Method for estimating longer-term future demand for biodiversity credits

This document outlines the method used to estimate longer-term future demand for biodiversity credits, based on major projects that are in the early stages of the New South Wales planning approvals process.

Background

In 2023, the Department of Planning and Environment commissioned work to prepare a repeatable method for estimating longer-term future demand for biodiversity credits, based on major projects in the New South Wales (NSW) planning approvals process.

Overview of the method

To estimate longer-term future demand for biodiversity credits, a spatial model was developed.

This spatial model takes input data in the form of digitised footprints of development proposals for major projects that are in the early stages of the NSW planning approvals process. These projects may have rough development footprints and have not yet undertaken a biodiversity development assessment report. The model overlays draft footprints with several key input layers, including vegetation mapping, to determine likely biodiversity values.

A credit demand estimate is then generated based on the Plant Community Types mapped by the NSW State Vegetation Type Map (SVTM) for each proposed development footprint.

The output contains both the demand and other relevant project information and metadata.

Method scope

The method focuses on generating estimates of longer-term credit demand, using publicly available data from major projects in the pre-assessment phase of the NSW planning approvals process (i.e. at the Secretary's environmental assessment requirements stage, prepare environmental impact statement stage or prepare modification report stage).

The method only uses data from major projects (state significant developments and state significant infrastructures – new development applications and modifications to existing).

Indicative spatial boundaries of proposed major projects in the pre-assessment phase of the planning approvals process were not readily available at the time the method was developed. Therefore, boundaries of these proposed developments were digitised from maps in scoping reports found on the Major Projects Planning Portal to provide the spatial input data to produce an estimate report.

Projects were incorporated into the input dataset if they met the following criteria:

- the scoping report for the project on the Major Projects Planning Portal contained a map able to be georeferenced, **and**
- the project impacts are direct impacts, that is, on biodiversity values within the project boundary, **and**
- the project boundary overlapped with native vegetation mapped as a native Plant Community Type in the SVTM.

Method exclusions

The method is based on desktop research and is therefore limited to data that was available and accurate. The process was also constrained by time and feasibility.

Therefore, several types of information were excluded from the method. The types of information included and excluded from the method are summarised in Table 1.

Table 1 Summary of included and excluded information

Information	Included	Excluded
Project type	Projects that are state significant developments or state significant infrastructures	All other development, including local development
Project stage	Projects at the pre-assessment phase of the NSW planning approvals process, including at the: • Secretary's environmental assessment requirements stage • prepare environmental impact statement stage or • prepare modification report stage.	Projects that are at other stages of the NSW planning approvals process, including: • projects that are not yet in the planning approvals process • projects for which a biodiversity development assessment report has been undertaken • projects that have already been determined.
Potential credit obligation types	Ecosystem credits	• Species credits • Ecosystem credits – hollow bearing trees • Threatened ecological communities
Biodiversity impact types	Impacts on biodiversity values within the project boundaries	• Impacts on biodiversity values outside the project boundaries • Impacts on matters of national environmental significance.

Data sources

The data sources used in the method are shown in Table 2.

Table 2 Data sources used in the method

Layer description	Format	Source	Date	Notes
Core Model Components				
NSW State Vegetation Type Map C1.1.M1.1	Spatial layer	Sharing and Enabling Environmental Data in NSW)	Latest version used published 12/12/2022	Publicly available
Draft statewide category 1 land	Spatial layer	Remote sensing and regulatory mapping (DPE)	Provided 14/09/2022	Not publicly available at the time provided. Mapping was later released for a select set of local government areas, as outlined
BioNet Plant Community Type and species data	Tabular data	Open Data protocol	Live	Publicly available
Interim Biographic Regionalisation of Australia (IBRA) version 7 (subregions)	Spatial layer	SEED NSW	Latest version used published 30/05/2016	Publicly available
Offset Trading Groups/ threatened ecological communities	Spatial layer	Biodiversity Offsets Program – NSW Biodiversity Conservation Trust (BCT)	Provided 12/10/2022	Not publicly available
Vegetation integrity	Tabular data	Offsets assessment & systems (NSW DPE – Biodiversity Offsets Scheme branch)	Provided 2/12/2022	Export from finalised Biodiversity Offsets and Agreement Management System assessment cases
Input data components				
Major Projects Planning Portal exports	Tabular data	Geographic information system & mapping (NSW DPE – Planning)	Data captured from July 2021 to 11 April 2023	Not publicly available
Scoping reports	PDF documents	Major Projects Planning Portal	Current to 28/03/2023	Publicly available
Digitising reference layers				
Public_NSW_Base_Map (DCS 2023)	Spatial layer	SixMaps	Live	Publicly available
EPI primary planning layers	Spatial layer	DPE ArcGIS Map Server	Live	Publicly available

Layer description	Format	Source	Date	Notes
Esri Imagery basemaps	Spatial layer	Sources: Esri, FAO, NOAA, USGS, Earthstar Geographics	Live	Publicly available

Process for applying the method

Modification of input data

The following changes and additions were made to the model input data sources.

1. Manual digitisation of project boundaries from scoping reports on the Major Projects Planning Portal.
   a. In most cases, project boundaries were manually digitised, as they were presented in the figure of their scoping report. However, this method differed where project boundaries were either presented incorrectly or at a scale so that a reasonable interpretation had to be made according to a structured ruleset.
   b. For modification assessment applications, only areas that were extensions to the original development footprint were included in the spatial model.
2. Creation of metadata for the digitised boundaries based on information from the Major Projects Planning Portal. A spatial and a project confidence score were applied to this metadata:
   a. the spatial confidence score relates to the confidence in the spatial components of the data produced from the inputs.
   b. the project confidence score relates to the confidence in the project being approved in its current form and thus the proponent being required to retire the associated credits as a condition of the approval.
3. Manipulation of exported vegetation integrity score (VI score) data.

VI scores from Plant Community Types on completed Biodiversity Assessment Method (BAM) development assessments were used to calculate a weighted average VI score per vegetation class. Mean VI and upper and lower bounds were calculated using the standard deviations of the datasets.

4. Manipulation of BioNet OData feeds.

Several BioNet OData databases were linked to the credit demand estimate output spreadsheet to import fields to help calculate the biodiversity risk weighting for each Plant Community Type.

Spatial model application and output

The spatial model was built in ArcGIS Pro Model Builder. Process repeatability was a key requirement of the model. Therefore, the data was used in its raw form to ensure future data revisions or superseding versions of the datasets can be used without needing to change the full model.

The spatial reference files used to determine the Plant Community Type (PCT)/IBRA subregion/Offset Trading Groups (OTGs)/threatened ecological communities (TECs) were kept in raw form and only manipulated within the model itself to ensure that the model can use the most up-to-date data each time it's run.

Once the input data was modified, it was fed into the spatial model. The following steps outline the broad components of the spatial model:

1. **Spatial reference layer preparation**

Each of the reference layers (SVTM, IBRA subregions, category T1 land, OTG/TECs) were clipped to each of the digitised development footprints and re-projected to the input coordinate system. The OTG/TEC layer was also converted from a raster to a feature class and linked to the SVTM.

2. **Removal of non-credit producing areas**

Category 1 land and PCT 0 (non-native vegetation) was removed.

3. **Joining tabular data from BioNet**

Data from BioNet OData relating to PCT definitions, TECs and threatened species were joined to the model to help calculate the biodiversity risk weighting.

4. **Calculation of biodiversity risk weighting**

Biodiversity risk weighting was calculated as per the Biodiversity Assessment Method, which combines sensitivity to gain (for the highest sensitivity of threatened species associated with a particular PCT) and sensitivity to loss (for clearing status or listing status of PCTs or TECs) within a matrix.

5. **Credit calculations**

The number of ecosystem credits for each PCT within each development was calculated as per the equation in the Biodiversity Assessment Method (Area of each PCT × Biodiversity risk weighting × VI × 0.25). This was calculated 3 times, using the mean VI score as well as the upper and lower VI bounds, giving 3 credit scenarios.

The output of each model run is a .csv (comma separated values) file that can be used within any platform that uses tabular data such as Microsoft Excel or PowerBI. This output was used in a MS Excel spreadsheet containing exported data from the Major Projects Planning Portal, the results of the confidence scoring methodology and digitisation notes. This data can be filtered or sorted by several parameters.

Limitations with the method

A number of challenges were encountered when applying the method, including the overlapping development footprints, inconsistent OTG and PCT classification and issues with matching extents in critical spatial layers. These were accounted for as best possible; however, it must be noted that these issues introduce a minor source of error when interpreting model outputs.

Limitations associated with the method include the digitisation of development footprints, the manipulation of historical VI score data and the assignment of spatial and project confidence scores, described above.

Other limitations associated with the input data into the spatial model included:

- **State Vegetation Type Map C1.1.M1.1:** there may be substantial difference between what is mapped and what occurs on-ground in terms of PCT allocation, native versus non-native vegetation and extent.
- **Statewide category 1 land:** areas mapped as category 1 land could be a derived native grassland associated with a critically endangered ecological community which would supersede its category 1 land status to category 2 land.

- **Offset Trading Groups/threatened ecological communities:** this layer was created internally based on data from TEC associations to best fit OTGs and TECs, however, it is also an approximation and will not always match on-ground results.
- **Vegetation integrity:** based on a 'point in time' dataset so data is static and may need to be updated over time as new information becomes available. Assessment data does not cover all PCTs/classes necessitating dilution of values across class or formation level.
- **Digitised development footprint boundaries:** there are many limitations to this data, which are largely a result of variation in the quality of figures used from scoping reports due to scale, readability and interpretation/definition of impacts. This data is also not updated as the assessment progresses and requires substantial effort to convert into a readily usable format.

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