

Abstract Title: Hydro AI: Amplifying the Voice of Water Through 5G-Enabled Ocean Intelligence

Innogle Technologies Pvt. Ltd. is a pioneering Oceanography DeepTech company and India's first 5G deployer on the ocean, building intelligent marine ecosystems through the convergence of oceanographic science, 5G connectivity, IoUT (Internet of Underwater Things), and Artificial Intelligence. Backed by 27 Intellectual Properties (IPs), Innogle addresses one of the most critical yet under-digitized domains on the planet: oceans and inland water systems. While more than 70% of the Earth's surface is covered by water, real-time underwater intelligence remains limited due to communication barriers, harsh environmental conditions, and fragmented data systems. Innogle bridges this gap by creating a unified, scalable, AI-driven marine intelligence infrastructure that transforms raw underwater signals into predictive, actionable insights.

At the core of Innogle's innovation lies Hydro AI – “Amplifying the Voice of Water” – a proprietary 4-layer Hydro AI Foundation Model designed to decode underwater signals and convert them into predictive ocean intelligence. Traditionally, underwater environments have been data-dark zones, where acoustic signals, biological patterns, chemical changes, and pressure variations remain underutilized. Hydro AI redefines this paradigm by structuring, analyzing, and interpreting multi-dimensional underwater data streams in real time.

The Hydro AI architecture operates across four intelligent layers. The first is the Sensing Layer, which captures acoustic, biological, chemical, pressure, vibration, and environmental underwater data through IoUT-enabled devices and distributed marine sensors. The second is the Data Fusion Layer, which aggregates multi-source IoUT inputs into structured and standardized marine datasets, eliminating fragmentation and enabling cross-domain intelligence. The third is the Foundation Intelligence Layer, trained on over 4,800 underwater species datasets. This layer enables species identification, behavioral analytics, benthic ecosystem modelling, biodiversity tracking, anomaly detection, and ocean health prediction. The fourth and final layer is the Predictive & Action Layer, which generates real-time alerts and decision-support outputs for coastal security, underwater cable inspection, dam safety monitoring, flood early warning systems, disaster prediction, and profitable fishing recommendations.

This 4-layer Hydro AI model was recognized with the prestigious Franchise-Based Blue Ocean Strategy Award, presented by the Honorable Deputy Chief Minister of Tamil Nadu and the Consulate General of France, acknowledging its global innovation impact and disruptive potential in marine intelligence systems.

Innogle's flagship platform, Swanee, is a plug-and-play ocean and inland water intelligence system designed to democratize real-time water analytics. Swanee is available in two distinct variants. The Ocean Variant supports deep-sea intelligence, coastal security, disaster early warning, underwater cable inspection, and ocean modelling. It enables governments, defense agencies, telecom operators, and environmental bodies to monitor underwater assets and ecological shifts in real time. The Inland Variant is engineered for aquaculture farms, dams, and river systems. It provides water quality analysis, early disease detection in fish and shrimp, structural dam safety insights, sediment and vibration monitoring, and real-time flood prediction.

to prevent large-scale economic and human loss. Together, these variants establish a unified intelligence network spanning coastal and inland ecosystems.

Another breakthrough innovation is Kadalcompass, an AI-powered underwater communication and analytics system. Designed to enable two-way communication beneath the ocean surface without harming marine ecosystems, Kadalcompass facilitates intelligent data exchange between underwater assets and surface networks. It integrates seamlessly with Hydro AI, enhancing situational awareness for fishermen, researchers, and maritime authorities. Complementing this is the Life Safety Watch, a specialized solution designed to protect ocean workers and fishermen by providing emergency alerts, environmental risk notifications, and location-based safety intelligence.

Innogle's technology has been validated by IIT Madras (IITM) and the company is incubated at IIT Ropar, reflecting a strong deep-tech research foundation. With more than 20 national and international recognitions, Innogle has established credibility across telecom, innovation, AI, and startup ecosystems.

The company was recognized as one of the Top 7 Telecom Innovators by the Department of Telecommunications (DoT) and selected by the Principal Scientific Adviser (PSA) for a real-time documentary by Netflix. It won the Best 5G Use Case at the 5G Hackathon organized by DoT and was awarded Most Innovative Enterprise 5G Use Case Deployed of the Year at the Indian Mobile Congress 2022. Innogle was selected as a Top Women Startup in India under the Qualcomm QWEIN Program and later awarded as Top QWEIN. It was recognized by IIT Ropar as a top startup under Water Innovation Challenges and received grant support.

In 2019, Innogle won the Innovative Startup of the Year Award from the Ministry of Electronics and Information Technology (MeitY), presented by former MeitY Minister Ravi Shankar Prasad and NASSCOM President Debjani Ghosh. The company also received the Manufacturing Spirit Award by TiE NCR and Power2SME for IT Adaptation and Innovation. It was a finalist at the National Startup Award 2020, a top finalist at the NITI Aayog Women Transforming India Awards 2019, a Top 40 finalist at the Data Innovation Bazaar 2020 by Western Digital, and a finalist in the Connected & Intelligence category at the NASSCOM Design4India Awards 2019.

Innogle's vision extends beyond products; it aims to build a global ocean intelligence infrastructure powered by 5G and AI. By deploying IoUT-enabled sensing systems integrated with edge computing and cloud intelligence, the company creates scalable marine data networks capable of supporting governments, industries, and communities. Its solutions contribute to coastal security, marine biodiversity conservation, disaster risk reduction, telecom infrastructure protection, sustainable aquaculture, and climate resilience.

In essence, Innogle Technologies is transforming water bodies into intelligent, communicative ecosystems. By amplifying the "voice of water" through Hydro AI, the company is redefining how humanity understands, protects, and benefits from oceanic and inland water resources. Through validated research, award-winning innovation, and scalable deep-tech architecture, Innogle positions itself at the forefront of next-generation ocean intelligence, building a safer, smarter, and more sustainable blue economy.