LEKO: Monitoring sounds to assess and track ecosystem health

Contact: Marie Maurel, Head of Water and Biodiversity Activities – BIRDZ
Author: Sandrine Oberti, Director of Scientific Valorization – DEST (Veolia Research & Innovation)

THE IMPORTANCE OF MONITORING BIODIVERSITY

Biodiversity is declining steeply, with 75% of terrestrial ecosystems and 40% of marine ecosystems degraded, a situation that threatens a million species with extinction, largely as a result of human activities (IPBES 2019, IUCN 2021). Biodiversity is vital for regulating the climate and protecting against natural disasters. Preserving biodiversity requires constant automated monitoring to overcome the drawbacks of the manual inventories traditionally used in the past.

Ecosystem health and human health are inextricably linked, as underlined by the One Health concept. This approach recognizes their interdependence and seeks to achieve a balance between the health of people, animals and ecosystems. The deterioration of natural habitats can facilitate the emergence of zoonotic diseases that impact human health directly. Monitoring and preserving biodiversity thus helps to prevent future health crises (WHO).

MONITORING BIODIVERSITY BY LISTENING TO BATS!

Birdz, working with France's natural history museum, has developed a monitoring system that uses acoustic sensors to listen to and analyze sounds made by over 100 species, from bats to grasshoppers, birds to nocturnal insects. The sensors identify and count the number of species in an ecosystem, constantly monitoring indicators for ecosystem health and helping to protect biodiversity.

Developing autonomous solar-powered sensors that communicate via cellphone networks and wifi was a major challenge. They have to be robust, safe from vandalism when sited in built-up areas, and effective at collecting data continuously, even in hard-to-reach locations.

ARTIFICIAL INTELLIGENCE ASSISTING BIODIVERSITY

Further significant technological challenges were successfully tackled, including the integration and analysis of bioacoustic data. The project, a result of a collaboration between Veolia and France's natural history museum via a chair in mathematical modelling, led to the development of advanced scripts and algorithms used to detect and identify different species' sonic signatures.

Establishing reliable and accurate correlations between species and sonic signatures was key to identifying the species present, understanding their interactions, and directly measuring the health of ecosystems and the effectiveness of measures to conserve them.

To date, the solution has identified 29 species and groups of bats, 42 species of grasshoppers, four species of mammals, three bird species and nine other species (butterflies, glow-worms and amphibians). Research is ongoing to expand the number of species identified. The ability to adjust these systems to suit different regions and variations in biodiversity is crucial to rolling them out worldwide.

KEY BIODIVERSITY INDICATORS THAT CAN BE USED TO MEASURE THE IMPACT OF MITIGATION SOLUTIONS

Leko is a major step forward in environmental monitoring because the data it collects can be used to define four key indicators for the impact of human activities on biodiversity.

1. **Ecosystem health:** proportion of specialist species (marker of the good health of an ecosystem).
2. **Light pollution:** species' light sensitivity.
3. **Tree cover:** health of forested habitats.
4. **Surface water quality:** presence of specialist species in bodies of water.

The indicators are accessible via a portal and are used to assess the health of ecosystems and measure the impact of biodiversity conservation strategies implemented as part of urban or industrial developments. Leko thus opens the door to proactive management of environmental challenges.

AWARD-WINNING SOLUTION

Leko has won several high-profile prizes recognizing its innovative approach to sustainable management of natural resources and protecting biodiversity: IoT Awards 2023, Grand Prix Change 2023, and winner of the Frost & Sullivan 2021 Company of the Year Award.

The Leko solution is already used in static and mobile applications in France, Spain, Italy and the UK and is soon to be rolled out in the USA. It provides long-term monitoring of biodiversity and ecosystem health, with no significant environmental impact. The innovations offered by this technology support ecological transformation by improving the protection of health and the environment.


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