

Watch your Danube



Fact Sheet 1

JDS3 Scientific Scope

About the Joint Danube Survey 3: The Joint Danube Survey 3, also known as 'JDS3', is the world's biggest river research expedition in 2013. Its main goal is to produce highly comparable and reliable information on water quality and pollution for the entire Danube River and many of its tributaries and to raise awareness about the importance of the Danube and sustainable water management. The International Commission for the Protection of the Danube River (ICPDR) coordinates the implementation of JDS3. Launched on August 14, 2013 from Regensburg, Germany, the boats of the JDS3 will travel 2,375 km downstream the Danube River, through 10 countries, to the Danube Delta in Romania and Ukraine until late September.

Expedition vessels

Two ships will lead the expedition. Serbia's *Argus*, the main laboratory ship during both previous surveys, was recently completely refurbished and includes instruments such as a continuous flow centrifuge, sieving machine, microscope, incubators and refrigerators. Romania's *Istros* is a coastal and river research ship with six cabins, a laboratory and dining room. For the fish sampling in the German Danube, the fish samples will be collected by the German team. For the fish survey in the Austrian reach of the Danube, Austria's Via Donau is providing an in-kind donation of the *Meßschiff IV* vessel. For the fish survey from the Austria-Slovak border until the final destination, the Austrian ship *Wien* will be available with a smaller boat (*Meßschiff I*) fixed aside to provide living and working space for five to seven people.

Sampling

A total of 68 sites will be sampled with one or two sites sampled daily on average. For JDS3, an effort was made to maintain most of the sampling points which were monitored during the previous research efforts of the JDS1 (2001), Aquaterra Danube Survey (2004)¹ and JDS2 (2007) in order to ensure comparability with their results. Each sampling site takes about four hours.

Unlike the previous Danube surveys, where a regular and unified sampling pattern was followed, the JDS3 follows a sophisticated and target-oriented sampling approach tailored to the in-depth investigation of particular quality elements. This will apply primarily to the biological quality elements (BQEs) where each parameter will be sampled according to an individual plan. A basic set of chemical parameters will be monitored at all sites whereas a number of representative sites will be investigated for a wide range of substances.

All sample containers will be prepared, labelled and pre-packed before the survey. Sampling at JDS3

¹ Aquaterra was an EU project from 2005-2009 aiming to provide the scientific basis for improved river basin management and to better understand the river-sediment-soil-groundwater system as a whole. The Danube was one of the key study areas.



Watch your Danube



stations may include up to five different sample types -- water, sediment, biology, suspended particulate matter (SPM) and biota (fish), each with a different list of tests. Many samples will be tested on-board the ships, while others will be sent to participating laboratories throughout Europe.

Parameters

Overall, seven key elements will be monitored and tested by the expedition's experts:

Biological quality elements include fish as well as the following:

- *Macro-invertebrates* (aquatic insects, worms, clams, snails and other animals without backbones that can be determined without the aid of a microscope and that live in or on sediments)
- *Macrophytes* (plants, either free-floating or attached to a surface, that can be determined without the need for a microscope)
- *Phytoplankton* (free-floating plants, mainly microscopic, existing in water bodies)
- *Phytobenthos* (microscopic plants such as algae that live attached to surfaces in the bottom layers of the river)

EU priority and other chemical substances: Chemical parameters play an important role in the assessment of water quality according to the Water Framework Directive. The samples collected during JDS3 will be analyzed for hundreds of organic substances using state-of-the-art analytical techniques and the results of these analysis in combination with the ecotoxicological screening will help to determine the Danube river basin specific substances. The ICPDR will receive substantial support to this activity from the NORMAN network which is an association of stakeholders dealing with emerging substances.

Physico-chemical parameters: On-board analyses will include in-situ temperature, pH, conductivity, dissolved oxygen, and the filtration of suspended solids. External laboratory analyses will include: total nitrogen, dissolved total phosphorus, calcium, magnesium, suspended solids in water, dissolved organic carbon (DOC) and total organic carbon (TOC) in water .

Microbiological monitoring will cover the analysis of bacterial abundance and biomass, bacterial secondary production, *Escherichia coli*, total coliforms, faecal streptococci (enterococci), and DNA determination. DNA based - large scale microbial faecal source tracking will apply a novel human specific genetic marker system in combination with basic microbiological water quality parameters (*E.coli*, enterococci) which proved to be a valuable tool for the characterisation and quantification of sewage input by the tributaries into the main river. In addition, antibiotic resistance patterns of *E.coli*, Enterococci and metagenomics of bacterial populations based on Next Generation Sequencing will be carried out.

Radioactive contamination, with attention to nuclear energy production and, primarily, to the consequences of the Chernobyl accident.

Watch your Danube



Hydromorphology: The description and evaluation of hydromorphological characteristics (i.e. physical characteristics of a water body's shape, boundaries and content) for large rivers is strongly dependent on various background data such as historical, topographical and navigation maps; satellite images; and hydrologic, morphometric (i.e. quantitative analysis of form) and land use data. The JDS3 approach includes a number of different studies such as:

- Continuous longitudinal survey of stretches 10 rkm-long; an inventory of dams and continuum interruptions; bathymetrical (i.e. measurement of the depth of bodies of water) data to understand width and depth variability and channel incision; degree of degradation of channels and banks; gravel and sand bar occurrence and shape; data on harbours and daily traffic density (e.g. wave surge impacts); and possibly some ornithological work such as the occurrence of bird colonies adapted to open gravel and sand bars.
- Detailed hydromorphological characterizations of each JDS3 site.
- Sediment characterisation, by collecting river bed material at each sampling site.
- Flow velocity and discharge measurements at selected sites.
- Suspended sediment measurements.
- Water level slope and fluctuation data. Water level slope helps understand channel forming processes (e.g. erosion, deposition) essential for habitat diversity, and can show changes in flow on rivers that have been modified. Water level fluctuation shows change in discharge and flow and can help document the effects of hydropeaking (where hydropower stations store as much water as possible before releasing it to create peak energy surges).

Fish survey

Fish sampling will be organized by a Fish Survey Core Team. Non-lethal electro-fishing will be used to stun fish for collection. The river bottom will also be sampled for fish with an electrified bottom trawler net. The assessment of the fish species collected over the whole reach of the Danube will provide a unique picture of the fish diversity and species composition.

External labs

A substantial part of the laboratory services for JDS3 will be secured as in-kind contributions by the ICPDR Contracting Parties. Leading national hydro-analytical laboratories from Germany, Austria, the Czech Republic and Slovakia will carry out the chemical analyses, as well as the European Commission's Joint Research Centre in Ispra, Italy. Laboratory biological analyses will be performed by the Core Team members and their respective institutions after the monitoring survey. Additional in-kind contributions are expected from TZW Karlsruhe (DE) / IAWD, BOKU Vienna (AT) and from the partner laboratories of the NORMAN network.

A strong element of the JDS3 will be a close cooperation with the 7th EU RTD Framework Programme project SOLUTIONS (Solutions for present and future emerging pollutants in land and water resources management). The project consortium led by the Helmholtz Centre for Environmental Research in Leipzig (Germany), consists of 39 participants. The project will provide solutions for prioritisation, management, and abatement of emerging pollutants and a knowledge base for a range of toxicants.