BILBI: CSIRO's global biodiversity modelling & assessment capability

Australia's national science agency CSIRO has linked advances in biodiversity informatics, remote sensing, macroecological modelling and high-performance computing to assess biodiversity change at fine spatial resolution across the entire land surface of the planet.

Assessments of past-to-present change in the state of biodiversity, and of potential change under future scenarios, can help to inform effective design, implementation and review of conservation policies and actions worldwide.

However, the spatial resolution of relevant information sources offering complete global coverage is often far coarser than the grain of landscape-level patterns and processes shaping interactions between human activities and biodiversity. The biological scope of such information also tends to be limited largely to better-known groups, particularly vertebrates.

BILBI (Biogeographic modelling Infrastructure for Large-scale Biodiversity Indicators) has been developed by CSIRO to help estimate the impact of observed and projected environmental change, and associated policy responses, on the retention of overall diversity of plants, invertebrates and vertebrates across the entire land surface of the planet.

BILBI can report results for any set of spatial units at or above the refined 1km grid resolution at which all analyses are undertaken – e.g. provinces, countries, ecoregions, biomes, or the whole world.

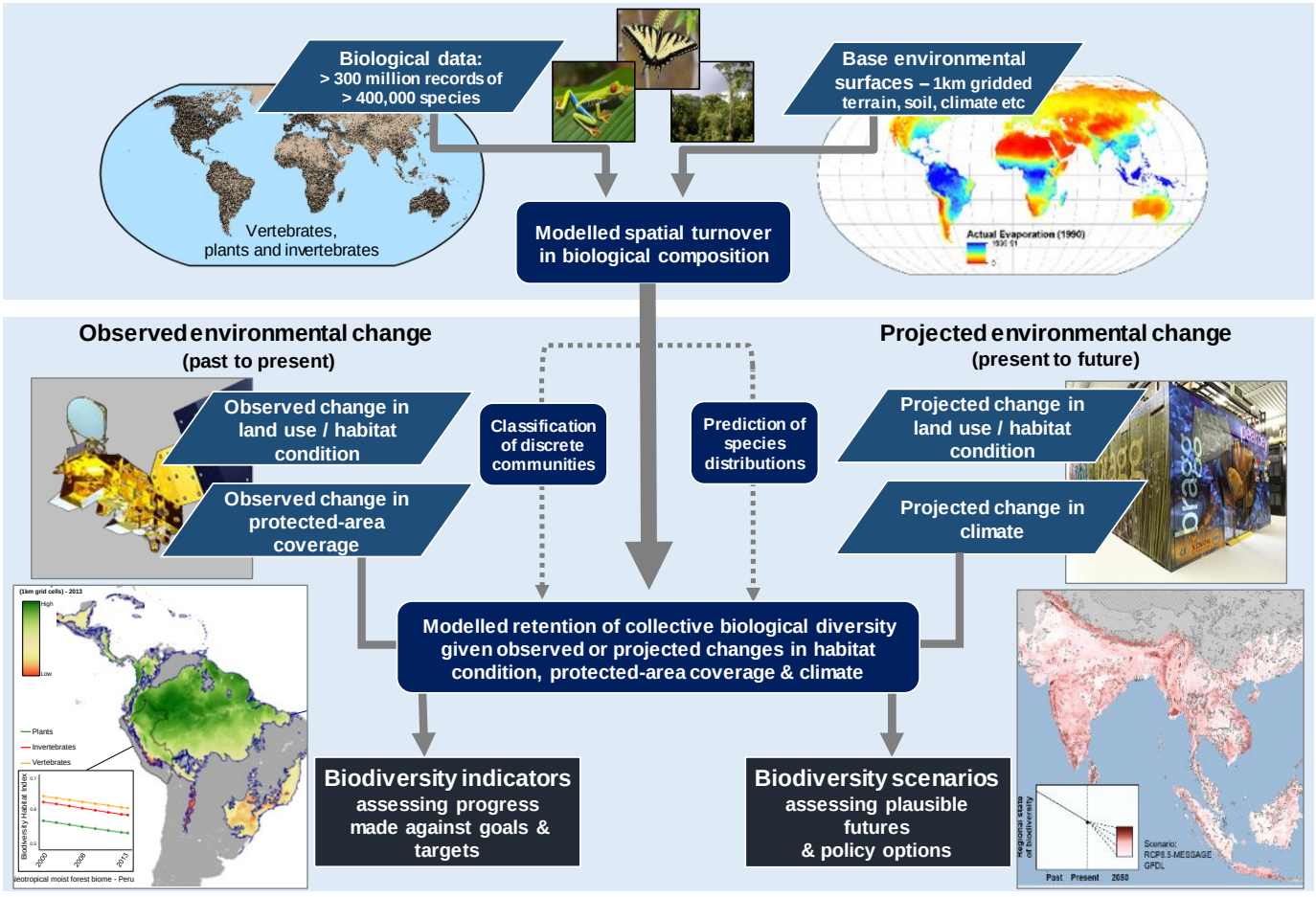

Figure 1: Conceptual depiction of BILBI modelling infrastructure and application pathways, including estimation of past-to-present change in biodiversity resulting from observed environmental change, and projection of future change in biodiversity expected under alternative climate and land-use scenarios.

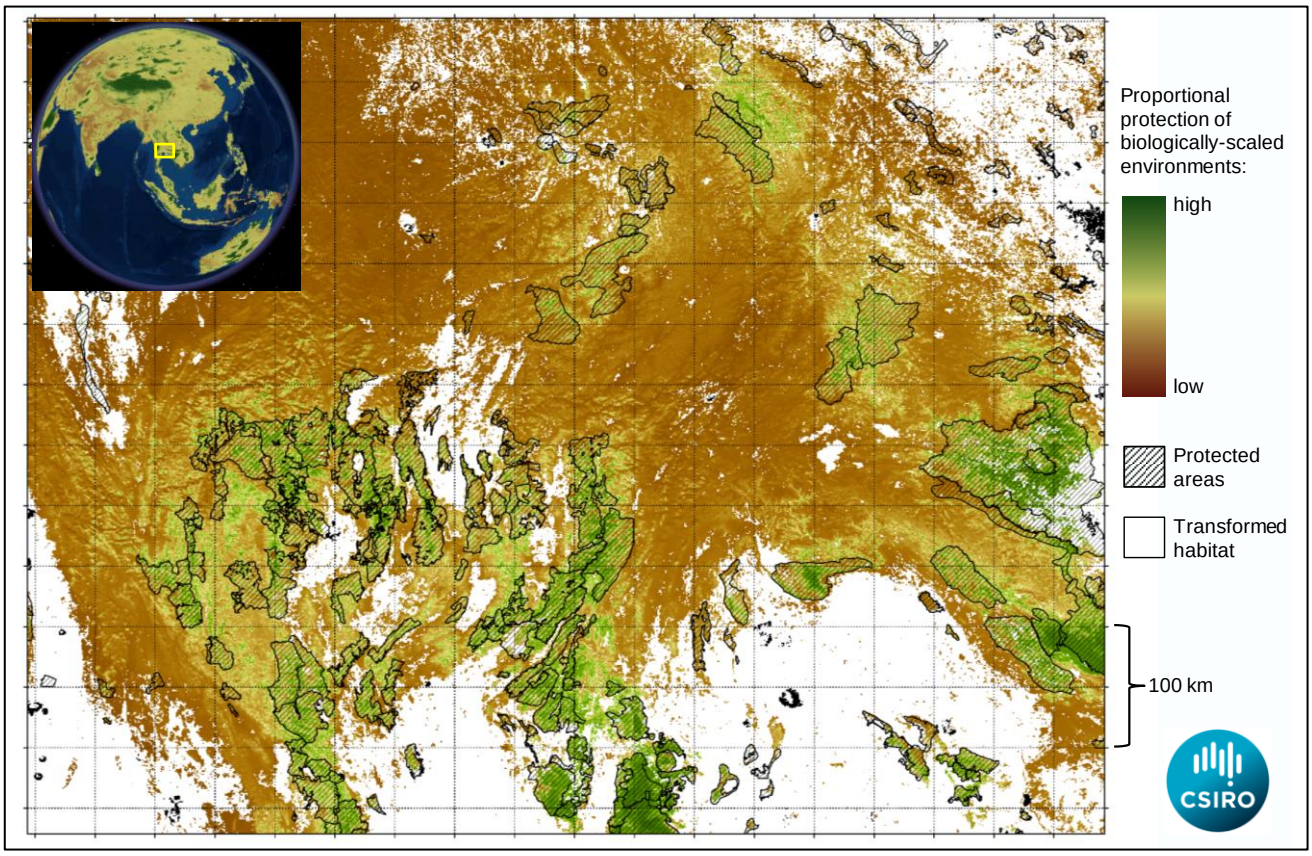

Figure 2: Example output from BILBI, mapping the proportional protection of biologically-scaled environments (supporting distinct assemblages of plants and animals), with those achieving greater than 17% protection mapped in green.

Global biodiversity modelling at locally relevant spatial resolution

BILBI maps spatial patterns in the distribution of biodiversity by integrating best-available data from biodiversity informatics and remote environmental mapping initiatives with advances in high-performance computing and macroecological modelling. Spatial turnover in community composition and species richness are modelled as continuous surfaces across the globe for three major biological groups (vascular plants, invertebrates and vertebrates) using more than 300 million occurrence records for over 400,000 species. Resulting patterns can be represented as continuous biologically-scaled environmental surfaces or converted into discrete ecosystem classifications, depending on the needs of the end user.

By coupling these modelled biodiversity patterns with remotely-sensed changes in the extent of natural habitats, and with mapping of protected-area boundaries, BILBI can generate indicators assessing progress against targets set by international environmental agreements.

BILBI can also project potential outcomes for biodiversity expected under scenarios of climate and land-use change, and alternative policy and management options aimed at addressing these impacts. This capability incorporates customised advances in downscaling coarse-resolution land-use and climate observations and projections.

Applications of the BILBI framework

BILBI has a wide range of applications at global, regional, national and subnational levels, including:

- Biodiversity change indicators
- Environmental accounting
- Environmental impact assessment
- Conservation planning
- Future scenario analysis
- Integrated cross-sectoral assessment
- Biological survey gap analysis

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