canarie

iEnvironment

Innovation in data management to accelerate global, collaborative environmental research

Scientists, researchers, and engineers from government, academia, and related agencies such as conservation authorities are constantly collecting environmental data to better understand how our world is changing and to predict what is likely to happen in the future. This data is very valuable – especially today in the face of unprecedented global change. However, there is no standard storage repository where such data is archived for future use. Often, it is used once and then kept in a filing cabinet or personal computer, making it inaccessible to other researchers and organizations. Because of this, researchers often duplicate efforts in data collection and/or do not benefit from the insights afforded by historical data.

iEnvironment is a research software platform for storing and sharing vast amounts of data on many different aspects of the environment.

A research team at the University of Waterloo Computer Systems Group is trying to change this. Along with 50-plus partners from other Canadian universities, government agencies, and private industry, these researchers have developed iEnvironment, a research software platform for storing and sharing vast amounts of data on many different aspects of the environment, as they relate to fresh surface water.

Supporting a wide range of research initiatives

As a platform or framework, iEnvironment can be leveraged to support a wide range of research initiatives in such areas as climate change, natural storm management, biodiversity, water pollution prevention, and water level management. It has already

been used to create the Flowing Waters Information System (FWIS), a data repository on the quality of flowing fresh water or "wade-able" streams in Ontario. Hundreds of thousands of data records on channel morphology, water quality, wildlife health, and other indicators, collected since the early 1970s and held in various locations, are now centrally located in this one repository and made available to many different government and research organizations.

The Toronto and Region Conservation Authority (TRCA) is one such organization. Scientists and engineers at the authority and at the University of Waterloo are using the data to understand and mitigate the erosion of riverbanks and bridge abutments, and to restore natural habitats for species such as Atlantic salmon. Rather than sending technicians numerous times to various sites to collect

Software Evolution

Thanks to funding from CANARIE, the software toolkit used to develop the iEnvironment platform is evolving to support new teams of researchers and practical applications, some in completely different disciplines:

> **VolunteerAttract** – an organization that develops software to promote volunteerism and facilitate community engagement has leveraged the toolkit used in the iEnvironment platform to create a large data hub that connects over 150 local centres across Canada with willing volunteers, managing more than 75,000 opportunities at any given time.

> **myPerthHuron.ca** – an online resource based on the Canadian Index of Wellbeing that tracks the wellbeing of communities in the Perth and Huron areas of southwestern Ontario, has used the software toolkit underlying iEnvironment to collect, analyze, visualize, and store economic, environmental, social, and cultural data on these two distinct but similar rural communities.

measurements themselves, the TRCA uses the repository data to understand the vulnerabilities of its streams and map out a channel stability index, which they then use to prioritize funding and in-person inspections. Other uses include studying floodplains and water quality.

Cutting data acquisition time in half

Monitoring environmental change and modelling future scenarios requires a vast amount of data collection. Conservative estimates consider the data acquisition process to take at least fifty percent of the time in any research study. Researchers who use iEnvironment for data collection, processing, and storage can cut the time to complete many important studies by half, creating a significant gain in productivity and allowing researchers and engineers more time to focus on using the data to answer complex questions about environmental change and develop mitigation strategies.

Repurposing the platform to save historical data

Getting the iEnvironment platform into the hands of more researchers is the next stage for the iEnvironment team. They are currently racing against time to capture historical data as a large number of biologists and other researchers approach retirement age. Many of these soon-to-be-retirees have important data dating back several decades – data that is now at severe risk of being lost completely. Thankfully, iEnvironment provides these researchers with a mechanism for standardizing, scrubbing, and archiving their data in a way that makes it of tremendous value to future generations of researchers and engineers as well as Canadians in general, who stand to benefit from a healthier environment and better-managed ecosystems.

Platform: iEnvironment

Description	iEnvironment is a web-based, extensible and distributed data management platform and user gateway for integrated environmental monitoring and modelling (IEMM) related to surface water. The platform supports access to and sharing of data from multiple distributed heterogeneous data sources, as well as the monitoring and modelling of models and tools to enable researchers to perform complex analyses easily and efficiently on the integrated data.
Contributor(s)	University of Waterloo
Research Subject	Multi-Discipline
Portal	http://www.comap.ca/fwis/
Portal Access	Conservation Professionals
Supports Separate Projects	Yes
Software Licence	Source code is private. Data Sharing Agreement in place.
To Learn More	https://science.canarie.ca/res/137