

Executive Summary:

NECKLACE OF LIVING LABS (NoLL): A GLOBAL NETWORK OF BIODIVERSITY LIVING CLASSROOMS FOR EXPERIENTIAL LEARNING

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To the education-without-border pioneers of the world

No single place can teach the story of our planet; together, the Necklace of Living Labs lets students learn from Earth itself.

Necklace of Living Labs (NoLL) is a proposed international consortium to create a globally connected network of biodiversity-based Living Labs and associated global Earth-sensing data and knowledge repositories that provide authentic experiential learning opportunities for K–12 and undergraduate students worldwide while fostering international collaboration in environmental education and research.

The initiative seeks to bring together universities and schools from Africa, Asia, Europe, Latin America, North America, Oceania, and island nations. Each participating institution contributes a distinctive ecosystem that collectively represents Earth's biological and ecological diversity- and may engage research institutions, botanical gardens, protected areas, and biosphere reserve organizations around their vicinity.

Rather than constructing new field stations, NoLL will connect existing educational and environmental assets in the easy proximity of the institutions into a coordinated global network capable of supporting scalable experiential learning and collaborative scientific discovery.

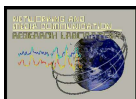
The immediate goal of this planning effort is to establish the founding NoLL consortium, develop a shared vision, identify representative Living Lab sites, define governance and partnership models, establish common educational and data standards, and create a roadmap for long-term international collaboration and seek funding from NSF and other agencies.

Conceptually inspired by the principles of UNESCO's Man and the Biosphere (MAB) Programme, NoLL extends the concept through a globally distributed cyber-enabled educational network that integrates standardized sensing (EYE), shared curricula, AI-assisted learning, and interoperable environmental data for K–12 and undergraduate experiential education. AI-driven analytics will transform distributed observations into searchable environmental knowledge, predictive models, and reusable educational resources shared across the consortium.

Participating sites will ultimately leverage Internet of Things (IoT) sensors, remote sensing, edge computing, digital twins, interoperable data platforms, and data analytics to enable students to investigate biodiversity, climate, water resources, ecosystem health, and environmental change through local field experiences and globally shared observations.

The consortium envisions a future in which students from diverse regions collaborate on common environmental challenges, compare ecosystems across continents, participate in virtual field experiences, and contribute to international citizen-science and research activities. Faculty and educators will jointly develop curricula, educational resources, and collaborative learning experiences that integrate environmental science, engineering, computing, artificial intelligence, and sustainability.

Innovation in Sustainable Global Scale Education Instrument: The Necklace of Living Labs (NoLL)'s initiative to rest on four mutually reinforcing foundations: (i) institutions contribute existing local ecosystems and educational assets, those are near to them- eliminating the need for costly new field infrastructure; (ii) distributed local institutional ownership but global value- sum is much bigger than the part- where each partner maintains its own Living Lab while benefiting from an unique shared global



network;(iii) the EYE (Environmental Intelligence Edge) platform, a compact, rugged, solar-powered, autonomous sensing unit designed for long-duration, nearly maintenance-free operation. EYE integrates environmental sensors, edge computing, wireless communication, and standardized data collection within a weather-resistant enclosure, enabling reliable environmental monitoring even in remote and resource-constrained locations; and iv) focus on **curriculum-driven rapid adoption**, where ready-to-use, standards-aligned experiential learning modules to enable K–12 schools and undergraduate programs to readily integrate and expand Living Lab activities into existing courses. Together with shared cyberinfrastructure, AI-enabled analytics, and interoperable data platforms, these four pillars create a scalable, low-cost, and self-reinforcing ecosystem in which every new institution, deployment, educator, and student increases the educational and scientific value of the entire global network, ensuring sustained growth well beyond the initial NSF investment.

Join the Founding Consortium. This planning initiative will establish the partnerships, organizational framework, technical architecture, and educational vision necessary to launch a sustainable international network of Living Labs. By connecting representative ecosystems across the world into a shared educational ecosystem, NoLL aims to cultivate environmental literacy, interdisciplinary problem-solving, global collaboration, and the next generation of scientists, engineers, educators, and environmental leaders. We invite organizations around the world to join as the founding members to co-design the consortium, contribute their unique ecosystems and expertise, and help develop shared technologies and standards-aligned curricula, and **work together to pursue national and international funding** that will transform this shared vision into a lasting global educational infrastructure.

