- We have conducted a thorough review of the quality of the groundwater of the Ljubljansko polje and Ljubljansko Barje aquifers and have outlined the main pollutants.
- With seven new groundwater monitoring facilities at Ljubljansko polje, we have expanded our observation network and thereby increased the possibility of timely detection of contaminants and actions before the contaminants reach the drinking water wells.
- We have implemented 31 shallow monitoring facilities in the catchment area of the Brest water plant and determined the distribution of contaminant concentrations in space and time.
- We developed a sampler for sampling in wells or temporary facilities, which allows sampling of groundwater from several levels at the same time.
- We performed a tracer experiment in the catchment area of the Brest water plant, with which we have determined the velocity and flow direction of contaminants in the catchment area of the water plant.
- We have researched groundwater dynamics with the analysis of stable isotopes of oxygen and tritium.
- We have developed passive samplers and new laboratory methods for determining stable isotopes 13C and 37Cl at low concentration levels of contaminants from types of volatile hydrocarbons.
- We held six interactive workshops aimed at exchanging views of various professional publics and the general public.
- We have spread the knowledge of hydrogeology, the importance of clean drinking water and the project INCOME at meetings with primary and secondary schools.
- We have tested the environmental awareness of the population with a survey and compared the results with previous studies.

INCOME Water Care

www.life-income.si

WHAT HAVE WE DONE AS PART OF PROJECT INCOME?

- We have established a web-based Environmental Data Viewer for the general and professional public, which combines in one place information relevant to the management of water resources of Ljubljana. The application provides an overview of the Register of pollutants, quality parameters and fluctuations in groundwater levels, and geological data. Access to this information is free.
- We have developed a decision-making support system, which in the event of environmental accidents in water protection areas will provide key information for action and propose ways to prevent or at least mitigate the effects on the environment. The system also provides support for long-term decisions on the use of agricultural land with a calculation of the costs caused by the selected actions.
- We have established a computer system for the City Municipality of Ljubljana that is intended for managing data on illegal landfills.
- We have prepared a proposal for measures to improve the situation, which deals with reasonable and implementable measures at the state and local levels, for the realisation of which we will continue to strive.
- Research has given us better understanding of the hydrological processes in the Ljubljansko polje and Barje aquifers. Based on this, we have updated the mathematical model of groundwater, which is the foundation for the expert bases for the legal act on protection of water resources, the tool for their management and the basis for the decision-making support system.
- We have developed a model of burdens and impacts that allows the projection of burdens with various actions taken in agriculture or urban land use (e.g. cultivation of soybeans instead of corn, restoration of the sewers, where the effect is greatest).
- We have established a numerical method for contamination tracking, which allows the determination of its path from its appearance at the observation point to its origin.

JP Vodovod-Kanalizacija d.o.o., Design: ENKI communications, 2012

WHO SUPPORTS THE PROJECT FINANCIALLY?

The project is funded by the European Union through the LIFE + financial mechanism, the Ministry of Agriculture and the Environment, and the City Municipality of Ljubljana.

IN LJUBLJANA, GROUNDWATER IS FOUND

FROM 5 TO 25 M UNDER THE SURFACE.

THE WATER-BEARING LAYERS OF THE LJUBLJANSKO POLJE AQUIFER ARE

UP TO 100 M DEEP.

WHAT ARE THE KEY PROJECT PROPOSALS OF THE PROJECT INCOME?

We suggest that:

- the City Municipality of Ljubljana assumes custody of the environmental viewer and the decision-making system and to upgrade the environmental viewer into a central environmental information portal with information on air quality, noise, etc;
- the experiences of establishing the environmental viewer and the decision-making system be transferred to other water protection areas;
- the ministry with jurisdiction over environmental affairs assumes the initiative in implementing the INCOME proposals to improve the state of water resources, including those for which it is not directly responsible, through appropriate communication between responsible Ministries.

THE SUPPLY OF 300,000 INHABITANTS WITH DRINKING WATER IS DEPENDENT ON THE QUALITY OF GROUNDWATER OF THE LJUBLJANSKO POLJE AND LJUBLJANSKO BARJE AQUIFERS.

400 MILLION M3 OF GROUNDWATER IS STORED UNDER THE TOWN OF LJUBLJANA IN ROCK PILES DEPOSITED BY THE SAVA RIVER. WITH THIS AMOUNT OF WATER, YOU COULD FILL LAKE BOHINJ FOUR TIMES OVER AND LAKE BLED FIFTEEN TIMES OVER.

50% OF THE WATER IN THE LJUBLJANSKO POLJE AQUIFER IS RENEWED THROUGH RAINFALL, WHILE 50% FROM THE SAVA RIVER.

THE COST OF PROJECT INCOME IS EUR 0.005 PER DAY PER USER OF DRINKING WATER IN LJUBLJANA

THE VELOCITY OF GROUNDWATER UNDER LJUBLJANA IS UP TO SEVERAL TENS OF METERS PER DAY.

THE WATER PROTECTION AREAS OF THE WATERS RESOURCES FOR THE TOWN OF LJUBLJANA COVER 25,576 HA.

0.000000002 G/L IS THE DETECTION LIMIT OF LABORATORY METHODS FOR PESTICIDES.

WHY PROJECT INCOME?

Water resources should be preserved. The management of water resources is a complex area of work both professionally and administratively, which needs help at this moment: advanced initiatives, plausible ideas, political power to make decisions and professional staff who are aware of the responsibility. It would be wrong to consciously use professional and clerical methods, procedures and measures for future decisions that we know are not sufficient to maintain the quality and the quantitative status of water resources. The INCOME results show the way forward.

31 MILLION M³

OF GROUNDWATER IS PUMPED ANNUALLY FOR THE NEEDS OF LJUBLJANA AND THE SURROUNDING AREAS.

THE WATER UNDER THE TOWN IS OF SUCH QUALITY THAT IT DOES NOT REQUIRE ADDITIONAL TREATMENT.

THE DETECTION TIME FOR CHEMICAL CONTAMINATION OF THE LJUBLJANSKO POLJE AQUIFER IS UP TO 50 YEARS AND MORE.

HTTP://AKVAMARIN.GEO-ZS.SI/INCOMEPREGLEDOVALNIK

INSTITUTIONS PARTICIPATING IN THE PROJECT:

JP Vodovod-Kanalizacija d.o.o., Geological Survey of Slovenia, Anton Melik Geographical Institute SRC SASA, Technische Universität Darmstadt, Fugro Consult GmbH, and the Slovenian Environmental Agency.

TEXT CONTRIBUTED BY:
Dr Brigita Jamnik (JP Vodovod-Kanalizacija)
Dr Mitja Janža (Geological Survey of Slovenia)

PHOTO:
INCOME archive