

Forest fragmentation: causes, consequences and challenges

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Two initial clarifications

- When we use the concept of "**land fragmentation**", we are not referring to its ecological impacts (changes in how the land is used across a landscape because of human activities), but to the **division of a forest into smaller blocks** due to the changes in land tenure rights.
- Our focus is to the **European context**.

Prevailing private forest management schemes till the '50s of last century in many countries (esp. Mediterranean and Eastern Europe)

Small wooded plots mainly managed for self-consumption (coppices for fuelwood and wood poles production) that are that are part of farms.



Source: Regione Piemonte. Il ceduo

Causes of land fragmentation (and abandonment): declining workforce on agriculture and forest land

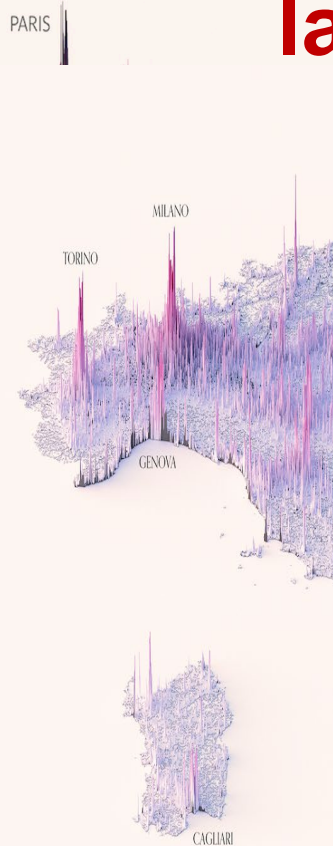
- Total European population in the '50s was approx. **550 million**; now (2025) is **744 million**.
- Workforce in agriculture and forest activities in Europe: **from 35–40%** in the '50s (2024) **to 3%**
- **country-level examples:**
 - **France:** from ~31% to 2.5%
 - **Germany:** from ~24% to 1.2%
 - **Italy:** from ~42% to 3.7%
 - **Spain:** from to 3.8
 - **Poland:** from over 70% to 10%
 - **UK:** from 5% to 1%

Urbanisation and industrialization (and later tertiarization) outcomes



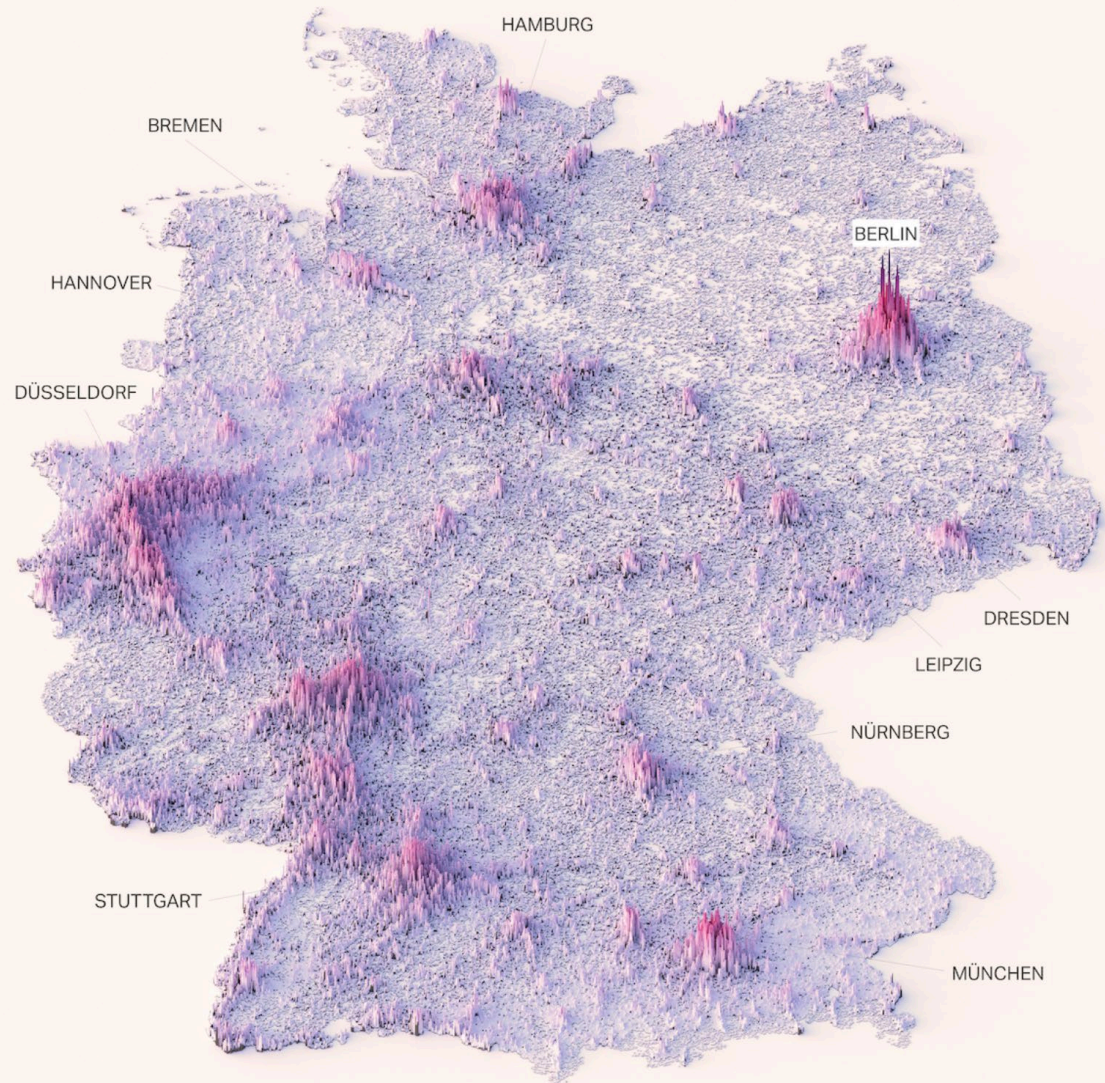
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<https://www.visualcapitalist.com/>

**Some common trends in Europe:
land extensivation, farmland
abandonment, conversion of
farmland to forests, growing
forest stocks, ...**

... but quite different patterns of forest
land fragmentation (and land
consolidation)

Land fragmentation process.

Different patterns in forest land use connected to:

- a. The traditional juridical systems
- b. The traditional land tenure systems
- c. The problems connected to land renting and estate market dynamic
- d. The action of the State to reduce the problems of land fragmentation

a. The traditional juridical systems

According to the inheritance practices related to the land, the Roman law is in contrast with German law where the land is considered an estate *indivisum*:

- in the tradition of **Roman law** land is **inherited by all sons and daughters** → land splitting
- In the **German law** the land is **passed exclusively to the first-born male child** → relatively large agriculture and forest productive units are maintained

An interesting case: the two Autonomous Provinces of Bolzano (German law) and Trento (Italian Law) in Italy

Average size of the agriculture and forest farms (source: ISTAT):

- in Bolzano: 30.7 ha
- in Trento: 9.6 ha



b. The traditional land tenure systems

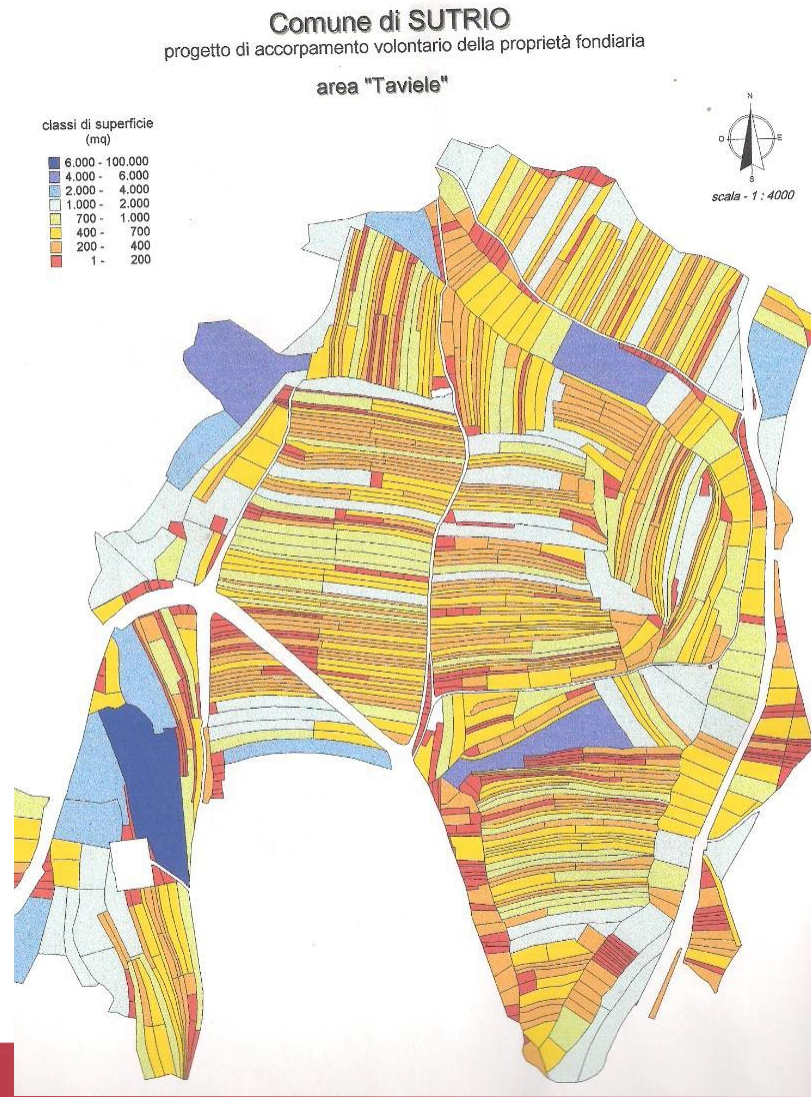
At State and regional level, the influence and power of small, fragmented forest owners is greatly affected by the presence and organization of other owner typologies:

- The public forest owners:
 - State forests (see EUSTAFOR)
 - The municipal forests (see FECOF)
- The community forests
- The Industrial Forest Owners (IFO) and the large investors (Pension funds)
- The farmers (see budget allocation of EU Rural Development funds)

c. The problems connected to land renting and estate market dynamic

- **Leasing of forest land is problematic:** when defining the annual rent, it is difficult to split the rent component related to the use of the growing stock from that depending on annual wood increment.
- The experience and diffusion of **alternative contracts** between owners and managers (stewardship contracts, long-term increment contracts: see US experience) is limited.
- The **different dynamism of the land market** (ease of carrying out land transactions).

These factors have had a big effect on the process of land fragmentation in Italy, where we speak of «pathological land fragmentation»



Source: S.Di Bernardo

d. The action of the State to reduce the problems of land fragmentation

Many countries have been able to reform their institutional and regulatory framework:

- to make it easier to bring **land consolidation** (and, as a first step, to create and update the **cadastre system** and its updating) and to allocate land.
- The **legislation** regulating land consolidation **dates back to the 70's** (e.g. in Austria, Belgium, Germany, Norway and Sweden) or to the **80's** (e.g. in the Netherlands, Poland, France and Hungary) with special focus on farmland consolidation (Source: Vitikainen, 2004)

The action of the State to reduce the problems of land fragmentation

Other areas of policy action where countries have been able to reform their institutional and regulatory framework:

- to support contracts that **give land management responsibility to other organisations.**
- to encourage forest landowners to form **associations.**
- to help small forest owners with **technical and financial support.**

Some
positive
examples

Forestland owner associations and related services provided to the members: Scandinavian countries



Home | Nordic family forestry | Members | Contact



Bureau of Nordic Family Forestry
Nordiska skogägarorganisationernas förbund - NSF

Denmark

Danish Forest Association
0.62 million hectares = 15%
Annual fellings: 3.2 million m³



Norway

Norwegian Forest Owners' Federation
12 million hectares = 37%
Annual fellings: 7 million m³



Sweden

Federation of Farmers Forestry Division – LRF Skogsägarna
28 million hectares = 62%
Annual fellings: 95 million m³



Finland

MTK (Central Union of Agricultural Producers and Forest Owners)
23 million hectares = 76%
Annual fellings: 62 million m³



Source: <https://www.nordicforestry.org/>

Forest landowner associations and related services provided to the members: France

Public agency to support private forest owners

3.5 million ha

11 Regional Centres

Technical assistance, forest planning

Project management, research and advisory services

Training



Source: www.cnpf.fr

Forest landowner associations and related services provided to the members: Portugal

17 500 landowners
31 forest associations
(private entities)
1.5 million ha



Technical, legal, economic assistance
Project planning
Training
Communication

Source: www.forestis.pt

Not only problems, but also positive challenges, for example:

- Potentially, quite a lot of land available for implementing the **Nature Restoration Law** (“associations for restoration under indenisation”)
- Fragmented land: well suited for **supporting an integrative approach** vs. a segregative approach in forest land use (fully protected forest, plantations, ...)



Source: <https://www.tabledebates.org/building-blocks/what-land-sparing-sharing-continuum>

Take home messages

- Forest land fragmentation is **not an issue of the same importance** in Europe: we may observe **different outcomes of the policies** designed to deal with it.
- There are **good lessons to be learned** of how to deal with problems caused by land fragmentation, but these examples are **not well known and shared**.
- There are also **good potentialities** that can come out of the problem.