Freely accessible environmental modelling platforms

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**Abstract:** Accessibility of modelling and analysis tools beyond the academy is important across modelling and computational research domains. Cloud based systems are important for such processes, but are often not free, and do not readily address the issues of data discovery and access.

Biodiversity is one example application domain for modelling. We are in the sixth mass extinction event in Earth’s history, with key threatening processes such as climate change and land use and land cover change operating at a global scale, and thus needing to be modelled across regional scales at least. However, it is unusual for conservation practitioners to have either or both of access to computational resources and the modelling skills to use them to full effect.

Two platforms have been recently developed to provide such access: The Biodiversity and Climate Change Virtual Laboratory (BCCVL) and Ecocloud. Both are substantial collaborative projects involving multiple universities and research support organisations, with primary funding from the Australian Research Data Commons (ARDC) and its antecedent organisations. Both are open source projects that are freely accessible to anyone, and provide access to algorithms and data supported by a high performance computing back-end.

The BCCVL (<https://bccvl.org.au>) provides a “one stop modelling shop” for the analysis of biodiversity and climate change. It provides an easy to use, web based interface to seventeen species distribution modelling algorithms, including terrestrial, marine and aquatic environments, and supports the projection of these results into the future under nine different potential emissions scenarios (Hallgren et al. 2015). Secondary analysis types support the identification of hotspots of endemic species, combination of SDM results from different algorithms using ensemble methods, species trait and migratory species analyses. All of this is supported by a range of visualisations and performance metrics. Many essential data sets are provided, with support for users to upload their own and tools to access them from online providers such as the Atlas of Living Australia (<http://ala.org.au>) and the Global Biodiversity Information Facility (<http://gbif.org>).

The Ecocloud (<https://ecocloud.org.au>) is a broader project that allows more advanced users to work “closer to the metal”. It provides access to virtual desktops (CoESRA) and interactive coding environments (Jupyter notebooks supporting both Python and RStudio) with greater resources than the average desktop machine due to direct access to the high performance computing back-end. A key part of the Ecocloud is its Data Explorer. This provides a search interface across a wide range of environmental data providers for Australia, with more than 47,000 data sets indexed at the time of writing. The system provides code snippets to make loading of these data sets a simple copy-and-paste exercise.

Platforms like the BCCVL and Ecocloud are an important step forward to make modelling research available to non-researchers. They remove a large part of the learning curve needed to implement and models and analytical tools, while also providing the resources to operate on realistically sized data sets relevant to practical applications.

# References

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1. Biodiversity, environmental data analysis, Ecocloud, BCCVL