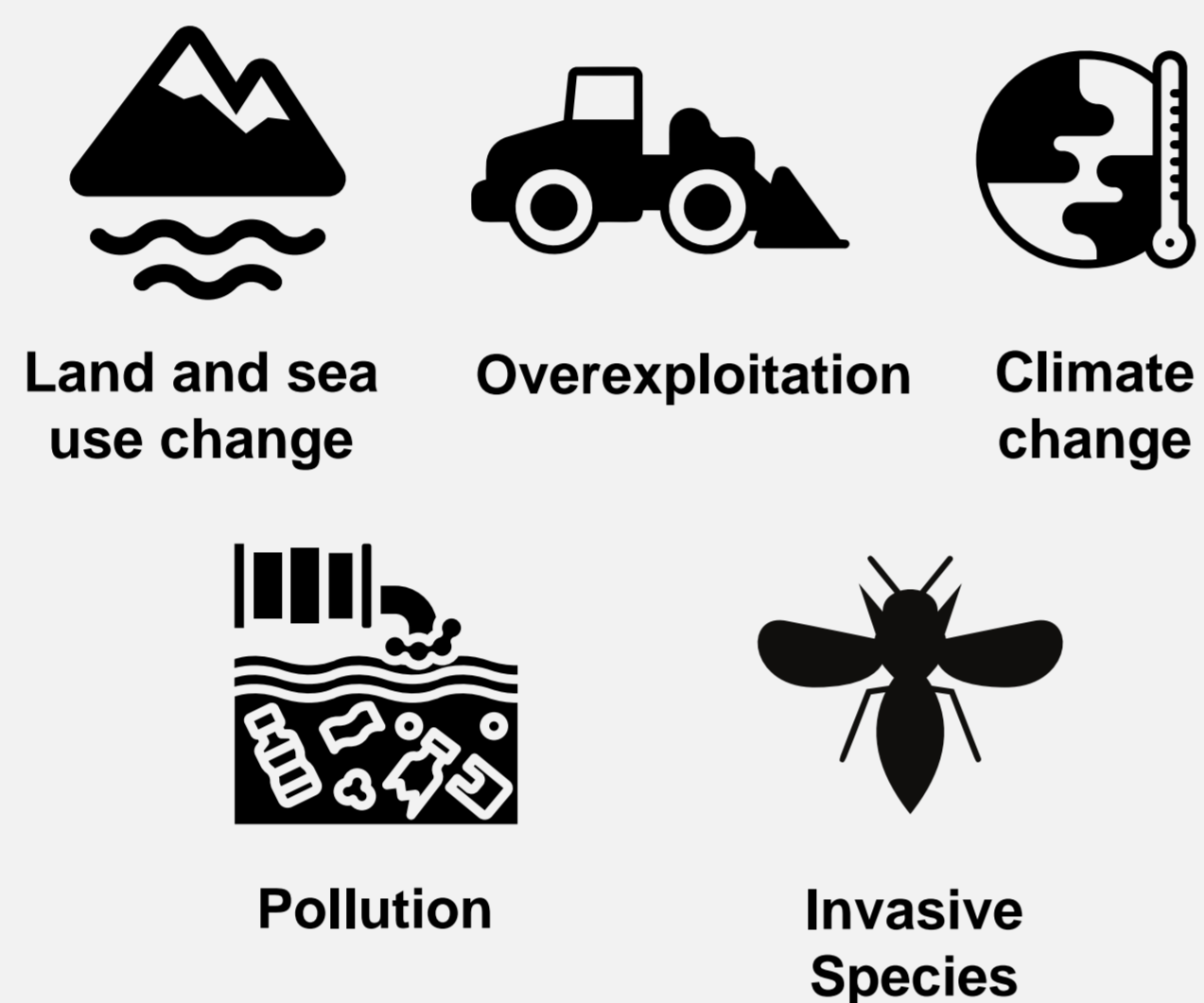# AI-Driven Biodiversity Management for Sustainable Circular Economy
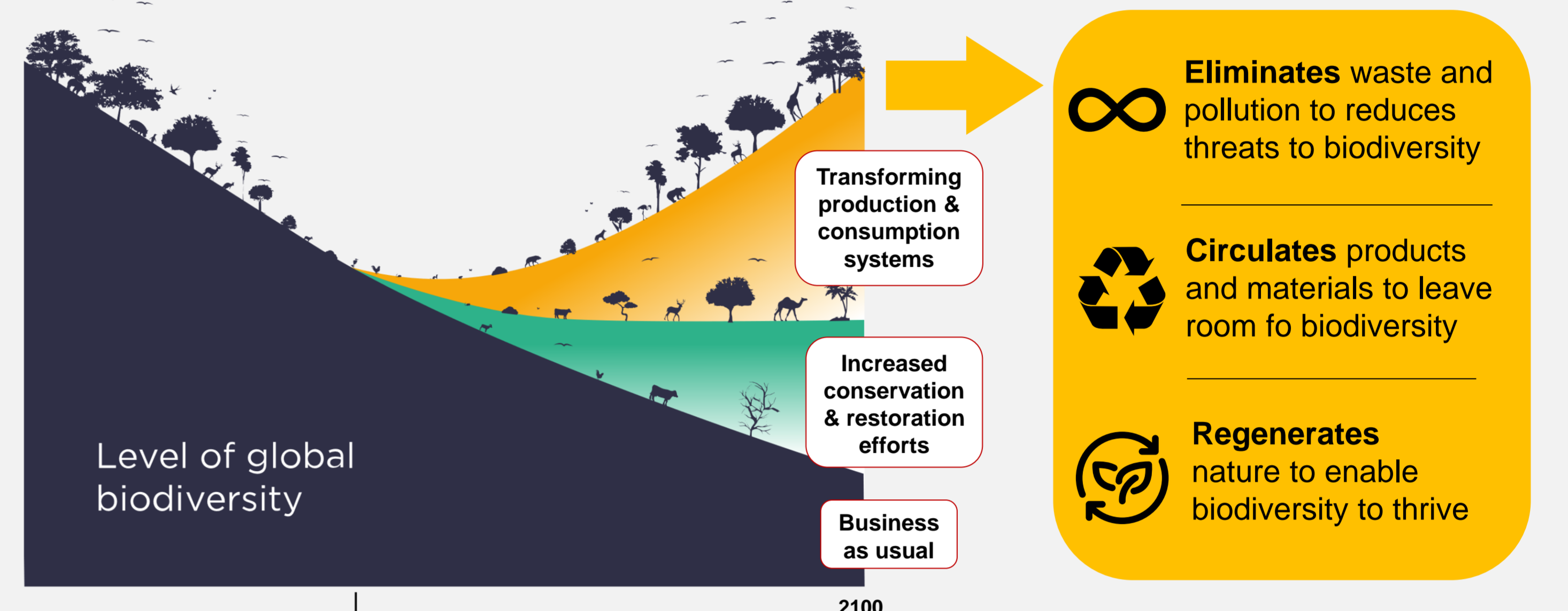
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1| Biodiversity Loss- Impacts and Drivers

- The extraction and processing of natural resources accounts for more than **90%** of biodiversity loss and water stress [1].
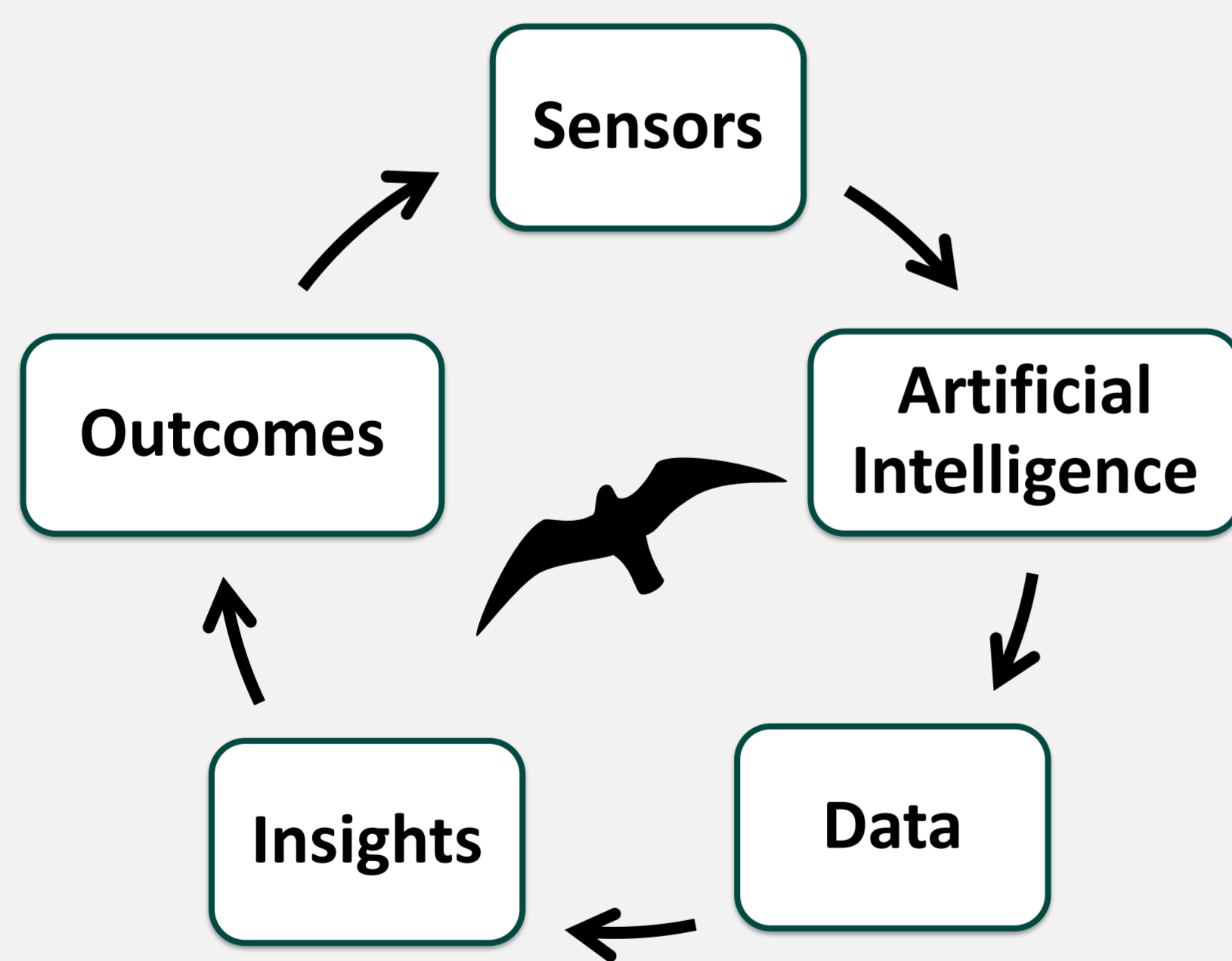- 55% of global GDP—equivalent to about US$ 58 trillion—is highly or moderately dependent on nature.

Land and sea use change

Overexploitation

Climate change

Pollution

Invasive Species

2| How Circular Economy Tackles Biodiversity Loss

Level of global biodiversity

Transforming production & consumption systems

Increased conservation & restoration efforts

Business as usual

TODAY

2100

Source: 'Biodiversity and the circular economy, https://www.ellenmacarthurfoundation.org/topics/biodiversity/overview

Eliminates waste and pollution to reduces threats to biodiversity

Circulates products and materials to leave room fo biodiversity

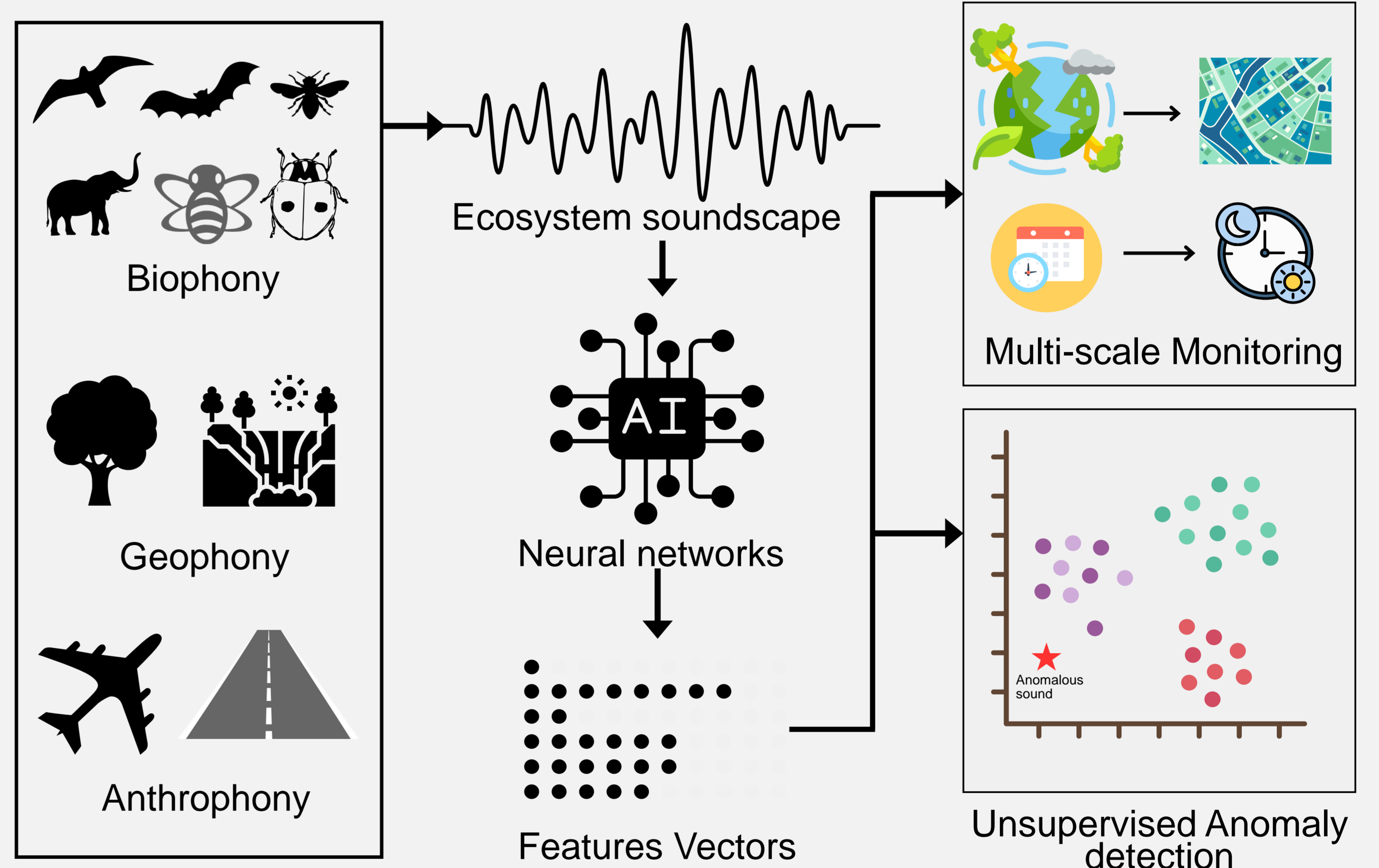**Regenerates** nature to enable biodiversity to thrive

3| Approach for Quantification of Global Biodiversity

- Lack of standardized metrics and measurement approaches.
- High-quality biodiversity measurement is a key step in enabling action to reverse biodiversity decline.

Sensors → Artificial Intelligence → Data → Insights → Outcomes → Sensors

4| Biodiversity Monitoring using AI-driven Acoustic Detection

Biophony

Geophony

Anthrophony

Ecosystem soundscape

AI

Neural networks

Features Vectors

Multi-scale Monitoring

Anomalous sound

Unsupervised Anomaly detection

5| Current Work and Outlook

- Acoustic characterisation of bee hives for precision beekeeping (Queen bee detection, swarming prediction)

Source: B. Leiding

Source: B. Leiding

- Automated, rapid assessment of ecological status (habitat quality, biodiversity, anthropogenic disturbance) from soundscape monitoring.
- AI for harmonising and integrating monitoring data from multiple observation systems.
- Near-real-time data processing, detection of individuals and species identification, behaviour.
- Coupling monitoring with biodiversity models and future projections (causal analysis, predictive ecology).

References:

1) van Oorschot et. al, Business for biodiversity: mobilising business towards net positive impact (2020)

2) S. S. Sethi et al., 'Combining machine learning and a universal acoustic feature-set yields efficient automated monitoring of ecosystems'. bioRxiv, p. 865980, Dec. 05, 2019. doi: 10.1101/865980.

3) 'Biodiversity and the circular economy'. Accessed: Nov. 21, 2023. [Online]. Available: https://www.ellenmacarthurfoundation.org/topics/biodiversity/overview