## TECHNOLOGY AS THE DIFFERENTIATOR

Knowledge and perspective on technology has always been a differentiator in the environmental industry. Firms have developed $100 million value propositions on a single technology. Others are technology agnostic: purporting to equally represent every technology available in the tool bag to make the most cost-efficient and enduring solution for their clients. So whether a service provider or a technology developer, or whether a consultant or a contractor, staying at the forefront of technology development and implementation is a key element in environmental industry competitiveness.

But not all technology is created equal. And not all technology works as intended or expected. And few and far between is the client or project that is willing to be experimented on. Equally elusive is the client willing to fund innovation on a project by project basis. The traditional regulatory paradigm behind prescriptive technologies or guaranteed results for treatment, pollution control, analytical methods or other processes across the environmental industry also serve to suppress or inhibit innovation. And while these barriers to technology innovation are important, they aren't the primary focus of this review. And while treatment and pollution control technologies are also important, they aren't the primary focus of this review either.

The technology revolution of the 21st century is about Information Technology (IT), and the revolution continues to be in full gear, if not accelerating, in 2023. From the mainframe to the personal computer to the smartphone and the interconnection of devices, and from data sharing to the internet and the cloud to computational models and artificial intelligence today, the pace of change has been persistent—and an underlying challenge of being in any business.

Areas Where Firms Have Significant Investments in Technology
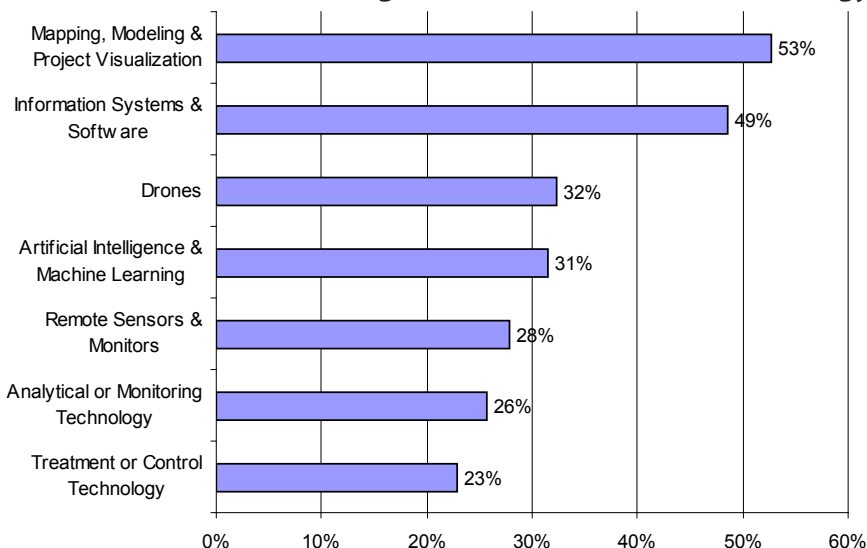
Source: 2023 Survey of Disruptive Technologies in the Environmental Industry, EBI, Inc. Question was: What is the level of investment that your company is putting into the following technologies. Percentage are categories rated by respondents as 'very significant' or 'significant' investment in technology in 2023: just the top 7 of 18 displayed.

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Deployment of Technologies in Environmental Projects: 2020-2023

	2023 Deployment	2020 Deployment	2023 vs. 2020
IT Systems & Software	52.5%	52.2%	0.3%
Mapping, Modeling & Visualization	47.4%	41.1%	6.3%
Analytical or Monitoring Technology	34.3%	44.0%	-9.7%
Treatment or Control Technology	22.5%	31.0%	-8.5%
Remote Sensors & Monitors	20.3%	22.5%	-2.1%
Satellite Technology	19.1%	19.4%	-0.3%
IoT or Connectivity	17.8%	14.4%	3.4%
Power Generation Equipment	15.3%	11.9%	3.4%
Energy Efficiency Systems/Equipment	14.6%	14.2%	0.4%
Drones	13.3%	9.6%	3.7%
Automated O&M Systems	12.0%	n/a	
Artificial Intelligence & Machine Learning	8.2%	8.8%	-0.6%
Power Storage Equipment	6.6%	7.5%	-0.9%
Automated Compliance/Permits	5.7%	n/a	
Robotics	3.8%	4.2%	-0.4%
Augmented & Virtual Reality	3.4%	5.6%	-2.2%
3D Printing	0.6%	3.5%	-2.8%
Block Chain	0.5%	3.0%	-2.5%

Source: 2023 and 2020 EBJ Survey of Disruptive Technologies in the Environmental Industry, EBI, Inc. Question was: Indicate the percentage of projects in which you are using the following technologies.

EBJ Respondents by Segment

Environmental C&E	20%
Remediation	16%
IT & Tech	11%
NRM/CRM	8%
AEC	6%
Investigation	5%
Remediation Tech/Eq	5%
Air Quality	3%
Compliance	3%
Statistics/Risk	3%
Sustainability	3%
Water/Wastewater	3%
Energy	2%
Infrastructure	2%
RNG	2%
Renewable Energy	2%
Solid waste	2%
Transportation	2%
Waste Management	2%
Water Instrumentation	2%
Water Testing	2%

Source: 2023 EBJ Survey of Disruptive Technologies in the Environmental Industry,

DATA-INFO-INTEL

So where are we in the development of Information Technology in the environmental industry? And how are we advancing on the continuum in our ability to collect and manage data, produce data into aggregated information, and assemble the appropriate information into actionable intelligence? Managing this data-information-intelligence continuum is not easy, but the difficulty is compounded by the fact that we have more data due to better and more detailed data collection apparatus—putting pressure all the way along the continuum toward the ultimate goal of actually making a decision. And all this data and information taxes the human brain enough that we are becoming increasingly reliant on digital processes to make sense of the data and convert it into useful information and actionable intelligence. Hence today's obsession with artificial intelligence (AI) and debates about its ability to transform business and society in many ways.

But how are we using these tools to address today's challenges? And how is the environmental industry using technology to advance its ability to satisfy client needs and optimize its own business operations facing a changing future? Seeking answers to those questions, Environmental Business Journal conducted it's second thorough survey of environmental service and technology providers in the summer of 2023, repeating a similar survey conducted early in 2020.

The results of EBJ's 2023 Survey of Disruptive Technologies in the environmental Industry are summarized here on these pages, and indicate some key trends that are affecting, and will increasingly affect the environmental industry throughout the rest of the 2020s and beyond. Along with this analysis we present some results of surveys conducted by peers in the industry that find an unsurprising recent surge in capital expenditures and operating

Strategic Information for a Changing Industry

technology for site assessments, we employ rigorous protocols to ensure the data collected meets high standards of accuracy and consistency.

Advanced Analytics and Machine Learning Integration: To support next-generation problem-solving, the data ecosystem needs to seamlessly integrate with advanced analytics tools and machine learning algorithms. In our work on sediment transport models, integrating machine learning algorithms helps us make more accurate predictions based on large and complex datasets.

Accessibility and Collaboration: Data should be easily accessible to various stakeholders, from field staff to executives, while supporting collaboration across disciplines and industries. Our teams at Anchor QEA span multiple disciplines, each contributing unique data to our projects. Creating a central, accessible data repository enables effective collaboration, both internally and with our clients and partners.

Visualization and Storytelling Tools: The data ecosystem should evolve to incorporate more sophisticated visualization and storytelling tools that make complex data comprehensible to non-expert stakeholders. At Anchor QEA, we use a suite of visualization tools to communicate complex environmental scenarios to our clients, regulatory bodies, and the public, enabling clearer understanding and dialogue.

Sustainability and Environmental Consciousness: As an environmental company, we prioritize data operations that reflect a commitment to sustainability, opting for solutions that minimize environmental impact. Our migration to a virtual desktop infrastructure not only enhances our operational efficiency but also reduces our hardware footprint, contributing to our broader sustainability goals.

The data ecosystem needs to evolve into a more integrated, secure, flexible, and user-friendly environment. This maturation will enable companies like Anchor QEA to continue delivering high-quality, compliant, and innovative solutions in the ever-changing landscape of environmental services. ❑

ECOBOT STREAMLINES DELINEATION OF AQUATIC RESOURCES, PLANS EXPANSION INTO OTHER ENVIRONMENTAL SEGMENTS

Ecobot (Ashville, N.C.) was designed from within the environmental and architecture, engineering and construction (AEC) industries as a digital solution for mandatory pre-construction environmental assessments and reporting. Ecobot streamlines the process, eliminating errors and ensuring data consistency to support quicker project turnarounds. Ecobot also provides a framework for managing and analyzing environmental data over time and in a variety of contexts. Environmental data collected during permitting is valuable both for planners and engineers as they design and build climate-resilient assets and in terms of ecological insights and long-term planning for preservation and biodiversity. Ecobot has provided a tool for collecting and managing data at scale. Ecobot has been used to generate over 100,000 regulatory reports, encompassing more than 1 million biodiversity and water-related data points. Customers range from global enterprise companies to small businesses.

Lee Lance is Co-Founder and CEO of Ecobot. Lee is a communications and operations professional with 20 years of experience driving technology development and strategy, serving regional, national and international clients.

EBJ: How has fieldwork changed, and is technology providing efficiencies that were unavailable five years ago?

Lee Lance: Fieldwork and permitting have, until quite recently, been paper-driven processes. Not only was this cumbersome, especially in an outdoor environment, but data was static and difficult to manage and use long-term. The availability of technology in the field has exploded in the past five years, from GNSS/GPS devices to field data collection applications installed on readily available mobile devices. There are lots of ways to get your data in – some better than others – and at Ecobot, our focus, beyond driving efficiency and saving time in the field and office, is on maximizing ways for our customers to utilize this data long-term, even beyond the permit.

EBJ: How has Ecobot's platform evolved since the company was founded?

Lance: Ecobot originated as a digital solution for the wetland delineation process, one of the many mandatory environmental assessments needed before construction starts. The goal at the outset was to streamline this process, driving efficiency during fieldwork and reporting. As Ecobot has grown, we've expanded the platform to

allow customers the ability to manage and utilize huge volumes of data in a meaningful way.

EBJ: Is Ecobot looking into incorporating additional products or technologies? Which problems are you trying to solve for your customers?

Lance: The most successful technology platforms across all industries are those that deeply integrate with the tools and applications already established within an organization. We believe that this is essential for technology in this space as well. We're **ESRI** partners, and our platform functions as an extension of ArcGIS FieldMaps by allowing our customers to push their data into the Esri tech stack as a feature service layer.

We are partners with all of the major GNSS/GPS hardware providers, ensuring geospatial accuracy during field data collection and reporting, which is essential to ensure further downstream value. As we expand the Ecobot platform, we are working to deepen our existing partnerships, and include others such as Autodesk and Bentley Systems. We view these integrations and partnerships as tools to help planners and engineers create a more climate-resilient built environment by pro-

viding them a platform to easily consume data regarding environmental resources occurring on a site.

EBJ: Can you share details about Ecobot's collaborations and partnerships?

Lance: We've worked closely with Esri since Ecobot's inception—we went through the Esri Startup Program, and we've since become Silver Partners. We work with GNSS providers like Hexagon/Leica, Trimble, Juniper, Eos GNSS, and more. And we're always collaborating and learning from others in the conservation and policy research fields, like EPIC and NatureServe.

EBJ: What other key technology trends do you see in our industry?

Lance: While not currently considered a tech trend, permitting reform *should* be one. Sadly, better technology (and better data) are nearly absent from this conversation when they should be the drivers behind effective regulatory policy. Policy and permitting reform will only get humankind so far and it's better technology and better data that will help us accomplish the purpose of environmental policy: to conserve natural resources and better connect people to the planet.

EBJ: What impact are new regulations having on how you use technology? How have you used it as an opportunity to expand your services? Which of these are generating more demand and profit?

Lance: Ecobot allows our customers to spend more time being scientists. As a workforce enablement platform, the field consultant handles the assessment and data collection, while Ecobot performs the calculations and provides suggestions based on the regional guidance documents.

The recent Sackett v. EPA decision by the Supreme Court to roll back federal wetland protections and the uncertainty this ruling has created is extremely concerning. Environmental policy and permitting processes will continue to evolve, but the need to collect usable data and put that data to use in a more resilient manner becomes even more critical. Market tailwinds ranging from UN climate and biodiversity initiatives to ESG promises by companies to their stakeholders to the increasing awareness of how biodiversity and ecosystems impact capital markets are only increasing.

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Regulations are not the only drivers of technological advancements and integrations. Take, for example, the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA). Both are demand-drivers for technologies like Ecobot. We need to modernize our infrastructure, and these bills task us to do that with sensitivity to the environment via sustainable and resilient planning. In order to spend the money flowing out of these bills and achieve the goals for our infrastructure, we have to address the fact that – in addition to the bottleneck of permitting processes – there is a need for a larger workforce than is currently available.

Applied environmental knowledge is going to be in high demand over the next five to 10 years, and the regulated community needs the right technology to more efficiently conduct their jobs and generate data that can help us make better decisions about economic growth, especially as it applies to the built environment.

Ecobot currently provides a solution for streamlining the documentation and reporting on aquatic resources, which represent some of the most highly regulated ecosystems we have. We're in the process of expanding our platform to address all other environmental-related sectors to address the broader need. While our operating footprint is currently restricted to the United States and portions of Canada, we believe our approach has a global application. ☐