Properties among Urban and Peri-Urban Forests: A Case Study from Metropolitan Area of Brasov

- Soils from the urban and peri-urban forests are different from the point of view of chemical and physical properties.
- Soils from urban forests had an alkaline reaction and the ones from peri-urban forests had a moderately acid reaction.
- Soil from the peri-urban plots was sandier and the other ones were more clayey.
- The soil richness (trophicity) was not significant between these types of forests but the soils of the urban forest are eutrophic (richer than that of the peri-urban forest).
- Testing the differences between the forests led to significant differences in the case of seven properties of which we mentioned pH and sand and clay content.
- Using PCA, the most significant and important soil properties of the urban forest were sum of basic exchangeable cations, cation exchange capacity, soil organic matter content, silt and clay contents, and for the peri-urban forest were cation exchange capacity, um of basic exchangeable cations, and Global Potential Trophicity Index.
- The heavy metal concentrations were under the legal limit with one exception—the lead content of two plots from the urban forest exceeded the alert threshold of 50 mg kg^{-1}
- From the relief characteristics point of view, the surfaces are similar in terms of land slope, but different in altitude, which is much lower in the urban forest compared to the peri-urban.

Enescu R.E., Dinca L., Zup M., Davidescu S., Vasile D., 2022. Assessment of Soil Physical and Chemical Properties among Urban and Peri-Urban Forests: A Case Study from Metropolitan Area of Brasov. Forests 2022, 13, 1070. https://doi.org/10.3390/f13071070

Facts about soils





Source: https://treepeople-org.medium.com/soil-brown-infrastructure-for-community-resilience-cc65c4c81c42

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