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

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CONSERVATION INTERNATIONAL

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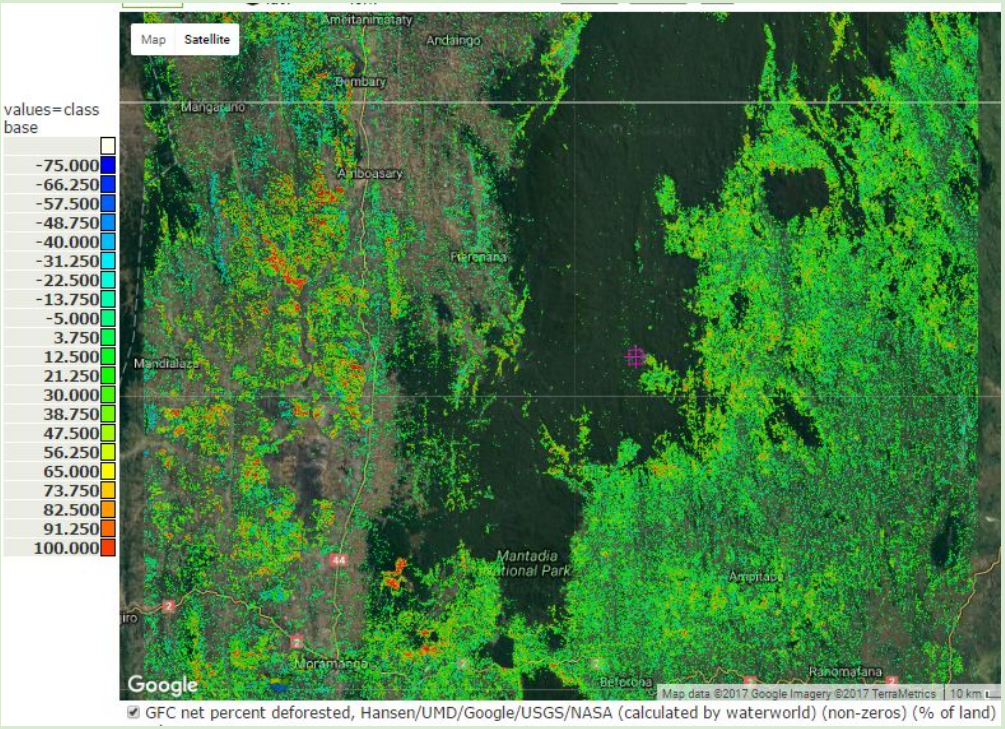
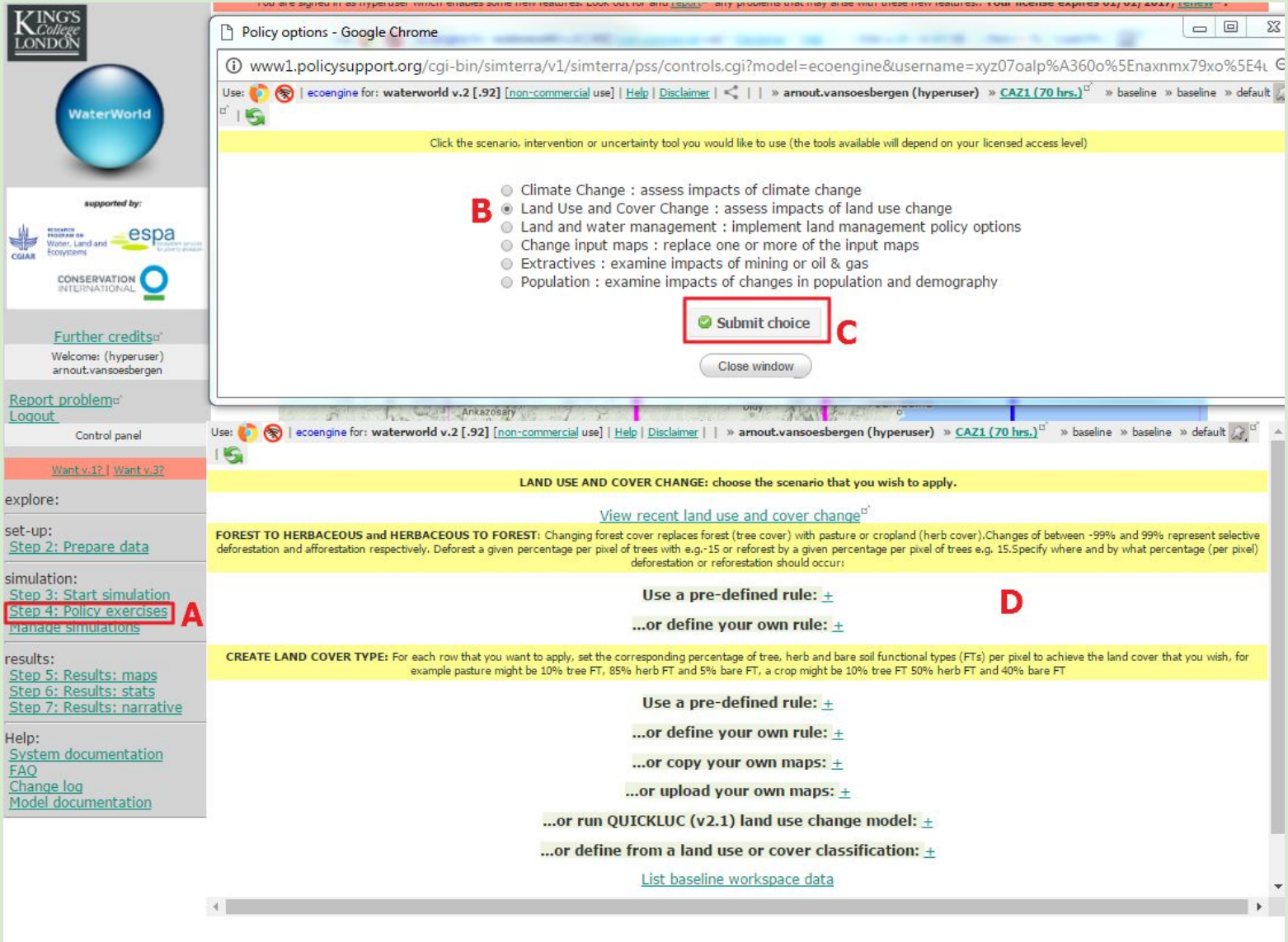
Running a Business As Usual deforestation scenario in WaterWorld

- 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

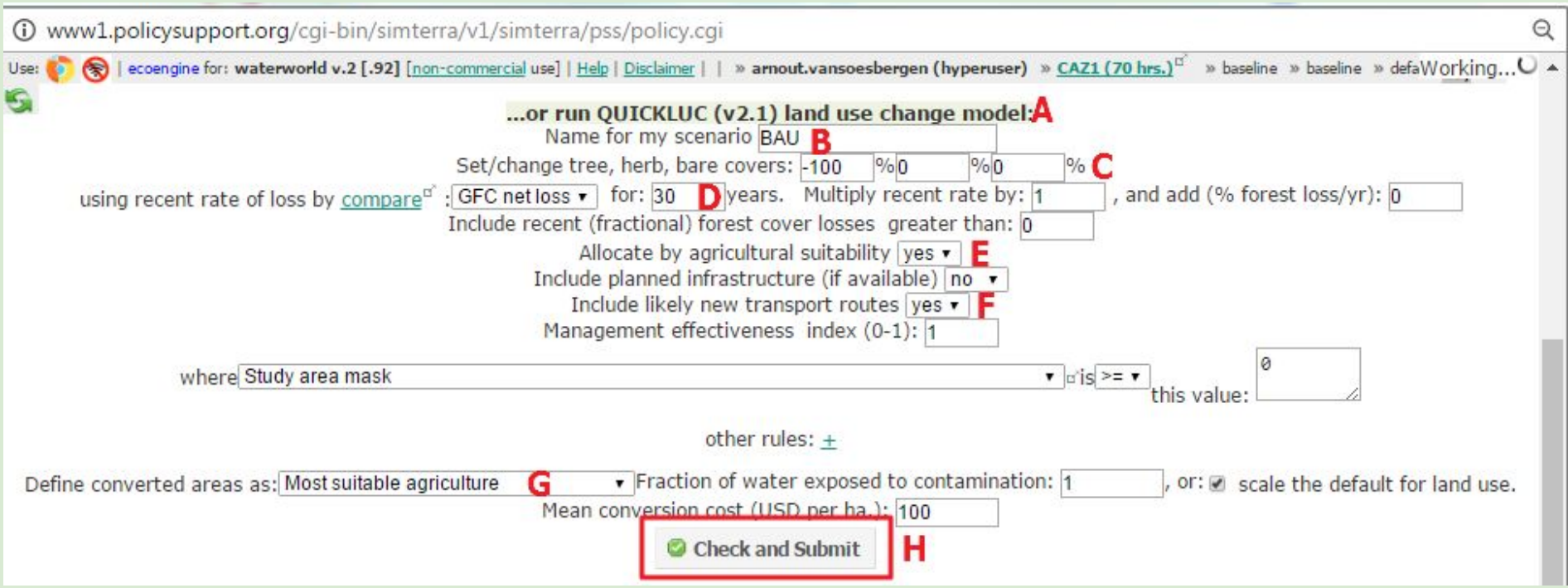




Step 4: policy exercises

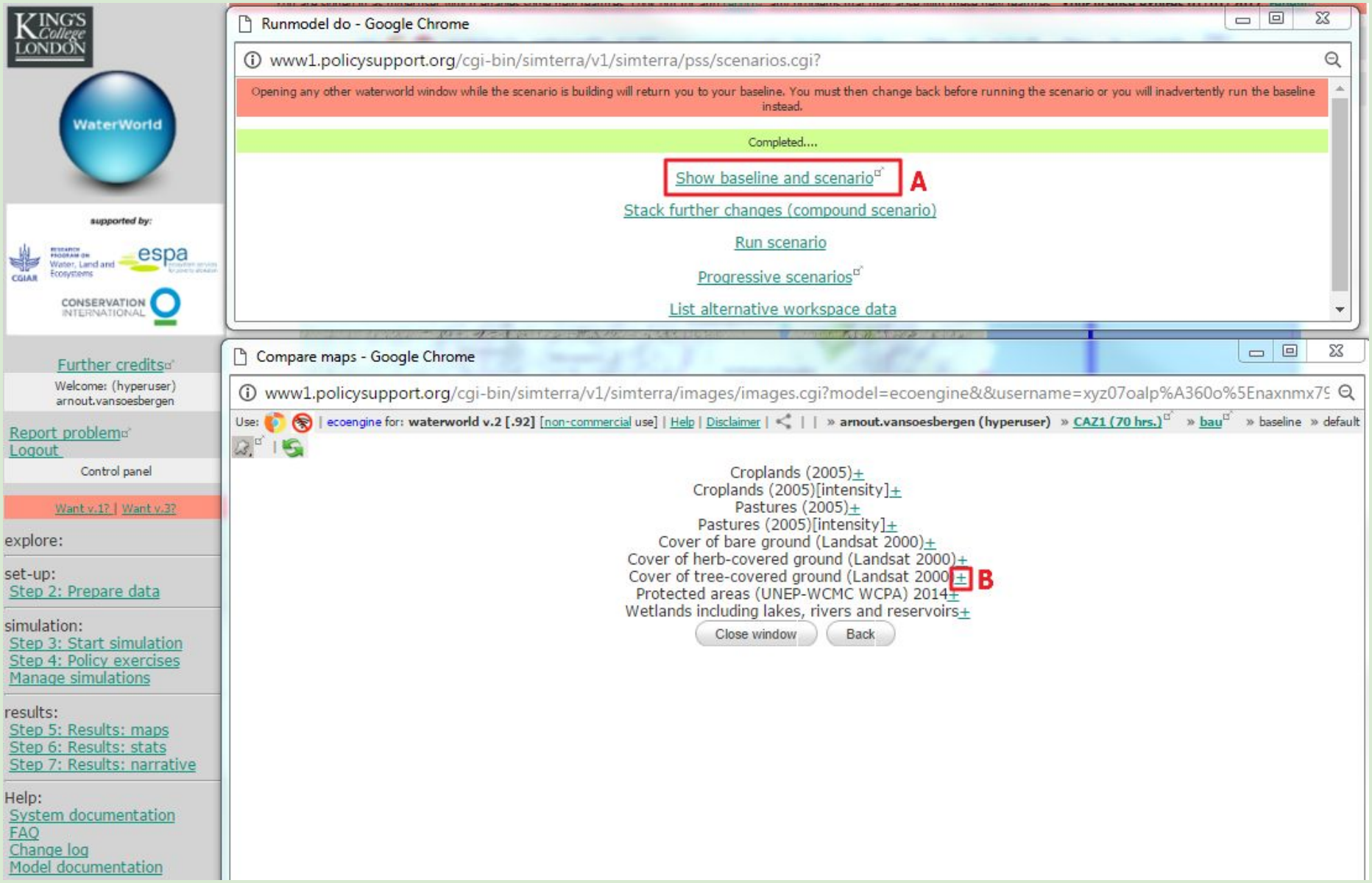
Apply a scenario for land use change

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)**

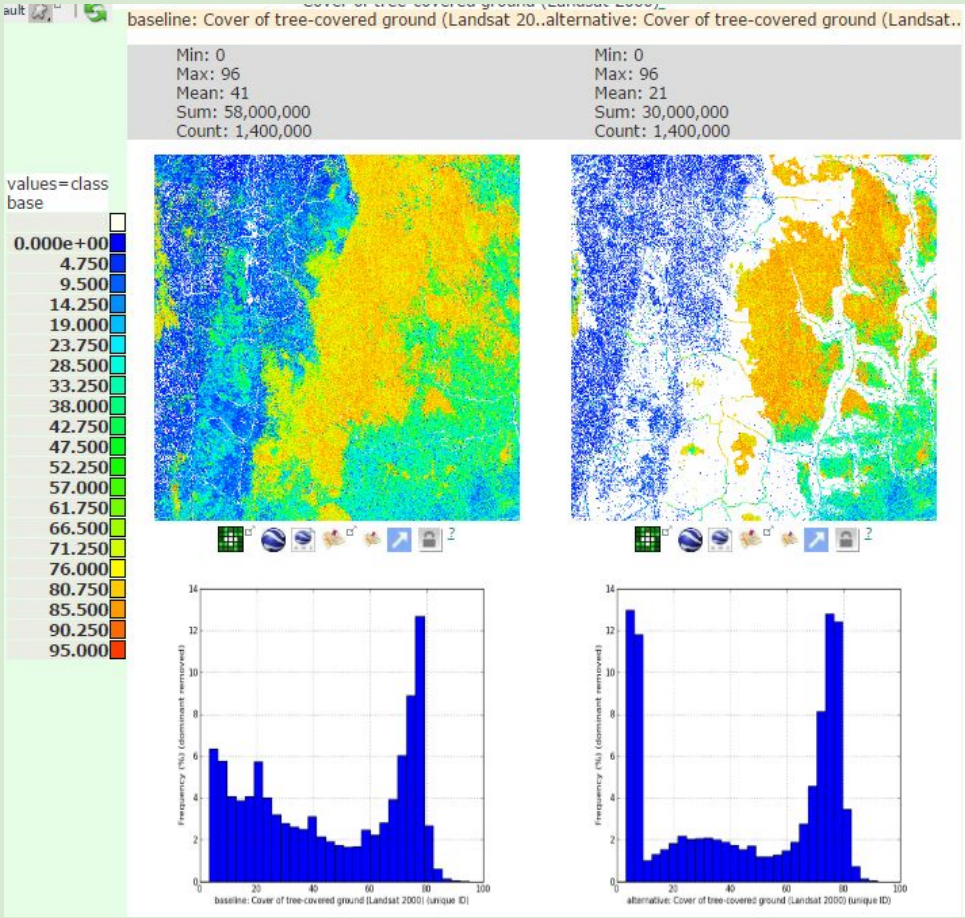


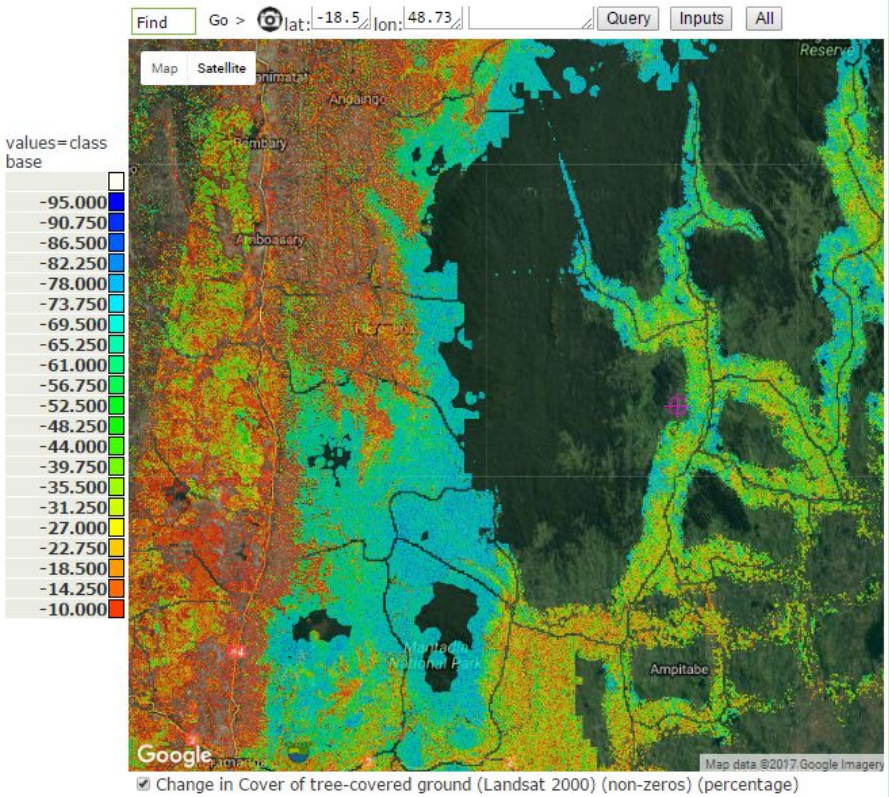
Setting up the land use change model:

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**

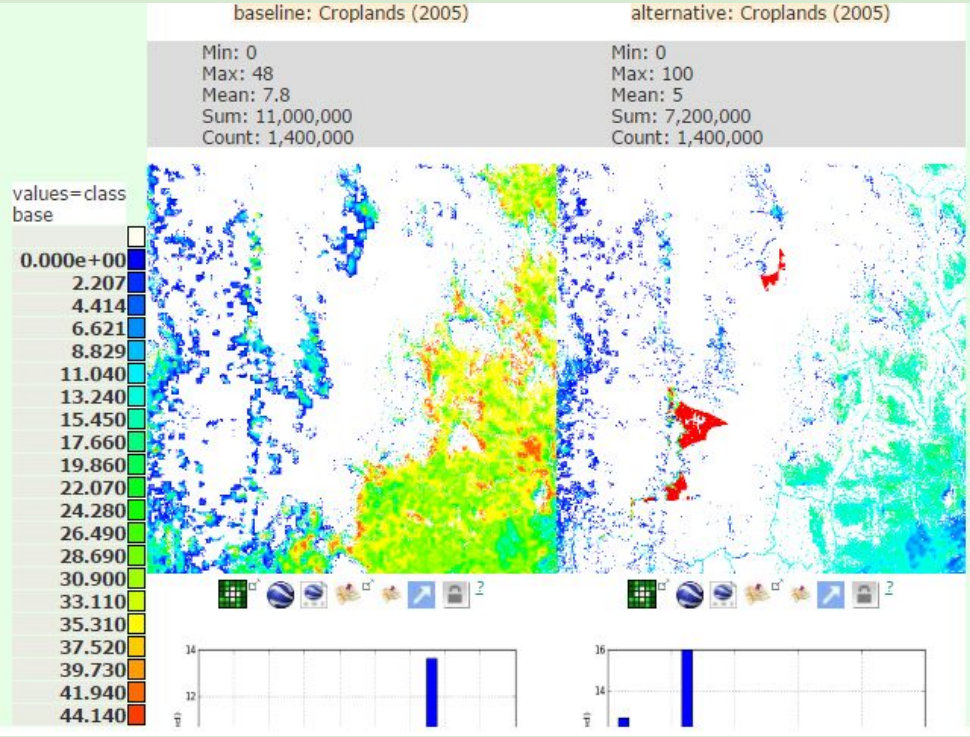


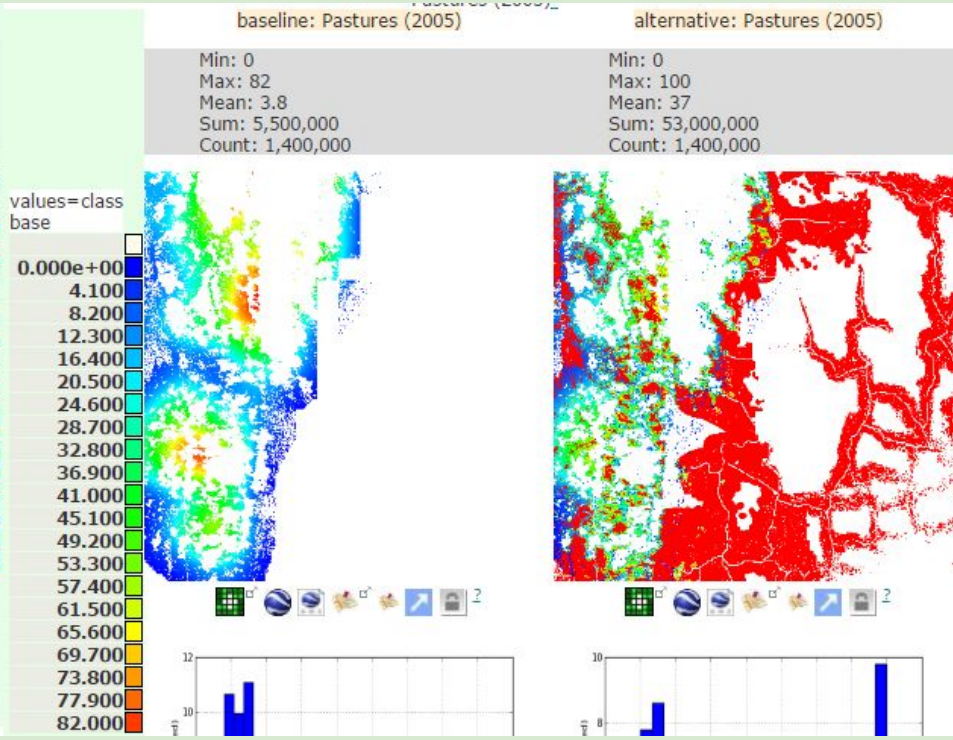
Once the scenario is built, click on Show baseline and scenario (A) to see what changes under your scenario (this will take a few minutes). You can then look at land use and land cover changes under your scenario. Look at cover of tree-covered ground (B)



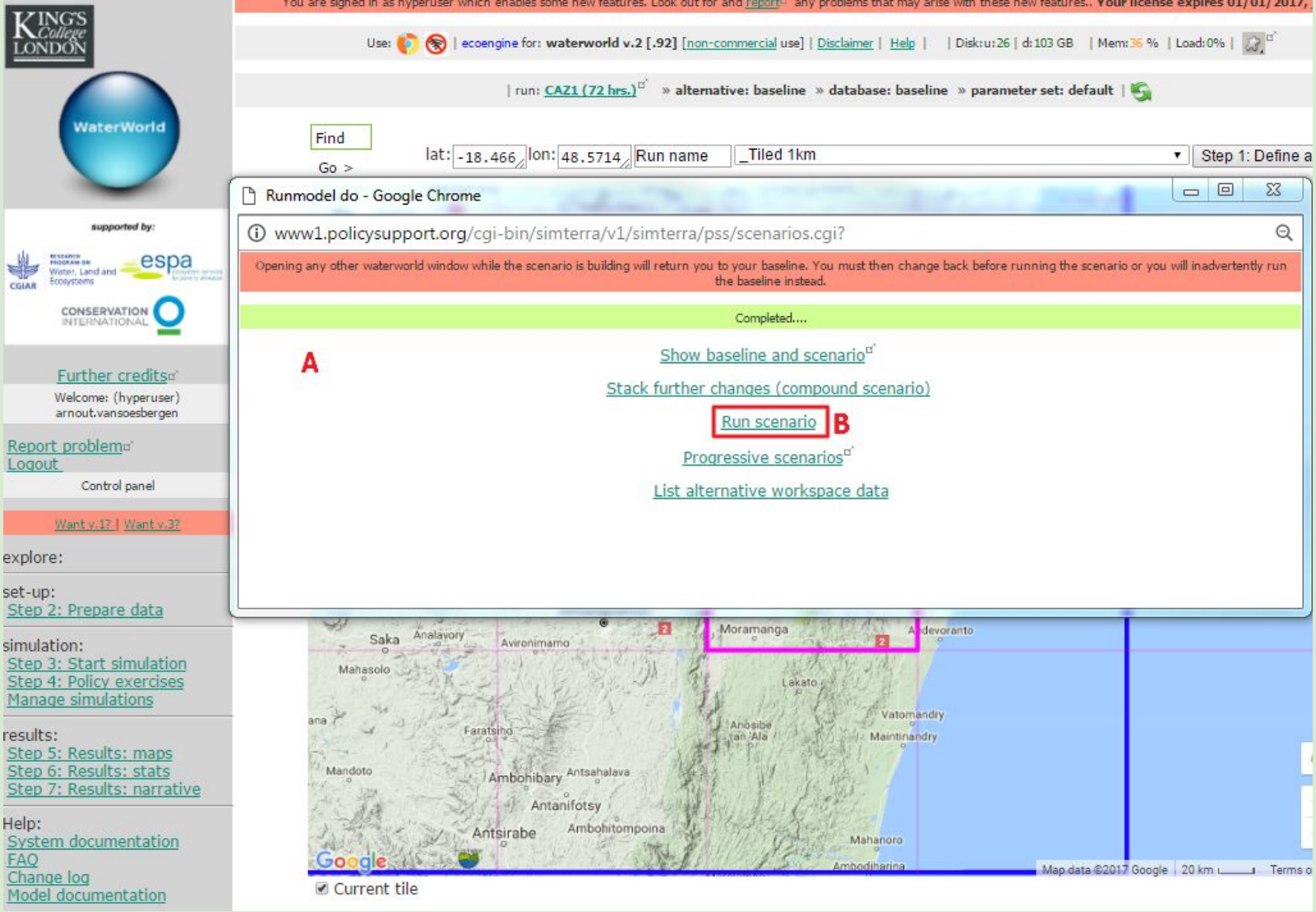


- **Land use change scenario: tree cover changes**
- **Baseline and scenario tree cover remaining.**
- **The mean % tree cover decreases from 41% to 21%**
- **Difference (showing non-zero's only) between baseline and scenario shown on the right.**
- **The coloured areas have lost tree cover 0-100% from 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)**





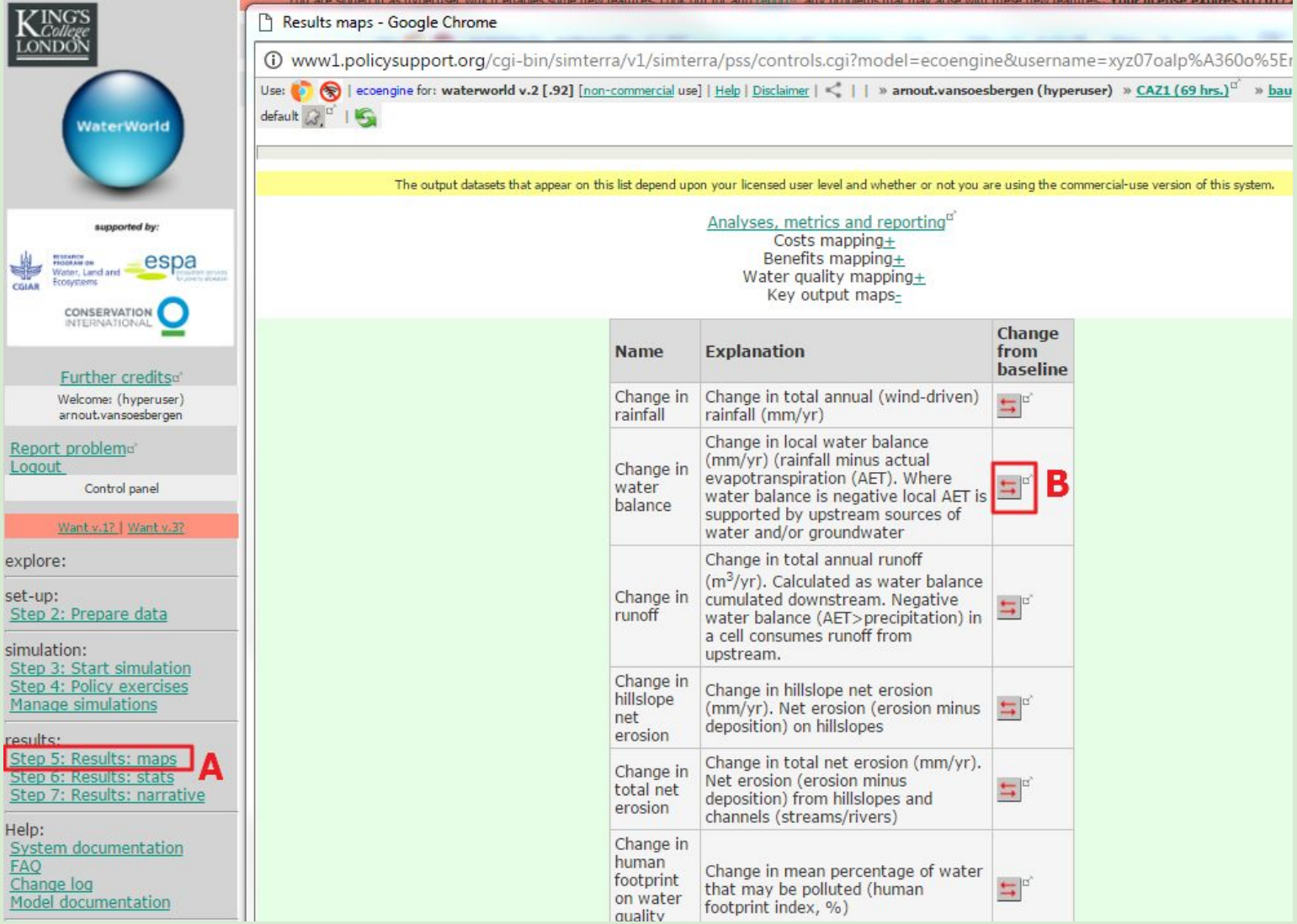
- **Land use change scenario: change in cropland (left) and pastures (right).**
- **More of the area is suitable for grazing than cropland (according to the global datasets used)**
- **Therefore deforestation is mostly for pasture lands, increasing from around 4% to around 37%**
- **Allocating by existing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



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.

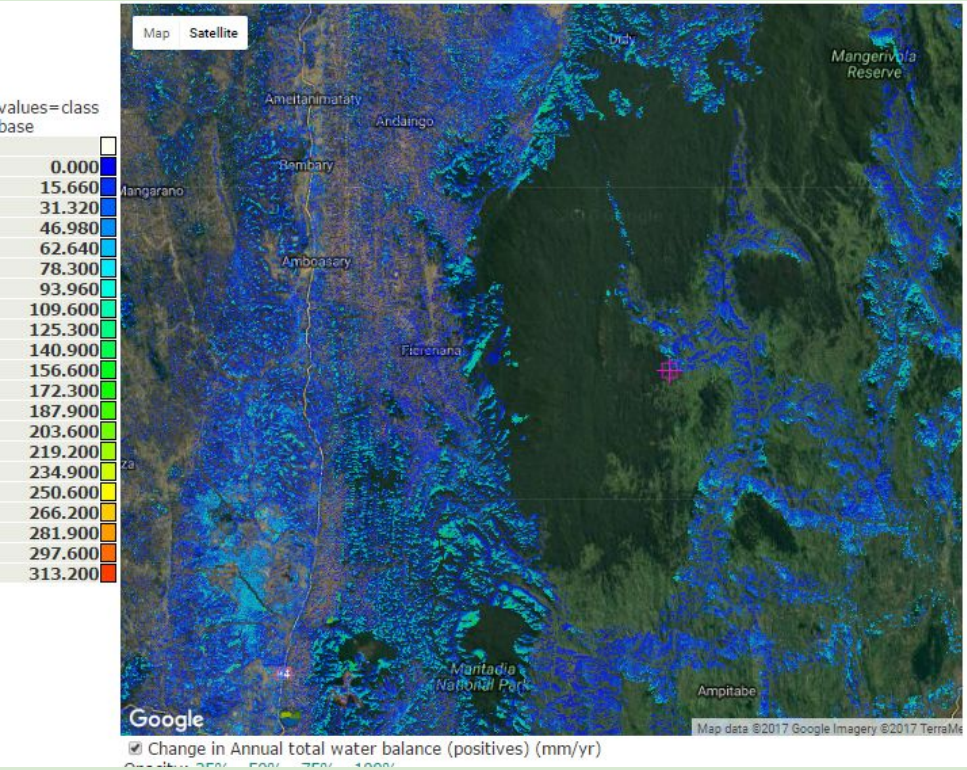
DISCUSSION/REST while model is running



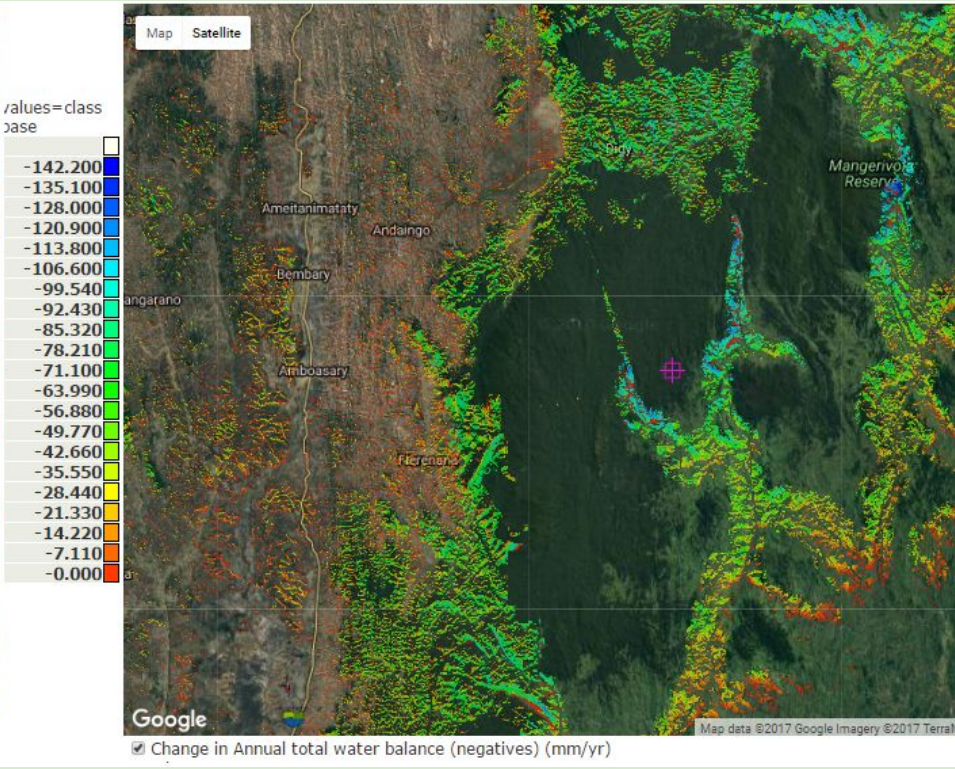
Land use change: step 5: results maps

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)

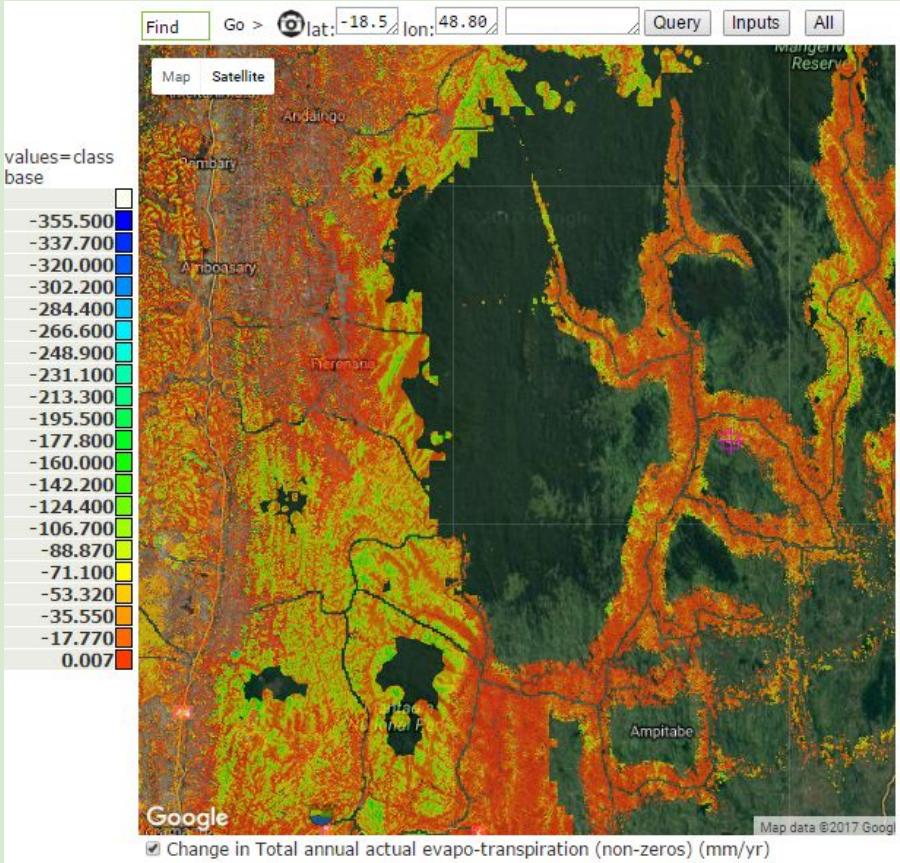


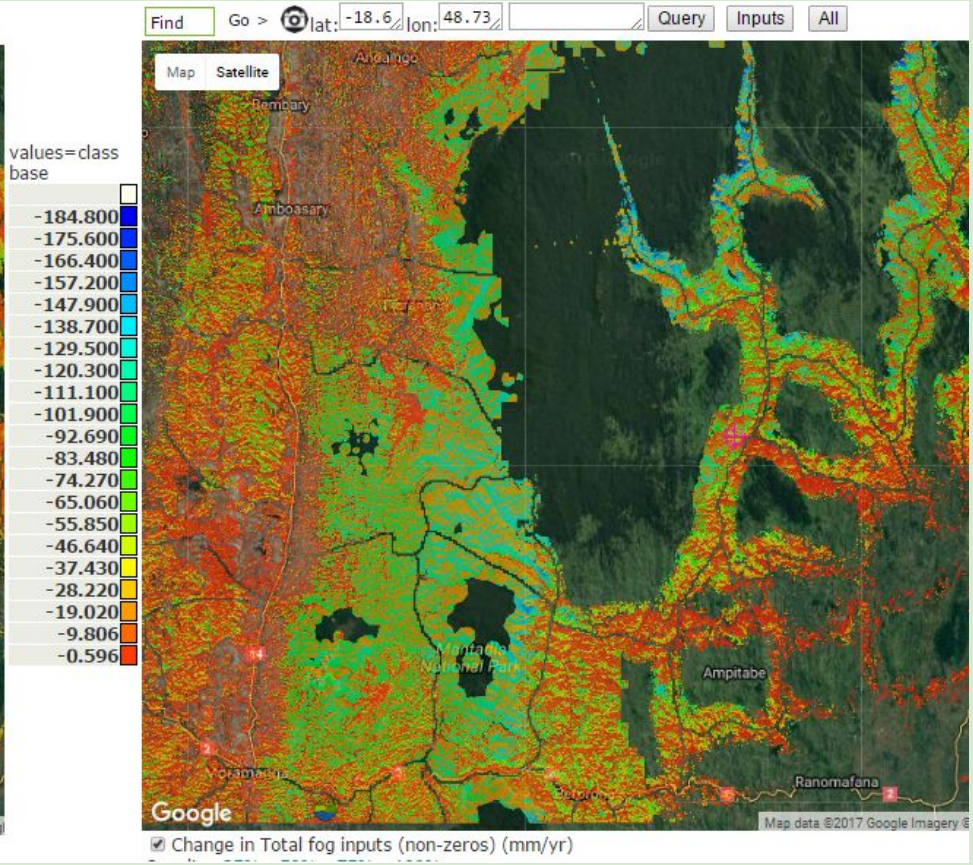
Change in water balance (negatives only)



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**



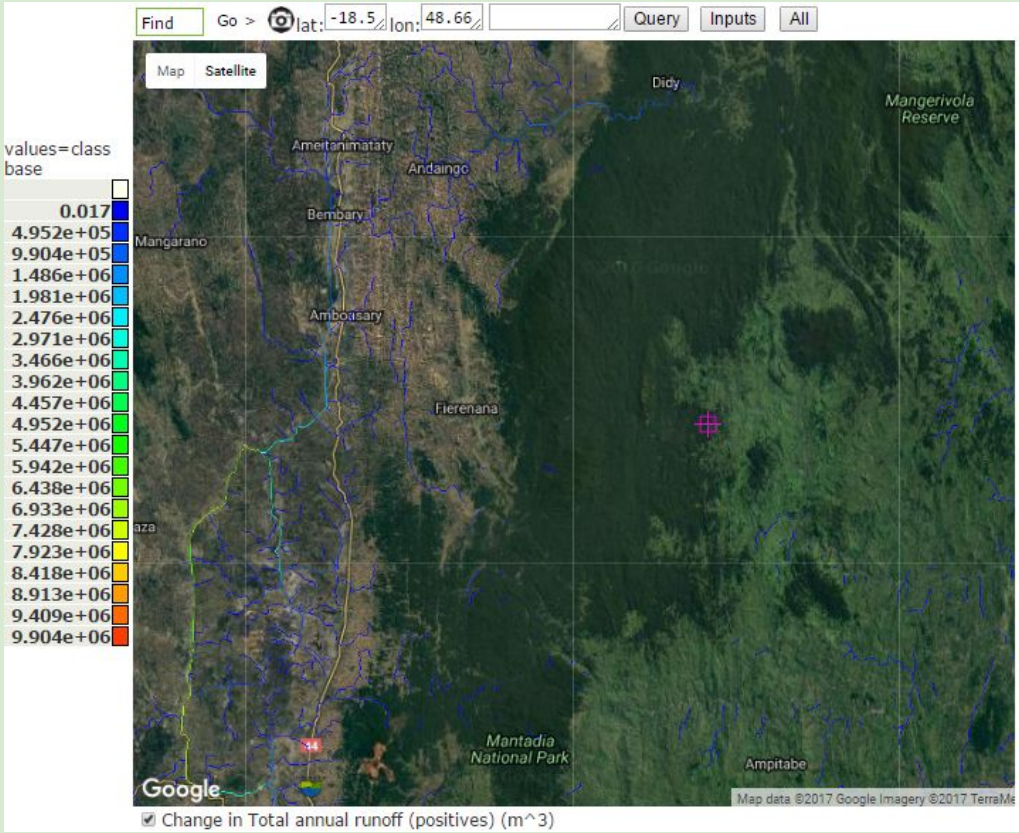


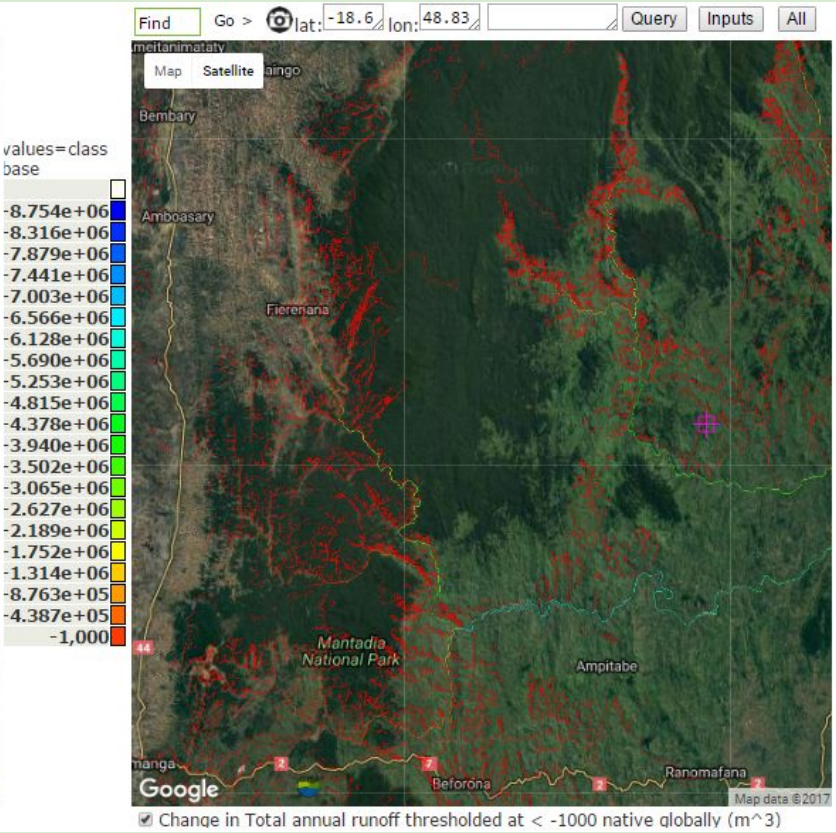
AET ↓ means WB ↑

Fog inputs ↓ means WB ↓

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

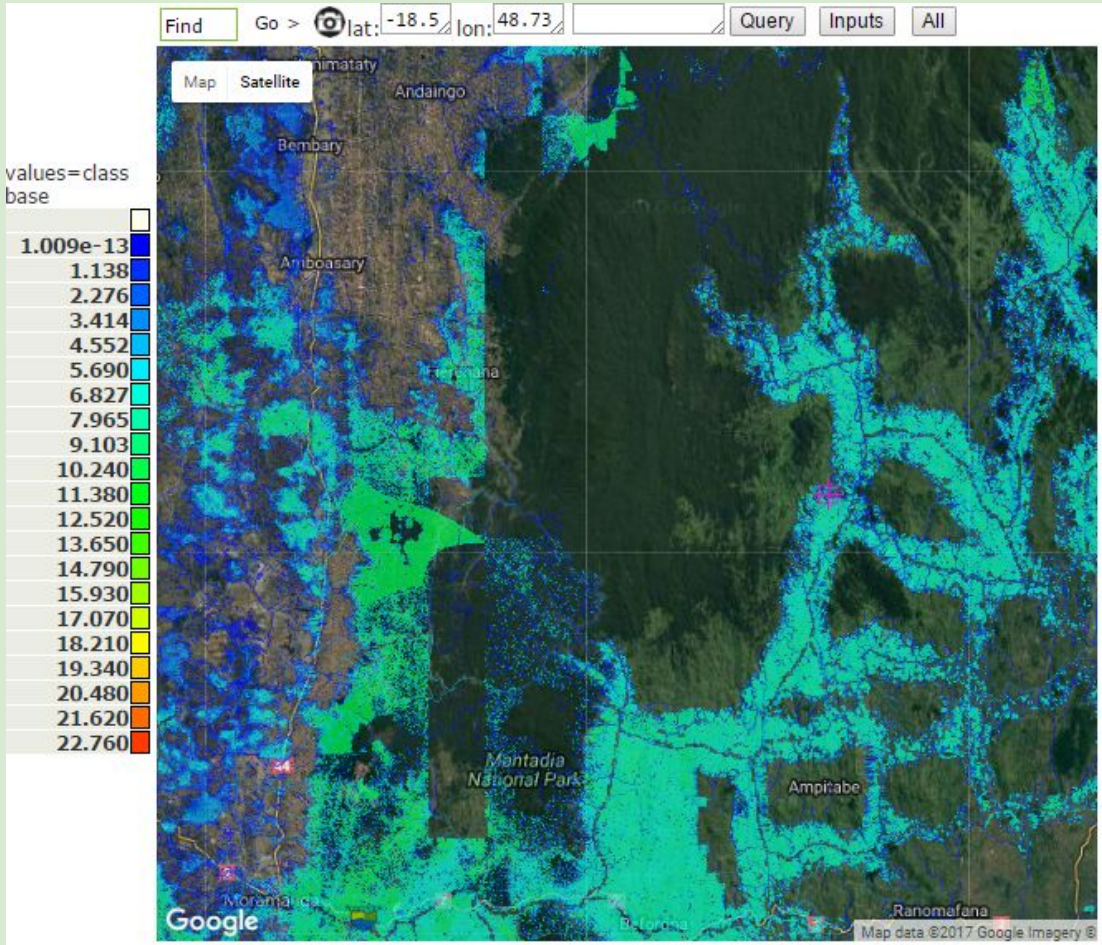
- **Both AET and total fog inputs decrease as a result of deforestation. The changes in water balance depend on the balance between reduction in AET and fog inputs**



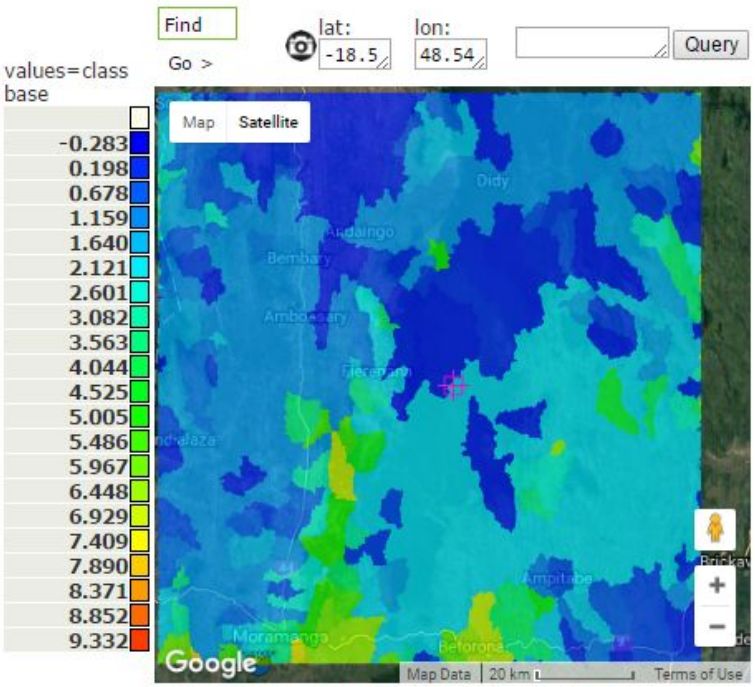


Changes in runoff

- **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!**



Change in Human footprint on water quality (% contamination) (positives) (%)



Change in Human footprint on water quality (% contamination) averaged over Sub-catchments of order 6 classes (%)

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		
2.4 Sustainability	Fraction of agricultural land with Et>rainfall (irrigation)		show	show		
Goal #3. Ensure healthy lives and promote well-being for all at all ages	Goal #3:					
3.3 Water-borne disease	Population with (seasonal) exposure to diarrhoeal disease		show	show		
3.9 Lack of domestic water	Population with less than (seasonal) 20L/day (WHO) of quality water		show	show		
Goal #6. Ensure availability and sustainable management of water and sanitation for all	Goal #6:					
6.1 Access	Population with less than (seasonal) 20L/day (WHO) of quality water		show	show		
6.2 Sanitation, hygiene	Persons benefitting from natural footprint on water quality		show	show		
6.3 Pollution load	Total human footprint on water quality		show	show		
6.4 Water scarcity	Mean per-cent of time in which demand is not met by supply		show	show		
6.6 Protected hydrological services	Proportion of realised clean water provision from protected areas		show	show		
Goal #7. Ensure access to affordable, reliable, sustainable, and modern energy for all	Goal #7:					

7.2 Renewable energy	Sedimentation of hydropower reservoirs.	
Goal #11. Make cities and human settlements inclusive, safe, resilient and sustainable	Goal #11:	
11.5 Ecosystem based natural hazard mitigation	Proportion of hazard mitigation services protected	
11.5 Flood protection by green infrastructure	Flood storage in excess of flow volume upstream of cities	
11.7 Urban green infrastructure and ecosystem services	Urban vegetation and protected area fraction	
Goal #13. Take urgent action to combat climate change and its impacts	Goal #13:	
13.1 Hazard resilience	Proportion of HM services protected	
13.2 Climate change planning	pressured carbon, threatened carbon	
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:	
15.1 Ecosystem service protection	Fraction of bundle of realized ecosystem services protected	
15.2 Forests and forest loss	Net forest change	
15.3 Desertification	Soil erosion on agricultural land	
15.5 Species richness	Richness loss	
15.5 Endemism	Endemism loss	