



can paying 4 global ecosystem services reduce poverty?

les paiements pour les services écosystémiques globaux peuvent-ils réduire la pauvreté? [www.p4ges.org](http://www.p4ges.org)

# Co\$ting Nature baseline for Madagascar (1km resolution)

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UNIVERSITY OF TWENTE.



Co\$ting  
Nature



This PSS is a testbed for the development and implementation of conservation strategies focused on sustaining and improving ecosystem services. It also focused on enabling the intended actions on ecosystem service provision to be tested in silico before they are tested in vivo. The PSS incorporates detailed spatial datasets at 1-square km and 1 hectare resolution for socioeconomic processes along with scenarios for climate and land use. The PSS calculates a baseline for current ecosystem service provision and allows a series of interventions (policy) to understand their impact on ecosystem service delivery. The model integrates with a range of geobrowsers for immersive visualisation of outcomes. A series of scenario and intervention policy analysts, scientists and students in Spanish or English. Works best in the Mozilla Firefox browser. Your browser must have Javascript enabled and any pop-up blockers disabled. [Quick overview](#). Latest news-

[Model documentation](#)

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Password :

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Hyperuser

Language

English

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1. Open Firefox or Chrome browser (system does not work with IE). Log out of WaterWorld
2. Go to <http://www.policysupport.org/costingnature/training/level-2>
3. Normally you would access using <http://www.policysupport.org/costingnature>
4. Select your assigned training server and click the link. Type your assigned username and password for use today
5. Choose hyperuser
6. Hit the **Login button**



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Find  lat:  lon:  **B** Run name  **A** Step 1: Define area

Map Satellite

Tanzania Dar es Salaam  
Comoros  
Lusaka Malawi  
Harare Mozambique  
Zimbabwe  
Pretoria Johannesburg Swaziland  
Maputo  
einen Lesotho Durban  
Google

Madagascar [Country,1km]  
Kingman Reef [Country,1km]  
Kiribati(E hemi) [Country,1km]  
Kuril islands [Country,1km]  
Kuwait [Country,1km]  
Kyrgyzstan [Country,1km]  
Lao People's Democratic Republic [Country,1km]  
Latvia [Country,1km]  
Lebanon [Country,1km]  
Lesotho [Country,1km]  
Liberia [Country,1km]  
Libya [Country,1km]  
Liechtenstein [Country,1km]  
Lithuania [Country,1km]  
Luxembourg [Country,1km]  
Ma'tan al-Sarra [Country,1km]  
Macau [Country,1km]  
**Madagascar [Country,1km]**  
Madeira Islands [Country,1km]  
Malawi [Country,1km]  
Malaysia [Country,1km]

Mauritius Reunion

Map data ©2017 AfriGIS (Pty) Ltd, Google, ORION-ME 200 km Terms of Use

Current tile

- 1.STEP 1: at **A** use the dropdown list to find **Madagascar [country]** NOT Madagascar basin.
- 2.At **B** give the run a name (e.g. Madagascar)
- 3.Click on 'Step 1: Define area'



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Use: | [ecoengine for: costingnature v.2 \[.50\]](#) [[non-commercial use](#)] | [Disclaimer](#) | [Help](#) | | Disk: u:21 | d:103 GB | Mem: 27 % | Load: 0% |

| run **Madagascar (73 hrs.)** » alternative: baseline » database: baseline » parameter set: default **A**

Find  Go > lat:  lon:  Run name  Step 1: Define area

Map Satellite

Tanzania Dar es Salaam

Comoros Mayotte

Antananarivo

Madagascar

Mauritius Reunion

Zimbabwe Harare

Mozambique

Malawi

Zambia Lusaka

Swaziland Maputo

Pretoria Johannesburg

Lesotho Durban

Google

Map data ©2017 AfriGIS (Pty) Ltd, Google, ORION-ME 200 km Terms of Use

Current tile

1. The map will re-center on your area of interest (if it does not, click the green refresh button at **A**).
2. Your run name will change



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## Step 2: prepare data

1. Click on the **Step 2: Prepare data button (A)**

2. In the window that opens, click on '**Copy data to your workspace**' (B). The system will now take a few minutes to gather and copy the necessary data to your workspace on the servers. When the data is ready you can see the inputs by clicking the **+** (C)



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costingnature was developed with the  
[//ecoengine](#) framework.

Copy to workspace - Google Chrome

www1.policysupport.org/cgi-bin/simterra/v1/simterra/uti/file\_mgt.cgi?model=ecoengine&username=xyz07oalp%A360o%5Enaxmx79xo5

Use: | ecoengine for: costingnature v.2 [.50] [non-commercial use] | [Help](#) | [Disclaimer](#) | [amout.vansoesbergen \(hyperuser\)](#) » [Madagascar \(72 hrs.\)](#) » baseline »

baseline » default

Data ready.

show workspace data\_

The datasets that can be visualised and downloaded from this list depend up our licenses with the data providers, your license with us and whether or not you are using the commercial-use version of this system.

17 model mean precipitation change to 2050s (IPCC .. <sub>2</sub>					<a href="#">view by:</a>	
17 model mean temperature change to 2050s (IPCC SR.. <sub>2</sub>					<a href="#">view by:</a>	
Accessibility (seconds to nearest town of 50K popn.. <sub>2</sub>					<a href="#">view by:</a>	
Rainfall accumulated down flow lines (Hydro1k) (Mm3.. <sub>2</sub>					<a href="#">view by:</a>	
Presence of mines (unique id) <sub>2</sub>					<a href="#">view by:</a>	
Endemism richness for (IUCN redlist) amphibians (d.. <sub>2</sub>					<a href="#">view by:</a>	
Species richness for (IUCN redlist) amphibians (sp.. <sub>2</sub>					<a href="#">view by:</a>	
Mean slope upstream (>10 deg) (degrees) <sub>2</sub>					<a href="#">view by:</a>	
Alliance for Zero Extinction site (2012) (unique I.. <sub>2</sub>					<a href="#">view by:</a>	
Endemism richness for (IUCN redlist) birds (dimens.. <sub>2</sub>					<a href="#">view by:</a>	
Species richness for (IUCN redlist) birds (species.. <sub>2</sub>					<a href="#">view by:</a>	
Carbon stock (tonnes C/km2) <sub>2</sub>					<a href="#">view by:</a>	
Cell area (fraction*100000) <sub>2</sub>					<a href="#">view by:</a>	
Cereal crop fraction (fraction) <sub>2</sub>					<a href="#">view by:</a>	
Underweight population under 5 years old (Estimate.. <sub>2</sub>					<a href="#">view by:</a>	

costingnature was developed with the [//ecoengine](#) framework.

## Step 2: prepare data

1. Most maps can be viewed online.
2. Click on the view icon (A) for any available map to interrogate the data and to see if you have selected the correct study area



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| run: [Madagascar \(73 hrs.\)](#) » [alternative: baseline](#) » [database: baseline](#) » [parameter set: default](#) |

Find  lat: 18.776 lon: 45.8223 Run name: Madagascar [Country 1km] Step 1: Define area

Current simulation - Google Chrome

[www1.policysupport.org/cgi-bin/simterra/v1/simterra/pss/controls.cgi?model=ecoengine&username=xyz07oalp%A360o%5Enaxmx](#)

Use: | [ecoengine](#) for: [costingnature v.2 \[.50\]](#) [[non-commercial use](#)] | [Help](#) | [Disclaimer](#) | | » [arnout.vansoesbergen \(hyperuser\)](#) » [Madagascar \(73 hrs.\)](#) » [baseline](#) » [baseline](#) » [default](#) |

Currently set to index maps globally rather than locally within tile. [Index locally.](#) **B**  
Use the following button(s) to control the simulation.

**C**

(You may close this window, break your connection or switch off the computer. The simulation will continue).  
(If the refresh button does not refresh the progress bar, click Start simulation again on the main menu to refresh this window).

0 %  
activity : waiting | timestep: 0 of 12

Map data ©2017 AfriGIS (Pty) Ltd, Google, ORION-ME | 200 km | | [Terms of Use](#)

Current tile

## Step 3: Start simulation

1. Click **Step 3: start simulation (A)**
2. **Click index locally** so maps scale 0-1 within your study area) instead indexed globally (for comparing around the world). Default is globally
3. Press **Start (C)** to run the simulation. Runs only take a few minutes.



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explore:

set-up:  
[Step 2: Prepare data](#)

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www1.policysupport.org/cgi-bin/simterra/v1/simterra/pss/controls.cgi?model=ecoengine&username=xyz07oalp%A360o%5Enaxnm79xo%

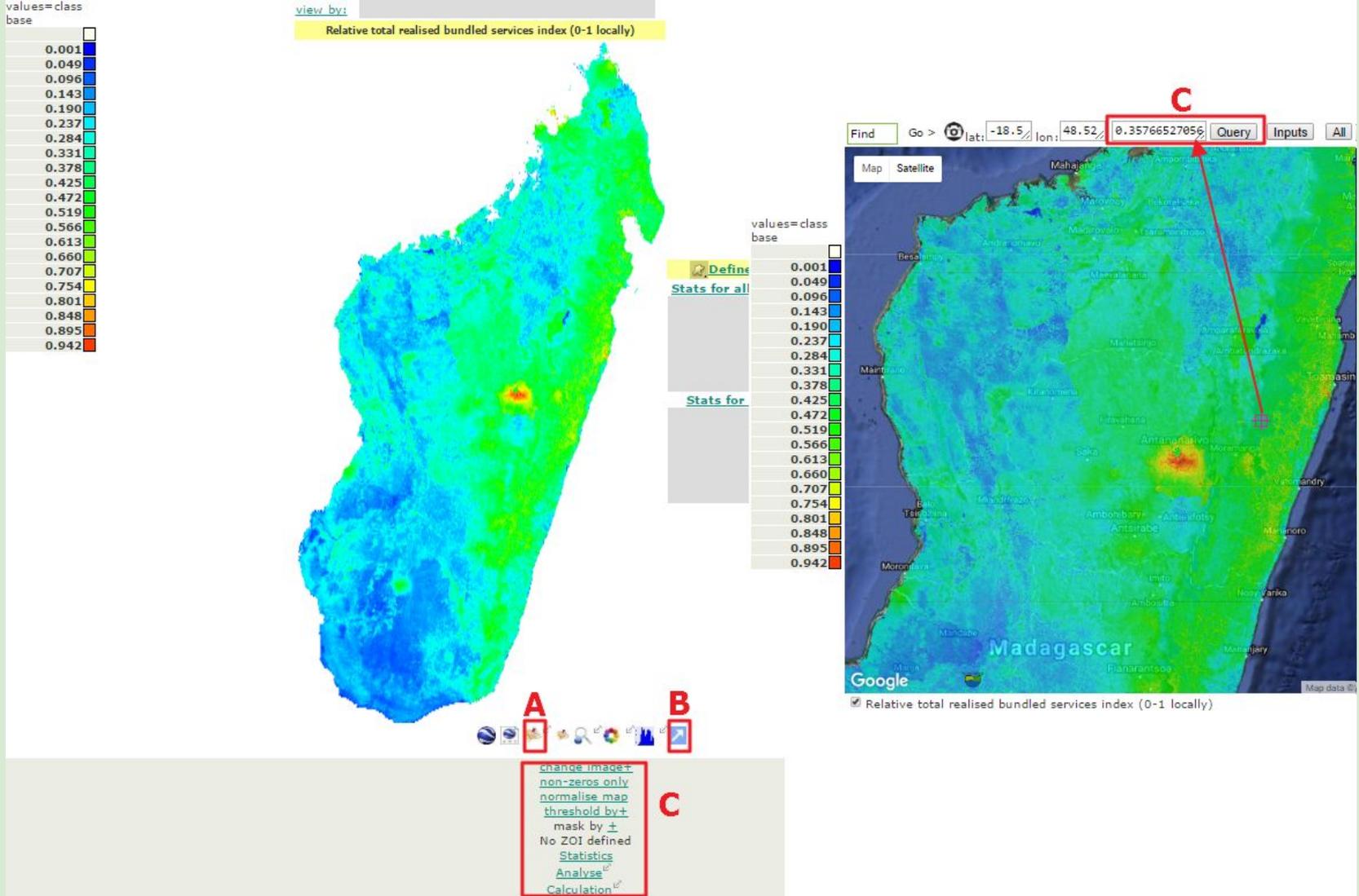
Use: | ecoengine for: costingnature v.2 [.50] [non-commercial use] | [Help](#) | [Disclaimer](#) | < | | » arnout.vansoesbergen (hyperuser) » [Madagascar \(72 hrs.\)](#) » baseline » b

nature conservation priority index (potential services)	Pressured and threatened conservation priority areas with high potential service provision	
Relative biodiversity priority index	Relative richness and endemism for redlisted mammals, reptiles, amphibians, birds	
Relative delphic conservation priority index	Conservation priority by overlap of EBAs (Birdlife), Global200 Ecoregions (WWF), Hotspots (CI), Last of the Wild (WCS,CIESIN), Important Bird Areas (Birdlife) and Key Biodiversity areas (IUCN, BI, PI,CI)	
Relative pressure index	Current pressure according to population, wildfire frequency, grazing intensity, agricultural intensity, dam density, infrastructure (dams,mines,oil and gas, urban) density	
Relative threat index	Future threat according to accessibility, proximity to recent deforestation (MODIS), projected change in population and GDP, projected climate change, current distribution of nighttime lights	
Relative total potential bundled services index	Total potential services including water, carbon, nature based tourism and hazard mitigation services	
Relative total realised bundled services index	Total realised services including water, carbon, nature based tourism and hazard mitigation services	<b>A</b>
Greatest relative total realised bundled service	Greatest realised service (water, carbon, nature based tourism and hazard mitigation)	

[Refresh](#)  
[Close window](#)

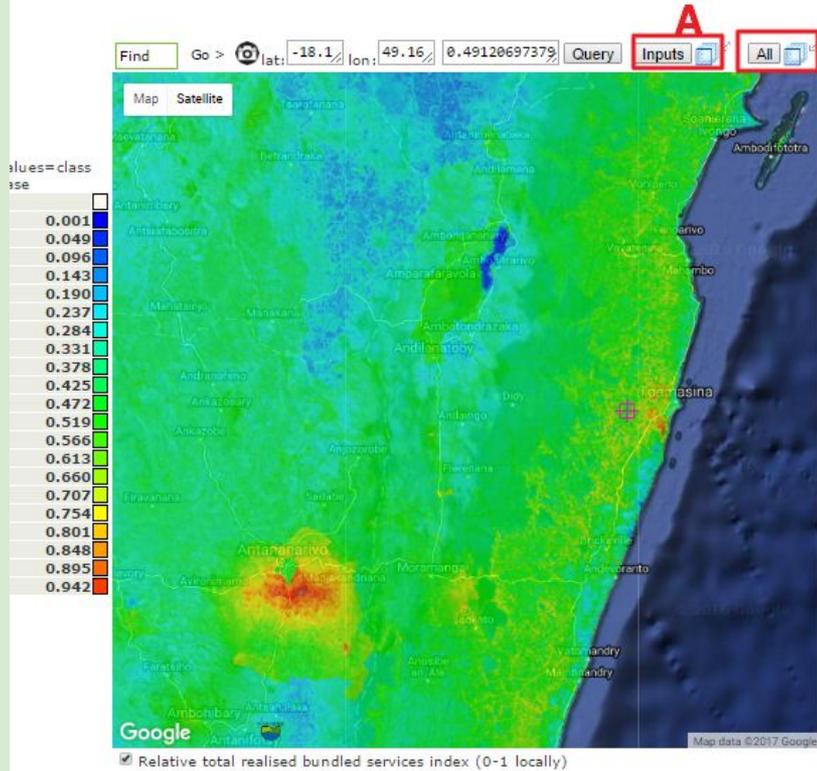
### Step 5: Results maps

1. We are skipping Step 4 as we want to look at the baseline results
2. Key results are presented
3. To view them, click the view map icon. Do so for the map Relative total realised bundled services index (A). Simpler indices towards bottom, aggregate ones towards top of list



**GEObrowse: view the data**

Click **(A)** to view in Google Maps. To read the value at a point drag the map until the cross hair is over the point of interest and click **Query (C)**. You can also pop the map out for comparison with other maps **(B)**, change colour scales, mask, normalise or get statistics as well as a few other options **(C)**.



Baseline: Values at LAT -18.177028962551, LON: 49.163271411713 VALUE: 0.49

**A** [Show all](#)

Variable	Baseline	Units
Relative potential carbon value index	0.65	0-1 locally
Relative realised nature-based tourism index	0.0027	0-1 locally
Relative realised water provisioning services index	0.012	0-1 locally
Relative realised hazard mitigation ecosystem services	0.32	0-1 locally

[download as excel](#)

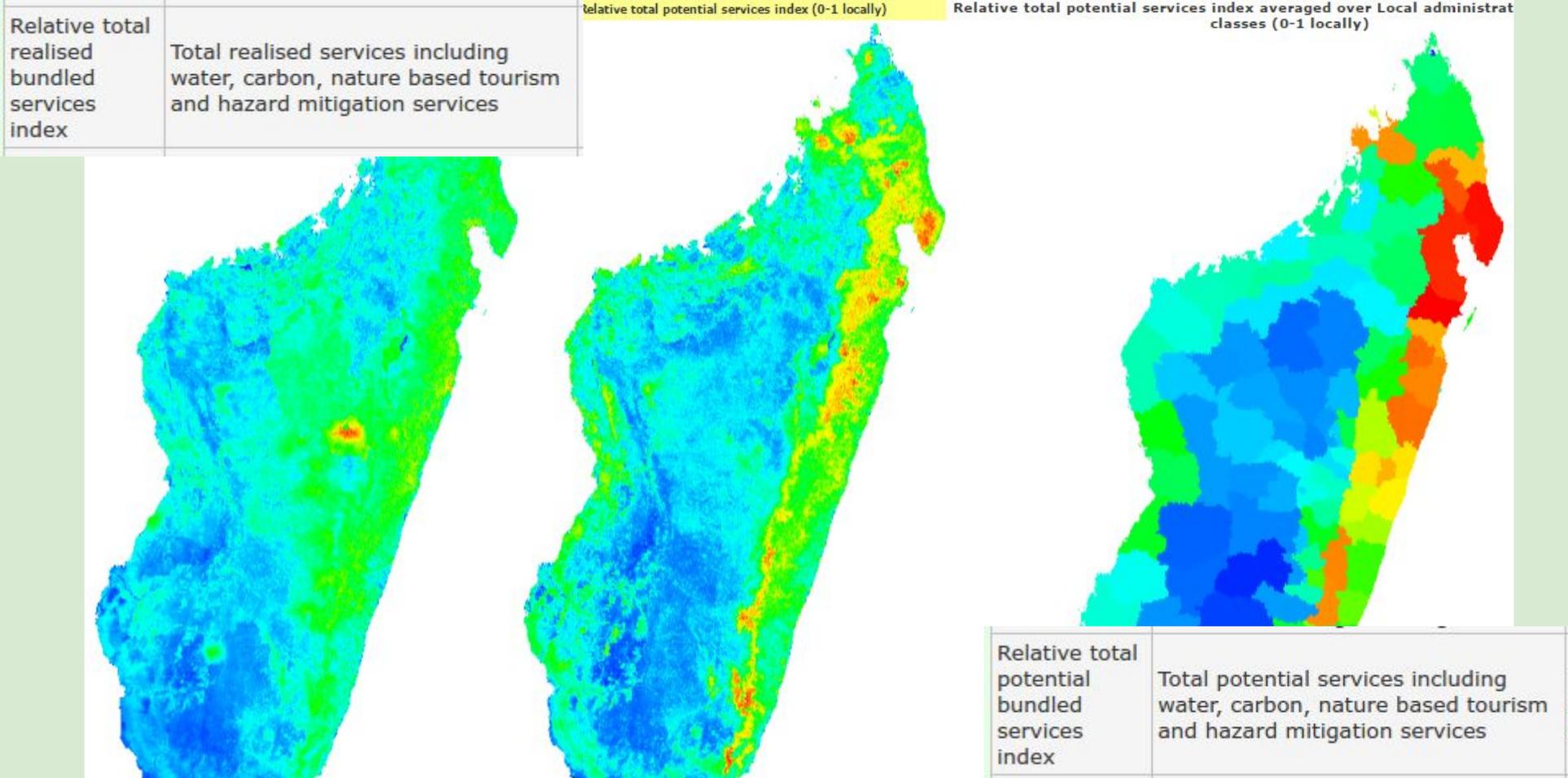
Baseline: Values at LAT -18.177028962551, LON: 49.163271411713 VALUE: 0.49

**B**

Variable	Baseline	Units
Relative socio-economic vulnerability to hazards (result)	1	0-1 locally
Relative untapped nature-based tourism index (result)	0.5	0-1 locally
Relative total untapped services index (result)	0.44	0-1 locally
Relative total realised bundled services index (result)	0.49	0-1 locally
Relative total development priority index (realised services) (result)	0.36	0-1 locally
Relative total ES and nature conservation priority index (realised services) (result)	0.49	0-1 locally
Relative total potential services index (result)	0.51	0-1 locally
Relative total nature conservation priority index (result)	0.4	0-1 locally
Relative total locally realised services index (result)	0.19	0-1 locally
Relative total globally realised services index (result)	0.58	0-1 locally
Relative total development priority index (potential services) (result)	0.43	0-1 locally
Relative total ES and nature conservation priority index (potential services) (result)	0.55	0-1 locally
Relative ES relevant risk (exposure x vulnerability) (result)	0.17	0-1 locally
Species richness of red-list species (mammals, amphibians, reptiles, birds) (result)	140	taxa
Relative threat index (result)	0.16	0-1 locally
Relative pressure index (result)	0.14	0-1 locally
Relative realised water provisioning services index (result)	0.012	0-1 locally
Relative realised nature-based tourism index (result)	0.0027	0-1 locally
Relative realised hazard mitigation ecosystem services (result)	<a href="#">show</a>	0-1 locally
Ratio of locally to globally realised services (result)	<a href="#">show</a>	ratio
Relative potential water provisioning services index (result)	<a href="#">show</a>	0-1 locally
Relative potential nature-based tourism index (result)	<a href="#">show</a>	0-1 locally
Relative potential hazard mitigation ecosystem services (result)	<a href="#">show</a>	0-1 locally
Relative potential carbon value index (result)	<a href="#">show</a>	0-1 locally
Relative potential for ES relevant hazard (result)	<a href="#">show</a>	0-1 locally
Relative socio-economic exposure to ES relevant hazard (result)	<a href="#">show</a>	0-1 locally

## GEOBROWSE 2: view inputs

In addition to querying the value at a point you can view the values of the inputs for any map in Google maps mode. Click on **inputs** and a blue icon will become available (**A**). Clicking on this will open a new window with all input maps and values. To view the values of all model results at that point, click **All** and the **blue icon** (**B**) which opens another window.



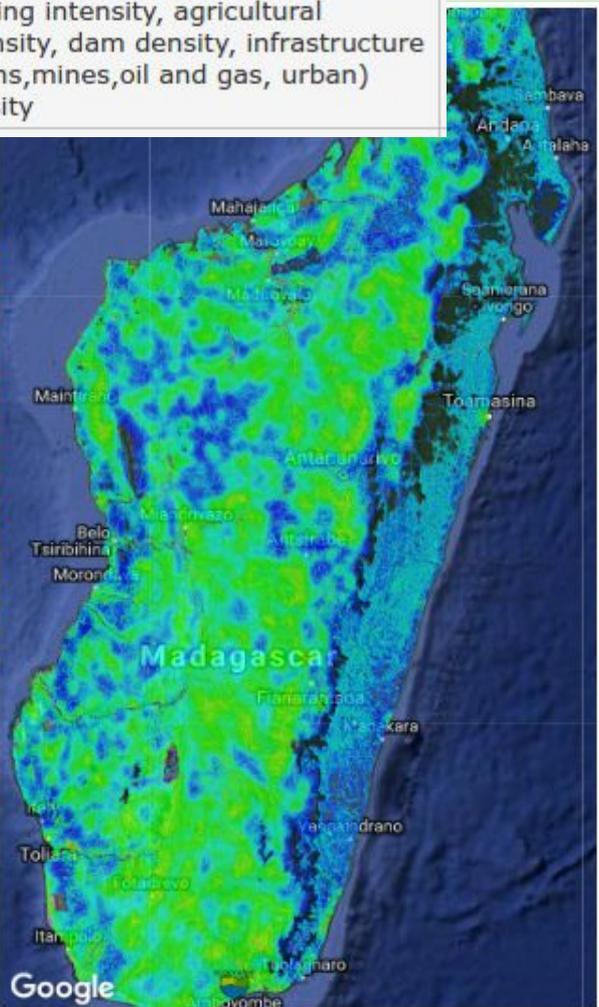
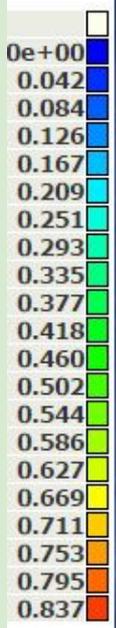
## Results: bundled Ecosystem Services:

- CN maps sites of service production
- Realised bundled services (left) particularly high in and near densely populated areas (Tana) since they depend on supply to beneficiaries
- Potential bundled services (middle and right, by admin regions) are higher along the east coast (carbon, water provisioning, hazard mitigation) since they are **irrespective of provision to current beneficiaries (future services, services not yet realised)**

Relative pressure index

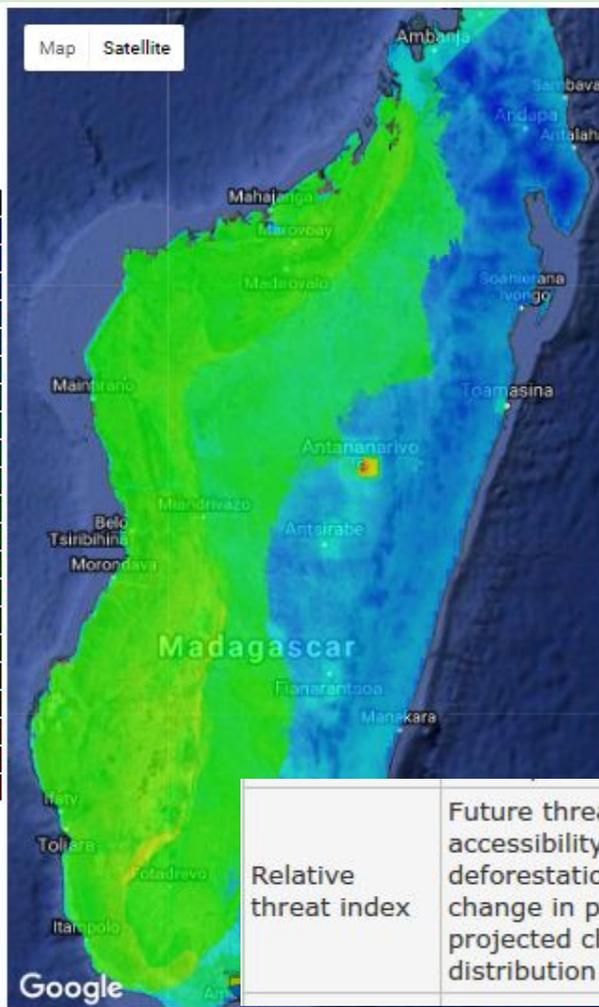
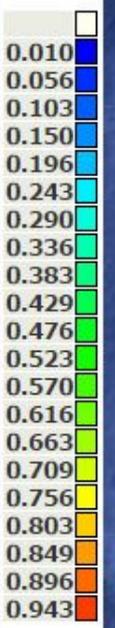
Current pressure according to population, wildfire frequency, grazing intensity, agricultural intensity, dam density, infrastructure (dams, mines, oil and gas, urban) density

s=class



Relative pressure index (0-1 locally)

=class

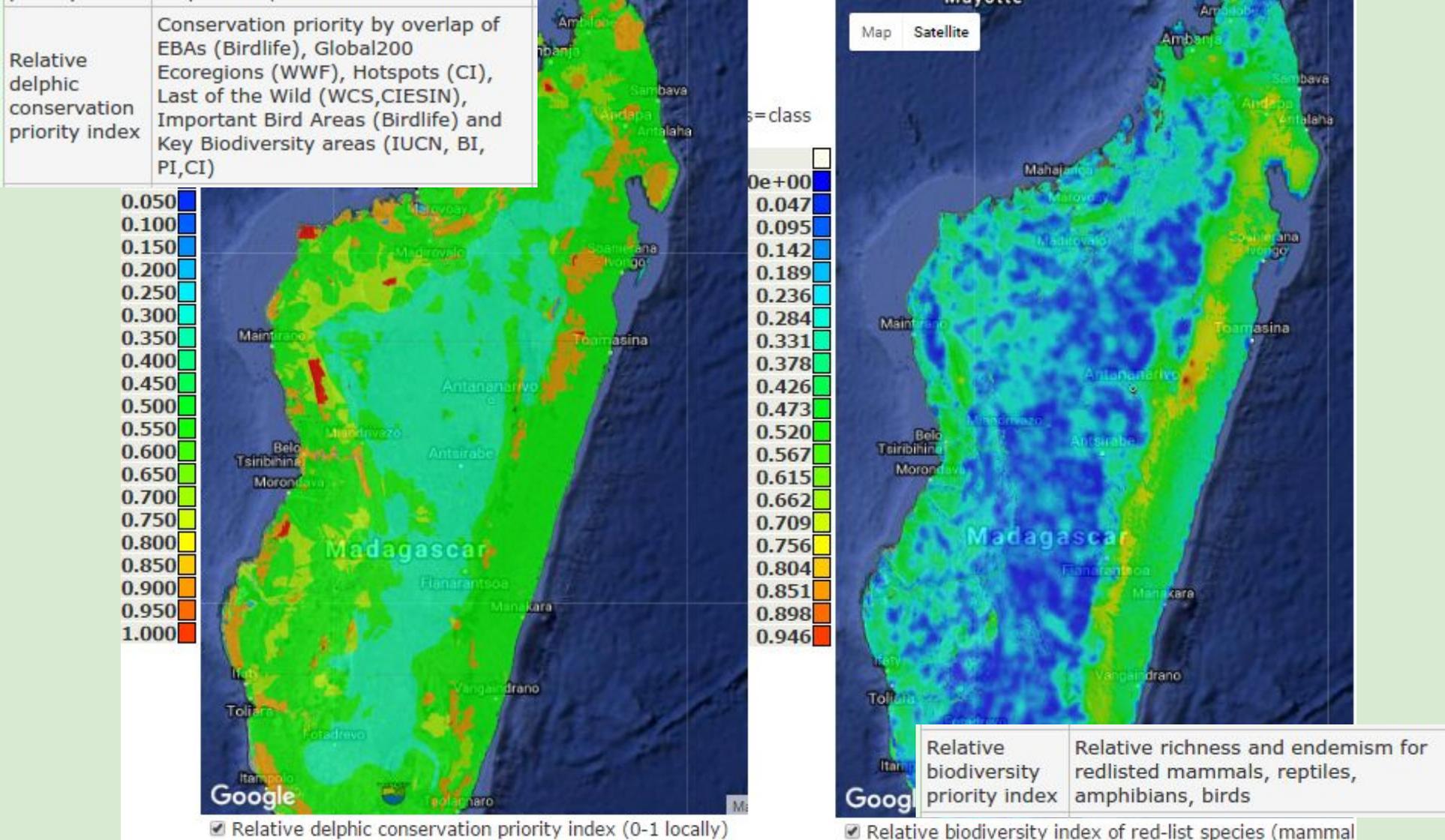


Relative threat index (0-1 locally)

Relative threat index	Future threat according to accessibility, proximity to recent deforestation (MODIS), projected change in population and GDP, projected climate change, current distribution of nighttime lights
-----------------------	---

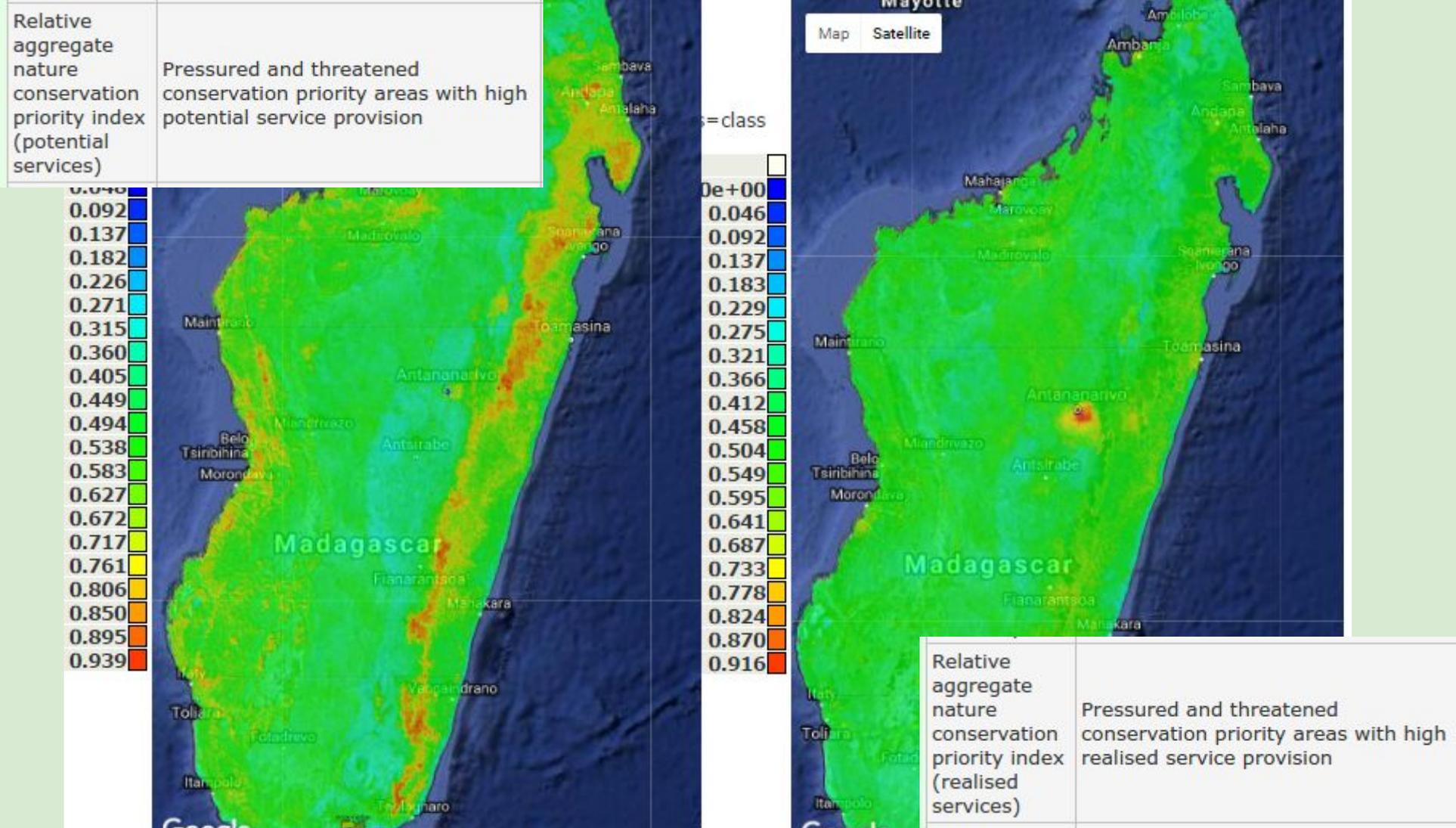
### Results: pressure and threat:

- Pressure variable. Differences mainly due to presence of roads, population and grazing. Low in CAZ, relatively. Could update inputs for e.g. new mining activity.
- Threat higher towards the west of the country, mainly due to higher agriculture (and oil and gas concessions).



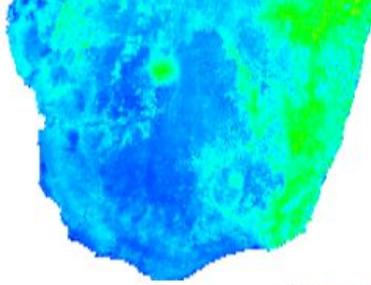
## Results: Conservation priority and biodiversity priority

- Many of the highest conservation priorities already protected areas
- Biodiversity values highest along the east coast (high species richness and low impact of land use change on species ESHs - Extents of Suitable Habitat)



Compound indices: where is high in ES but also under pressure and threatened

- Priority areas (potential services) (left): protect because threatened & **we will need their services in the future**
- Priority areas (realised services) (right): protect because threatened & **we use their services now**

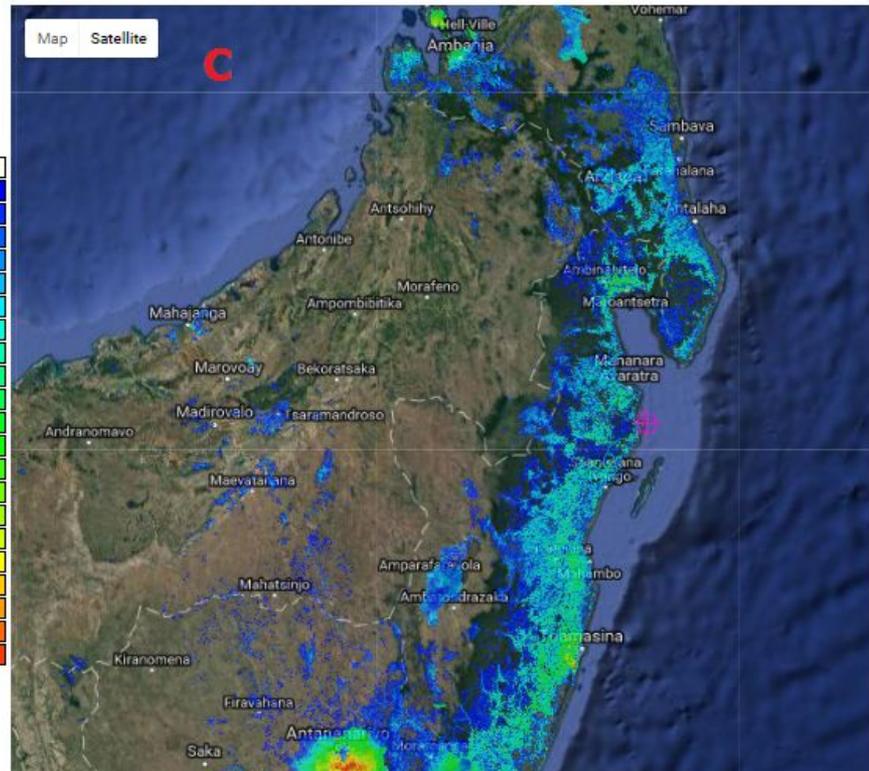
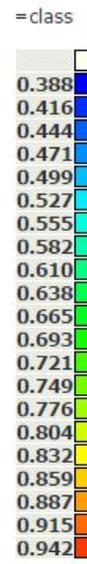


Show where values in this map are  this value:  in , exclude:

**B**



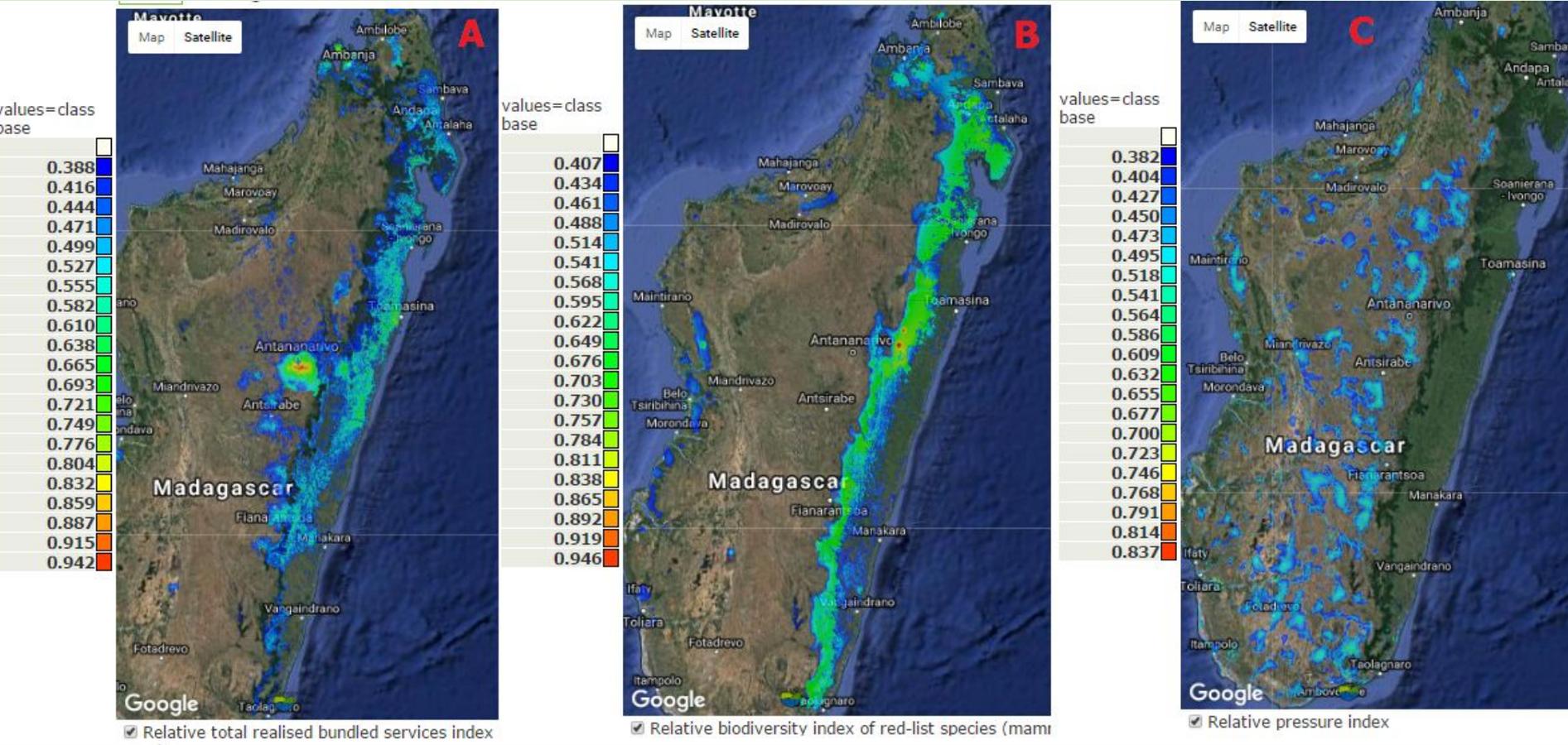
- [change image+](#)
- [non-zeros only](#)
- [normalise map](#)
- [threshold by+](#) **A**
- [mask by ±](#)
- [No ZOI defined](#)
- [Statistics](#)
- [Analyse](#)
- [Calculation](#)
- [Show world file \(for full res. map\)](#)
- [download+](#)



## Results: investigating policy targets

By thresholding a map we can look at the spatial location of highest or lowest values. Click on **threshold by** (A) underneath any map (example bundled realised services). This will open window (B) where you can set a threshold value (in % of land area or by values). In this example we look at the 17% of pixels with the highest values (**>83 per-cent**) resulting in the map shown in (C) in Google maps mode. We could also exclude already protected areas (not now)

# Investigate Aichi 2020 target: where are top 17% based on ES and biodiversity values

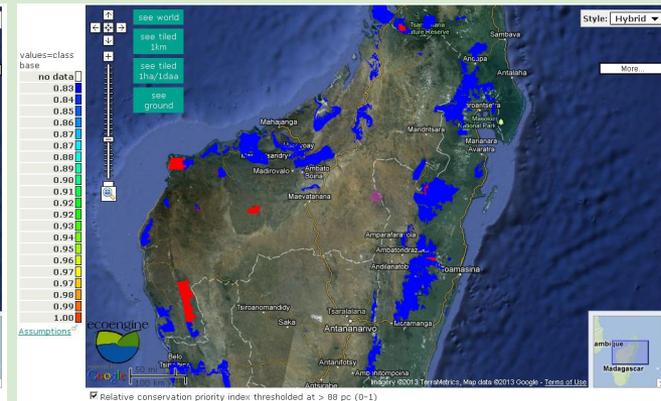
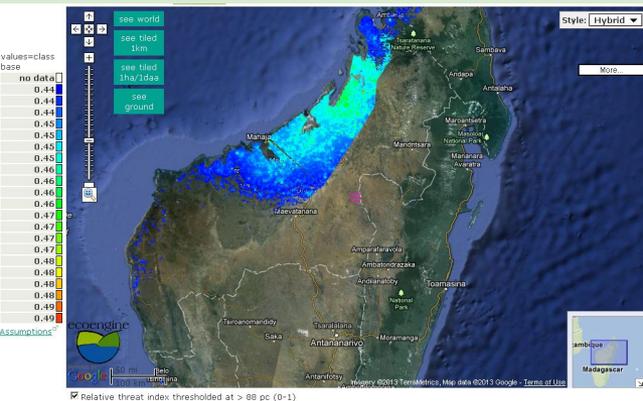
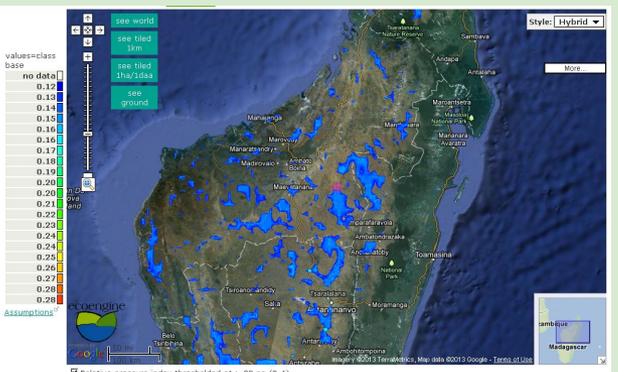
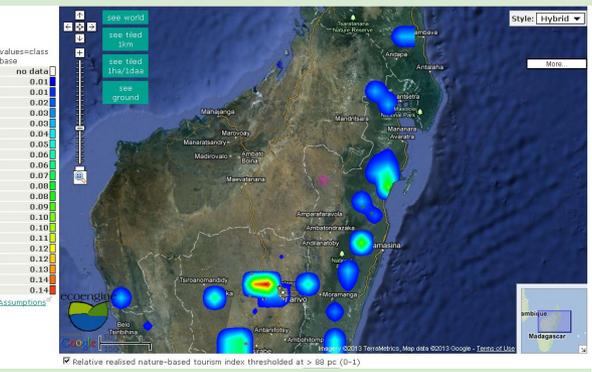
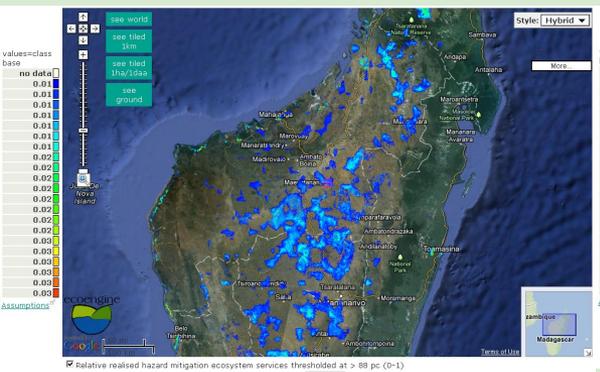
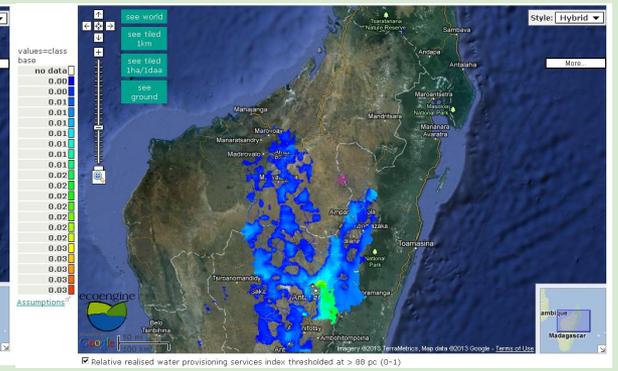
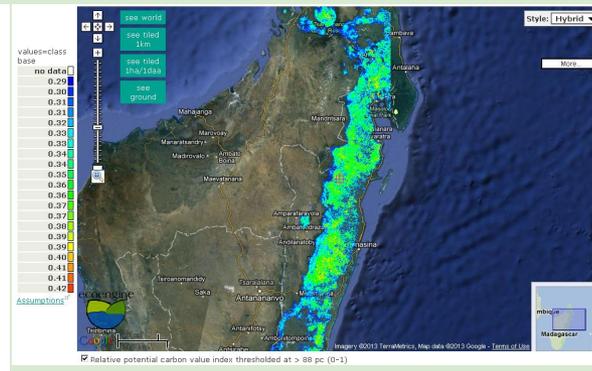


**Results**  
 Top 17% of realised ES (A), top 17% of biodiversity (B) and top 17% of current pressures (C)  
 Clearly in different places: **trade-offs**

# Investigate spatial and temporal trade-offs in ES provision

## Different priorities are greatest in different areas

**CN (policy options) allows weighting of different priorities to define an aggregate priority of greatest relevance to the local, national policy environment or conservation finance**



- Your WaterWorld account on the public servers also works for Co\$ting Nature