



## **TRANSNATIONAL INTEGRATED MANAGEMENT OF WATER RESOURCES IN AGRICULTURE FOR EUROPEAN WATER EMERGENCY CONTROL (EU.WATER)**

**Priority Axis:** Protection and Improvement of the Environment

**Area of Intervention:** A.O.L. 1.2 Improve integrated water management and flood risk prevention

**Project Duration:** 36 months

**WP3:** Knowledge capitalization and sensitive area maps

**Action 3.2:** regional report

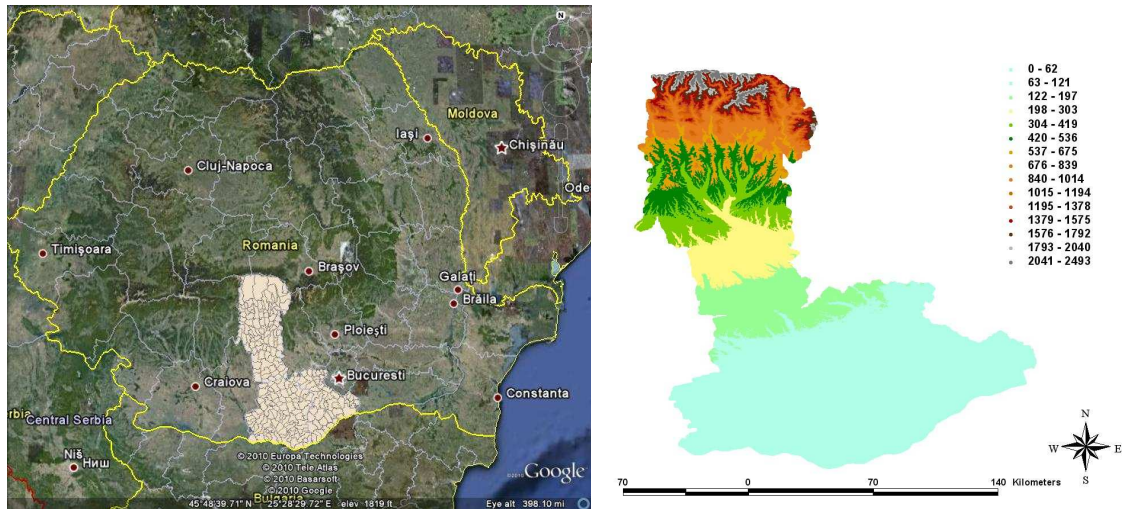
### **Abstract of the regional report**

**Pilot area:** Arges-Vedea watershed (Romania)

**Partner:** ICPA



The studied area covers three counties (Arges, Giurgiu, Teleorman) located in the Arges-Vedea watersheds, South Romania (Figure 1). The total surface is 16,183 km<sup>2</sup> (Arges county: 5,800 km<sup>2</sup>, Giurgiu: 3,549 km<sup>2</sup>, Teleorman: 6,834 km<sup>2</sup>) representing 75% of the Arges-Vedea watersheds (21,548 km<sup>2</sup>). Arges and Vedea rivers are tributary to Danube. The area lies between Carpathian mountains in the north (up to 2,500 m altitude) and Danube river in the South. Therefore, all the major relief forms (mountain, hill, plane) are included in the area (Arges: mountain, hill, plain; Giurgiu and Teleorman: plain only).



**Figure 1. Location of the EU.WATER case study area in Romania**

Due to its relief the area shows a distribution of climate from mountain specific climate (low temperature, excedent of water) to the dry climate of the plain next to Danube river.

Soil cover the case study area is very complex from soils specific to the high altitude grasslands and forests (litosols, brown acid soils) to the sandy soils in the Danube plain. In the central part of the area chernozems and vertisols with more than 45% clay content are dominant.

The dominant land use is arable (886454 ha) followed by pastures (151093 ha), hayfields (46611 ha), orchards (23526 ha) and vineyards (12800 ha). Forest area is 357680 ha. Arges county shows the greatest variety of land use. Giurgiu and Teleorman counties are almost entire arable.

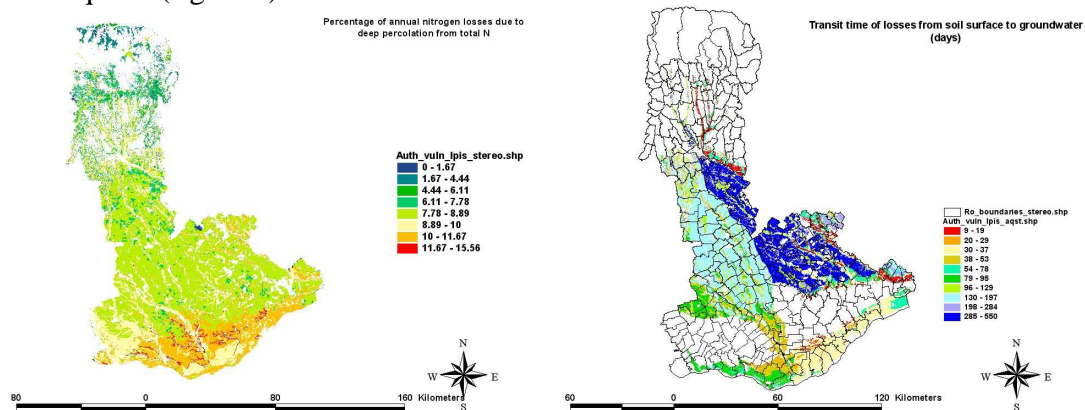
The farm structure for arable land shows the very complex pattern of the farms with the dominance of small farms (30-50% of the farm area belongs to farms less than 3 ha, depending on the county) but with large farms, too (dominating farm size based on agriculture area is about 600 ha).

In small farms low-input agriculture (subsidence agriculture) is practiced. Here nitrogen inputs are in the range of 40-60 kg ha<sup>-1</sup>. In large farms (mainly in Teleorman county) high input agriculture with nitrogen inputs up to 200 kg ha<sup>-1</sup> is used. Irrigation is practiced on the plane areas near the Danube river, only

Calculating the biophysical criteria defining the less favoured areas for agriculture most of the agriculture area of the case study is included in severe and very severe constrains. Therefore, the yields in rainfed conditions are low compared with EU averages (winter wheat: 1500-3200 kg ha<sup>-1</sup>; maize: 1600-4100 kg ha<sup>-1</sup>; sunflower: 1000-1700 kg ha<sup>-1</sup>; potatoes: 5000-17000 kg ha<sup>-1</sup>; winter oilseed rape: 900-1800 kg ha<sup>-1</sup>; alfalfa: 10000-20000 kg ha<sup>-1</sup>). The great variability of the yields is due to the high variability of the weather conditions from year to year.

The case study area includes 5 aquifers of various origins (Holocene, Upper Pleistocene and Upper Pleistocene-Holocene), lithology of the vadose zone (siltic clay, clay-sandy clay, loess), thickness and hydraulic conductivity of the vadose zone.

Using the methodology developed in the EU.WATER project by the Aristoteles University the vulnerability areas of the aquifer to the nitrate percolation were evaluated as percentage of nitrate leaching to the nitrogen applied at the topsoil and as the transit time from root zone to the aquifer (figure 2).



**Figure 2. Percentage of annual nitrogen losses due to deep percolation from total nitrogen applied on topsoil and the transit time of losses from soil surface to groundwater**

The main pollution sources for nitrates in water bodies comes from animal wastes. According with agriculture statistics in the case study area the number of animals are: cattle: 208972 heads, pigs: 492257 heads, sheep: 406324 heads, goats: 78549 heads and poultry: 4329230 heads. Most of the animals in small individual farms are inside the village area. Therefore, the pressure for groundwater pollution is inside the perimeter of build-in areas of villages.

The national network developed by Romanian Waters Administration was used for evaluating the nitrate concentration in the groundwater in the case study area. Field campaigns measuring the nitrate concentration in public and individual wells in hill region of the Arges county were added to the national network. The pattern of nitrate concentration in the groundwater shows that the pollution of groundwater with nitrates is more a site-specific problem than a diffuse one (points with high nitrate concentration near points with low concentration, no correlation with high animal concentrations).