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Adapting technology for worldwide use

*Wastewater's role in the
water-energy nexus*

*Groundwater management
lessons from Brazil*

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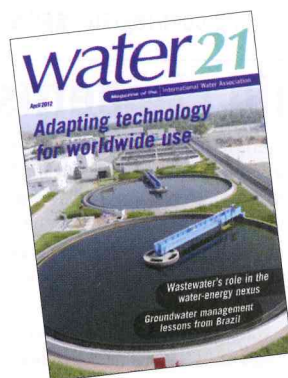


Promoting sustainable
forest management

Why the name 'Water21'? 'The general
objective is to make certain that
adequate supplies of water of good
quality are maintained for the entire
population of this planet, while
preserving the hydrological, biological
and chemical functions of ecosystems,
adapting human activities within the
capacity of nature and combating
vectors of water-related diseases.
Innovative technologies, including the
improvement of indigenous
technologies, are needed to fully
utilize limited water resources and to
safeguard those resources against
pollution.' From 'Agenda21', the UN
programme of action from the Rio
Earth Summit, 1992.



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International Water Association

COVER STORY

The German Federal Ministry of Education and Research has been financing a wide range of projects looking into adapting established technologies to the conditions of other countries. Hermann Orth and Peter Wulf discuss work on wastewater treatment, nutrient recovery and wastewater reuse technologies and how they could be adapted for use around the globe.

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Photo shows an example of an activated sludge process plant in high-temperature conditions: Fujairah wastewater treatment plant (100,000 PE, UAE). Credit: Emscher Gesellschaft fuer Wassertechnik mbH.

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Project INCOME: developing a comprehensive approach for Slovenian aquifer management

● In an effort to combat deteriorating groundwater quality in two aquifers supplying Slovenia's capital city, the project INCOME was set up to develop new monitoring and remediation tools to improve the management of these groundwater resources. As the project nears its conclusion, **BRIGITA JAMNIK**, **MITJA JANŽA** and **JOERG PRESTOR** look at how INCOME's solutions are being put into practice.

The main source of drinking water in Slovenia is groundwater – 97% of the country's population depends on groundwater for its water supply. The Ljubljansko polje and Barje alluvial aquifers, exploited for the public water supply of Ljubljana, the capital city of Slovenia, are among the most important. They are characterised by a strong interconnection of surface and groundwater, a high vulnerability, and high velocities of groundwater flow and pollutant transport.

Not only is a long-term stable and safe water supply in Ljubljana the primary goal of the water supplier, JP Vodovod-Kanalizacija, the leading partner of the INCOME project, it is also the project's main focus. Financially supported by LIFE+, EU's funding instrument for the environment, the Municipality of Ljubljana, and the Ministry of the Environment and Spatial Planning of Republic of Slovenia, the INCOME project started in January 2009 and is now in its final phase, which will conclude at the end of June 2012.

Anthropogenic conditions in the catchments of the aquifers are characterised by the significant pressures of urbanisation, industry, traffic, agriculture and old environmental burdens. Unknown pollution sources are a serious challenge to groundwater quality, which is deteriorating in spite of basic measures and strict environmental legislation.

Due to the wide range of potential threats to and the dynamics of groundwater systems, legislation has proven to be lacking in adaptability and flexibility when dealing with these problems. The patchwork of policies, regulations, programmes and guidelines that generally concern groundwater protection issues and the multitude of agencies involved at all levels of

legislation are especially discouraging. Natural conditions require a fast administrative response, timely decisions and adequate measures. In case of sudden pollution, reactions should be very fast to avoid serious impact to the water supply. With a mostly widely-spaced monitoring well network and limited sampling, the present standard monitoring approaches bear a high risk of not detecting contamination events. Therefore, new investigation, monitoring, remediation and administrative tools as well as a combination of tools have been investigated within the INCOME project.

Improving groundwater monitoring

The establishment of the register of potential and actual polluters, created by the Anton Melik Geographical Institute, and a detailed overview of the chemical status of the groundwater put together by the Geological Survey of Slovenia (GeoZS), were two of the project's most important early milestones. The results of these activities were the basis for the planning and construction of seven deep (48 to 122m) observation wells for groundwater quality and level measurements in the Ljubljansko polje area, and 31 shallow (up to 30m) observation wells to control the upper part of the aquifer of Ljubljansko barje. The new observation wells have made up for the shortage of appropriate monitoring sites necessary for the timely detection of potential threats to the drinking water supply. The direct push technology, used by the German INCOME partner Fugro Consult GmbH (formerly geo-log) for the construction of shallow wells, was successfully applied for the first time in Slovenia.

The knowledge of aquifer characteristics has been additionally improved by tracer experiments and periodical sampling for chemical and isotope analyses. A new method of

passive sampling and analytical laboratory techniques were developed at the Technical University of Darmstadt, Germany, proving that environmental forensics is a useful tool in determining traces of volatile organic hydrocarbons and their origin. The gathered information has been included in an environmental database that is accessible to the public through a website (<http://akvamarin.geo-zs.si/incomepregledovalnik>) developed as the basis for a hydrological model and a model of environmental pressures and impacts by GeoZS.

Decision support

The problems in water management are complex – an interdisciplinary approach is often necessary and solutions must be reached under strict time constraints. In such circumstances decision support systems (DSS) are a beneficial tool that can help decision makers to choose the right long- or short-term measures, e.g., in the process of land use and spatial planning in water protection zones or in the case of environmental accidents. As a result, in the frame of the INCOME project, one such DSS has been developed by GeoZS as a lead partner.

The developed DSS is an interactive computer system that utilises a database, hydrological modelling, and experts' and stakeholders' knowledge, which is updated with the information acquired in the frame of INCOME project. It consists of three components, tackling the different above-mentioned issues in water management. The first utilises the work on identification, cleaning up and restoration of illegal dumpsites that are a serious threat to the qualitative status of groundwater. The other two components utilise the predictive capability of the hydrological model and scenario analysis. The user interacts with the system through a graphical interface that guides the user step-by-step to the recommended remedial measures. Consequently, the acquisition of information to support the water management's decisions is simplified and faster, thus contributing to more efficient water management and a safer supply of drinking water.

In the 'INCOME after INCOME' period the project group has set itself a demanding task: to present the benefits of the established INCOME tools and proposals to potential users and to spread the INCOME ideas to the entire Slovenian territory and even beyond its borders, to places where aquifers are situated below urbanised areas. ●

For more information, visit:
www.life-income.si

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