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Land Consolidation and Anti-Erosion Meliorations, as Tool to Counteract Climate Change in the Water Sphere in Agricultural Areas

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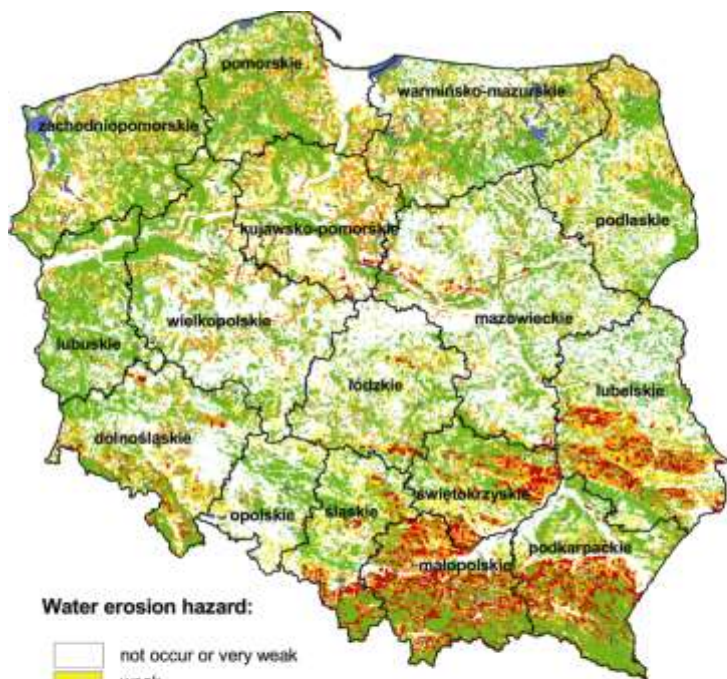
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





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**Water erosion hazard
on agricultural land in Poland**

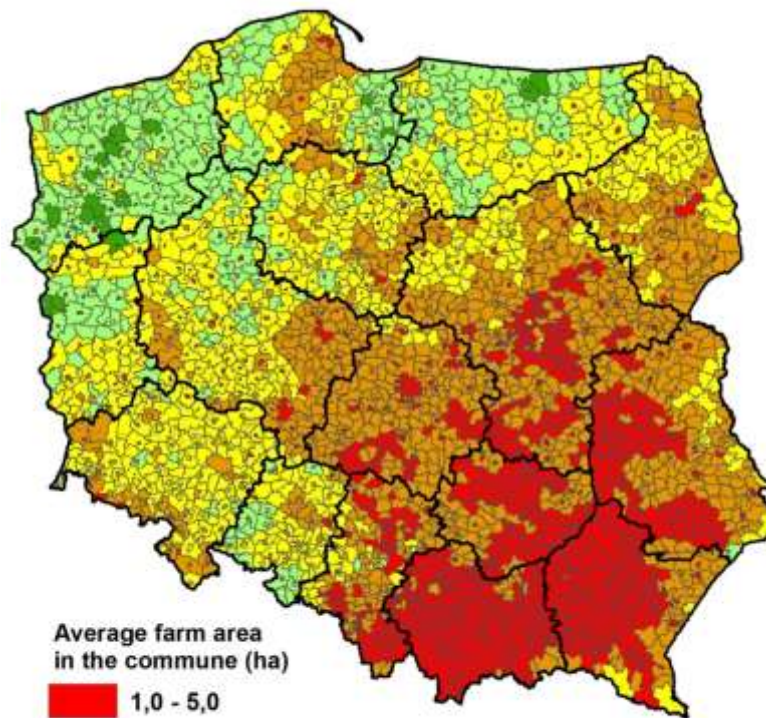


Water erosion hazard:

-  not occur or very weak
-  weak
-  moderate
-  heavy
-  water
-  forest areas
-  borders of voivodeships

Water erosion hazard approx. 20% AL.
Including 10% in moderate and heavy degrees

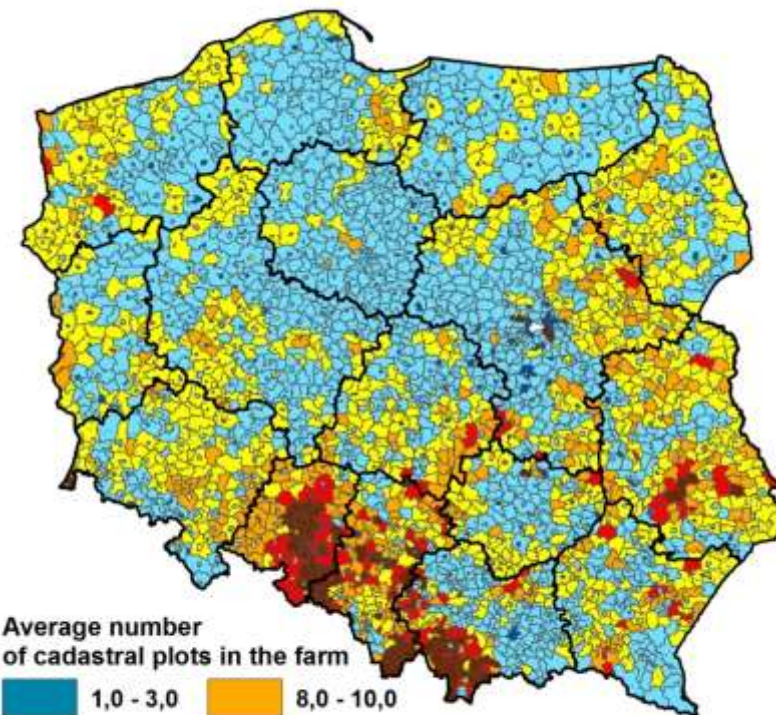
**Average farm area in the communes in
Poland**



**Average farm area
in the commune (ha)**

-  1,0 - 5,0
-  5,0 - 10,0
-  10,0 - 20,0
-  20,0 - 40,0
-  40,0 - 67,9

**Average number of cadastral plots in the
farms in Poland**



**Average number
of cadastral plots in the farm**

-  1,0 - 3,0
-  3,0 - 6,0
-  6,0 - 8,0
-  8,0 - 10,0
-  10,0 - 12,5
-  12,5 - 79,9

Upland loess landscape with an example of sheet, rill and gully erosion



Basic anti-erosion meliorations in eroded areas with a fragmented plots structure should be associated with consolidation lands and includes:

- transformation of steeply sloping arable land into permanent grassland or new afforestation
- transformation of arable land exposed to concentrated periodic runoff to permanent grassland
- buffer strips of permanent grassland along the active edges of gullies
- proper location of agricultural roads and plots in relation to the topography to ensure, if possible, a contour direction of cultivation and minimize the concentration of surface runoff
- hardening and drainage of agricultural roads



These issues seem "trivial" and "irrelevant", but will become more and more significant – in the photo, the United Kingdom commonly associated with rain was in this year mostly a "dry area"!

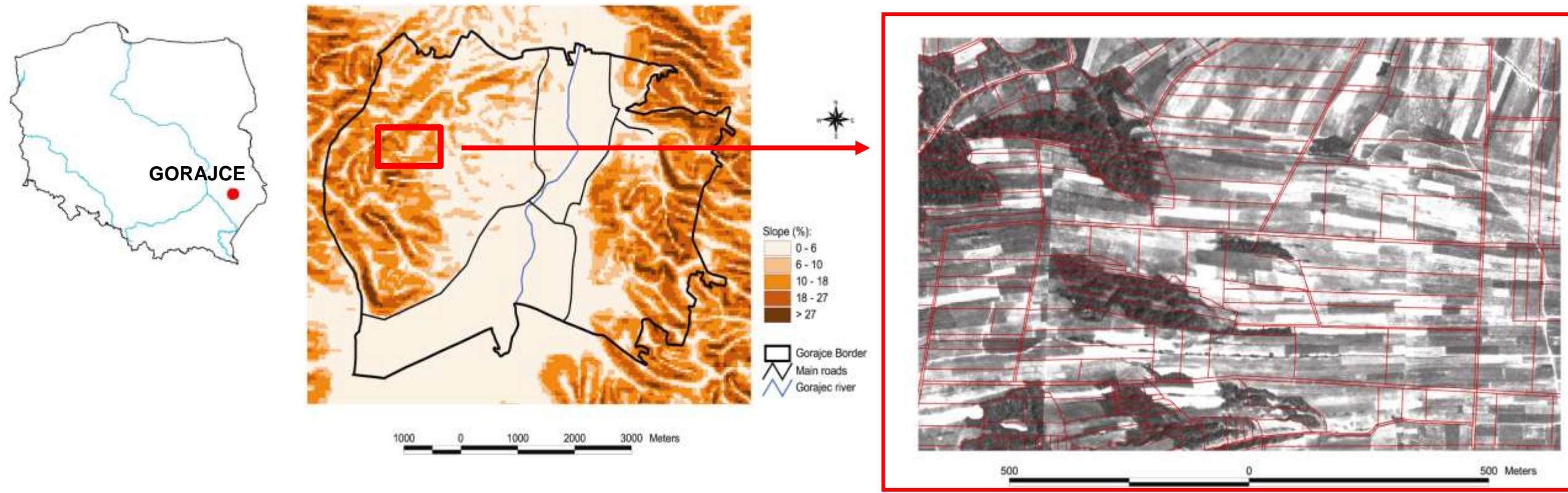
The main goal of anti-erosion meliorations implementation in the process of land consolitaions are environmental, economic and social objectives

- reduction of surface runoff, erosion and increasing water retention in the soil and reduction of the negative effects of agricultural drought
- limiting of soil degradation, losses of soil organic materr (SOM) and minerals from agriculture lands, as well as limiting eutrophication of surface waters (rivers, lakes and water reservoirs)
- decreasing of the SOM mineralization process and its negative impact on climate change
- increasing the economic efficiency of agricultural production
- increasing the standard of living of the rural population



Without land consolidation, these tasks cannot be properly implemented, as they require a change in the agrarian structure

Example of consolidated land in the „Gorajce” object in 1974, where the anti-erosion meliorations was not fully implemented



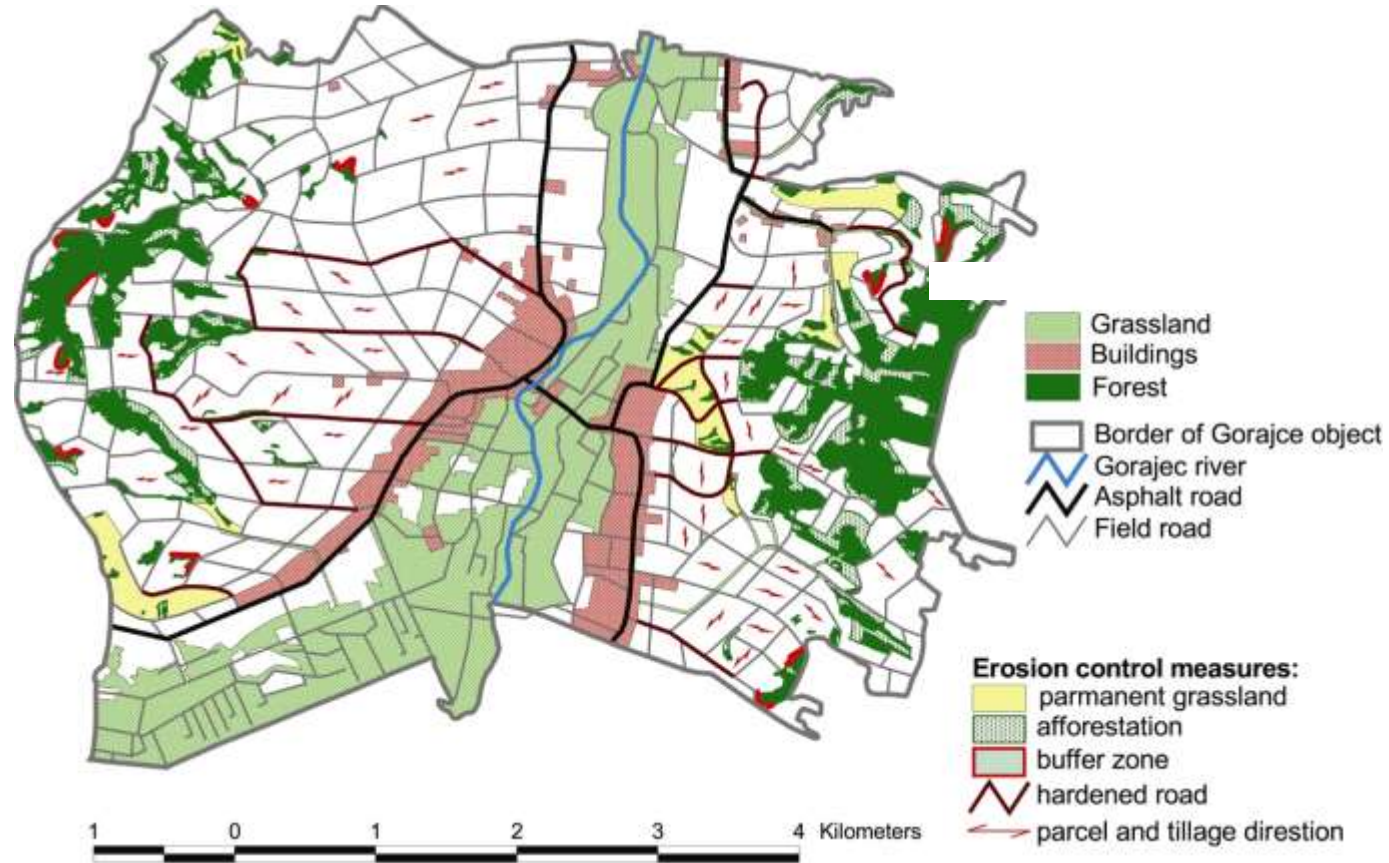
The process of degradation of ground roads with a slope of 8-10% into a gully roads in the years **1975 - 2022**



Example of degradation of agricultural road by erosion after land consolidation and its protection with openwork concrete slabs in the following years at the "Gorajce" object



Theoretical land consolidation project including complex anti-erosion meliorations



In Poland much attention is paid to preparing agriculture and rural areas for climate change

- Rural areas and agricultural land will play a key role in preventing floods and droughts in the coming years.
- To make it possible, it is necessary to properly shape the space in a land consolidation and melioration process – including very important anti-erosion treatments.
- The Institute of Soil Science and Plant Cultivation in Puławy and the University of Agriculture in Krakow have been conducting research in this field for many years.
- In 2021, the research project "Environmental and social effects of agricultural land development works" was carried out.
- **The project shows that this kind of activity is dramatically neglected in Poland. Unfortunately the consolidation work is not well perceived due to the bad experiences of society during the communist era**



Conclusions

- Land consolidation is the only way to reconcile:
 - the aims of agriculture and climate change mitigation goals
 - environment protection
 - reducing of food production costs
- The importance of such an approach is not yet sufficiently appreciated in Poland
- One thing is certain – it will not do without meliorations activities, including anti-erosion meliorations, best coordinated with land consolidation.



