Are smart environmental monitoring technologies worth it?

How to cut costs, save time and avoid litigation on your next construction project

More than ever before, construction projects are being asked to up their game when it comes to ongoing environmental monitoring. A company's social license to operate may depend on it, and failing to catch serious environmental impacts could kill a project before it can be completed. And mandated assessments and regulation is only set to increase as governments come under pressure to ward off ecological damage and protect wildlife, native species, and waterways.

"Stakeholders, increasingly well informed and vocal, will demand proof and may threaten litigation. At the same time, major construction, and infrastructure projects can struggle to keep up, faced with unexpected changes impacting environmental monitoring requirements. And in many cases, grab samples and low-tech methods no longer cut it," said Alex Dumitrescu, responsible for business development at Rice Resource Technologies, a Canadian firm specializing in environmental monitoring solutions.

As a result, project teams are turning to technologies that give them automated data collection, monitoring, and alarm capabilities along with the potential for telemetry—an advanced system that, in some cases, doesn't require a SCADA system, and allows data to be stored in the cloud for decision-making in real time.

"These more efficient, streamlined methods are not only better equipped to safeguard a company's environmental reputation and avoid costly law suits, they can also offer significant benefits and savings—potentially big when considering large scale projects—when done right," added Dumitrescu.

But, how do you know if high-tech environmental monitoring is worth it for your project? And if so, where do you start?

What should you look for in a smart water monitoring solution?

The rapid expansion of Internet of Things (IoT) technologies, cloud computing and big data combined along with advanced smart sensor devices are opening new possibilities for construction monitoring, particularly in hard-to-reach aqueous settings. But what features should you be looking for when in the market for smart environmental water monitoring system and how do you assess their value for your specific project needs?

Criteria to consider:

1 What are your scope and risks related to your project?

There are a huge number of locations when it comes to monitoring aqueous environments. To deploy the infrastructure on a large scale means the price of components and their integration should be cost-effective relative to the project's scale. At the same time, be sure to consider the financial and legal risks of not implementing a comprehensive monitoring solution.

2 Does the solution offer a robust build that withstand use over time?

The sensor and monitoring technology should be robust, with adequate battery life/power supply, built with chemically-resistant materials and able to withstand the elements and harsh conditions over time. This includes stable sensors and instrumentation for accurate results and minimal calibration. It should be easy to clean, deploy and re-deploy, with a wiper and clutch system that does not burn out should debris become lodged in the unit.

3 Will the solution adapt and flex to your growing needs?

Ideally, choose a modular solution so it can grow with your needs. Sensors should be flexible and adapt to a cross-section of measurements such pH/ORP, Rugged Dissolved Oxygen (RDO®), turbidity, chlorophyll a, Phycocyanin (BGA-PC), Phycoerythrin (BGA-PE), Rhodamine WT, ammonium (ISE), chloride (ISE) and nitrate (ISE).

4 Does it offer logging and redundancy to protect your data?

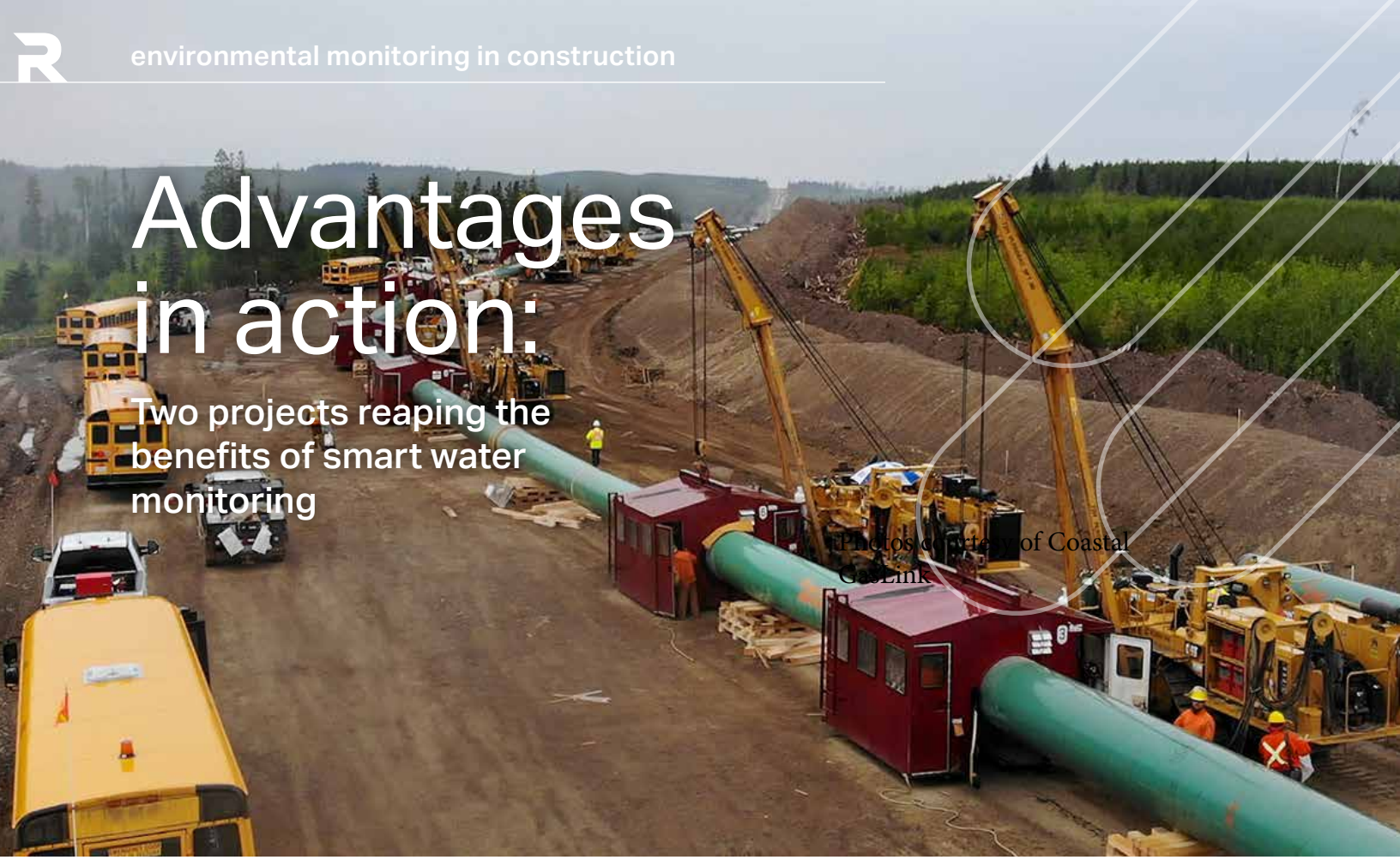
Choose a system that offers redundant and stable logging of data. This includes adequate onboard storage capacity, that can withstand a cut to power without losing data.

5 Is it hassle free and easy to use?

Monitoring systems were historically hard to use, and some still are. To make sure your team takes full advantage of the technology, be sure to select an easy-to-use solution that offers an intuitive user interface, programmability and includes features such as Bluetooth enabled smart phone compatibility.

Advantages in action:

Two projects reaping the benefits of smart water monitoring



Photos courtesy of Coastal GasLink

Two massive infrastructure projects in western Canada—Coastal Gaslink and Trans Mountain Pipeline Expansion—are both taking advantage of smart water monitoring solutions.

The Coastal Gaslink project is a 670 kilometres (416 miles) pipeline that will safely deliver natural gas across the northern region of Canada's most westernly province and open up opportunities to export it to global markets. Once built, the pipeline will move 2.1 billion cubic feet per day (bcf/d) of natural gas with the potential for delivery of up to 5 bcf/d.

The Trans Mountain Pipeline Expansion—set to twin the original pipeline built in 1953 that runs between Strathcona County near Edmonton, Alberta and Burnaby, British Columbia—will provide 980 kilometres (608 miles) of new pipeline, expanding its capacity from 300,000 barrels per day to 890,000 barrels per day.

"As high-stakes projects with the need for fail-safe environmental monitoring, we helped both projects deploy advanced sensor technologies to measure any potential impacts to surface and groundwater across hundreds of kilometres of challenging terrain—with a solution that uses the latest sensor and electronics technology to provide laboratory-quality measurements for field use," said Kevin Hunsche, technical sales and business development at Rice Resource Technologies.

In both cases, the sensor solution they opted for included a fully customizable multiparameter sonde with interchangeable sensors, with long-lasting battery power, and a smartphone interface that delivers accurate data and enables simplified calibration, panoramic data view, and report creation.

"For the Coastal Gaslink project,

we provided about 90 advanced sensor devices, with each of those having 4 sensors capable of either directly or derived readings of 12 parameters. For Trans Mountain they took advantage of the option to rent the units—anywhere from 15 to 60 units at time—to monitor all affected surface water—still and flowing—along the construction route" said Hunsche.

Photos courtesy of Coastal GasLink

"Renting the devices gives you the flexibility to expand or shrink your sensor count as needed. You can be confident that the equipment would always be in good repair without the ongoing need to maintain them," he added.

The sensor options include temperature, pressure, conductivity, pH/ORP, Rugged Dissolved Oxygen (RDO®), turbidity, chlorophyll a, Phycocyanin (BGA-PC), Phycoerythrin (BGA-PE), Rhodamine WT, ammonium (ISE), chloride (ISE) and nitrate (ISE).

"As a prime consultant for the Coastal Gaslink project, we are using these products for water quality monitoring—tracking turbidity, temperature, pH, conductivity, and dissolved oxygen. We are able to rent as many as we need and they're easy to use," said Scott MacKenzie , Water Quality Lead at Stantec.

"With this technology, we can have a single crew monitor multiple sites each day. The Bluetooth connection means that we don't have to go into the water to download the data, which is a bonus for water quality measurements and safety in the winter."

"These units are smaller and lighter than the alternative that we had been using, so the crews like them. And downloading the data is fast and streamlined," he adds.

Additional sensors could be selected and replaced to suit a project's needs. There is also an option to include a motorized sensor wiper.

"This type of solution can be adapted to a variety of aqueous monitoring needs including groundwater sampling, low-flow testing, mine water monitoring and stormwater management," said Dumitrescu.

A built-in LCD screen displays battery status, connectivity info, and other vital information. Setup was relatively easy with the use of an app and a Bluetooth-enabled mobile device. The device can record data to an internal micro-SD-card and offers the option to use telemetry devices for remote monitoring.

"For the Trans Mountain team their primary concern was to measure turbidity—and one of the primary benefits of the solution was the ability to provide continuous data collection without the need for numerous onsite sampling crew members," added Dumitrescu.

Redundant data storage made for easy downloading on site using Bluetooth enabled transfers to a smart device and quick import into data processing software.

For both projects, a simple daily download offers the team thousands of data points, each time stamped so they can have an accurate representation of the parameters being measured over time, rather than simple spot sampling.

"The cost savings are also a large component to be considered. If you need multiple data points from each site, you'll need multiple people continuously taking manual readings. With sensor technologies, a single person can show up on site and download thousands of data points in minutes, then move on to the next site and repeat," said Hunsche.

Taking monitoring to the next level with telemetry

Beyond automating sample grabs, telemetry— the use of in situ collection for the automatic recording and transmission of data from remote or inaccessible sources to an IT system in a different location for monitoring and analysis—can further boost the benefits of construction monitoring.

The primary benefit of telemetry is the ability of an end user to monitor aqueous environment from a remote location. Thanks to telemetry, those insights can be delivered directly into a dashboard for you to analyze and act on.

For example, the City of Calgary is looking to telemetry monitoring technologies for an upcoming project that will require relocation of gravel within the Bow River—the major river that cuts through the city taking in the Elbow River at the historic site of Fort Calgary.

"Telemetry systems are a key piece of technology that can provide data directly to the contractors, facilitating more agency in their role to make decisions within the environmental and economic aspects of river construction projects," said Greg Courtice, a PhD Candidate studying the management of sediment releases from river construction projects and who is working on the project for the City of Calgary.

"Using telemetry in conjunction with more pragmatic management strategies help to achieve maximum production and minimizes equipment downtime at various stages of the project. Providing a more direct link to the data facilitates more efficient management decisions that can reduce construction downtime and enhances environmental protection," he adds.

Advanced features such as telemetry,

can be intimidating at first, and historically very complex. The good news in recent years there are user-friendly solutions that make the leap to continuous environmental monitoring much easier.

Criteria to consider:

1 What are its communication options—cell or satellite?

It's helpful to have multiple methods available within a product network so you can take advantage of more affordable cellular data costs where available. Availability of Iridium, Globalstar or GOES within the platform is critical in Canada due to significant geographical areas without cellular signal.

2 What are your power consumption requirements?

Figure out your power needs and choose power-use efficient transmitter system. Consider options with solar charging system to back up the battery array.

3 How big/bulky is your system?

In remote locations, size may not be as important, however in rural and urban environments, having a system that is easy to hide or harder to notice will increase its lifespan. Large bulky systems with enclosures and big solar panels can be prone to theft or vandalism. There is significant advantage to systems that can be installed in enclosure that looks like 2-4" piping.

4 Is it compatible with your data collection systems?

Ensure the solution is addressing any issues related to compatibility with proprietary client-owned data collection systems. Open communications protocols solutions easily integrate with sensors and telemetry systems where multiple manufacturers are required within one system. Starting fresh? Considering adopting new open-source systems, such as HydroVu, that can future-proof compatibility concerns with programming that accepts multiple sensor platforms.

"As telemetry technologies get better and more affordable, I think we will see more and more companies adopting these solutions. They have the potential to fundamentally change environmental monitoring and improve our relationship with the planet," said Hunsche.

"Data from telemetric real-time environmental monitoring systems can be used to identify trends, make predictions, and establish parameters and trigger levels, which is essential for early warning strategies and protecting the earth's resources."