METHOD PROFILE

Co$ting Nature

An online GIS-based tool for conservation planning that evaluates ecosystem services and their possible future changes.

In a nutshell

Co$ting Nature assesses the impact of human interventions on ecosystem services at the regional and local level. The tool provides information for assessing consequences of a project or policy prior to its implementation.

Co$ting Nature is a rule-based spatial model with a global dataset at 1-square km or 1-hectare resolution. The tool incorporates spatial models for biophysical and socio-economic processes along with scenarios for climate, land use and economic change. Co$ting Nature calculates a baseline for current ES provision and combines them with an analysis of current pressure, future threats, biodiversity and conservation priority to produce an assessment of priority areas for conservation management on the basis of all of these factors.

1. What information does the method provide?

Co$ting Nature provides information on how different policy interventions or future scenarios affect ecosystem services. It generates a set of spatial, statistical outputs: The tool starts by mapping individual services for water, carbon and tourism and then connects them with analysis of current pressure, future threats, biodiversity and conservation priority to generate an assessment of priority areas for conservation on the basis of all these factors.

The tool provides the following information:

- Raster maps of different environmental scenarios (downloadable in GIS format).
- Outputs are expressed in an index from 0-1 indicating relative conservation priority.
- Statistical models and graphs describing relationships between environmental threats or policy interventions and ecosystem services.

The tool distinguishes between “potential” and “realised” services.

2. Which ecosystem services can be assessed?

This tool focuses on multiple ecosystem services. In particular, it assesses hydrological services, carbon services, hazard mitigation services and tourism-related services but also provides information on beneficiaries and opportunity costs of conservation targets.

3. When and where can the method be applied?

Co$ting Nature focuses on ecosystem services provision and the assessment of human impacts on these services. Therefore the tool can be applied for e.g.:

- Supporting ecosystem services assessments or conservation prioritization.
- Analysis of co-benefits e.g. for REED+.
- Analysis of pressure and threats on carbon stocks and biodiversity.
- Analysis of specific planned agriculture, industrial or extractive interventions.

Co$ting Nature is particularly useful when a cheap, rapid and preliminary assessment of the impacts of policies or environmental influences on ecosystem services provisions is needed.
However, the tool merely gives an indication of the direction or trend of change in ecosystem services provisions given various factors of influence but cannot predict future magnitudes of change for a particular ecosystem service.

It is also not applicable if the user needs a locally calibrated model or when a micro-local assessment (<1km^2) is required.

4. How does the method work?

- The user firstly refers to baseline datasets representative of the current state of various ecosystem services.
- Subsequently, users select and apply various scenarios for climate, land use or land management change and investigate the impacts – in terms of change in ecosystem services – and implications for beneficiaries.
- All outputs are expressed in relative terms as indices from 0-1 globally. This uniform scale allows for a comparison of the state of ecosystem services across different scenarios. These indices are constructed through a combination of various factors that condition the functionality of a respective ecosystem service, e.g. the index for carbon services is made up of a component for carbon stocks as well as for carbon sequestration. These indices are available for the following ecosystem services: water provisioning services, carbon services, biodiversity, recreation, vulnerability to hazards.
- Several policy options are available which can be applied and their impacts traced through the socio-economic and biophysical systems. Analysing various environmental scenarios allows the user to compare the respective outcomes. The tool works with various global data sets.

The application is simple in its operation. Before running a simulation the user has to:

1. Define an area of interest (indicating latitude and longitude).
2. Select or prepare the data for upload. The tool provides a large amount of data from the internal data server on water-related -, carbon-, mitigating-, and tourism-related services that can be applied without any data mining. If you are using your own data, the respective data set needs to be formatted.
3. Choose policy options (e.g. climate change initiatives, infrastructure development, reforestation initiatives, anticipated conservation areas) or environmental threats (e.g. land use change, climate change) as the conditioning factor of interest.
4. Run the simulation to obtain output (indexed on a scale from 0 to 1).

5. What resources are required for applying the method?

The tool can be used at anytime and in any place with a reliable Internet connection and sufficient IT-equipment to run the assessments.

Time:

- Time requirement is low for running a simulation in Co$ting Nature. Application with the provided datasets takes only half an hour, once familiar with the tool.

Data:

- When using your own data sets instead of the system-internal data (Modules incl. conservation priority, water quantity, water quality, water provisioning services, carbon services, biodiversity, recreation, threats and pressures and vulnerability to hazards) additional time is required for data mining and preparation.

Costs:

- Co$ting Nature is free for non-commercial use. However, some additional costs apply for commercial use. Additional costs for the user may occur for GIS data preparation.

Skills:

- Some expertise is required regarding knowledge of GIS data and software knowledge about environmental processes in order to interpret the results is required. Regular training programs (for using GIS) and resources are available at www.policysupport.org/taining-course-shedule.

Equipment:

- ArcGIS 10 (with Spatial Analyst extension), Maxent maximum entropy modelling software when experimenting with self-collected data but the provider's data can be analysed without any GIS capacity.
- Additionally, the user's computer must also run the .NET Framework and Java.

6. What are the strengths and challenges?

Strengths	Challenges
• Comparison between various scenarios' impacts on ecosystem services • Free for non-commercial use • Results can be visualized online or download as a GIS file for further analysis • Large user community • Quantitative, spatially explicit analysis of environmental resources • Verification of output sensitivity to data uncertainties • Free-of-cost, rapid assessment method for institutions lacking GIS capacity • Large pool of data already available • Using available data for application anywhere globally at a range of scales • Fast and easy to learn due to a straightforward user interface as well as detailed documentation on how to use the application. Skills requirements are low	• Own data sets have to be formatted according to the application's requirements before uploading • Some knowledge of environmental processes and GIS software is necessary • Limited range of services modelled (more being added) • Global data sets can be misleading when applied at local scale • Cannot simulate climate change impacts, only land use and land cover change. • Common limitations and data shortcomings associated with statistical analysis. Program does not predict outcomes, but rather gives a rough approximation of how ecosystem services delivery might change under different scenarios. • Since the simulations are run on the provider's servers, the user can only store a limited number of simulations at a time. Therefore the provider advises to download the results of a simulation and delete it on the server in order to start a new one.

7. Case study example

Case Study	**The future of Yasuni (Ecuador)** Yasuni national park (Ecuador) is one of the most biodiverse places on earth. Yasuni is also key for the provision of several ecosystem services (water, carbon, hazard mitigation and nature based tourism). In this case study, Co$ting Nature is applied to examine what impact new infrastructure projects for oil extraction might have on the park's ecosystem. The impact of deforestation on ecosystem services is compared between a scenario with effectively functioning protected areas and one with poorly consolidated protected areas. The Co$ting Nature land use change module assumes that deforestation and forest degradation continues at the highest of current rates for a further 50 years. In order to examine the effects of deforestation on ecosystem services in the Yasuni national park, data on current deforestation rates are related to indices on various ecosystem services such hydrological services, climate regulating services and biodiversity. Almost all of Ecuador's remaining forests would be lost in the scenario with poorly consolidated protected areas, with clearly better results in case of effective conservation. Effective protected areas would improve the situation dramatically for biodiversity - in particular for population viability - and less so for carbon and water, preventing deforestation for some 7 % of the area. Availability of high quality freshwater for Ecuador could fall by 30 % relative to current levels for the scenario without effective protected areas and still 23 % for a scenario with effective PA's. Both scenarios assume for the Amazon water resource and quality issues similar to those currently experienced in the intensively used parts of the Andes. This would have immediate consequences for the local population. With regard to climate change mitigation, the assessment indicates that under both scenarios carbon stock in the Ecuadorian Amazon will fall significantly, by 0.4 billion tons without effective protected areas, and by 0.3 billion tons with them. URL:http://www.policysupport.org/costingnature/example-applications/the-future-of-yasuni
Website	Official website for Co$ting Nature with overview of publications and case studies: URL: http://www.policysupport.org/costingnature

8. Further guidance

Websites	Model and data documentation can be found here: URL: https://docs.google.com/document/d/19jje32EeuiBZk_ibRkwT4sAObYsbdiVxp6Vh0sZDGAs/edit System (interface and functionality) can be found here: URL: https://docs.google.com/document/pub?id=1t_JxjV82A58YoaAxS-LZRrYMoxhFYJYZD3qbjCCtMIo A presentation of the science behind the application can be found here: URL: https://docs.google.com/file/d/0B5Wf1ntCjOObdGFHcjVaSHl6ZXM/edit
Video	Webinar: Demonstration of Co$ting Nature (plus Water World): URL: http://vimeo.com/101279787

References:

The case study is based on information given by:

Silvestri, S., Kershaw, F. (eds.) (2010): Framing the flow: Innovative Approaches to Understand, Protect and Value Ecosystem Services across Linked Habitats, UNEP World Conservation Monitoring Centre, Cambridge.

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Compiled by: Sebastian Müller (GIZ), 2015/08
Contact: info@aboutvalues.net

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