

PRIN
Progetti di Rilevante Interesse Nazionale
2023-2026

LAGO-ON

optical wireless underwater positioning for marine monitoring

- (*) Anna Maria Vegni, Dept. of Industrial, Elect. and Mech. Eng. annamaria.vegni@uniroma3.it
- (**) Daniele Ventura, Dept of Environmental Biology daniele.ventura@uniroma1.it
- (**) Michele Bruno, Dept of Environmental Biology michele@michelebruno.org
- (***) Salvatore Mauro, Dept. of Maneuverability salvatore.mauro@cnr.it
- (***) Massimo De Lauro, Dept. of Maneuverability massimo.delauoro@cnr.it



LAGO-ON aims to use optical wireless (OW) technology in the range of visible light for an accurate and eco-compatible underwater positioning system for moving platforms, like AUVs (Autonomous Underwater Vehicles) and divers.

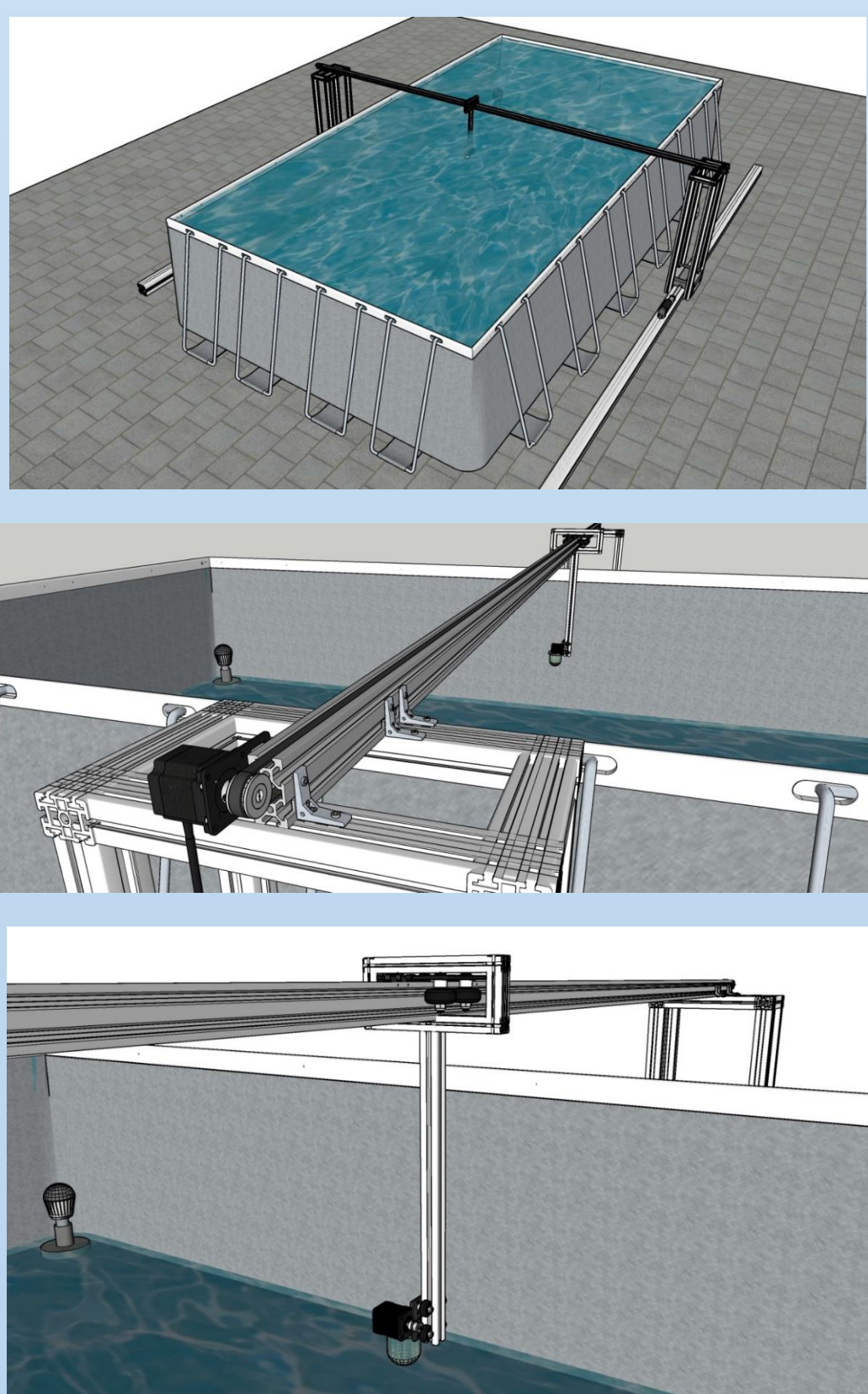
Main goals of UVLP (Underwater Visible Light Positioning):

- localization estimation in harsh GPS denied environments
- water monitoring (i.e., level of turbidity) that, as compared to COTS turbidimeters, is "Calibration-free" and faster
- to develop a non-invasive communication system that safeguards marine species sensitive to noise

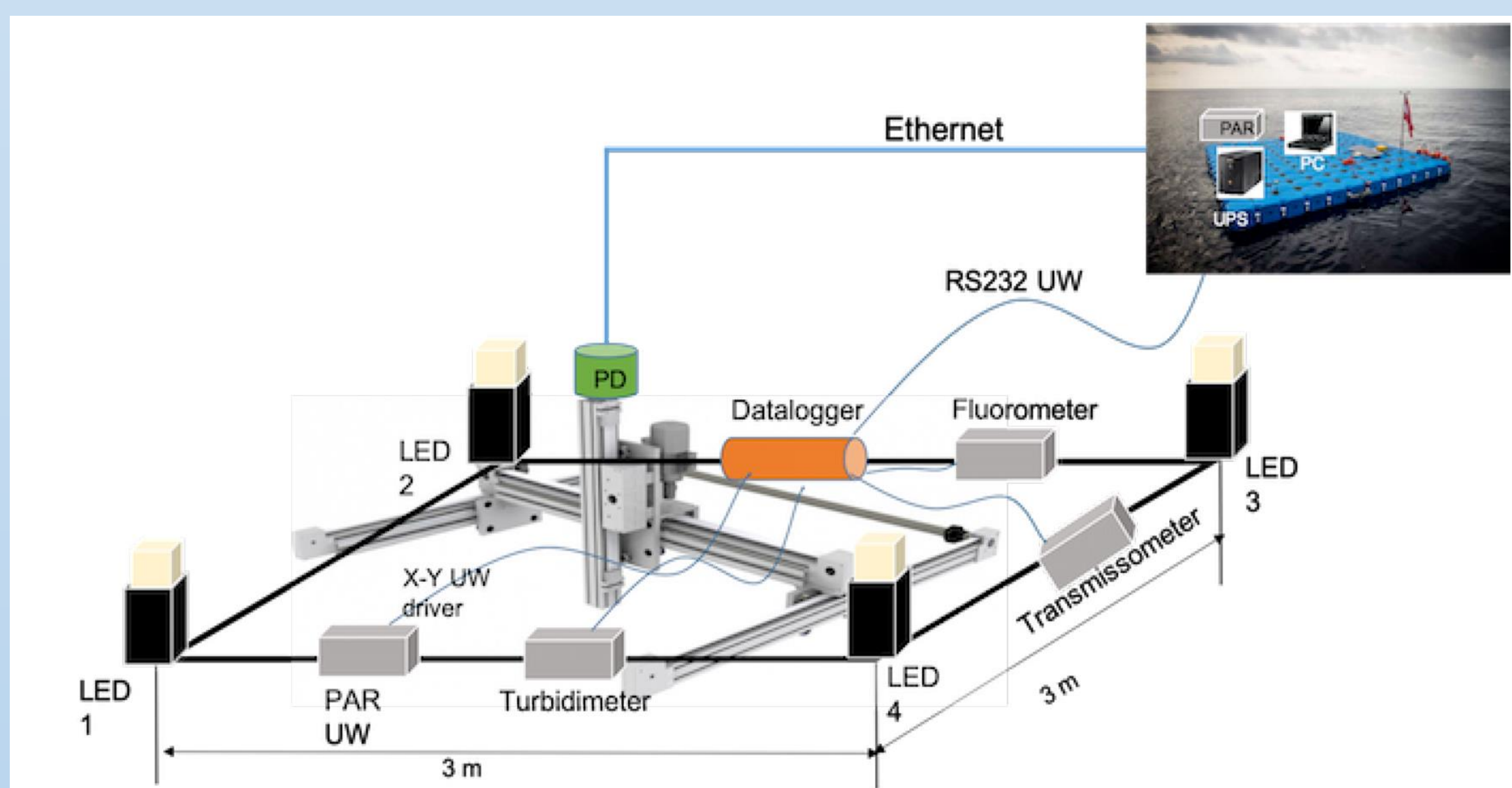
	Acoustic	UOWC
Bandwidth	7-200 KHz	≈ 40 MHz
Bitrate	2-65 Kbps	0,5÷500 Mbit/s

acoustic Vs optic UW communication systems

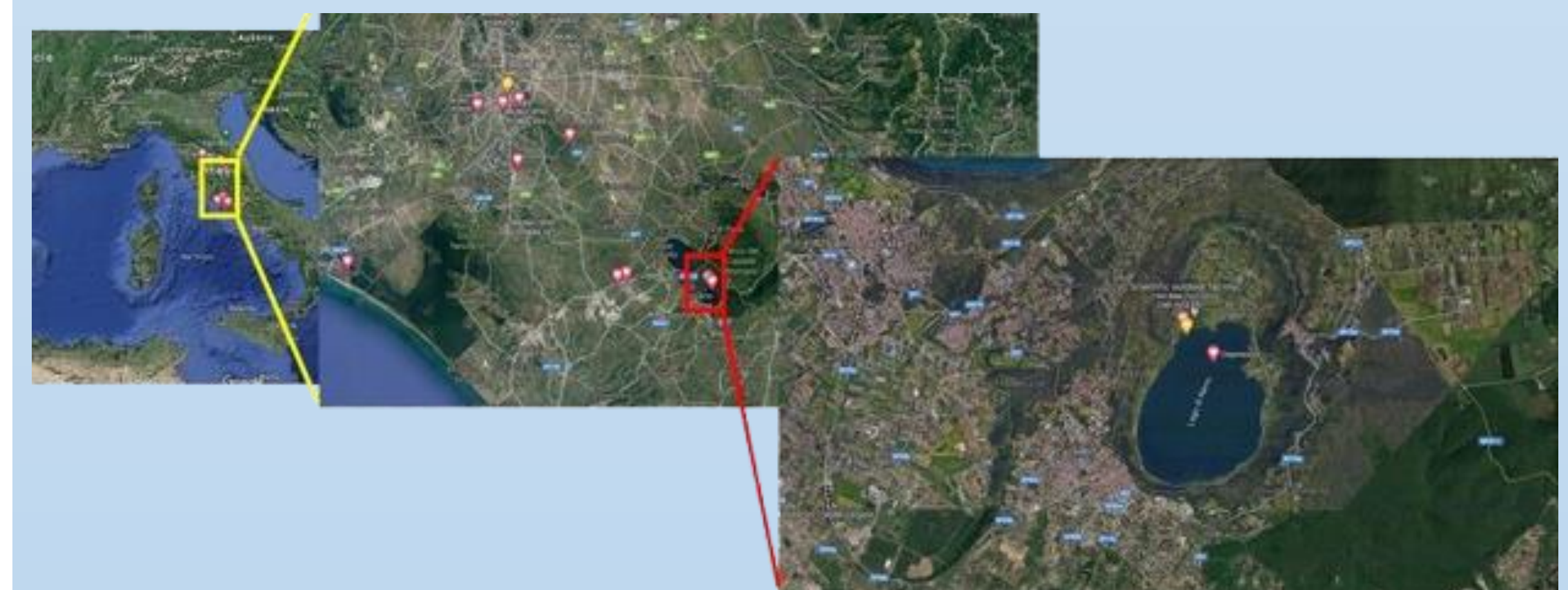
WorkPackages and Tasks	Year 1												Year 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
WP0 - Coordination and dissemination activities																								
T0.1 Project management																								
T0.2 Dissemination activities																								
WP1 - Underwater environment specifications and																								
T1.1 Reference scenario specifications																								
T1.2 Specific building blocks and system architecture																								
WP2 - Underwater Visible Light Positioning techniques																								
T2.1 Underwater VLP algorithms																								
T2.2 System integration																								
WP3 - Test activities for validation																								
T3.1 In dry-lab VLP tests																								
T3.2 In wet-lab VLP tests																								
T3.3 Test validation																								



Indoor



Schematic of LAGO-ON wet testbed to be realized and tested at CNR-INM's facilities (IVth Q 2025)

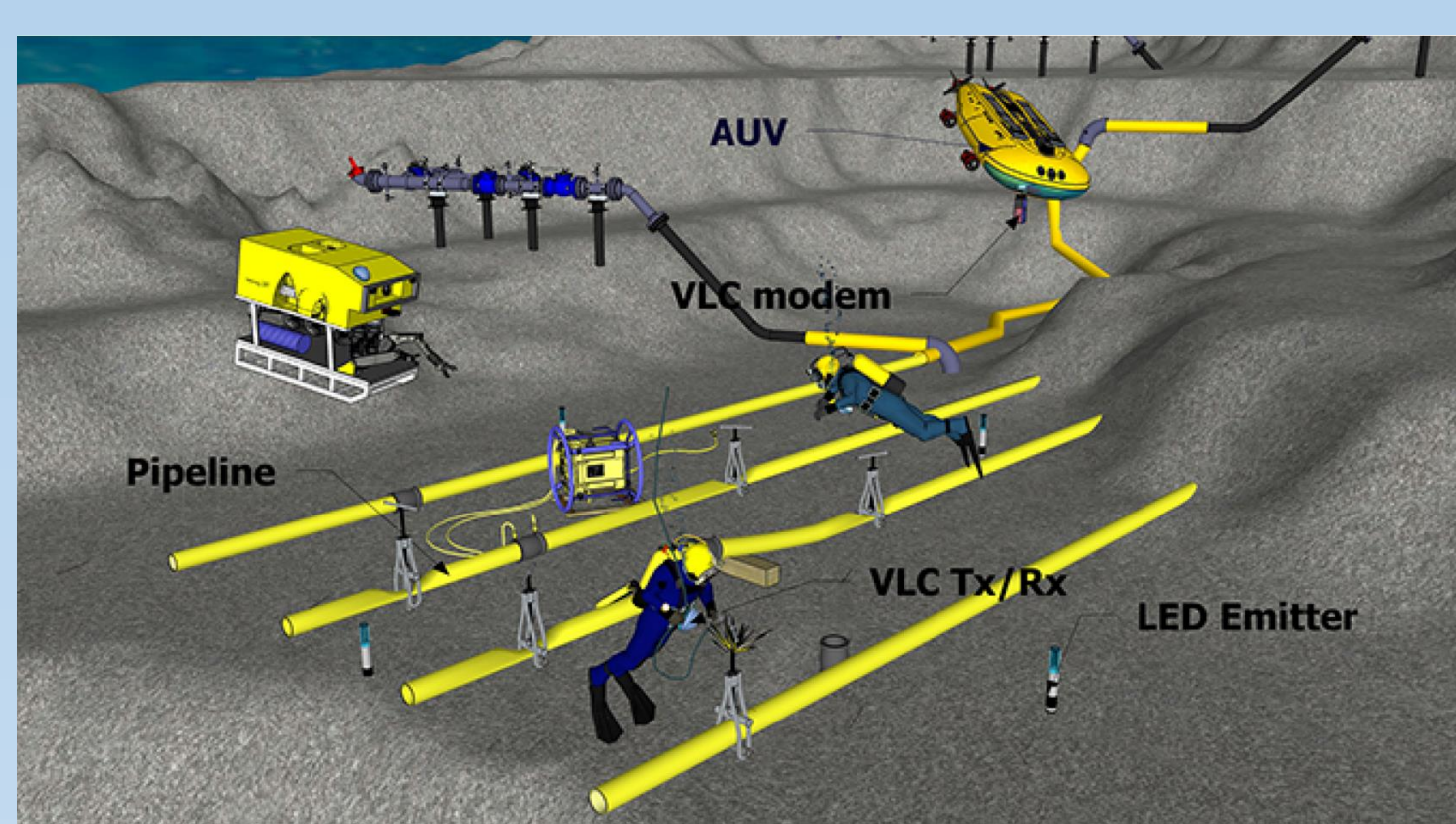


Outdoor at the Lake of Nemi
(fresh water volcanic lake)

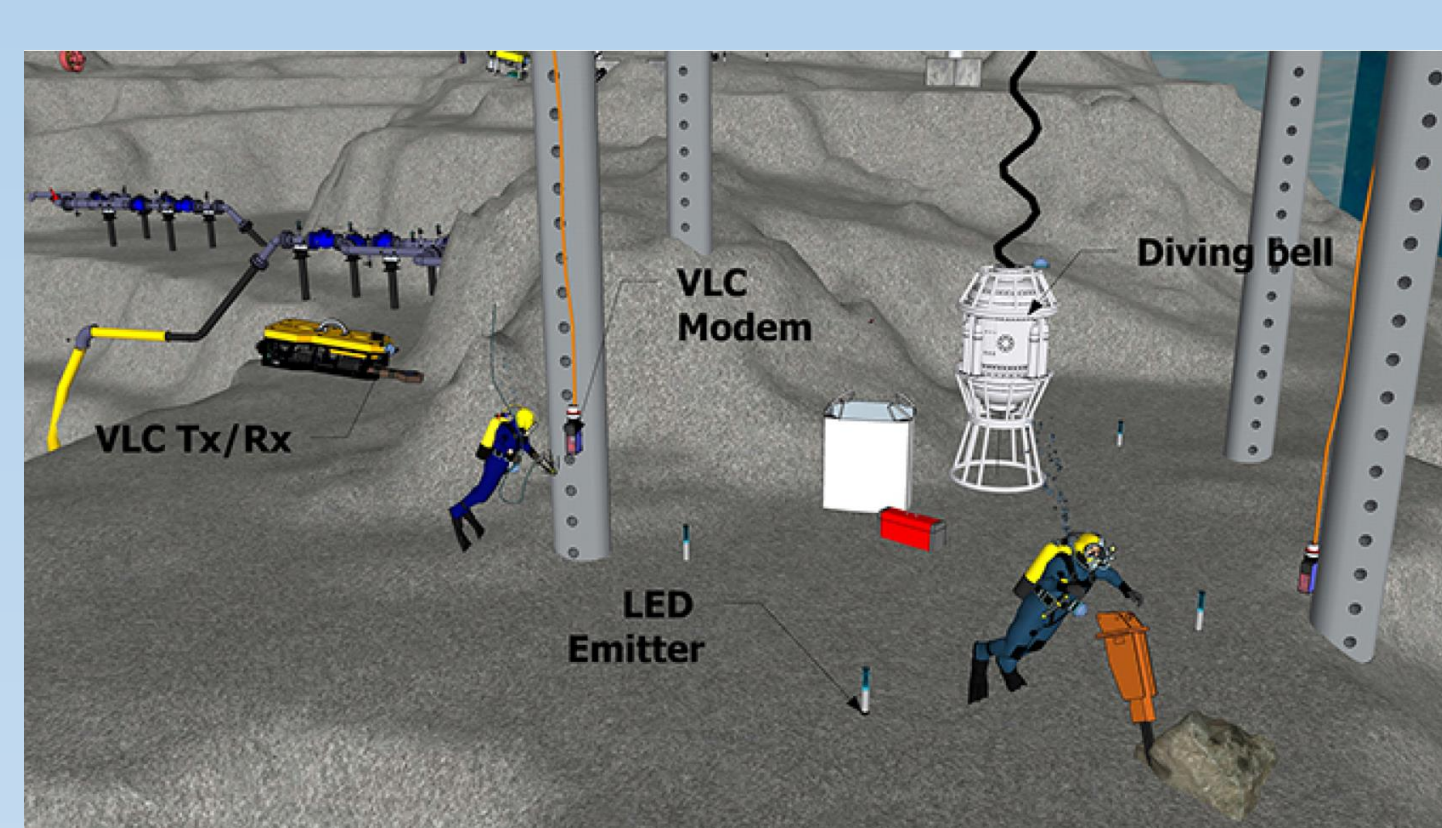
LAGO-ON tasks:

- Define novel VLP techniques, based on the use of well-known approaches such as RSS, TOA/TDOA, as well as relying on Artificial Intelligence and convolutional neural networks
- Define our Underwater Things paradigm (IoUT) network architecture for underwater positioning, where specific blocks will be considered
- Integrate VLP algorithms into the LAGO-ON IoUT system
- Deal several test activities (in-out door) for validation purpose of the proposed IoT system

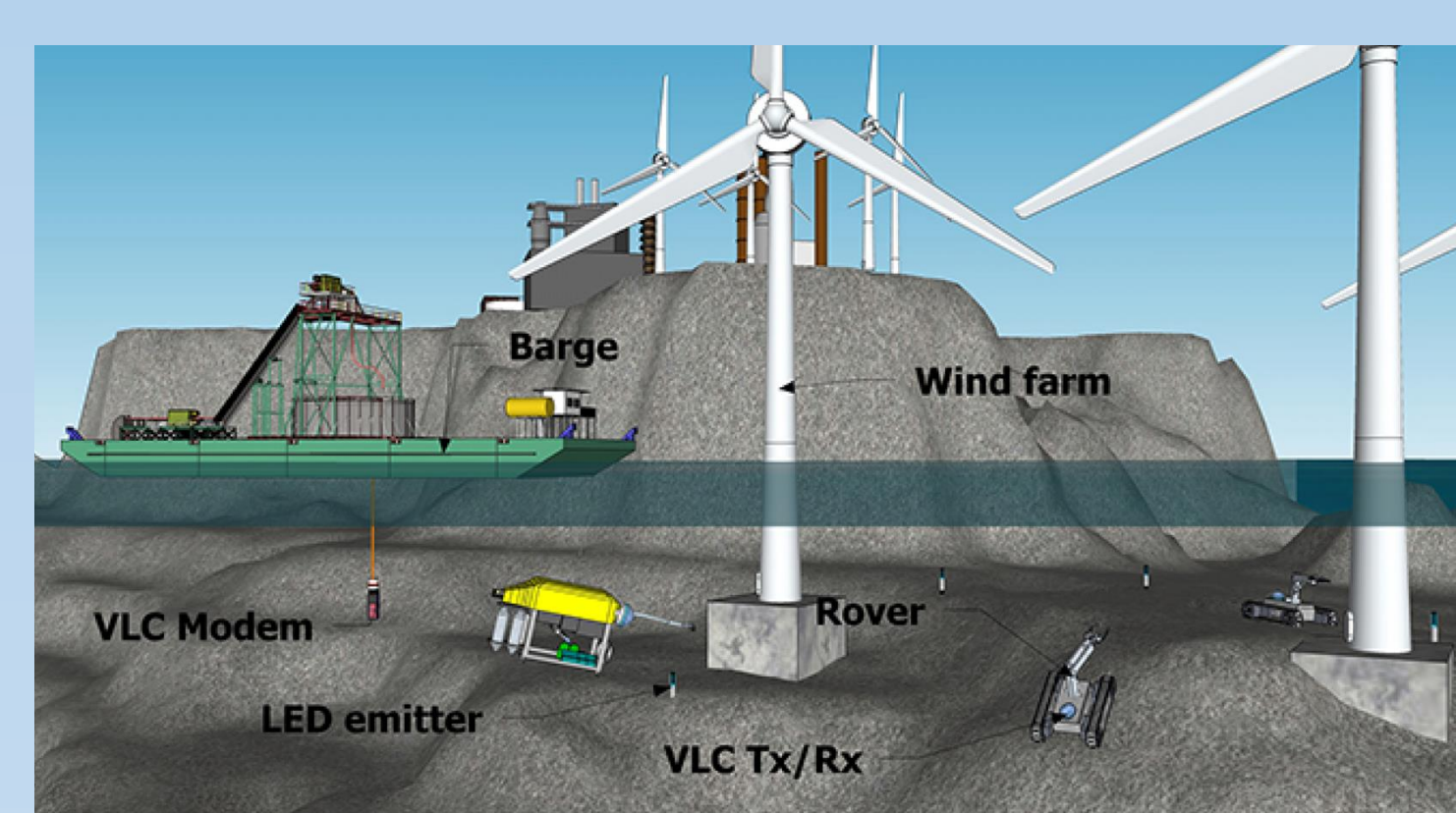
Some future applications of UOWC systems



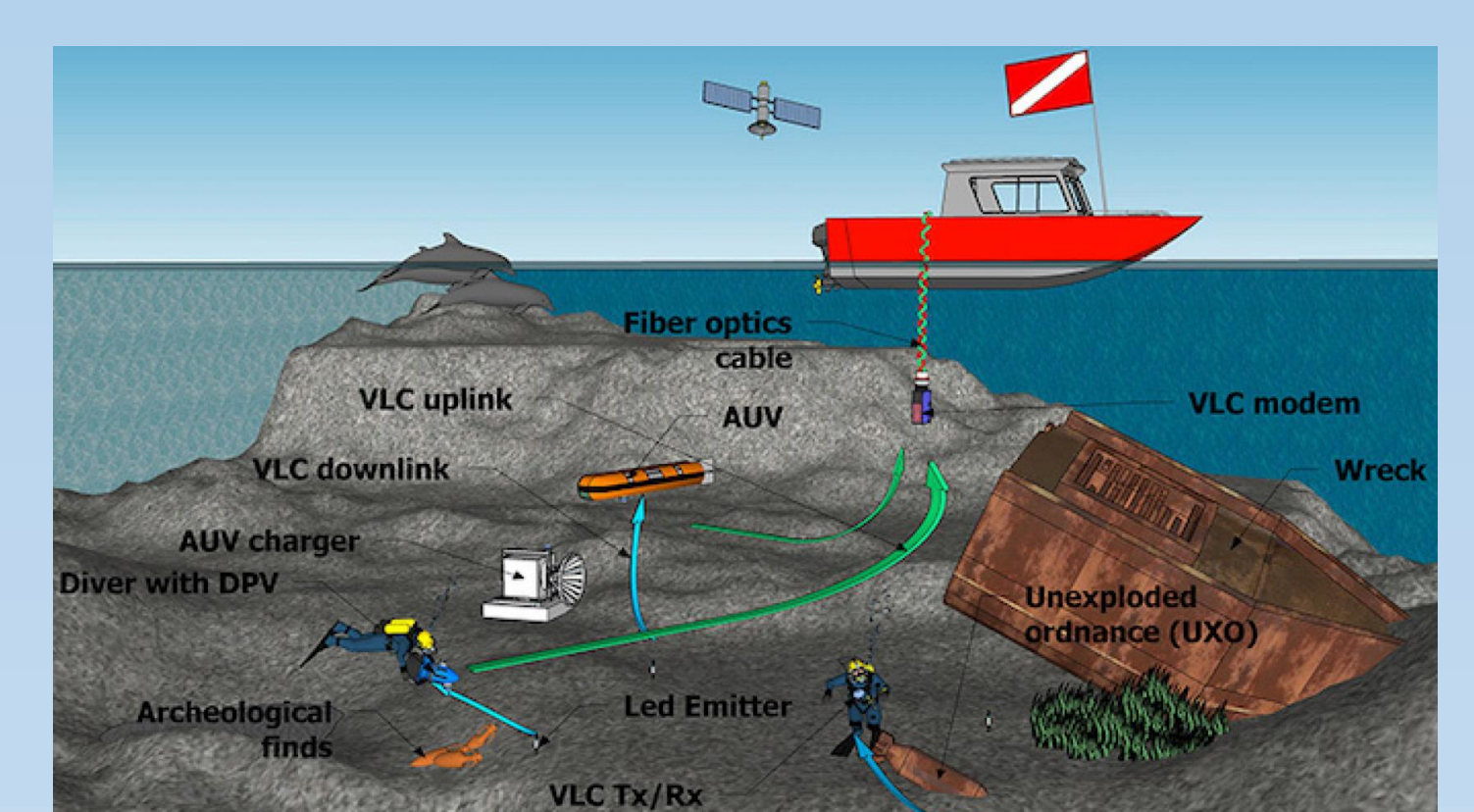
Pipeline installation and maintenance



Maintenance of Oil/gas platform



High precision ROVER manoeuvring



Archeological and wreck survey