AQUASERVETM

"Cloud-based water surveillance service with integrated innovative space- air- and water-borne sensing technologies & predictive analytics"



TECHNOSCAPE Strategy & Technology P.C.

TECHNOSCAPE Strategy & Technology P.C. Member of STRATEGIS Maritime ICT Cluster



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Water - The "Life Blood of Our Planet"

- Water is the "life-blood" of our economy, industries, societal functions, nature as well as health & wellbeing of our citizens
 - Without water everything else in the €69.8 Trillion global economy would fail
 - 75% of our jobs depend on water, and
 - water crises rank among the top 5 global risks in terms of impact
- Fresh Water is a scarce resource
 - While water covers 70% of our planet, only 3% of the world's water is fresh water
 - The <u>United Nations</u> reports that over **2 billion** people live in countries that experience high water stress
- EU Water Framework Directive WFD (2000/60/EC), a legislation framework to achieve good ecological quantitative and chemical status for all surface and ground waters by 2027
- Water Europe (WE): cross-sectorial and combined research and innovation actions to achieve the Water-Smart Society

Water Pollution - Impact on Society & Environment

Harmful Algal Bloom (HAB) \$2.2 billion annually cost to the US

Eutrophication 90% of Germany's rivers fail EU standards due to high nutrient

Lake Eerie Algae 2014 - 400,000 ppl no water for days. Cost **\$272 million** p.a.

Climate Change Water Scarcity Flooding, Coastal Erosion

Eutrophication is a global environmental problem of undesirable algae increase caused by high nutrient levels in water (nitrogen, phosphorus, etc)

Fertilizer runoffs, septic system effluents, & atmospheric fallout caused by burning fossil fuels are the main reasons to cause eutrophication, an issue exacerbated by climate change





North Sea (11 May 2000)



Karenia mikimotoi 8 Noctiluca scintillans in English Channel (20 Jul 2000)

· Early warning for fish farming and aquaculture

SHELLEYE - "Satellite-based monitoring of harmful algal blooms & water quality for aquaculture farms", 2018, P. Miller, PML



The New Hork Times

356 Elephants Dropped Dead. Did This Bacteria Poison Them?

Some conservationists accepted the explanation provided by Botswana's government, but others raised doubts.



"Botswana - toxic algae in large rain puddles in the Okavango Delta are to blame for the hundreds of mysterious elephant deaths in recent months.". Rachel Nuwer, NY Times, Sep. 23, 2020



Water quality monitoring is a prerequisite for diagnosing climate impacts on natural or agricultural systems

Water Quality Monitoring: Shortcomings of Existing Solutions

Harmful Algal Bloom (HAB) \$2.2 billion annually cost to the US

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Insufficient Information

Difficulty in Modeling, Management & Planning

> Access to Remote, Difficult to Reach Areas

Resource Utilization Management

Manual Processes

Higher Uncertainty Inefficiency, Consistency Partial Measurements (time- or spatial) Poor understanding of hydrological processes

↓ Water Quality, ↑ Natural Disaster Impact
 ↓ Water resource Modeling/Forecasting

Costly, Laborious, Time consuming

↓ Global Hydrological Models
 ↑ Damages from natural disasters

Error prone, Human bias

Cost, Response time, Lack of transparency Safety issues, Regulations, Compliance

TECHNOS

Water quality monitoring is a prerequisite for diagnosing climate impacts on natural or agricultural systems

Problem addressed

Design a Water quality monitoring system which can effectively perform its central role in diagnosing climate and management impacts on natural or agricultural systems

GOAL Large scale, high density sampling, near realand continuous-time surface waterbody monitoring system

Bridge the gap between

- Local monitoring (e.g., insitu water quality devices) &
- Large scale surveillance systems (e.g., remote sensing, satellite)



AQUASERVE Vision & Mission

- With the vision
 to become a leader in
 water management for
 the Water-SMART Society
- AQUASERVE's mission is to provide effective affordable and scalable information & insights regarding a region's inland and coastal waters for worldwide stakeholders & decision-makers

AQUASERVE Goal

- AQUASERVE's goal is to simplify digitalize & automate water quality monitoring
 - enabling the digital transformation of water resource management

AQUASERVE Mission

Actionable analytics for any surface waterbody in seconds, all the time



EARTH OBSERVATION LOCATION INTELLIGENCE WATER MONITORING SENSORS HYDROLOGICAL MODELING ML



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AQUASERVE Concept Diagram

AQUASERVE Cloud-based Water Surveillance System with Innovative Sensing Technologies & Data Analytics



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AQUASERVE System

- A fully automated large-scale water monitoring system for inland and coastal surface waters
- The AQUASERVE system comprises

 a) Water quality sensors
 b) Sensor data integration module
 c) Data fusion module
 - d) Data analysis module
 - e) Data visualization module



In-situ Sensor TRITON®





- AUG Signals Hellas (AUG-H) offers the TRITON[®] in-situ water sensor to continuously analyse freshwater samples
 - AUG Signals Hellas, <u>Water Surveillance</u>
 - TRITON® Brochure
 - Reference <u>installation in EU</u>: IREN, Italy
- <u>AUG-H</u> an ISO 9001:2015 certified company
 - AUG-H oversees the proper operation of the endto-end AQUASERVE system to ensure that it adheres to the strictest standards of quality of operations & environmental regulations

Satellite Data



ShellEYE, "Satellite-based monitoring of harmful algal blooms & water quality for aquaculture farms", Peter Miller et al., Plymouth Marine Laboratory, Nov. 2018 www.shelleye.org

- Satellite & Remote Sensing
 - Spatial patterns and dynamics not noticeable from the ground
 - Long time series of Earth-Observation (EO) data, dating back to the 1970s
 - Typical water quality observations show suspended particulate matter concentrations, chlorophyll concentrations, or presence of algae blooms
- EU <u>Copernicus</u> framework of sensors & services
 - Data are made available on a free, full and open access basis to all its users & the public, through the <u>DIAS</u> (Data and Information Access Services) platform or the <u>Sentinel-Hub</u>

DRONES - UAS Unmanned Aerial System USV Unmanned Surface Vessel

Drones [Unmanned Aerial Vehicles or Systems UAVs or UASs] have considerable potential to radically improve environmental monitoring

• Can be deployed in all but the worst weather conditions, flying just above the water surface, & reach remote and non-easily accessible areas

Monitoring Macroalgal Biodiversity with Multispectral UAVs



Figure 5. Examples of RGB multispectral, and composite imagery (a), the observed habitat classes that were apparent from both in situ transects and acrail imagery (b), closes primation of the 10 histiat classification outputs for RGB, multispectral, and composite imagery (d), and accuracy for physical and agait classes for the three imagery types tested (e).

Tait, L., et al., Unmanned Aerial Vehicles (UAVs) for Monitoring Macroalgal Biodiversity. Sens. 2019, 11, 2332; <u>Result</u>: Diverse spectral profiles of intertidal & shallow subtidal marine macroalgae lend themselves to remote sensing and habitat classification Optional: Terrestrial Mobile (e.g. 4G/5G)

Within the AQUASERVE project



AQUASERVE System - Implementation



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opt. Over VPN and/or private Secure tunnels (i.e. Ngrok)

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Pilot Test - at a Water Reservoir in Cyprus



Kouris Dam, Cyprus (TBC)

 The Water Development Department (WDD), Limassol, to offer permit for access to the dam **Pilot test** of the AQUASERVE integrated water quality system will take place in 2H22 at a Reservoir in Cyprus

- AUG Signals Hellas (AUG-H), will supply the TRITON® in-situ water sensor to continuously analyse freshwater samples in real-time
 - The parameters to be measured will include chlorophyll, total suspended solids (TSS), total dissolved solids (TDS), pH, temperature, and dissolved oxygen (DO), which are closely associated with the algal blooms
- The Sentinel Hub: satellite data will be acquired via the Copernicus Sentinel Hub
- Drone based multispectral data: Water quality parameters that can be estimated using multispectral detection will be obtained via UAS (aerial) & USV (water surface) drones
- Water quality data will be uploaded to the cloud infrastructure for cleansing, fusion, processing and visualization through a web service

Market Opportunity

Beachhead: Water Quality Monitor

• The global smart water management market size is expected to grow from **USD 11.7 billion** in 2019 to **USD 21.4 billion by 2024**, at a CAGR of 12.9% during the forecast period



Key factors

- Key factors driving growth
 - the rising demand for quality water services,
 - need to replace aging water infrastructure,
 - rising digitalization of utilities sector,
 - government regulations favoring the development of smart water management solutions
- EU Water Framework Directive WFD (2000/60/EC), a legislation framework to achieve good ecological, quantitative and chemical status for all surface & ground water by 2027
 - A total of 111,062 surface waterbodies in EU are presently *reported* on under the Directive, 46% of which are actively monitored for ecological status
 - Cyprus MoA, Water Dev. Department <u>WDD-WFD</u>

Accessed Oct. 2, 2020 https://www.marketsandmarkets.com/Market-Reports/smart-water-management-market-1265.html

Accessed Oct 2, 2020 https://www.alliedmarketresearch.com/water-quality-monitoring-systems-market

Market Positioning



GIS, autonomous systems, AI

Data-driven Business Strategy

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AQUASERVE - Business Model



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Sales Forecast (CY Market) Number of Contracts / Units Sold Monitoring as a Service - Water Quality (inland & coastal) - RS1 PRODUCT Sales (Drone-based Water Monitoring) - RS2 PRODUCT Sales (VAR of Water Monitoring Systems) - RS3 Consulting RTD in Drone apps (aerial & underwater)- RS4

VOCATIONAL Training (Drone Applications & Business) - RS5



RIMA 2nd Open Call WATER QUALITY & SANITATION - AQUASERVE

Financial Projections

- The AQUASERVE project has a positive NPV value of
 €842,965 over a five-year period
 (7% Cost of Capital)
- The pro forma balance sheet, shows a Break-Even point of
 3.5 years



Performance to date





SILVER-DOT TECHNOLOGY & SERVICES
 LTD

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- Under a lease agreement with Silver-DOT / AQUASERVE, AUG Signals Hellas (AUG-H) offers the TRITON[®] in-situ water sensor to continuously analyse freshwater samples
- [Apr. 19, 2020] AUG Signals Hellas & Silver-DOT signed an NDA & Commercialization Agreement for the commercial exploitation of the AQUASERVE service and the Value-Adding Reselling of TRITON



TESTING SITE Smart Integrated Water Surveillance

Sentinel Hub account





AQUASERVE[™] offers

"Actionable insights from data" for all your water monitoring needs

For additional information contact

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