



# Danube Facts and Figures

## ROMANIA

(April 2006)

### General Overview

Romania, a country of 237,391 km<sup>2</sup> and over 21,794,793 inhabitants, is almost entirely situated within the Danube Basin (97.4%). The Romanian section represents 29% of the surface area of the whole Basin, with 37.7% of the river flowing through its territory. The Romanian (and also Ukrainian) Danube is the end carrier of all wastewater discharges from upstream countries to the Black Sea.

The Convention and Co-operation for the Protection and Sustainable Use of the Danube River was adopted in Sofia in 1992. Developed from a previous initiative in 1985 (the Bucharest Declaration), Romania has gone on to ratify the Danube Convention through Law no. 14/1995.

### Topography

Romania's relief is split threefold: 31% mountainous; 36% hills/plateaus; 33% plains; and is arranged in a ring and amphitheatre structure. The mountains of the Carpathian ring, along with the Transylvanian Depression which skirts it, represent the high relief of 1800-2500m. Beyond this, between 200m-1000m are hills, tablelands and the Dobrogea Plateau, plus the plains of the Lower Danube (Romanian Plain) and Banat-Crisana, an expansion of the Tisza Plain.

Romania's territory has a complex geological structure of orogenic, foreland and intercarpathic units. Key elements are the alpine folded belt of the Carpathians and the North Dobrogean Mountains. The Carpathian foreland includes platforms (Moldovian, Scythian, Moesian) and the intercarpathic areas of Transylvanian and Pannonian Depressions. Part of the Alpine chain, the Carpathians are connected to the Alps in the west and the Balkans in the south and are divided into three main areas: Eastern Carpathians, Southern Carpathians and Apuseni Mountains.

The plateau areas are built up by successions of varying geological history. The alpine North Dobrogean range has a peculiar, intracratonic position within the foreland. The Transylvanian Depression (central Romania) is a Neogene molasse basin. The Middle-Upper Miocene and Pliocene succession of the basin fill includes important Early Badenian salt deposits and several levels of volcanic tuffs. The easternmost part of the Pannonian Depression (also a Neogene molasse basin) is represented in the western part of the country by Neogene deposits.

### Precipitation, climate and water flow

Romania has a mild, temperate-continental climate with four distinct seasons, most precipitation in the warm season and some Mediterranean influence to the south. Mean annual temperatures are 8-11<sup>0</sup>C in the agricultural area and -2<sup>0</sup>C on

the Carpathian summits. Similarly, frost-free periods exist for 200-240 and 100-120 days and mean annual precipitation is 400-800mm (potential evapotranspiration: 600-700mm) and over 1200mm (potential evapotranspiration: <500mm) respectively. Precipitation has an uneven distribution and severe drought occurs every 15–25 years. With territory extending over almost 5° in latitude, significant temperature variations exist between the south and north (mean annual temp. is 3°C lower in the north, assuming same altitude). Temperature variations between west and east are less marked (c. 1°C higher in east); with precipitation variations being more significant: c.700mm in the west; <400mm in the east.

Romania is poor in water resources, with 1700 m<sup>3</sup>/inhabitant/year, ranking it 13th in Europe. Specific mean flow is under 1 l/s.sq.km on the Romanian, Dobrogea, Timis and Arad Plains and 40 l/s.sq.km in the high zones of the Fagaras and Retezat mountains. The river network comprises 78,905 km.

### **Land use and settlements**

Romania has considerable land resources. According to data from 2000, 62% (14,857,800ha) is agricultural; 27% forest (6,457,000ha); 3.7% waters (857,000ha) and 6.9% other land uses (1,646,000ha). Of the agricultural land, arable accounts for 63.2%; pastures: 23.2%; hayfields: 10.14% and vineyards/orchards: 3.5%. Share of agricultural and arable land per capita is significant at 0.6 and 0.41ha respectively. Agricultural lands are unevenly spread in the three major relief units. The highest proportion of agricultural land use as compared to total land use is found in the plains (>80%: Romanian and Western Plains and the Central and Southern Dobrogea Plateau); reducing down to 40-65% in the hill/tablelands areas and only 20% in mountain regions.

Romania has 16,044 settlements: 173 towns, 103 municipalities, 2727 communes and 13,042 villages. Major cities are Bucharest (1,929,615 residents), Constanta, Iasi, Timisoara, Cluj-Napoca, Brasov, Craiova, Galati, Ploiesti and Braila, with Black Sea ports at Constanta and Mangalia. Danube ports include Moldova Noua, Orsova, Drobeta Turnu Severin, Calafat, Corabia, Turnu Magurele, Zimnicea, Giurgiu, Oltenita, Calarasi, Cernavoda, Harsova, Macin, Braila, Galati, Tulcea and Sulina.

### **Natural highlights**

Regarding only those sites where the status of the water resource is a key factor, 6.1% of Romania (14,437.3 km<sup>2</sup>) has been designated for the protection of habitats/species (216 sites).

The *Danube Delta*, covering 4178 km<sup>2</sup> (82 % in Romania) is the country's most important protected area; part of UNESCO's Man and Biosphere Programme and Ramsar and World Heritage sites since 1990. Located in the County of Tulcea, it provides a diverse mosaic of habitats for 5200 species of plants and animals. The Danube Delta Biosphere Reserve covers 580,000ha in Romania and is sub-divided into: core areas of highest value and conservation priority (8.7%); buffer areas

(38.5%) and economic areas (52.8%) where the majority of the 15,000 Delta residents live. Previous development (taking place 1961- 1990) led to only small-scale micro-structural changes in the Delta's ecosystem. However, changes on macro-structural level have been caused by degradation in Danube water quality.

The *Iron Gates Natural Park*, located in SW Romania on the border with Serbia and Montenegro, is also one of the most beautiful natural areas of Europe with a vast biological diversity covering 115,655ha. It includes 14 natural protected areas of national interest (Natural Reserves and Nature Monuments).

*Retezat National Park*, located in the Southern Carpathians, is a spectacular landscape of natural forests, alpine meadows, mountain peaks, gorges, scree and glacial lakes. Covering 38,138ha, it has a very rich flora and fauna, with 1190+ plant species (one third of the total found in Romania including 60+ endemics/local varieties) and 50+ mammal species (including bear, wolf, lynx and chamois). The site is notable as the first park in Romania (set up in 1935).

## **Human uses of water resources**

Romania's water resources comprise: the Danube (44%), inland rivers (46%) and groundwater (10%). In 2005, 7.8 billion m<sup>3</sup> was abstracted for human use. Main users are: industry: 56.4%; agriculture: 26.3% and general population: 17.3%.

### ▪ Flood and high discharge management

Key causes of flooding in Romania include: heavy localised rainfall (c.100-200 l/m<sup>2</sup>); increased urban land use; ad hoc development in floodplains; reduced river bed capacity due to embankments and non-rational deforestation of large areas.

Water management infrastructure includes: 400 significant reservoirs (13,070 million m<sup>3</sup> stored volume); 1490km diversions; 18,240km embankments and river bed regulation schemes; 3.2 million hectares of drainage works; 2.3 million hectares of soil erosion prevention schemes and also flood protection works for 1927 localities, 3100 water users and 6100km roads and railways.

Structural flood mitigation measures in Romania include: river regulation works; building of reservoirs, polders and local embankments; wet zones conservation; development of high flood mitigation schemes in high-risk areas; measures for torrent control, reforestation and protective forest belts; soil erosion schemes and removal of some houses from high risk zones.

Non-structural mitigation measures include: ensuring river basin management schemes are updated; reviewing watercourse schemes; mapping high risk zones and measures to prevent development in these areas; promotion of home and contents insurance for flood damage; development of early flood warning systems; local community involvement in river conservation actions and education campaigns on dealing with flood crisis situations.

▪ Use of hydroelectric power

Romanian power generation is split between coal fired (40%), hydroelectric (29%), oil and gas (21%) and nuclear (10%) – 2002 data based on per power plant types. The 363 national hydropower plants use 276,832 million m<sup>3</sup> water/annum and produce 1,884,589 MWh/annum. Hydropower infrastructure often superimposed the measures undertaken against floods.

▪ Navigation

A significant pressure on the Danube, it affects river bed morphology and risks accidental pollution. Between 1983-2003, 455 accidents involving ships occurred on the Danube, 30 of which resulted in significant water pollution. The ICPDR has recommended a number of regulations to reduce such incidents e.g. recovery of clean-up costs from polluters; increased use of modern waste separation and burning equipment and the development of a system of Oil Record Books.

▪ Rivers as receiving waters for effluents

Many Romanian inland rivers, particularly those from mountain areas, remain undisturbed by major anthropogenic pressure (57% of water bodies) and are of high ecological value. However, economic development between 1960 and 1989 resulted in a significant worsening of the water quality of the Danube and inland rivers. Since this time, water quality has been improving (due to a reduction in economic activities and also new regulations based e.g. on the “polluter - pays” principle) but remains inferior to 1950s levels. See below for details.

▪ Use of groundwater bodies: drinking water supply

Romania’s groundwater bodies mainly comprise delimited porous-permeable types but also include karstic, fissure and mixed bodies. Drinking water supply is predominantly from surface waters (250 areas designated for abstraction, 71.7% of which have protection zones). Where groundwater is used it generally does not require treatment, unlike surface waters. Within Romania’s basins, 1223 areas of groundwater are used for abstraction, 80.1% of which have protection zones.

**Pressures and impacts on rivers**

▪ Organic pollution

Romania contains 2609 settlements with 2000+ people equivalents (p.e.). This is made up of 22 settlements with 150,000+ p.e; 241 with 10,000-150,000 p.e. and 2346 with 2000–10,000 p.e. Of these, 453 (17%) have sewage systems (340 have biological treatment plants; 4 have urban wastewater plants with nutrient removal). 263 settlements (of 10,000+ p.e) require systems with nutrient removal. Limit values for urban wastewater effluents and authorisation for discharges are given in Governmental Decision 352/2005 (amending 188/2002).

51.1% of Romania’s population is linked to wastewater collecting systems and 27.3% is linked to wastewater treatment plants. However in rural areas, 95.9% of

the population is not connected to sewer systems. Rural wastewater management is thus the main challenge up until 2018. Individual systems will comprise cess pits or small household treatment systems such as septic tanks, conventional biological treatments plants or constructed wetlands. According to Article 12-13 of the UWWT Directive, of 28 industrial units, only 3 comply with requirements. Programmes for compliance have been established.

▪ **Nutrient discharge**

i) *Point source*: 359 significant pollutions have been identified at the basin level (80% of total discharges recorded). In 2004, 13,034 tonnes of nitrogen (N) and 3399 tonnes of phosphorus (P) were released, 98% and 85% of which respectively derive from settlements. 4 urban areas have wastewater plants with nutrient removal. New facilities are needed at 263 towns (with 10,000+ p.e).

ii) *Diffuse discharges*: Agro-chemical fertilisers are the main source. In rural areas, the most significant sources are agricultural activities, especially in the 255 localities identified as being nitrate "vulnerable" areas. Sources include:

- Agricultural fertilisers: figures vary between 0.39-8.7 kg P/ha and 6.91-23.6 kg N/ha (generally lower than the Basin average of 5.9 kg P/ha and 31.4 kg N/ha).
- Agricultural pesticides: data vary between 0.08-1.17 kg/ha (lower than the mean of 7 of the Danube Basin States at 1.39 kg/ha).
- Domestic animals: stocking densities are 0.16-0.65 animal unit/ha, (compared with a Danube Basin average of 0.45-0.55 animal unit/ha).
- Rural and urban settlements: only a small percentage of the population is connected to sewage systems (4.1% in rural areas, 47% in urban areas).

The status of the Danube River and Delta depends considerably on pollutant inputs from upstream countries (particularly for N and P loads). Between 1998-2000, the annual quantity of P retained in the Iron Gates reservoir was 8.5 KT/year, c. 36% of the incoming load (23.6KT/annum). For the same time period, the retained quantity of N represented c. 3%. Diffuse agricultural sources, especially from chemical fertilizer use in upstream countries and the improper working of wastewater treatment plants in Central and Eastern Europe is a major input.

The status of Romanian coastal waters depends considerably on Danube water quality. With regard to all sources (the Danube and other seashore based sources) the vast majority of pollutants are brought by the Danube: 99.5% of nutrients; 99%+ of N and 91.8% P-PO<sub>4</sub>. The dominant N-S flow of marine currents favours pollutant dispersion from the Danube in Romanian coastal waters. This has led to an increase in nutrient concentrations in marine sediments (levels decreasing N-S).

▪ **Priority substances**

EU Council Directive 76/464/EEC on pollution by specific dangerous substances discharged into the aquatic environment has been transposed into Romanian Law by Ministerial Order no. 44/2004 and Governmental Decision no. 351/2005.

Current monitoring activities include a river monitoring system for dangerous substances; heavy metals monitoring for all water categories and micro-pollutants monitoring. These have been implemented using Trans-boundary National Monitoring Network (TNMN) data. 582 industrial units (2001 data) have been inventoried as discharging dangerous substances into water resources /sewage systems. Starting in 2005, the Water Users Inventory (discharges of dangerous priority substances) and the Water Users Register (priority substances) are being updated.

- Impacts on fluvial, coastal and groundwater resources from organic pollution, nutrients and hazardous substances (based on the 2004 National Analysis Year for the EU Water Framework Directive).

i) *Permanent freshwater bodies:* Of the 2347 identified, their status is as follows:<sup>1</sup>

| Type                       | "At risk" | "Possibly at risk" | "Without risk" |
|----------------------------|-----------|--------------------|----------------|
| <b>Organic pollution</b>   | 9.5%      | 5.5%               | 85%            |
| <b>Nutrient pollution</b>  | 12.3%     | 7.3%               | 80.4%          |
| <b>Priority substances</b> | 2.4%      | 3.3%               | 94.3%          |
| <b>All categories</b>      | 27.2%     | 15.8%              | 57%            |

For the Jiu River Basin, located in a coal mining area, 4 water bodies are considered "possibly at risk" with regard to total suspended solids.

ii) *Transitional water bodies:* Of the 6 bodies identified, their status is as follows:

| Type                       | "At risk" | "Possibly at risk" | "Without risk" |
|----------------------------|-----------|--------------------|----------------|
| <b>Organic pollution</b>   | 1         | 5                  | 0              |
| <b>Nutrient pollution</b>  | 6         | 0                  | 0              |
| <b>Priority substances</b> | 3         | 2                  | 1              |

iii) *Coastal waters:* Of the 3 bodies identified, their status is as follows:

| Type                       | "At risk" | "Possibly at risk" | "Without risk" |
|----------------------------|-----------|--------------------|----------------|
| <b>Organic pollution</b>   | 0         | 1                  | 2              |
| <b>Nutrient pollution</b>  | 3         | 0                  | 0              |
| <b>Priority substances</b> | 0         | 2                  | 1              |

iv) *Groundwater bodies:* Of the 129 bodies identified (19 of which are trans-boundary), 20 are considered to be "at risk" – see table below:

| <b>Type</b>                | <b>"At risk"</b> | <b>"Possibly at risk"</b> | <b>"Without risk"</b> |
|----------------------------|------------------|---------------------------|-----------------------|
| <b>Organic pollution</b>   | 4                | -                         | -                     |
| <b>Nutrient pollution</b>  | 14               | -                         | -                     |
| <b>Priority substances</b> | 2                | -                         | -                     |

- Impacts from hydro-morphological alterations (based on the 2004 National Analysis Year for the EU Water Framework Directive and initial classification of heavily modified water bodies).

Hydro-morphological pressures affect a large proportion of watercourses in the analysed river basins/hydrographical areas. The most significant pressures come from: reservoirs (255 in number); embankments (7100km in length - 80% of the Danube is embanked in Romania); river regulation works (6600km in length); water diversions (including channels); 138 significant water abstractions and 147 significant water restitutions.

From a total of 2356 water bodies (permanent/transitional freshwater and coastal), 37% are "at risk" and "possibly at risk" from such hydro-morphological alterations.

*i) Permanent freshwater bodies:* Of the 2347 identified, their status is as follows:

| <b>Type</b>                     | <b>"At risk"</b> | <b>"Possibly at risk"</b> | <b>"Without risk"</b> |
|---------------------------------|------------------|---------------------------|-----------------------|
| Hydro-morphological alterations | 20.9%            | 15.5%                     | 63.6%                 |

*ii) Transitional water bodies:* Of the 6 bodies identified, 2 are considered to be "at risk" from hydro-morphological alterations.

*iii) Coastal waters:* Of the 3 bodies identified, 1 is classed as "at risk" and 1 "possibly at risk" from hydro-morphological alterations.

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<sup>1</sup> A water body is considered "at risk" if one of the criteria concerning pressures and/or impact is reached. If no criteria is reached then the body is considered "without risk". In the case where data are missing, then the body is considered "possibly at risk".