

▣ LAYMAN'S REPORT

INCOME

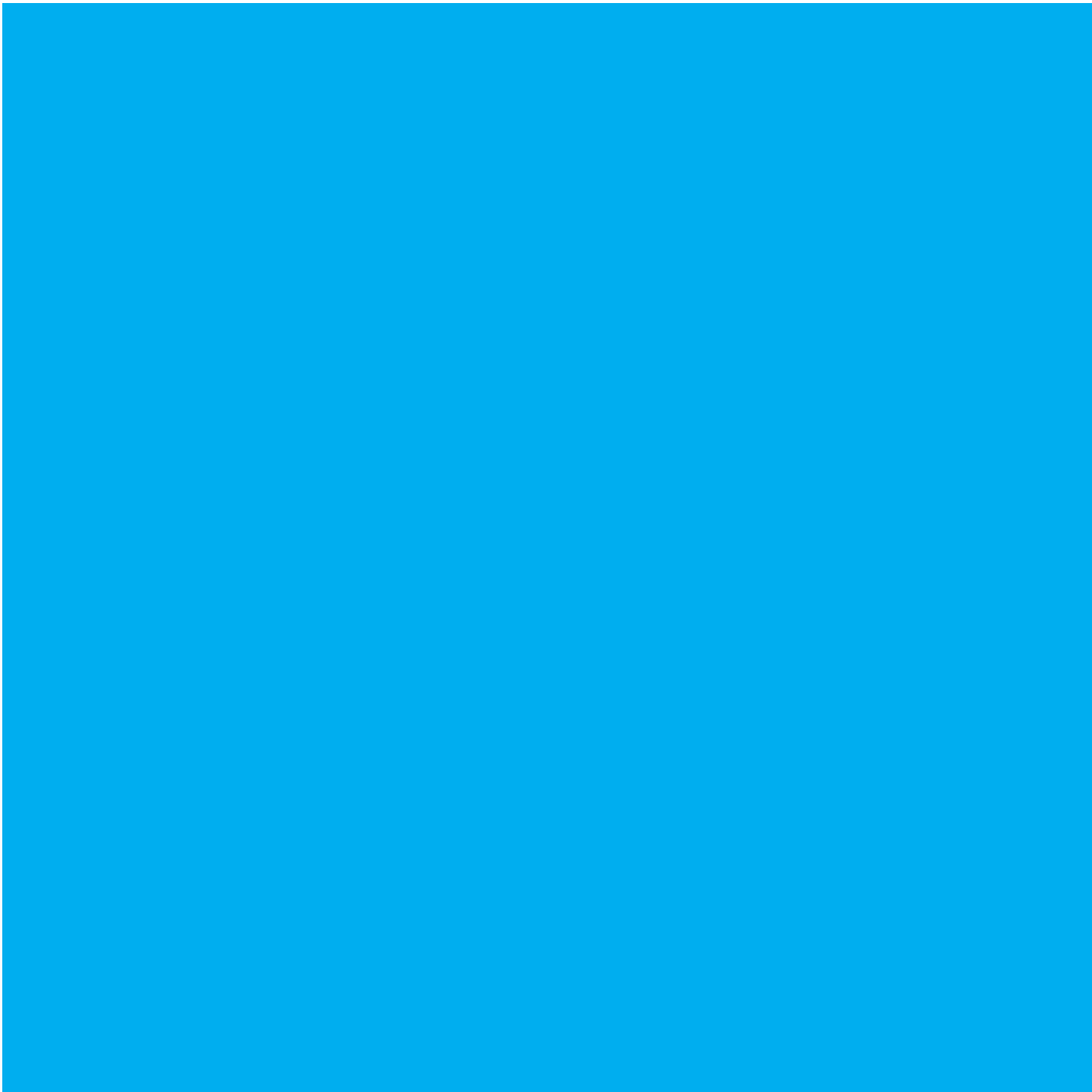
Professional Support for Sustainable
Management of Ljubljana's Water Resources

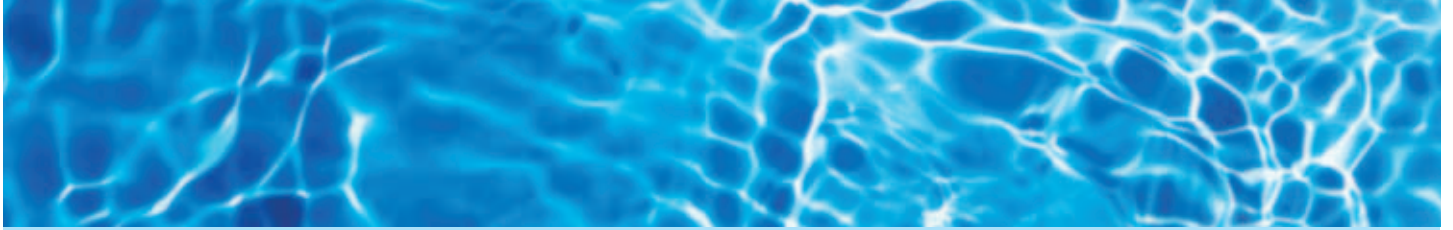
INCOME
Water Care





Caring for the environment and the quality of water resources is becoming an increasingly important part of our everyday lives. The INCOME project group, whose objective is to continue realising the vision of sustainable management of water resources in Ljubljana, has turned this concern into concrete actions. With the results of the project INCOME, Ljubljana remains a water resources-friendly city and has the possibility to maintain this natural wealth for future generations. In this report you may read the purpose of the INCOME project, its most important achievements, and what the city of Ljubljana gained from the project.





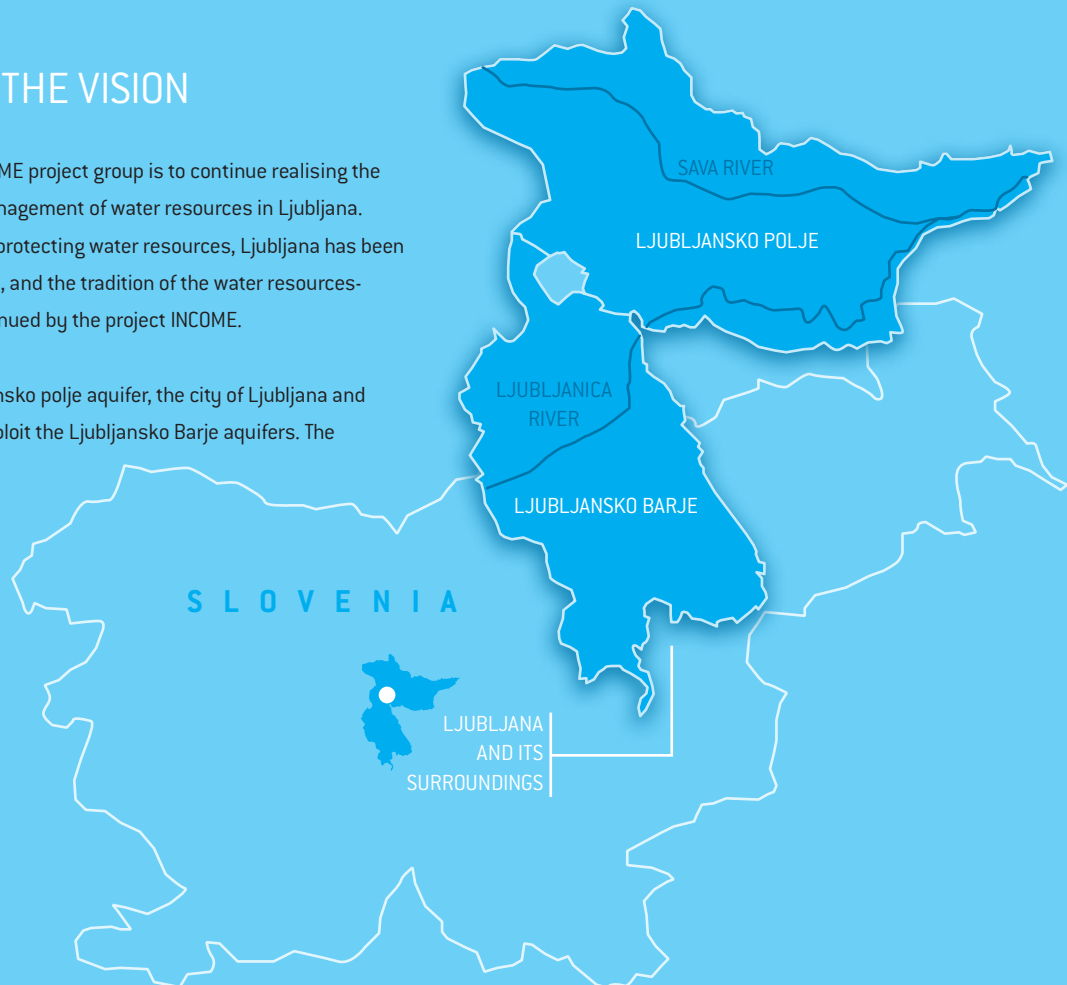
WATER RESOURCES – A PREREQUISITE FOR SAFE DRINKING WATER

For more than a century, the safe supply of drinking water to Ljubljana has been based on water resources from the immediate vicinity of the city. The vision of those who created the supply at the end of the 19th century was sufficiently advanced that generations of our antecedents only updated the concept. During the middle of the last century, the profession knew of the importance of quality water resources for the healthy life of the inhabitants of the capital. By overtaking the understanding of policy at the time, it allowed the city to keep this natural heritage to this day, when environmental protection has become an important part of our everyday lives.

INCOME – CONTINUING THE VISION

The objective of the INCOME project group is to continue realising the vision of sustainable management of water resources in Ljubljana. From the perspective of protecting water resources, Ljubljana has been a 'green city' for decades, and the tradition of the water resources-friendly city is also continued by the project INCOME.

In addition to the Ljubljansko polje aquifer, the city of Ljubljana and its surroundings also exploit the Ljubljansko Barje aquifers. The natural features of the two areas allow the exploitation of drinking water that does not require additional treatment. Due to urbanisation, agriculture and many other activities taking place in the area of sources of drinking water, maintaining the quality of drinking water is a difficult task





that requires careful spatial planning and supervision, and which also requires the need for development and use of modern techniques, methods and tools.

Therefore, the leading partner JP Vodovod-Kanalizacija together with our partners from Slovenia: Geological Survey of Slovenia, Anton Melik Geographical Institute SRC SASA, the Environmental Agency of the Republic of Slovenia, and two partners from Germany: Technische Universität Darmstadt and the company Geo-log from Brunswick, has responded to the call for LIFE+ 2007 project proposals with 'Improved management of contaminated aquifers by integration of source tracking, monitoring tools and decision strategies', abbreviated INCOME. In order to facilitate the presentation of the project to the interested Slovenian public, the project group decided to use an indirect translation of the project title in Slovenian. The Slovenian title of the project is 'Učinkovito upravljanje onesnaženih vodonosnikov – povezava postopkov za odkrivanje in nadzor virov onesnaženja ter ukrepov za izboljšanje stanja' [Effective management of contaminated aquifers - linking procedures to identify and control sources of contamination and measures to improve the situation]. The project run from 01.01.2009 to 30.06.2012. In addition to the European Union, the project was also co-financed by the City Municipality of Ljubljana and the Ministry of Agriculture and the Environment of the Republic of Slovenia.

WHY PROJECT INCOME

Water resources should be maintained. The INCOME project idea came to life on the basis of the common findings of the profession, the water system operator, and the decision makers both at local and state level, that in the field of management of water resources in Ljubljana and Slovenia, despite great efforts and the establishment of appropriate legislation for the effective management of water resources, it is necessary to do more than what has been done until now.

Today, 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. The consequences of a decision can be seen for decades and affect the environmental conditions in which future generations will live. Therefore, the current generation of decision makers holds great 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.

ACHIEVEMENTS OF THE 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, and it may be exported for further use.



<http://akvamarin.geo-zs.si/incomepregledovalnik>

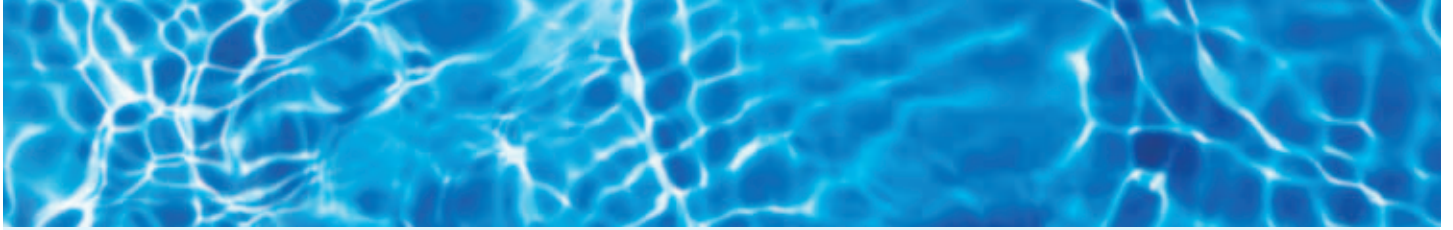
- We have developed a decision-making support system, which in the event of environmental accidents in water protection areas will provide key information for action and propose ways to prevent or at least mitigate the effects on the environment. The system also provides support for long-term decisions 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 new insights and better understanding of the hydrological processes in the Ljubljansko polje and Ljubljansko 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.
- 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.

WHAT WE LEARNED FROM THE PROJECT INCOME

- We know how to prepare a good project application, to manage a project successfully, meet the requirements of the European Commission for reporting, and to coordinate the interests of project partners for a common goal.
- We know what environmental information we need for the management of water resources and how to convert it into a useful and accessible to all electronic form.
- We have learnt what environmental information, relevant to the management of water resources on Slovenian territory, is missing.
- We know how to develop new laboratory methods and techniques of sampling groundwater.
- We are very familiar with the dynamics of drinking water sources and are prepared for possible environmental disaster that could threaten them.
- We know what kind of monitoring facilities we need relative to the natural characteristics of aquifers and types of problems.
- We are active users of demanding mathematical tools for modelling groundwater.
- We are aware of the shortcomings of the implementation of Slovenian environmental legislation and know what should be changed.
- We have learnt that the environmental awareness of users is largely voiced rather than put into practise.
- We know how to organise workshops, raise public interest, and motivate participants to active participation.
- We have progressed in our ability to coordinate interests among partners; we are also more efficient and skilled in solving everyday problems.



- With twelve 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. The sites are representative and can be included in the state or local monitoring of groundwater.
- 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.

LONG-TERM EFFECTIVE MANAGEMENT OF WATER RESOURCES

For the effective management of water resources, it is important:

- that the land use of water protection areas is oriented to sustainability for the purpose of maintaining water resources for future generations, while concern for drinking water must be a priority in spatial planning,
- that an effective control over spatial occurrences is established, which will prevent activities that could adversely affect water resources,
- to timely implement rehabilitation of old burdens on the land,
- that we have prepared scenarios of action in exceptional circumstances, if they are needed,
- to implement long-term protective measures, such as conservation of green space, promotion of organic farming and quality construction or reconstruction of the sewerage system.



- We have developed passive samplers and new laboratory methods for determining stable isotopes ^{13}C and ^{37}Cl at low concentration levels of contaminants from types of volatile hydrocarbons. The principle was used to determine the prevalence of contaminants from various sources.
- 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.
- We have kept the professional and general public informed of the progress of the INCOME project through the web site www.life-income.si, with colloquial and professional contributions and with various lectures.

PROPOSALS OF THE INCOME PROJECT GROUP

Despite the fact that we have achieved the planned results of the project proposal, the objective of the project group will only be fully fulfilled by their application in resolving everyday environmental problems.

The web browser can be updated with other environmental contents, e.g. information on noise levels, air quality and quality of drinking water. With the City Municipality of Ljubljana assuming custody of the Viewer that we suggested, it may become the central information portal for informing the residents of Ljubljana and its surroundings on the environment in which they live and how the quality parameters of their environment change. At the same time, the Viewer can become a collection of environmental data relevant to the work of decision makers at the local level.

The objective of the project group is to transfer the acquired knowledge, approaches and developed tools to other environments in Slovenia and abroad, where the issue of safe drinking water supply is currently even more acute than in Ljubljana. Both the ministry with jurisdiction over environmental affairs and the local communities need contemporary support in planning the sustainable use of land and in implementing measures for improving or maintaining the chemical status



of groundwater. The concept of a web-based Environmental Data Viewer and a computer decision-making support system is transferable to other water protection areas. The use of decision-making tools on other water protection areas, in emergency situations or for decisions related to long-term spatial planning, will also improve the security of drinking water supply in Slovenia. Tools are the foundation for professional decisions, without which decisions can be wrong and irreversible, while the financial consequences of unsuitable measures are high.

Therefore, we suggest that the staff of the City Municipality of Ljubljana and the ministries with jurisdiction over environmental affairs, agriculture and spatial planning become active users of the established e-tools. The INCOME project group also expects that the ministry with jurisdiction over environmental affairs will adopt the initiative to implement measures for improving the state of water resources, including those, for which they are not directly responsible, through appropriate communication between the ministerial departments.

RESPONSIBILITY FOR THE EFFECTIVE MANAGEMENT OF WATER RESOURCES

INCOME urges all participants in the process to care for water resources:

- the ministry with jurisdiction over spatial planning, and local communities, whose concern is the adoption and implementation of spatial planning documents that will enable the sustainable use of water resources,
- the ministry with jurisdiction over agriculture and environmental affairs, and the local communities, whose concern is a clean, healthy and safe living environment,
- the profession as a conductor for the preparation of professional foundations, which are decisive for the measures contained in the legal acts,
- operators of water systems that have a strong interest in maintaining the quality and quantity of water resources,
- land users that are restricted in their activities due to safeguards and restrictions, and
- users of drinking water from which we expect care for the environment and support for environmental projects.

INCOME FOR THE INHABITANTS OF LJUBLJANA

INCOME has created a sufficiently firm foundation on which the city of Ljubljana can manage its environmental policy on drinking water sources in a way that will be viewed as a winning formula in a decade or two. The positive name of the project INCOME says a lot: with INCOME the city of Ljubljana has received results which will prove to be one of the better environmental investments both in the environmental and financial statements of the city. The European Community has adopted a goal to improve the quality of its water resources and conserve them for future generations. In the area of Ljubljana, where water resources are of high quality, but exceptionally vulnerable, we have a unique opportunity to avoid the path taken by most polluted European cities. Instead, we should realise in time the importance of oriented city development and manage it so that impacts on the environment and water resources remain acceptable in terms of health of the population of Ljubljana.

INCOME AFTER INCOME

Based on the INCOME project results, we plan:

- that the INCOME concepts do not fade into oblivion upon the formal completion of the project,
- meetings with officials at the local and state level in order to transfer decision-making tools into practise in the Ljubljana region and beyond,
- to update the databases in the web-based Environmental Data Viewer,
- the use of new monitoring sites, piezometers, in groundwater monitoring and in internal control of public drinking water supply,
- participation in decisions on the future use of groundwater for the purpose of public drinking water supply at the Ljubljansko polje and Ljubljansko Barje, according to state and municipal spatial planning,
- monitoring of how the proposed measures will be applied in practise,
- participation in the process of amending legal acts regulating water protection areas,
- upgrading the plans for responding in emergency situations in water protection areas,
- and stricter representation of professional views in practise.

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