Mobile IoT

LPWA: Cost-Ef ct r the Environme

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SUMMARY

As population growth and climate change increase demand for fresh water, governments, businesses and individuals are looking for more effective ways to monitor and combat pollution. On the Chattahoochee river, which supplies four million people with drinking water in the south of the U.S., AT&T and Ericsson are trialling low cost connected sensors that highlight how new mobile technologies could help safeguard the environment and the supply of vital natural resources, such as water.

The innovative devices could enable local stakeholders to cost-effectively remotely monitor the temperature, the conductivity and the turbidity along the entire 430 miles of the river.

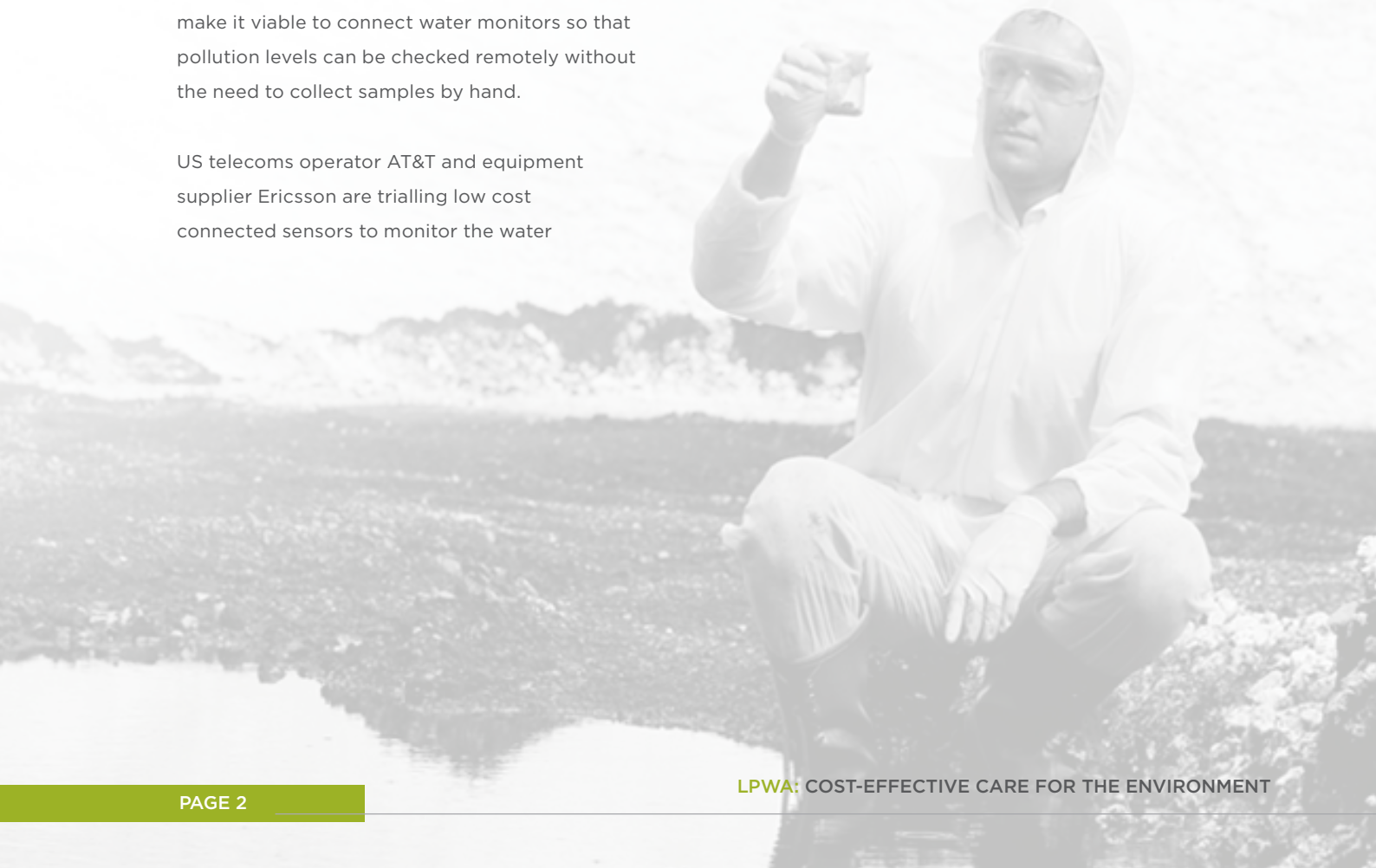
The Chattahoochee River, inset with the new connected water sensor

MINIMISING WATER POLLUTION

GLOBALLY, RIVER AND LAKE POLLUTION IS A MAJOR PROBLEM, LIMITING THE AVAILABILITY OF FRESH WATER FOR BOTH PEOPLE AND WILDLIFE, EVERY DAY, TWO MILLION TONS OF HUMAN WASTE ARE DISPOSED OF IN WATERWAYS AROUND THE WORLD, ACCORDING TO NATIONAL GEOGRAPHIC MAGAZINE, WHILE IN DEVELOPING COUNTRIES, 70 PER CENT OF INDUSTRIAL WASTE IS DUMPED UNTREATED INTO RIVERS AND LAKES, POLLUTING THE USABLE WATER SUPPLY.

Many countries and communities still rely on people manually testing the quality of water in rivers, streams and lakes to see whether it is fit for human consumption and help identify sources of pollution. Although connected sensors can be used to remotely monitor water quality, they have typically been too expensive to be deployed extensively. But new low power wide area (LPWA) mobile networks, together with other technological advances, look set to make it viable to connect water monitors so that pollution levels can be checked remotely without the need to collect samples by hand.

US telecoms operator AT&T and equipment supplier Ericsson are trialling low cost connected sensors to monitor the water quality on stretches of the 430-mile long Chattahoochee river, which flows through the suburbs of Atlanta. More than four million people rely on the river for their drinking water. The trials will enable the Chattahoochee Riverkeeper, an organisation dedicated to protecting water in the Chattahoochee River Basin, to remotely monitor the quality of the water at key watershed locations.



CUTTING THE COST OF SENSORS

Aiming to transform the economics of water monitoring, Ericsson's Technology for Good programme challenged US university students to assist in designing a connected sensor prototype that would be much cheaper to produce than the highly accurate, but expensive, $6,000 devices currently used by the Chattahoochee Riverkeeper.

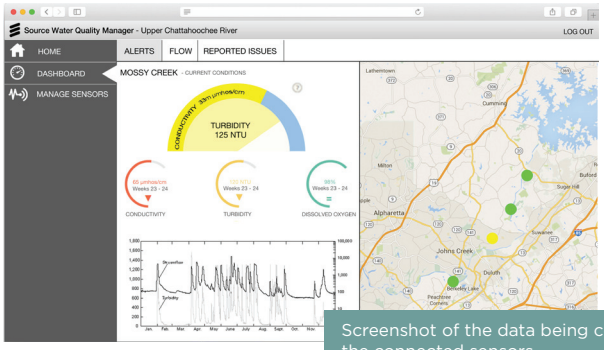
The student designers were asked to find a low cost way to monitor several aspects of water quality including temperature, conductivity, pH, nitrates, dissolved oxygen and turbidity. To be eligible to win the challenge, sensor device components would have to cost no more than $200, be waterproof, RoHS (Restriction of Hazardous Substances) compliant, environmentally safe and consume relatively little power. The jury, which included Ericsson executives, members of the United States Geological Survey, the Atlanta Department of Watershed Management, Sigma Connectivity, and staff from the Chattahoochee Riverkeeper, also selected the winning devices on the basis of their durability and the ease with which they can be deployed and anchored.

In November 2015, Ericsson and Chattahoochee Riverkeeper announced that designs submitted by Michael Sotiriou from Suffolk County Community College and John Marshall from Virginia Tech were selected as the winners. From these two winning designs, Ericsson inventors created a composite design that has since been deployed in the Proctor Creek area of the Atlanta Watershed. The design employs a new class of sensor technology, which is simpler and costs far less to make than the laboratory-grade sensors being used by Chattahoochee Riverkeeper. Ericsson continues to investigate the potential of large scale commercial deployments as well as potential pricing models.

If trials of the new devices are successful, it will be feasible for Chattahoochee Riverkeeper to deploy sensors enabling it to continuously monitor the entire length of the river. These sensors will be able to transmit data every 30 minutes – a major step change from the existing approach, which involves manually testing water in 70 to 100 spots, several times a week.

"Strong data is the bedrock of our work at Chattahoochee Riverkeeper," says Jason Ulseth, Chattahoochee Riverkeeper. "However, securing consistent and reliable data is a perpetual challenge. These winning designs are a fantastic way to begin the innovative process of creating an affordable device with the potential to revolutionise the work of Waterkeepers across the globe...This project will result in cleaner water supplies and a more sustainable future for metro Atlanta and beyond."

> *"potential to revolutionise the work of Waterkeepers across the globe"*



Screenshot of the data being collected by the connected sensors

HARNESSING THE POTENTIAL OF LPWA

For the trial, AT&T is using its existing 3G (WCDMA/UMTS) network to connect the new water monitoring devices to its servers, but it plans to employ a low power wide area (LPWA) technology as standard solutions become available. Currently being standardised by 3GPP, LPWA technologies are designed to enable mobile operators to provide low cost, long range connectivity that uses relatively little power - characteristics that make these new technologies well-suited for water monitoring and other environmental stewardship applications. LPWA technologies could enable sensors to enjoy battery lives of up to 10 years and superior coverage, for example.

The Chattahoochee River trial is part of a much broader alliance between AT&T, Ericsson and several universities to develop and deploy Internet of Things solutions that harness LPWA technologies. Ericsson is supporting AT&T's new smart cities framework, which is aimed at helping city administrations better serve their citizens. Focused on improving infrastructure, citizen engagement, transportation and public safety, the framework will be used to build smart city environments called "spotlight cities."

"Ericsson is a global leader with the proven software platforms and technology needed to develop smart cities, making them an ideal fit in this effort," says Mike Zeto, General Manager of Smart Cities, AT&T IoT Solutions. "Together we can help cities enhance the lives of their citizens by saving them money, conserving energy, improving quality of life and further engaging with residents."

Ericsson envisages that LPWA technologies, which can support millions of connections per cell site, will pave the way for a huge expansion of the Internet of Things. By adding a LPWA technology called narrowband IoT (NB-IoT) to existing LTE network infrastructure, Ericsson says mobile operators can quickly rollout reliable and secure mobile connectivity with a low total cost of ownership.

As well as NB-IoT, Ericsson is supporting LTE Machine-type Communication (LTE-M) and Extended Coverage GSM (EC-GSM), which it sees as complementary and necessary to address the diversity of LPWA IoT use case requirements and deployment scenarios while making best use of existing networks.

Together, these three technologies promise to dramatically expand the role of mobile connectivity across the economy, making it much easier for people and organisations to remotely monitor everything from water sprinklers and energy meters to pets and packages.

Ericsson expects the first LPWA solutions to be commercially available in the second half of 2016, paving the way for commercial deployments in the field in 2017.

ABOUT THE CONNECTED LIVING PROGRAMME

The GSMA's Connected Living programme focuses on enabling a world where consumers and businesses can benefit from rich new services across many different devices – securely connected to the Internet via ubiquitous mobile networks.

The Connected Living programme's 'Mobile IoT Initiative' is designed to accelerate the commercial availability of Low Power Wide Area (LPWA) solutions in licensed spectrum. Backed by 30 of the world's leading mobile operators, OEMs, chipset, module and infrastructure companies, this Initiative will facilitate demonstrations, proofs of concept and trials of a selection of complementary LPWA licensed spectrum technologies. It will also provide analysis and feedback to assist 3GPP in standardising the technologies

For more information, visit the programme's website at **www.gsma.com/connectedliving.**