



can paying 4 global ecosystem services reduce poverty?

les paiements pour les services écosystémiques globaux peuvent-ils réduire la pauvreté? www.p4ges.org

WaterWorld: impacts of business as usual land use change for the CAZ

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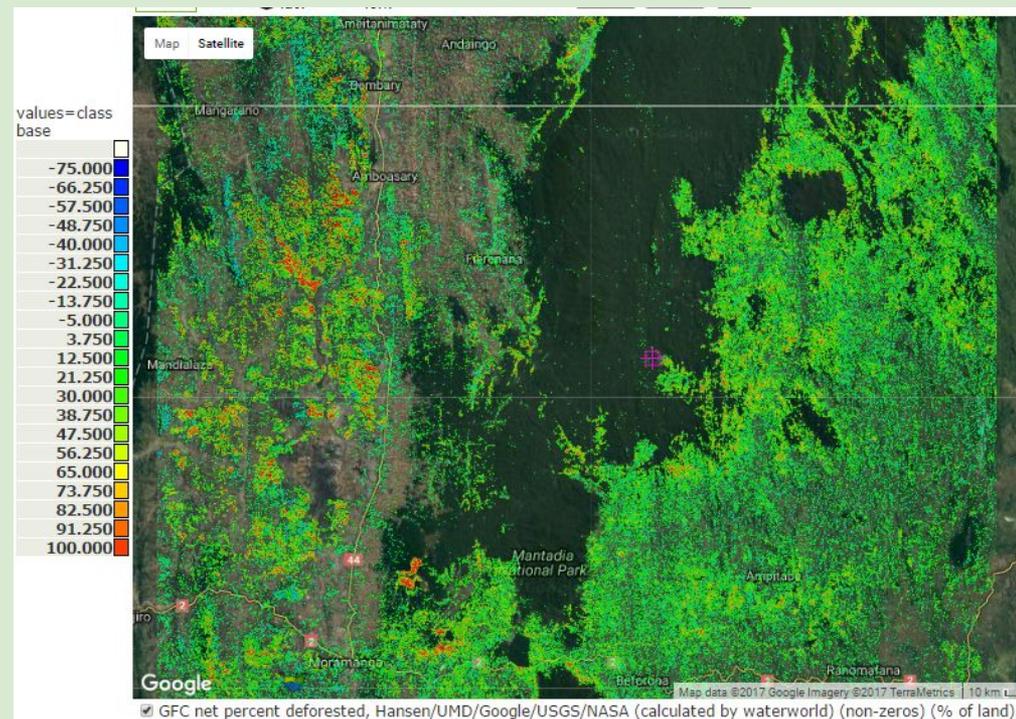


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Running a Business As Usual deforestation scenario in WaterWorld

- Project recent rates of deforestation forward for the next 30 years (based on GFC net loss data) and a land use change model.
- This is not the same scenario as run by Jenny Hewson for P4GES. Jenny used [Clark Labs land Change Modeller](#). We will use [QUICKLUC](#) in WaterWorld, which is similar
- Convert forest to most suitable agriculture for the pixel



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WaterWorld

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Policy options - Google Chrome

www1.policysupport.org/cgi-bin/simterra/v1/simterra/pss/controls.cgi?model=ecoengine&username=xyz07oalp%A360o%5Enaxnmx79xo%5E4t

Use: | ecoengine for: waterworld v.2 [.92] [non-commercial use] | Help | Disclaimer | » arnout.vansoesbergen (hyperuser) » CAZ1 (70 hrs.) » baseline » baseline » default

Click the scenario, intervention or uncertainty tool you would like to use (the tools available will depend on your licensed access level)

- Climate Change : assess impacts of climate change
- Land Use and Cover Change : assess impacts of land use change **B**
- Land and water management : implement land management policy options
- Change input maps : replace one or more of the input maps
- Extractives : examine impacts of mining or oil & gas
- Population : examine impacts of changes in population and demography

C

LAND USE AND COVER CHANGE: choose the scenario that you wish to apply.

[View recent land use and cover change](#)

FOREST TO HERBACEOUS and HERBACEOUS TO FOREST: Changing forest cover replaces forest (tree cover) with pasture or cropland (herb cover). Changes of between -99% and 99% represent selective deforestation and afforestation respectively. Deforest a given percentage per pixel of trees with e.g. -15 or reforest by a given percentage per pixel of trees e.g. 15. Specify where and by what percentage (per pixel) deforestation or reforestation should occur:

D

CREATE LAND COVER TYPE: For each row that you want to apply, set the corresponding percentage of tree, herb and bare soil functional types (FTs) per pixel to achieve the land cover that you wish, for example pasture might be 10% tree FT, 85% herb FT and 5% bare FT, a crop might be 10% tree FT 50% herb FT and 40% bare FT

[List baseline workspace data](#)

Step 4: policy exercises

Apply a scenario for land use change

1. Click **Step 4: Policy exercises from the main menu (A)**

2. Select Land use and cover change(**B**) and click on **Submit choice (C)** to see window (**D**)

...or run QUICKLUC (v2.1) land use change model: **A**

Name for my scenario **B**

Set/change tree, herb, bare covers: % % % **C**

using recent rate of loss by [compare](#) : for: years **D**. Multiply recent rate by: , and add (% forest loss/yr):

Include recent (fractional) forest cover losses greater than:

Allocate by agricultural suitability **E**

Include planned infrastructure (if available)

Include likely new transport routes **F**

Management effectiveness index (0-1):

where is this value:

other rules: [±](#)

Define converted areas as: **G** Fraction of water exposed to contamination: , or: scale the default for land use.

Mean conversion cost (USD per ha.):

H

Setting up the land use change model:

1. Select the QUICKLUC land use change model by clicking the + **(A)**
2. Give your scenario a name, e.g. BAU **(B)**
3. Set the % change values for the three land cover types to -100 for tree, and 0 for herb and bare **(C)**
4. Use the GFC net loss data for recent rates of tree cover loss and gain and project forward 30 years **(D)**
5. Allocate deforested pixels by agricultural suitability by selecting 'yes' at **(E)**
6. Include likely new transport routes in allocation by selecting 'yes' at **(F)**
7. Define converted pixels as most suitable agriculture for the pixel **(G)**
8. Once all the above values are set, click 'Check and Submit' **(H)** to build the scenario
9. You can develop a wide range of scenarios with this tool



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Runmodel do - Google Chrome

www1.policysupport.org/cgi-bin/simterra/v1/simterra/pss/scenarios.cgi?

Opening any other waterworld window while the scenario is building will return you to your baseline. You must then change back before running the scenario or you will inadvertently run the baseline instead.

Completed....

[Show baseline and scenario](#) **A**

[Stack further changes \(compound scenario\)](#)

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[Progressive scenarios](#)

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Compare maps - Google Chrome

www1.policysupport.org/cgi-bin/simterra/v1/simterra/images/images.cgi?model=ecoengine&&username=xyz07oalp%A360o%5Enaxnm79

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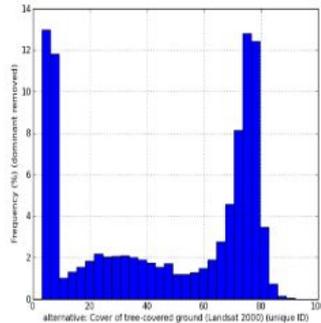
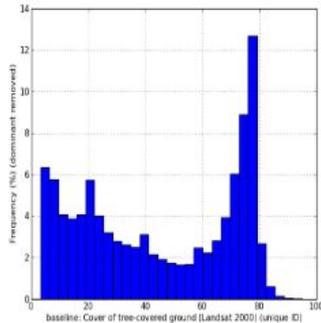
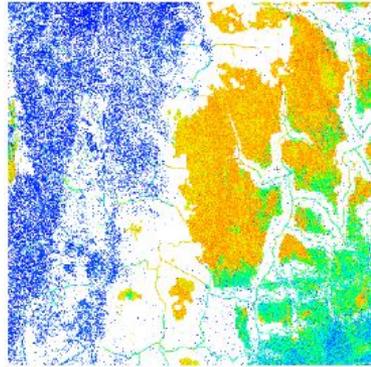
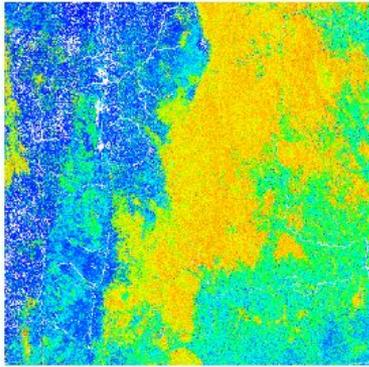
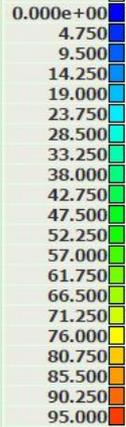
Croplands (2005)[±]
 Croplands (2005)[intensity][±]
 Pastures (2005)[±]
 Pastures (2005)[intensity][±]
 Cover of bare ground (Landsat 2000)[±]
 Cover of herb-covered ground (Landsat 2000)[±]
 Cover of tree-covered ground (Landsat 2000) **B**[±]
 Protected areas (UNEP-WCMC WCPA) 2014[±]
 Wetlands including lakes, rivers and reservoirs[±]

Once the scenario is built, click on **Show baseline and scenario (A)** to see what changes under your scenario (this will take a few minutes). You can then look at land use and land cover changes under your scenario. Look at **cover of tree-covered ground (B)**

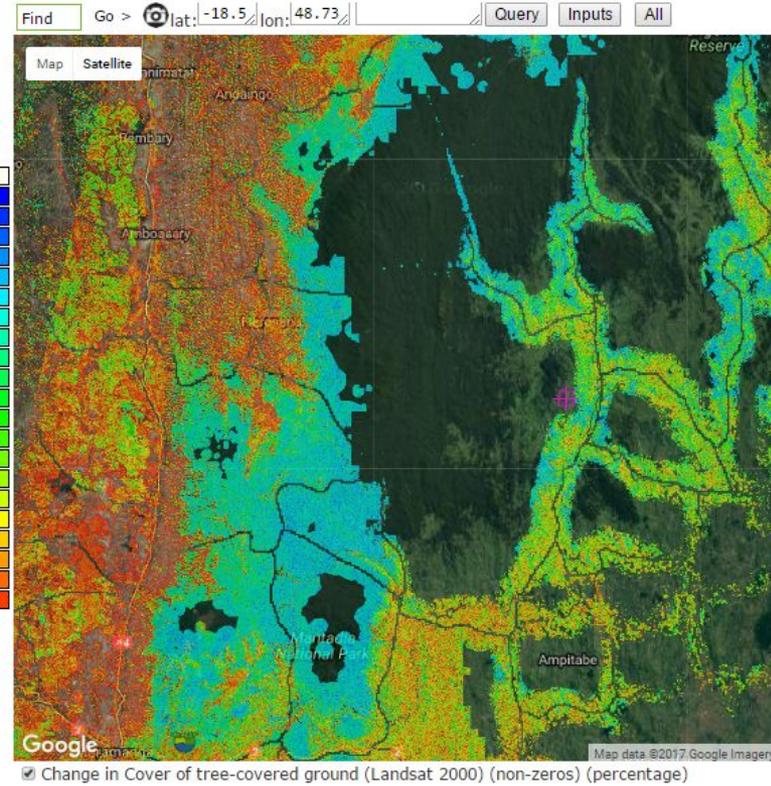
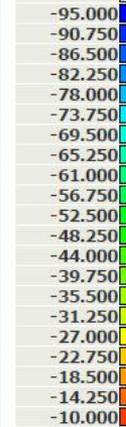
Min: 0
Max: 96
Mean: 41
Sum: 58,000,000
Count: 1,400,000

Min: 0
Max: 96
Mean: 21
Sum: 30,000,000
Count: 1,400,000

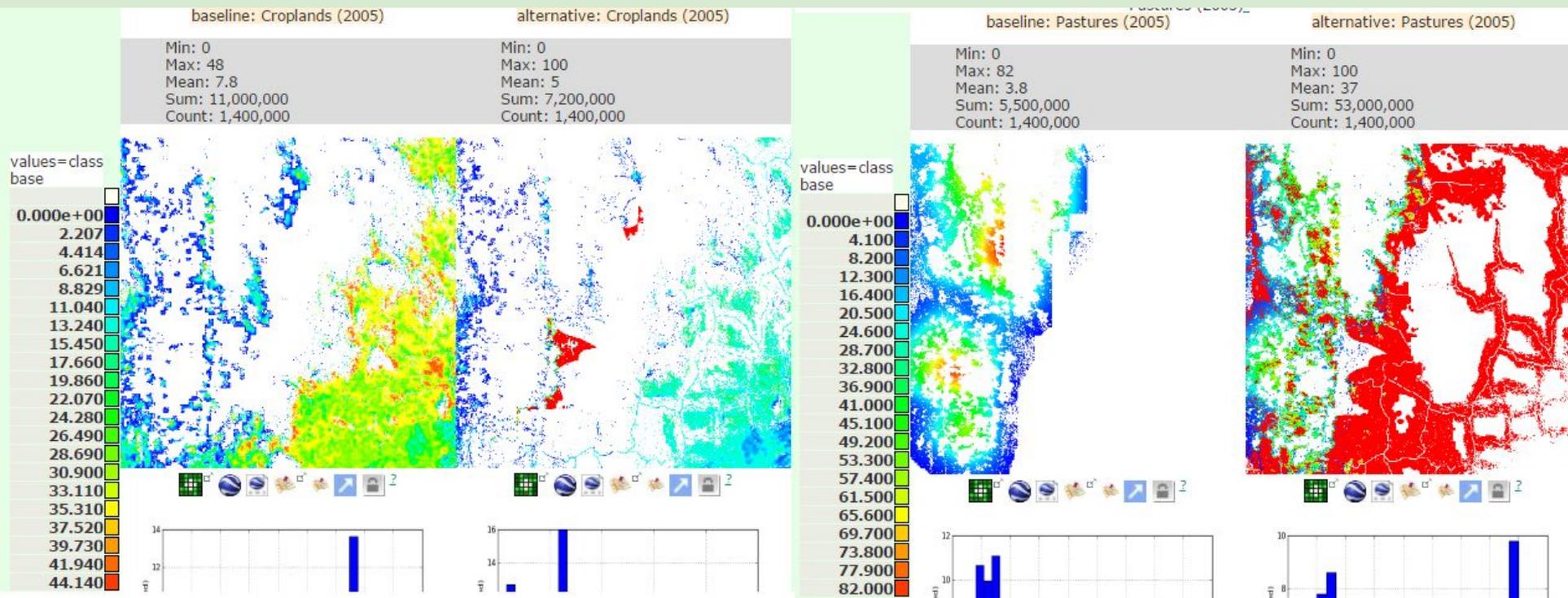
values=class base



values=class base



- Land use change scenario: tree cover changes
- Baseline and scenario tree cover remaining.
- The mean % tree cover decreases from 41% to 21%
- Difference (showing non-zero's only) between baseline and scenario shown on the right.
- The coloured areas have lost tree cover 0-100% from the scenario.
- There is no change in areas covered by tarmac, with no trees to start with or far from current and likely future access routes (these are transparent)



- Land use change scenario: change in cropland (left) and pastures (right).
- More of the area is suitable for grazing than cropland (according to the global datasets used)
- Therefore deforestation is mostly for pasture lands, increasing from around 4% to around 37%
- Allocating by existing agriculture (rather than suitability) would produce different results



Find

lat: -18.466 lon: 48.5714 Run name _Tiled 1km

Step 1: Define a

Runmodel do - Google Chrome

www1.policysupport.org/cgi-bin/simterra/v1/simterra/pss/scenarios.cgi?

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Completed....

A

[Show baseline and scenario](#)

[Stack further changes \(compound scenario\)](#)

Run scenario **B**

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Close the compare maps window and go back to the main scenario window (**A**). Click on **Run scenario** to start the scenario simulation (**B**).

The scenario will take around 15 minutes to run as before.

DISCUSSION/REST while model is running

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Results maps - Google Chrome

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

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The output datasets that appear on this list depend upon your licensed user level and whether or not you are using the commercial-use version of this system.

[Analyses, metrics and reporting](#)

- Costs mapping±
- Benefits mapping±
- Water quality mapping±
- Key output maps-

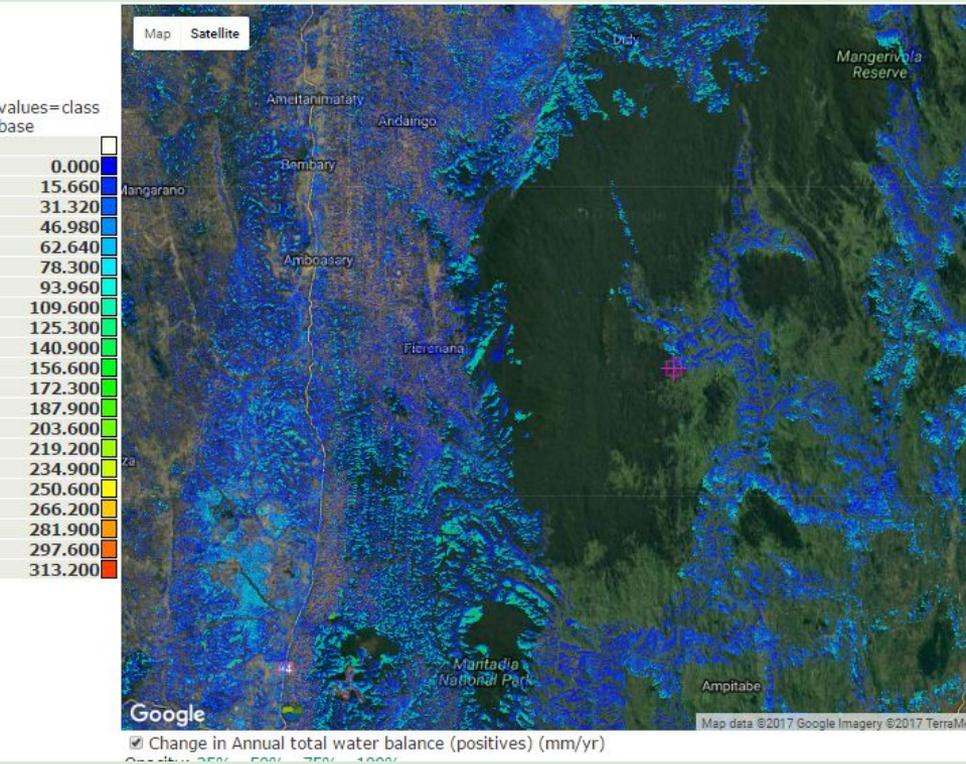
Name	Explanation	Change from baseline
Change in rainfall	Change in total annual (wind-driven) rainfall (mm/yr)	
Change in water balance	Change in local water balance (mm/yr) (rainfall minus actual evapotranspiration (AET). Where water balance is negative local AET is supported by upstream sources of water and/or groundwater)	B
Change in runoff	Change in total annual runoff (m ³ /yr). Calculated as water balance cumulated downstream. Negative water balance (AET > precipitation) in a cell consumes runoff from upstream.	
Change in hillslope net erosion	Change in hillslope net erosion (mm/yr). Net erosion (erosion minus deposition) on hillslopes	
Change in total net erosion	Change in total net erosion (mm/yr). Net erosion (erosion minus deposition) from hillslopes and channels (streams/rivers)	
Change in human footprint on water quality	Change in mean percentage of water that may be polluted (human footprint index, %)	

Land use change: step 5: results maps

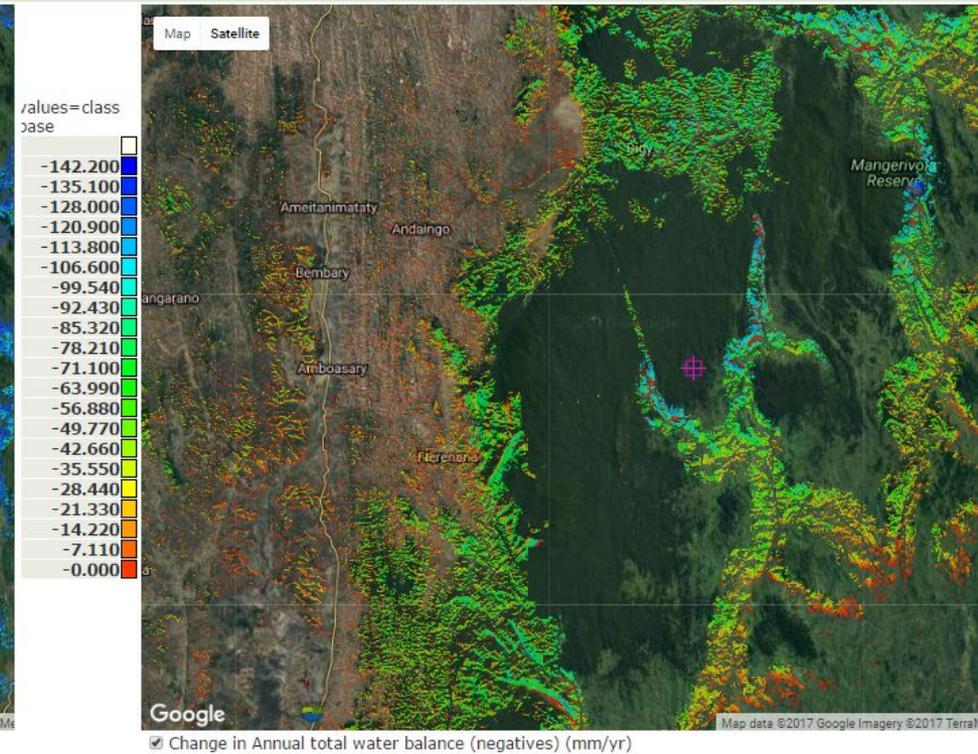
Once the run has completed, go back and click **Step 5: results maps (A)** from the main window.

Results now have a new compare icon as results will be expressed as difference from the baseline. Click on the change in water balance icon (**B**)

Change in water balance (positives only)

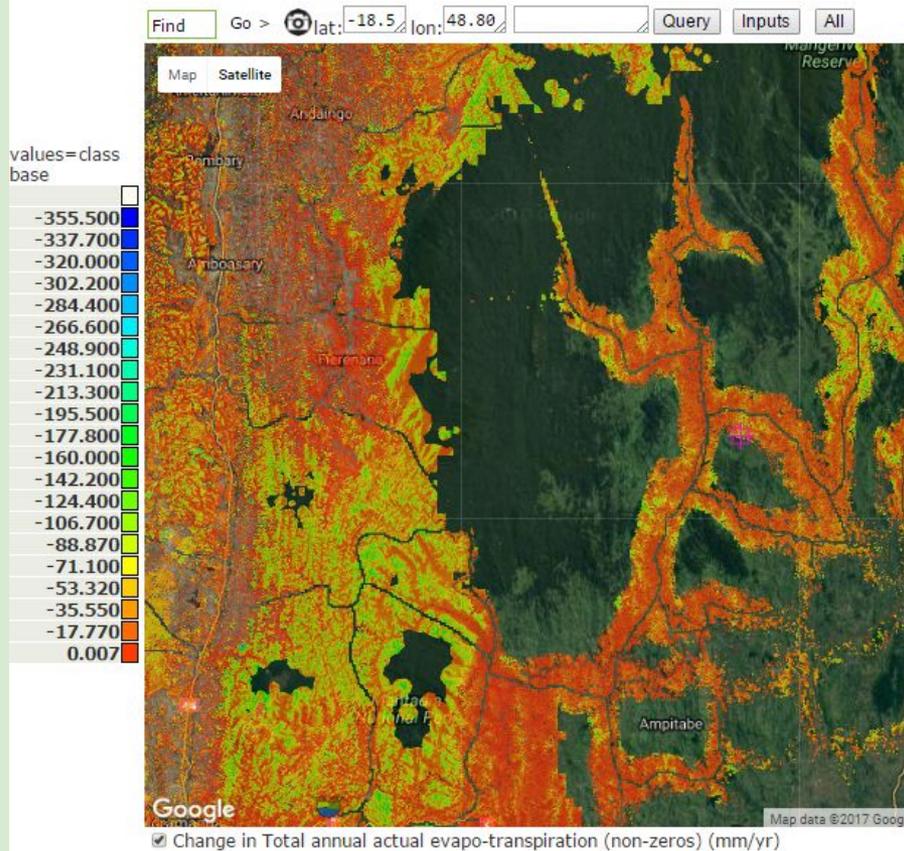


Change in water balance (negatives only)

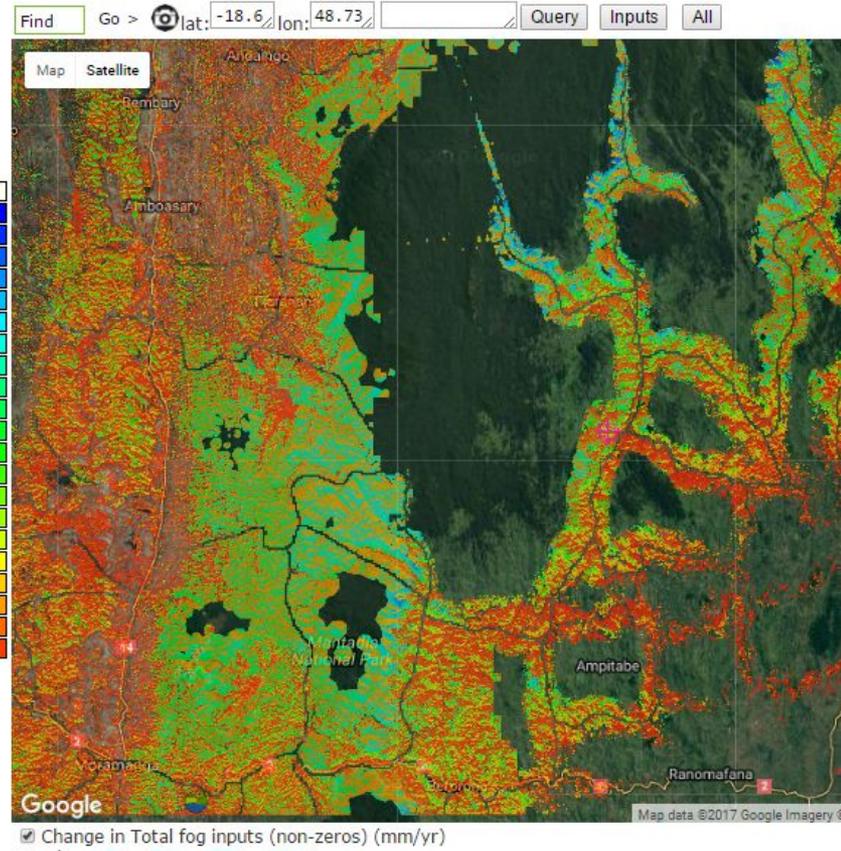


Water balance changes are variable over space:

- reduced water use (AET) by trees leads to increased water balance in some areas (left)
- but decreased cloud capture by trees results in decreases in water availability elsewhere (right), usually on steep, fog-exposed slopes



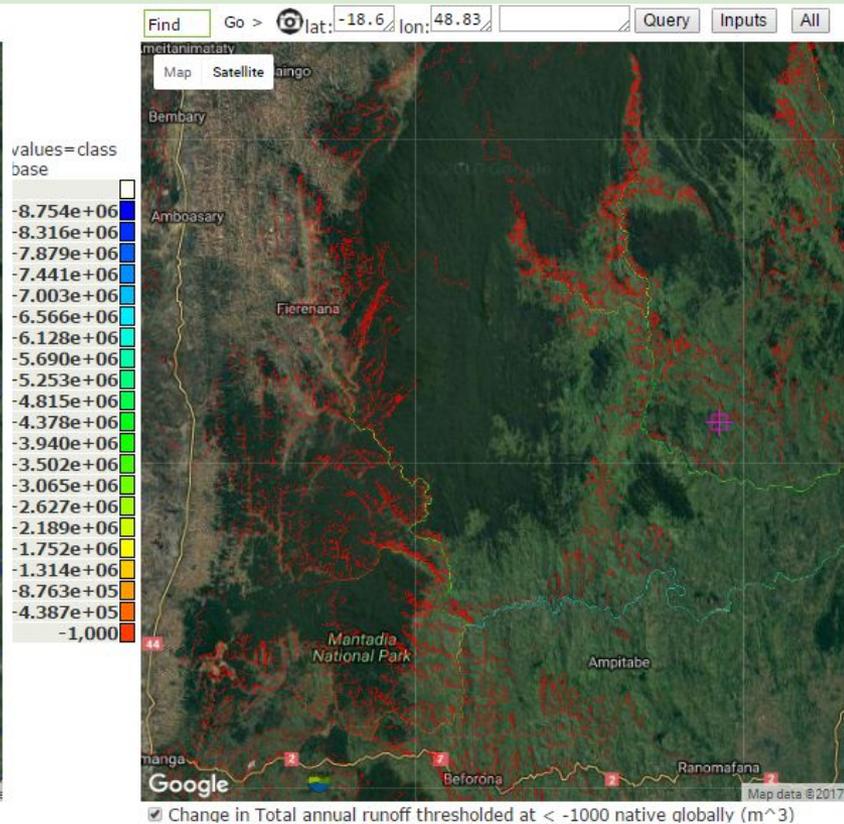
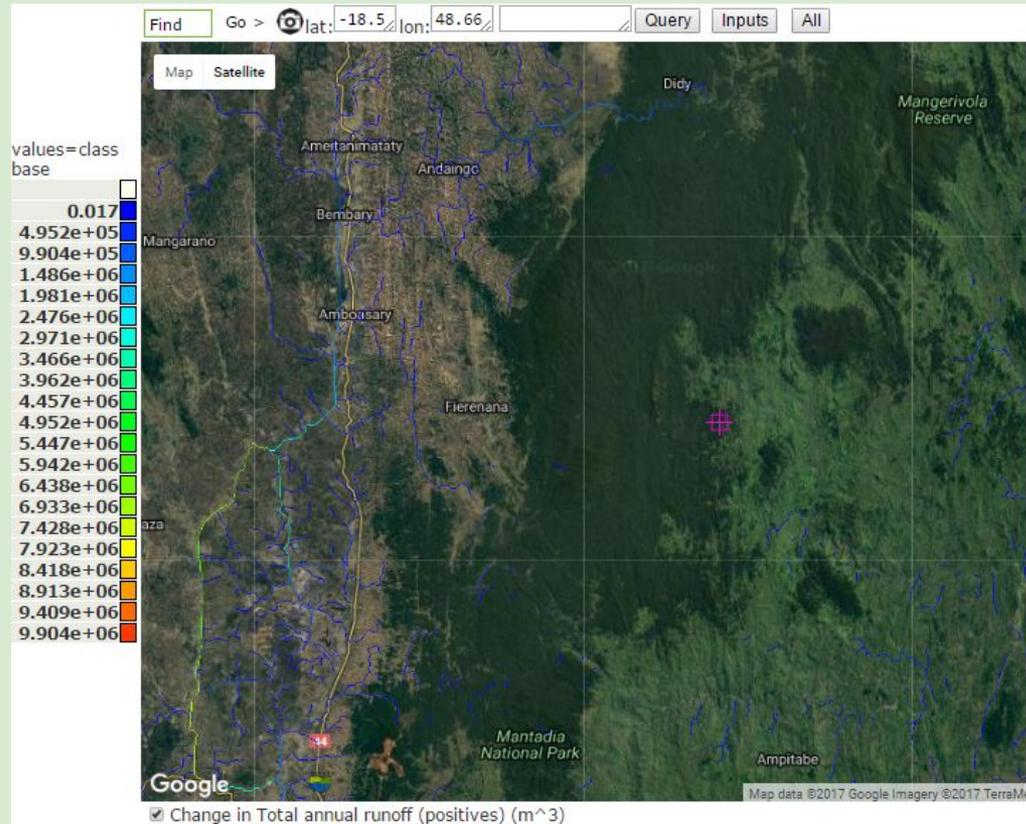
AET ↓ means WB ↑



Fog inputs ↓ means WB ↓

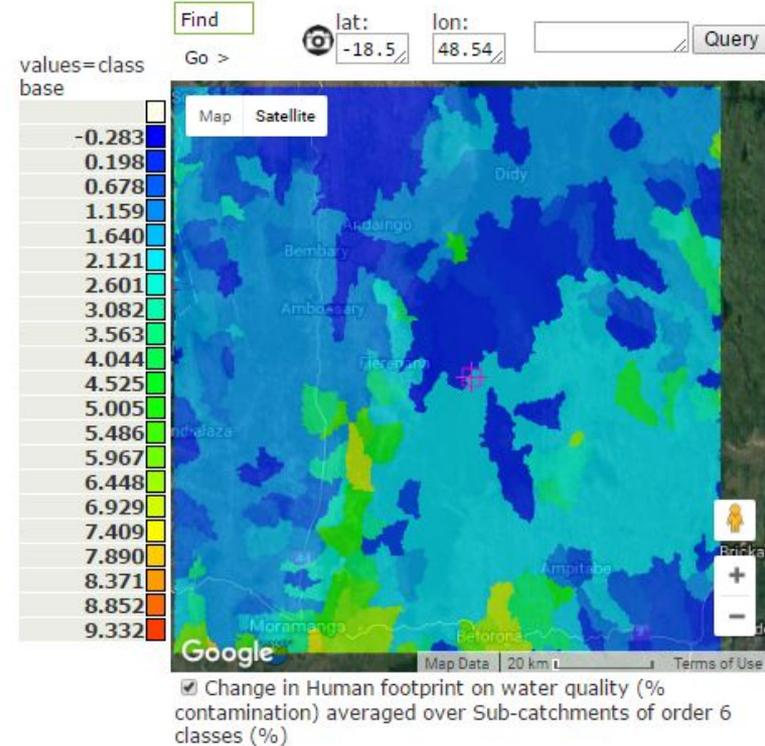
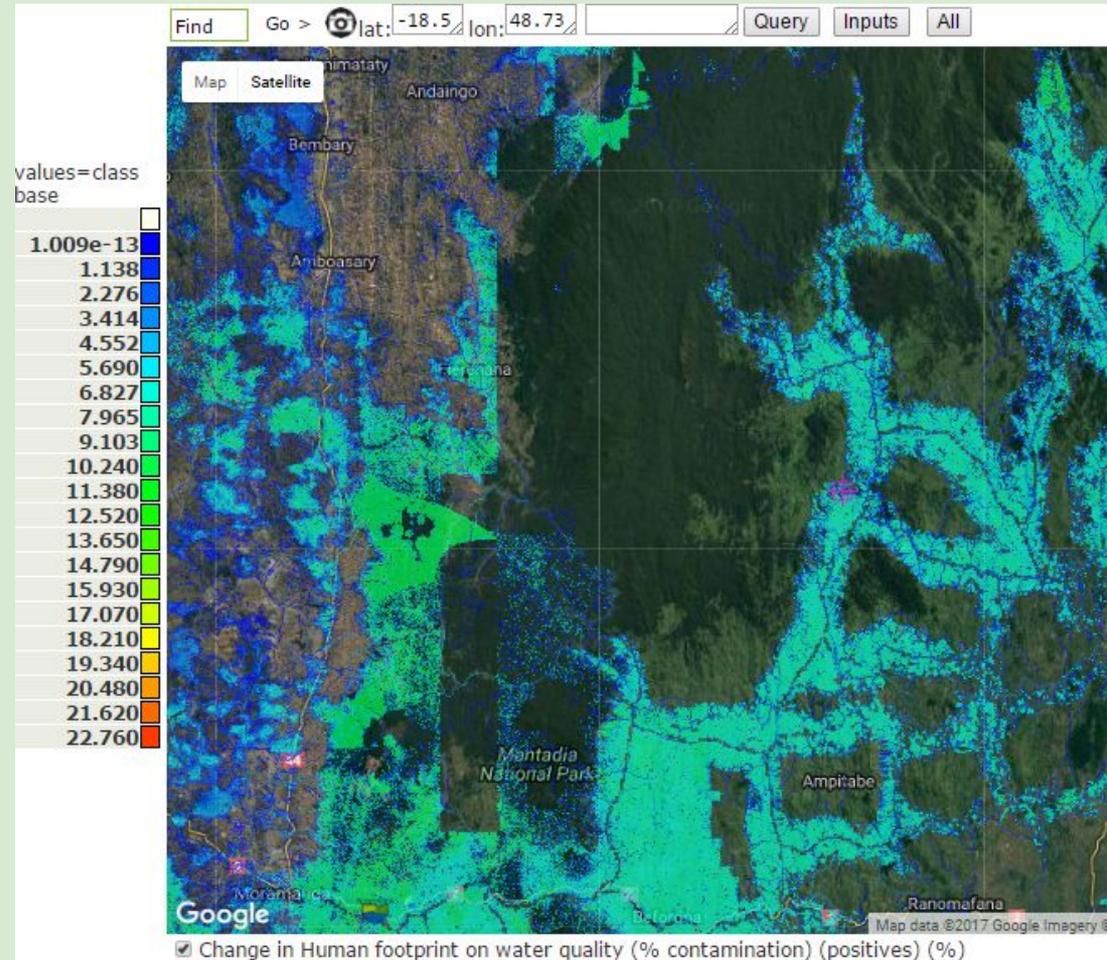
Actual evapo-transpiration (left) and total fog inputs (right)

- Both AET and total fog inputs decrease as a result of deforestation. The changes in water balance depend on the balance between reduction in AET and fog inputs



Changes in runoff

- Runoff is cumulative downstream and increases in some areas (left) and decreases (right) in others due to the changed water balance.
- In general, rivers flowing west see an increase in runoff as these areas are less cloud affected (i.e. **AET decrease > decrease in fog capture**)
- Rivers flowing east mainly see a decrease in runoff as changes in fog capture are greater than the changes in AET (i.e. **AET decrease < decrease in fog capture**)
- The hydrological impacts of deforestation **are not simple!**



Changes in human footprint on water quality index (pixel based increase left, mean for sub-catchments, right)

- Potential water pollution mostly increases due to deforestation and conversion to agriculture (affected by coarsity of baseline pasture map around Mantadia)
- Some areas see a small potential decrease in water pollution due to increased water availability (**dilution**)



WAVES reporting customized versions of WW/CN

WW customizations exist for:

- WAVES reporting
- SDGs reporting
- EPA water quality limits reporting

These provide customized metrics and added functionality on top of WW.

Basin water accounting for voltawaves (baseline)

Asset (stock) accounts (produced assets)

Treated and sanitised water_

Name	Explanation	Show
Water treatment costs	Total costs of domestic water treatment (USD)	
Volume of treated water	Total volume of treated water (m3)	
Sanitation costs	Total costs of sewage treatment (sanitation) (USD)	
Volume of sanitized water	Total volume of sanitized water (m3)	

Asset (stock) accounts (water resources)

Water natural capital_

Name	Explanation	Show
January glacier water equivalent	January glacier water equivalent (mm)	
January snowpack water equivalent	January snowpack water equivalent (mm)Distribution of dams	
Dams		

Water storage capacity±
Water storage±

Asset (stock) accounts (water quality accounts)

Flow accounts (contribution of water to the economy)

Flow accounts (agricultural water use)

Agricultural water use±

Flow accounts (domestic water use)

Flow accounts (returned treated water)

Close window

Some initial WW/C\$N SDG-relevant metrics: baseline view

[Analyses, metrics and reporting](#)
SDG indicators:

SDG	Indicator	Baseline map	# people	# urban people	# rural people	# poor people		
Goal #1. End poverty in all its forms everywhere	Goal #1:							
1.2 Water poverty	Population without access to sufficient quantity of quality water		show	show	show	show		
1.2 Lack of productive resources	Per-capita agricultural production		show	show	show	show		
1.2 Health poverty	Population exposed to diarrhoeal disease		show	show	show	show		
1.5 Natural hazard vulnerability	Persons in areas of unmitigated natural hazard risk		show	show	show	show		
Goal #2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Goal #2:							
2.3 Water-for-food	Population with limited water-for-food (Ea<		show	show	show	show		
2.3 Productivity	Per-capita agricultural productivity		show	show	7.2 Renewable energy		Sedimentation of hydropower reservoirs.	
2.4 Sustainability	Fraction of agricultural land with Et>rainfall (irrigation)		show	show	Goal #11. Make cities and human settlements inclusive, safe, resilient and sustainable		Goal #11:	
Goal #3. Ensure healthy lives and promote well-being for all at all ages	Goal #3:				11.5 Ecosystem based natural hazard mitigation		Proportion of hazard mitigation services protected	
3.3 Water-borne disease	Population with (seasonal) exposure to diarrhoeal disease		show	show	11.5 Flood protection by green infrastructure		Flood storage in excess of flow volume upstream of cities	
3.9 Lack of domestic water	Population with less than (seasonal) 20L/day (WHO) of quality water		show	show	11.7 Urban green infrastructure and ecosystem services		Urban vegetation and protected area fraction	
Goal #6. Ensure availability and sustainable management of water and sanitation for all	Goal #6:				Goal #13. Take urgent action to combat climate change and its impacts		Goal #13:	
6.1 Access	Population with less than (seasonal) 20L/day (WHO) of quality water		show	show	13.1 Hazard resilience		Proportion of HM services protected	
6.2 Sanitation, hygiene	Persons benefitting from natural footprint on water quality		show	show	13.2 Climate change planning		pressured carbon, threatened carbon	
6.3 Pollution load	Total human footprint on water quality		show	show	Goal #15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss		Goal #15:	
6.4 Water scarcity	Mean per-cent of time in which demand is not met by supply		show	show	15.1 Ecosystem service protection		Fraction of bundle of realized ecosystem services protected	
6.6 Protected hydrological services	Proportion of realised clean water provision from protected areas		show	show	15.2 Forests and forest loss		Net forest change	
Goal #7. Ensure access to affordable, reliable, sustainable, and modern energy for all	Goal #7:				15.3 Desertification		Soil erosion on agricultural land	
					15.5 Species richness		Richness loss	
					15.5 Endemism		Endemism loss	

