

# ENVIRONMENTAL BUSINESS JOURNAL®

Strategic Information for a Changing Industry

Vol. XXXIX, Numbers 5/6, 2026

AI & Digitalization

Environmental Business International Inc.

## AI MAKES A RAPID ADVANCES IN ENVIRONMENTAL CONSULTING

### From Labor-Driven Services to Intelligence-Driven Delivery

The environmental consulting and engineering (C&E) industry—long defined by labor intensity, regulatory complexity, and project-based service delivery—is approaching a structural inflection point, say a number of artificial intelligence (AI) experts. Advances in artificial intelligence, particularly over the past 6-12 months, are beginning to compress the core analytical and documentation functions that underpin much of the industry's revenue base. What began as incremental productivity gains has rapidly evolved into something more consequential: the potential redefinition of how environmental work is performed, priced, and scaled.

### From Hours to Outcomes

At the center of the disruption is AI's growing capability to execute tasks that have historically required teams of junior scientists, engineers, and analysts. Early-stage environmental work—often document-heavy, data-intensive, and iterative—is especially exposed.

Functions already being augmented or partially automated include:

- Phase I and Phase II Environmental Site Assessments (ESAs)
- Regulatory research and interpretation (e.g., NEPA, CEQA, PFAS guidance)
- Feasibility studies and remedial alternatives analysis
- Data reduction, visualization, and reporting

- Permitting documentation and compliance reporting

In many cases, workflows that previously required days or weeks of coordinated effort can now be completed in hours with AI-assisted tools. This is not a theoretical shift. It is already occurring within leading firms and among early adopters integrating AI into standard workflows.

## Disrupting the Labor Pyramid

Environmental consulting has traditionally operated on a leveraged labor model: senior professionals oversee project managers, who in turn rely on teams of junior staff to execute analysis and documentation. AI challenges this structure directly. By automating large portions of entry-level and mid-level analytical work,

## Inside EBJ: AI & Digitalization

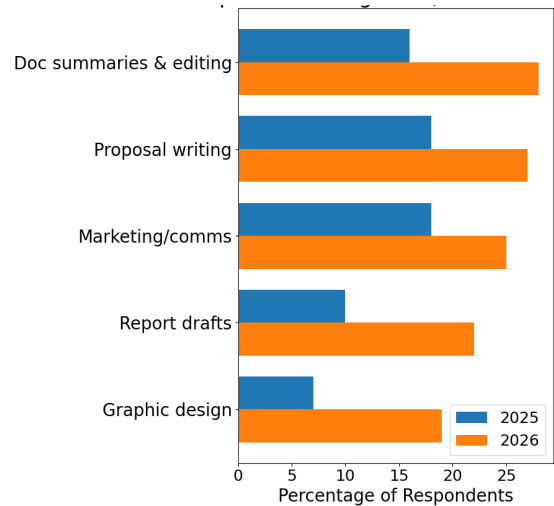
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**Use of AI in 2025 vs. 2026**

Use of AI	2026 Response	2025 Response
Document summaries & editing	28%	16%
Proposal preparation & writing	27%	18%
Website/marketing/comms	25%	18%
Document drafts for reports/permits	22%	10%
Graphic design & image creation/edits	19%	7%
Client communication & memos	18%	10%
Data QA & summary	14%	10%
Permitting & regulatory analyses	13%	n/a
Field data reporting & compilation	11%	n/a
Original code & code edits	8%	9%
Site assessments (Phase I/II)	6%	n/a

Source: EBJ Outlook surveys in 2025 and 2026; Question: Indicate how your company are using AI platform systems today (outside of default AI-tools embedded in search engines or inside mainstream software). Note: Average usage based on weighted factors of 8 options.

**Use of AI in 2025 vs. 2026**



Source: EBJ Outlook surveys in 2025 and 2026

**Use of AI in Environmental Services Companies in Q1 2026**

	Forbidden	Not Using Yet	<10% of our staff using	10-30% of staff using	30-50% of staff using	50-70% of staff using	70-90% of staff using	90-100% of staff using
Proposal preparation & writing	3%	10%	30%	23%	17%	7%	3%	7%
Website/marketing/comms	0%	23%	23%	23%	13%	13%	6%	0%
Document summaries & editing	3%	7%	23%	37%	13%	7%	7%	3%
Original code & code edits	4%	50%	27%	12%	4%	4%	0%	0%
Graphic design & image creation/edits	3%	10%	38%	28%	17%	0%	0%	3%
Field data reporting & compilation	3%	24%	48%	17%	3%	3%	0%	0%
Site assessments (Phase I/II)	0%	50%	39%	7%	4%	0%	0%	0%
Permitting & regulatory analyses	7%	28%	31%	28%	3%	0%	0%	3%
Data QA & summary	7%	21%	34%	24%	10%	3%	0%	0%
Document drafts for reports/permits	7%	14%	21%	39%	4%	7%	4%	4%
Client communication & memos	7%	17%	34%	21%	10%	7%	3%	0%

Source: Environmental Business Journal: EBJ Annual Outlook Survey 2026. Q: Please indicate how you and your company are using or plan to use AI platform systems today (outside of default AI-tools embedded in search engines or inside mainstream software) and comment on expected use or workflows in the near future.

AI enables a single project manager—supported by advanced tools—to perform the work of a much larger team. The result is the emergence of what some industry observers describe as the “AI-augmented super PM.”

In the near term, this shift can drive: Higher revenue per employee; Improved margins on fixed-fee contracts; and Greater scalability of project delivery.

However, rapid AI integration in workflows also raises structural questions about workforce composition. Entry-level roles—historically the foundation of the industry’s talent pipeline—are likely to contract, creating potential long-term challenges in training and professional de-

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## ESA USING AI TO TRANSFORM DRONES INTO TOOLS FOR AUTOMATED FIELD OPERATIONS

Founded in 1969, **Environmental Science Associates** (ESA) is an employee-owned environmental consulting and planning firm with more than 21 offices across the country and more than 750 professionals. ESA is ranked on EBJ's list of top environmental consulting firms with 2024 revenues of \$159 million. ESA's staff includes scientists, engineers, planners, geospatial analysts, and data and technology specialists who work across a broad array of markets, including energy, water resources, natural resource management, airports, transportation, and community development. The firm serves clients ranging from large water districts and state and federal agencies to regional park districts and private industry, providing services from initial due diligence and siting, environmental planning and permitting, construction monitoring, restoration design and mitigation, and long-term adaptive management. ESA's Technology Services practice, a team of approximately 50 software developers, engineers, user experience (UX) designers, geospatial analysts, data scientists, and architects, is an integral component of the firm's approach to projects and client service. This includes the oversight and administration of our UAS program, geospatial platform development, artificial intelligence (AI) and machine learning initiatives, and the build-out of client-facing tools and platforms.

**Mike Leech, Technology Services Practice Leader.** Mr. Leech has more than 25 years of experience delivering geospatial, data management, and environmental technology solutions across water resources, natural resources, and infrastructure programs. He leads multidisciplinary teams advancing mobile data collection, remote sensing, and cloud-based data platforms to support environmental planning, monitoring, and compliance. As former FAA Part 107-certified pilot and UAS Coordinator, Mike played a key role in establishing ESA's drone program, including the co-development of operational standards and safety protocols now used firmwide.

**Jason Nielsen, Southern California Geospatial Services Manager & UAS/Drone Program Lead.** Mr. Nielsen brings more than 20 years of expertise supporting and managing geospatial services across a broad spectrum of environmental disciplines, including biological and cultural resources, environmental permitting, water resources, and community development. He is FAA Part 107 Certified and currently serves as ESA's UAS Drone Program Lead, guiding the integration of drone technology across projects up and down the West Coast.

**EBJ: Drones have been used for years in environmental work. What has fundamentally changed in the last 2–3 years that is making them more central to project delivery today?**

ESA: Several converging factors have pushed drones from a supplemental tool into a core component of project delivery.

First, sensor technology has advanced rapidly. Multi-spectral and thermal sensors that were once limited to manned aircraft or satellite platforms are now compact, affordable, and field-deployable. That shift has fundamentally expanded what can be measured at the project scale.

Second, processing software has matured. Platforms like Pix4D and ArcGIS Drone2Map now allow teams to move from data capture to usable outputs (orthomosaics, surface models, and classified imagery) within days. That turnaround time makes drone data operationally relevant during active project phases, not just as a final deliverable.

Third, client and regulatory familiarity and comfort levels have increased. Agencies are more comfortable reviewing drone-supported documentation, and clients better understand how to use processed drone data in decision-making.

Finally, the growing emphasis on longitudinal monitoring, particularly in restoration and compliance programs, has created sustained demand for repeatable, high-resolution spatial data. Drones are uniquely suited to deliver consistent, time-series datasets across the full project lifecycle.

**EBJ: At what point do UAV/UAS capabilities shift from being a “nice-to-have” to a core requirement for environmental projects?**

ESA: The shift for UAV/UAS becoming a core requirement for environmental projects typically occurs when three conditions are present: medium-to-large spatial extent, the need for repeatable monitoring over time, and limited or hazardous site access (constraints). In restoration and mitigation projects, drones are increasingly standard from pre-design through post-construction monitoring. The ability to capture consistent, site-wide conditions quickly and then repeat that process (bi-annually or) annually creates both efficiency and data continuity that traditional methods struggle to match.

In biological and hydrological work specifically, drones are essential when key observations require vantagepoints that are physically inaccessible. In those cases, they are not just more efficient, they are often the only practical way to meet documentation requirements. In challenging terrain such as dense wetlands, steep slopes, or unstable ground, for example, drones now serve as a first-pass reconnaissance tool before field crews are ever deployed. A pre-survey flight can identify hazards, confirm site conditions, and inform safety planning in ways that reduce risk exposure for staff and improve the efficiency of the ground-work that follows.

**EBJ: How are clients' expectations evolving when it comes to drone-based data collection versus traditional field methods?**

ESA: Client expectations have shifted from curiosity to reliance, though the pace varies by sector.

In long-term programs, in water resources drone surveys for example, they are increasingly treated as a standard input

as part of monitoring and reporting workflows. Clients are no longer asking whether drone data will be used, but how it will support compliance and performance evaluation.

We are also seeing water resources clients managing long-term mitigation or restoration programs moving towards treating drone surveys as a standard line item. For example, our work with King County's Wastewater Treatment Division Mitigation and Monitoring Program initiated a series of UAV surveys to quantify vegetative and non-vegetative cover types across multiple mitigation sites which helped to evaluate permit compliance reporting.

Just as importantly, expectations have evolved beyond visualization. Early deliverables focused on imagery; today, clients are asking for classified outputs, quantified metrics, and change detection over time. This reflects a broader shift toward data-driven environmental management.

The remaining gap is formal return-on-investment quantification. While the value is clear in practice, drone data is still often introduced as added value rather than explicitly required in scopes of work, though that is beginning to change with more clients who adopt technology more readily.

**EBJ: Are drones beginning to replace certain field activities entirely, or are they still primarily augmenting traditional workflows? What are the biggest limitations today in converting drone-collected data into actionable insights?**

ESA: Drones are primarily augmenting fieldwork, but their role is becoming more central. In some cases, vegetation cover classification or topographic modeling using Structure from Motion (SfM) drone data is becoming the primary dataset, with field methods serving as validation rather than the main source of information. An example of this complementary relationship comes from our work on the Longboat Key Subaqueous Force Main project in Florida, where we used drones to document both seagrass conditions and mangrove impacts resulting from a sewer main leak.

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*Client expectations have shifted from curiosity to reliance... Early deliverables focused on imagery; today, clients ask for classified outputs, quantified metrics, and change detection over time... reflecting a shift toward data-driven environmental management.*

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Drone surveys provided broad spatial coverage of affected areas efficiently, while dive teams handled the underwater ground-truth verification needed to distinguish seagrass from drift algae and confirm species composition. Neither method alone was sufficient; together, they produced a more defensible and complete dataset than either could on its own. The same dynamic plays out in land-based vegetation mapping, where sensors can characterize cover types at landscape scale, but a biologist still needs eyes on the ground for fine-scale species identification that imagery can't yet reliably resolve.

The largest gap today is not data collection, but data interpretation. High-resolution imagery is relatively easy to acquire; transforming that imagery into reliable, analysis-ready outputs still requires image data processing including machine learning and deep learning workflows combined with review by environmental scientists who understand what the results mean in a regulatory and ecological context. That human interpretive step is not a workaround; it's a core part of what makes drone-derived data defensible.

A recent Southern California watershed assessment illustrates both the potential and the real effort involved. Working from high-resolution imagery across a nearly 34,000-acre study area, we applied a FasterRCNN-based deep learning model to detect invasive palm trees including Mexican fan palm, canary palm, and date palm. The initial model run produced usable results, but reaching production-quality performance required an additional round of training data preparation: exporting image chips from the site, labeling examples, and retraining the model on local conditions. The final output was a spatially explicit detection layer that field crews could use to prioritize removal efforts directly into a field action plan.

AI is beginning to close the gap between acquisition and insight, but model development, training data preparation, and validation remain iterative and resource-intensive. ESA is actively working to shorten that cycle building on project experience, expanding our library of labeled training data, and deepening the collaboration between our geospatial technologists and the domain scientists who know what they're looking for in the field. That pairing of computational capability with ecological expertise is where the most durable progress is being made, and it reflects how ESA approaches this work more broadly: not as a technology deployment, but as a scientific practice.

**EBJ: How are advances in sensors expanding what drones can measure in environmental projects?**

ESA: Sensor advances have been the most consequential driver of drone capability expansion in recent years.

Multispectral sensors have been the most impactful for our core environmental work. ESA operates several Sentera multispectral sensors, which allow us to collect near-infrared and other spectral bands alongside standard RGB imagery. That opens up a range of analytical applications: vegetation health indices, identification of stressed or dying plant communities, and machine learning-based classification of vegetation types and invasive species. The spatial resolution we can achieve with drone-mounted multispectral sensors (sub-5cm ground sampling distance) exceeds what's available from satellite-based multispectral products and is cost-competitive with manned aircraft for sites under approximately 2,000 acres.

The application of thermal sensors has added a different dimension. We operate a FLIR Vue Pro thermal sensor with ap-

plications in wildlife monitoring and water quality assessment. In stream assessment work, thermal imagery can reveal temperature differentials that are invisible in standard imagery and are useful for identifying cold-water refugia, detecting pollutant plumes, or assessing fish habitat characteristics.

Structure from Motion (SfM) photogrammetry has also extended what we can do with standard RGB cameras. By processing overlapping imagery into three-dimensional point clouds and Digital Surface Models, ESA has been able to support sediment transport analysis, restoration grading assessment, and topographic change detection at sites where traditional survey methods would require substantially more time and cost. Our work for Fontana Union Water Company on the Lytle Creek Diversion project used annual DSM differencing to track patterns of erosion and deposition over time a monitoring approach that would not be practical with ground-based survey methods at the same spatial coverage.

We are also exploring the potential of hyperspectral sensors for more refined vegetation discrimination, as multispectral bands alone are not always sufficient to distinguish between closely related invasive species.

**EBJ: Among the many use cases (infrastructure inspection, habitat monitoring, pollution tracking), which are seeing the fastest growth in demand?**

ESA: For ESA, we are seeing increasing demand with our restoration monitoring at all phases, spanning pre-design through multi-year performance tracking. This growth is driven by regulatory expectations for spatially explicit documentation over time.

Invasive species detection and vegetation mapping are other rapidly expanding areas, particularly where drone imagery is paired with semi-automated machine learning modeling approaches to identify and prioritize treatment areas. Hydrological and riparian monitoring is also growing, especially for longitudinal surveys that provide continuous spatial context along waterways, which is something traditional

field methods cannot efficiently replicate. Our work for Kern Delta Water District along the Lower Kern River is an example, where consistent, repeatable drone missions now provide spatially continuous documentation of river conditions to support long-term adaptive management.

**EBJ: Where are drones delivering the most measurable ROI?**

ESA: The clearest ROI emerges where drones replace time-intensive fieldwork, reduce safety risks, or expand spatial coverage. Plus, in multi-year monitoring programs, efficiencies compound over time. Once flight parameters are established, repeat surveys are both faster and more consistent, improving the quality of time-series analysis. In hazardous or inaccessible environments, the value is less about cost savings and more about enabling data collection that would otherwise be impractical or unsafe. At the landscape scale, fixed-wing drones can sometimes be cost-competitive with manned aircraft while offering higher resolution and greater flexibility in deployment.

**EBJ: How are drones being used differently across sectors like energy, water, transportation, and public agencies?**

ESA: ESA's drone work spans all industries, and the application emphasis differs meaningfully by sector. In the water resources sector, drones support biological monitoring, hydrological assessment, and restoration program management. Water district clients also use drone surveys for routine mitigation monitoring, permit compliance documentation, and operations and maintenance oversight of channel infrastructure. The time-series capability is particularly valued here, as many water programs involve multi-year monitoring obligations.

For clients with missions for natural resources management, drones support the full project lifecycle from preliminary site assessment and wetland delineation through construction monitoring and post-construction performance evaluation. These have been among the earliest and most consistent adopters of drone technology in our portfolio, in part because the spatial scale of restoration projects often

exceeds what ground survey can efficiently cover.

For energy clients, drone deployment has supported construction monitoring and facility inspection. Drones allow inspectors to document conditions at difficult-to-access locations mid-channel structures, levee slopes, and similar infrastructure without the safety exposure or cost of manned access.

Public agency clients, including regional park districts, county public works departments, and municipal water utilities have used drone deliverables to support permitting, public outreach, and regulatory reporting. Aerial video and promotional imagery from ESA drone flights have supported funding applications and public engagement materials for several park district restoration projects including East Bay Regional Park in Northern California.

**EBJ: How are drones being combined with technologies like LiDAR, digital twins, and real-time monitoring platforms?**

ESA: Integration with broader geospatial workflows is where we see the most opportunity and the most active development in our program. For elevation and topographic work, we primarily use SfM to generate Digital Surface Models and point clouds from overlapping drone imagery. This approach is well-suited to vegetation-covered sites where bare-earth terrain is the primary interest. For sites requiring bare-earth LiDAR penetration beneath canopy, we have subcontracted LiDAR-equipped drone flights and integrated those products with our own imagery-based deliverables. As drone-mounted LiDAR becomes more affordable, we expect to bring more of that capacity in-house.

Imagery products from drone flights are routinely published to ArcGIS Online or our Enterprise Portal, making them accessible to project teams and clients in web-based mapping environments. This integration with ESA's existing geospatial infrastructure means drone deliverables aren't standalone files. Rather, they feed into the same platforms used for project management, regulatory documentation, and client reporting.

The connection to AI and machine learning platforms is the area of most active investment. Drone-collected multi-spectral imagery serves as the input to classification models including deep learning workflows for feature detection.

**EBJ: How has ESA incorporated drone technologies into its standard workflows over the past year?**

ESA: Our drone program was established in 2018 and has grown progressively in both fleet capacity and technical integration. Over the past year, the program has expanded in two directions: broader adoption across practice areas and deeper integration of processed outputs into project workflows.

We operate more than a dozen drones, predominantly quadcopters from DJI, Autel, and Parrot, supplemented by Sentera multispectral sensors and a FLIR Vue Pro thermal sensor. Processing is handled using Pix4D and ArcGIS Drone2Map, with outputs integrated directly into project GIS environments.

In terms of workflow, the most significant recent development has been applying machine learning to drone-collected imagery at the project level. This includes using GeoAI tools within the ArcGIS environment. We are successfully evaluating pre-trained models for species detection, then improving performance by exporting training data image chips and fine-tuning the model on site-specific examples. The comparison between the first-pass detection and the post-training results demonstrated meaningful improvement in precision representing an iterative workflow we now have experience replicating on future projects.

Drone work now spans biological monitoring, archaeological documentation, restoration monitoring, hydrological assessment, stream survey, and vegetation mapping. The range of project types reflects how deeply the capability has been absorbed into ESA's standard delivery approach.

**EBJ: What internal changes were required (skills, teams, processes) to scale UAV capabilities?**

ESA: Scaling our UAS program has required deliberate investment across people, process, and technology, and a key strategic decision about what kind of drone program ESA wants to build.

We decided early on to develop drone capability within our existing scientific and technical staff rather than hiring dedicated drone operators as a separate function. ESA now has more than a dozen FAA Part 107 certified pilots. These pilots are also biologists, GIS analysts, restoration engineers, and hydrologists, professionals who can interpret what they're seeing in the air and make real-time decisions about what to document. This dual-competency is what allows drone data to be translated into actionable environmental insight rather than simply raw imagery.

We have standardized operations and safety protocols that apply nationwide. FAA Part 107 compliance, consistent pre-

flight planning practices, and autonomous flight planning for repeatability are foundational. Autonomous mission planning has been particularly important for monitoring programs, where consistent flight parameters across repeat surveys are essential for valid time-series comparisons.

We continue to build on our internal competency in imagery processing, too. Orthomosaics, Digital Surface Models, point clouds, and now machine learning classification has required investment in both software and staff skills. The geospatial team within Technology Services has taken on a significant role in post-processing and analytical workflows, connecting drone data collection to the broader GIS and data infrastructure to better serve our clients.

**EBJ: Are drone capabilities becoming a standard offering across environmental firms, or still a differentiator? Are**

***Artificial Intelligence, Drones, and the Next Evolution of Intelligent Field Operations***

Unmanned aerial systems (UAS), UAVs, and drones are rapidly evolving from niche technologies into critical tools across infrastructure, environmental management, public safety, logistics, and industrial operations. While drones were once associated primarily with military or recreational use, they are now being deployed for a wide range of commercial and environmental applications, including infrastructure inspection, construction surveying, precision agriculture, environmental monitoring, wildlife conservation, emergency response, and last-mile delivery services. Advances in drone design are significantly expanding operational capabilities.

Artificial intelligence is becoming an increasingly important layer within the drone ecosystem, transforming drones from simple data-collection tools into intelligent, autonomous operational platforms. AI-enabled image recognition, geospatial analytics, predictive modeling, and automated inspection capabilities are allowing organizations to process massive amounts of aerial data in real time and make faster, more accurate decisions. Combined with sensors, LiDAR, thermal imaging, and digital mapping technologies, drones are increasingly supporting predictive infrastructure maintenance, environmental risk assessments, and advanced monitoring applications that would have been far more difficult or cost-prohibitive just a few years ago. These capabilities are accelerating the shift toward more automated and data-driven field operations across sectors such as utilities, transportation, energy, environmental consulting, and emergency management.

At the same time, the regulatory environment surrounding drones is evolving rapidly to support broader commercial deployment. The anticipated rule changes could become a major catalyst for expanded autonomous drone operations, enabling larger-scale deployment of AI-enabled drones for commercial delivery, infrastructure management, environmental monitoring, and industrial inspection applications.

## clients increasingly requesting drone-based solutions, or is ESA leading the push?

ESA: Drone capability is increasingly table-stakes for environmental firms. The question is no longer whether a firm has drones, but what the pilots can do with the data they collect.

What continues to differentiate ESA's program is the integration of domain expertise with technical capability. Our drone pilots are environmental scientists. When a biologist-pilot flies a restoration site, they're not just capturing imagery; they're making real-time assessments about what the data will reveal, what conditions warrant closer documentation, and how the outputs will be used in the report or regulatory submittal. That's meaningfully different from a firm that subcontracts aerial acquisition and receives processed imagery without the interpretive connection.

### **EBJ: What emerging drone technologies or capabilities are you most excited about right now?**

ESA: The most promising developments are at the intersection of advanced sensors and AI. Multi-spectral and hyperspectral imaging combined with machine learning has the potential to significantly improve ecological analysis, particularly for species-level classification. At the same time, the growing availability of pre-trained environmental AI models is reducing the barrier to applying advanced analytics to drone imagery. Lightweight, highly portable drone platforms are also expanding access to remote and logistically challenging environments. ■

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*We are seeing increasing demand for restoration monitoring... spanning pre-design through multi-year performance tracking, driven by regulatory expectations for spatially explicit documentation over time.*

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## VAISALA XWEATHER EVOLVING WEATHER CONFIDENCE BUSINESS MODEL FOR RISK MANAGEMENT & RESILIENCE

**Vaisala Xweather** brings weather confidence to decision-makers in every weather-sensitive business. Backed by Vaisala's nearly 100 years of leadership in weather sensing and environmental measurement, Xweather delivers advanced weather data and intelligence that help organizations manage operational risk, improve safety, and increase resilience. Established as a distinct business in 2022, Vaisala Xweather has experienced sustained double-digit annual growth and serves customers globally through SaaS and DaaS offerings. Key markets include transportation and logistics, energy and utilities, finance and insurance, and developers and data distributors.

**Scott Mackaro, Chief Science Officer at Vaisala Xweather.** Mr. Mackaro is a recognized leader in the atmospheric science community, specializing in predictive modeling, artificial intelligence, machine learning, and environmental monitoring and their commercial applications. In his role, he connects scientific rigor with business and technology strategy to deliver practical weather intelligence at scale.

### **EBJ: How has AI fundamentally changed the way Xweather operates internally?**

Mackaro: At Vaisala Xweather, AI augments rather than replaces trusted forecasting and observational systems. While we lean into the science-based, quality data we provide, we also lean into AI to examine every opportunity to improve our technology and deliver flexibility, speed, and adaptability to customers. AI operates in partnership with physics-based numerical models and high-quality observational data to extract additional signals, improve scalability, and adapt outputs to specific applications.

This hybrid approach allows AI to learn real-world effects that traditional models may struggle to resolve while remaining grounded in physical understanding and data quality. This approach also allows AI to deepen our capabilities and scale solutions to varying customer industries. We see AI as an engine that will help us build the future of atmospheric intelligence with intention.

From a product development perspective, AI enables faster iteration and broader applicability. Rather than building narrowly tailored solutions, we develop flexible systems that adapt to local conditions and diverse use cases. AI does not fix poor data; our internal focus remains on cali-

brated sensors, representative observations, and scientifically validated models, with AI enhancing those foundations rather than substituting for them.

### **EBJ: At what pace has AI been integrated into your core offerings, and what has accelerated that adoption?**

Mackaro: AI has been integrated rapidly but deliberately as an accelerant on top of mature, science-based systems. Advances in machine learning, cloud computing, and data availability have removed historical constraints on scaling and personalization, allowing forecasts to adapt to many industries and geographies without bespoke development.

The primary accelerator has been growing demand for timely, decision-ready insights. Organizations want the right signal, at the right scale, delivered fast enough to act. AI makes it possible to meet these expectations while remaining anchored in trusted scientific foundations.

### **EBJ: How different is your platform today compared to just 2–3 years ago in terms of AI capabilities?**

Mackaro: Compared to two or three years ago, the most significant change is the shift of AI from an internal optimization tool to a core part of user interaction. Earlier efforts focused mainly on improv-