



Natural Value Performance

NVP METHODOLOGY



For transparency purposes, this document provides an overview of the methodology underlying the NVP – Natural Value Performance tool. The NVP runs in an open software environment and performs a natural capital assessment. Broadly speaking, the NVP methodology is based on four main activities.

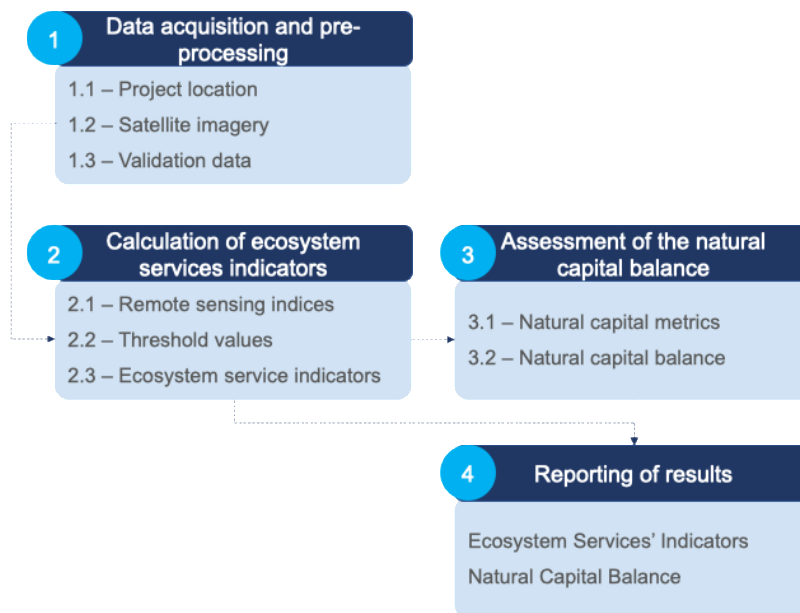


Figure 1. The four main steps of the NVP methodology.

Activity 1 - Data acquisition and pre-processing

This activity involves three main tasks related to the preparation of the geo-referenced data to be used in subsequent activities.

Task 1.1 – Location of the project: the user provides a georeferenced file with the location of the project to be analyzed, through its respective upload on the platform. The files go through a verification process, through a specialized algorithm, and are later validated by specialists in Geographic Information Systems (GIS). If and when necessary, geographical corrections are applied before proceeding. A buffer area is applied according to the operational area defined in the registry of the project.

Task 1.2 – Satellite imagery: In order to calculate the NVP indicators for the project area (including the buffer area), satellite imagery from Sentinel-2 of the European Space Agency's Copernicus programme is obtained and analysed. Satellite imagery is collected considering the starting year of the project (as expressed by the user) and the current year of analysis. The images obtained are subject to correction processes (e.g. positioning, removal of clouds, joining of adjacent tiles, cropping of images, among others), whenever needed.

Task 1.3 – Preparation of validation: The NVP team gathers complementary and available information on land cover and other natural values to support the validation of any calculation in subsequent activities (i.e. ecosystem service indicators and natural capital metrics).

Activity 2 - Calculation of ecosystem services indicators

The calculation of NVP indicators involves three main steps, related to remote sensing indices.

Task 2.1 – Remote sensing indices: different remote sensing indices (RS) are calculated from satellite images, considering publicly available and well-established science-based evidence.

Task 2.2 – Ecosystem service indicators: from the RS indices determined in Task 2.1, ecosystem services indicators are calculated (Table A), expressed by the mean values and variability of the RS indices in each pixel of the satellite images, over the period under analysis.

Task 2.3 – Limit values: after the calculation of the RS indices and indicators, ranges of values or limit values are defined, from which the potential provision of ecosystem services or groups of services is expressed. The process is complemented by GIS and natural capital experts, who refine the identification of thresholds from the complementary information in Task 1.3.

Table A – Relationship between ecosystem services (ES) and the proposed remote sensing indices (RS) underlying the ES indicators. CICES stands for Common International Classification of Ecosystem Services.

| CICES Code | Class ES | RS Index |
|-------------------------------|--|--|
| 1.1.1.1 | Terrestrial plants cultivated as food | MSAVI - Modified soil adjusted vegetation index |
| 1.1.3.1 | Animals reared for food | NDVI - Normalized Difference Vegetation Index |
| 4.2.1.1 4.2.1.2 4.2.1.3 | Surface water intended for human consumption Surface water intended for human consumption (uses other than drinking water) Surface water for energy production | NDWI-2 - Normalized Difference Water Index (McFeeters) |
| 2.2.1.1 2.2.1.2 | Soil erosion control Attenuation of mass movements | SAVI - Soil-Adjusted Vegetation Index |
| 2.2.1.3. | Regulation of the hydrological cycle | NDWI-1 - Normalized Difference Water Index (GAO) |
| 2.2.1.5 | Fire protection | NBR - Normalized Burn Ratio |
| 2.2.2.1 2.2.2.2 2.2.2.3 | Pollination Seed Dispersal Habitat maintenance | NDVI - Normalized Difference Vegetation Index |
| 2.2.6.1 2.2.6.2 | Regulation of the chemical composition of the atmosphere and oceans Temperature and humidity regulation, including ventilation and perspiration | NDVI - Normalized Difference Vegetation Index |
| 3.1.2 | Intellectual and representational interactions with the natural environment (aesthetics + visitation) | NDVI - Normalized Difference Vegetation Index |

Activity 3 - Assessment of the natural capital balance sheet

The assessment of the natural capital balance is based on the ecosystem services indicators and is calculated following three tasks.

Task 3.1 – Calculation of natural capital metrics: the project area, in equivalent hectares, occupied by the pixels identified through the limit values determined in Task 2.3 is calculated, for each quarter of each year under analysis. This procedure allows a common value of the natural capital (NC) associated with each ecosystem service to be obtained, presented for the start date and end date of the project, as selected by the user.

Task 3.2 – Calculation of the natural capital balance: the natural capital balance (NCB) is understood as the variation in natural capital associated with all ecosystem services of the project, and to be calculated the values of each ecosystem service indicator are considered on the start and end dates of analysis. These values are compared to provide a measure of natural capital change expressed in gains or losses of equivalent hectares.

Task 3.3 – Calculation of the total natural capital balance: To determine the total NCB in the analysis area, the non-overlapping area between the changing ecosystem services is measured, taking into account the two defined periods (start and end).

Activity 4 - Data communication

The start and end dates of projects are dynamic and may change. Additionally, the user has the ability to combine different projects in NVP to get the combined data. The data generated by the previous tasks is organized in a matrix file and the user is able to export this data for additional reports suitable for dissemination, decision-making, analysis or other purposes.