

INNOVATIVE TECHNOLOGIES FOR WATER SECURITY

The UN estimates that by 2050, 52 percent of the world's population will be at risk for water insecurity. Climate change is threatening water availability through increased temperatures and drought, unpredictable rain, and the continued threat of growing pollution. As the water supply and sanitation (WSS) sector continues to face increasing pressures, governments and service providers around the globe are under pressure to increase the WSS sector's resilience and sustainability. Can the world invent itself out of this growing calamity? It is a hope that seems to gather serious traction.

Innovation and technology are increasingly emerging as key tools in dealing with the issue of water scarcity and safety, water service efficiency, and utility operations. There is a growing willingness by academia, industry and utilities to consider, plan, test and adopt promising technologies, and governments work on creating favorable conditions for innovation that help to advance water security. To review the state of play, Mr. Stjepan Gabric hosted a panel of sector leaders to present some of examples of the innovative thinking and state-of-the-art solutions.

Digital water – key water management tool for 21st century

First to take the podium was Prof. Vladan Babovic, Department of Civil and Environmental Engineering, National University of Singapore, with a close-up look Artificial Intelligence applications in a smart city with high population density. Singapore with its 10,000 inhabitants per square kilometer is prone to highly localized rainfalls that frequently produce local flash floods that are extremely difficult to predict. Combining AI and Machine Learning with an X-band radar array, the authorities have now speeded up forecast processing to updates issued every 2 minutes. Singapore also applies AI-driven Natural Language Processing to process millions of tweets about floods and produce a georeferenced water level map of the city in real-time, and deep learning algorithms to deploy CCTV camera feeds in rainfall intensity monitoring. Prof. Babovic sees a Second Machine Age coming, predicting that human-AI teams will beat the performance of humans or AI working alone:

“There is no reason to be afraid of such a future.”

Israel – The Start-Up Nation”

Next, Mr. David Balsar, General Manager of Innovation and Ventures at the Israel National Water Company, introduced the audience to a big-thinking start-up culture in a small nation.

Israeli tech enterprises frequently attract investments from S&P 500 companies. Mekorot, the National Water Company, works systematically to harness the innovative power in this start-up scene for the Water Sector.

For instance, IT security company IXDen has joined Mekorot to co-develop a software that monitors the health of water network technology like sensors, controllers and SCADA, and gives advance warnings when equipment is about to fail. Another example is a partnership between Mekorot and CQM Water to develop an on-site chlorine generation system that works without chemicals, instead using the existing water salinity to produce chlorine and disinfect the water.

Lately, Mekorot and Newsight Imaging have jointly developed Watersight, a spectral sensing technology to identify particles and bacteria for water quality inspection purposes, both on the domestic and the industrial level. To meet Mekorot's stated goal of reducing energy consumption by 8-10% per year, the company uses AI by "Evolution Water" to search out ways to raise the energy efficiency of water systems.

Aware of the growing importance of water recycling, Mekorot also has newly established an international R&D center for wastewater treatment and recycling.

The Water Sector in Israel, Integrative Water Resource Management in Israel

Dr. Diego Berger, Coordinator of International Projects at Mekorot then added a general overview of approaches to Integrative Water Resource Management in Israel, presenting four basic principles behind the success for the Israeli Water Sector:

- the "Measurement of water law" of 1955 ordering the measurement of all water supply and consumption,
- the "Water law" of 1959, nationalizing all water resources,
- the "Centralized Management", establishing one generally responsible water authority in 2005,
- and "The Israeli's Water Sector is self-financed" rule, also introduced in 2005 to motivate efforts to raise efficiency and develop innovative technologies.

Water prices in Israel are the same for domestic and agricultural use. A full 30% of the revenue is earmarked for financing future projects, enabling Mekorot to introduce innovative technologies in an effort to reduce the risks caused by climate change (i.e. floods and droughts).

Smart Cities: Joint Investment Call

A presentation on innovative investment strategies came from Ms. Leona Aslanova, CEO of Innovation Starter Box, Bulgaria. The company joined Sofia Water Company to co-develop "Warmer, Digital, Cosier", a smart city start-up program to improve safety, health, environment, connectivity, the jobs and the cost of living in Sofia.

Five of altogether 86 applications found approval and joined this start-up acceleration program:

- InnovaOne is a team of high school students with an innovative approach to measuring and improving water and air quality in their hometown Harmanli.
- CW Engineering is a team of six, working on "Innovative wastewater treatment and green energy for industrial and domestic use".

- DigitalTwin company develops a digital twin technology-based software platform to support businesses in their transition to Industry 4.0.
- Smart Water consulting proposes individual improvements, trainings and automation of the water companies after initial assessment of their processes, hardware and software.
- SatGeo is the winner project, an innovative technology for detecting hidden water supply network leaks combining GIS and satellite images. SatGeo succeeded in reducing non-revenue water far beyond initial expectations.

Using online UV/VIS spectroscopy to monitor the raw water quality of the Viennese water supply

The session's final presentation was delivered by Mr. Christoph Wagner, Chief Innovation Officer, s::can GmbH, about an innovative approach to water quality monitoring. UV/VIS spectroscopy observes the absorption or deflection of light by particles in water samples, measuring turbidity, color, organic molecules, nitrate and nitrite and special parameters like disinfection by-products, chlorine demand and chloramines.

With about 70 stations installed at springs, wells and along Vienna's pipelines, UV/VIS monitoring offers a safety net that ensures the famously impeccable quality of Vienna's water. The technology allows for responding to pollution events by tracking turbidity and other parameters at stations along the pipeline and discharging polluted water before it enters the distribution network.