Solution A service of the service

les paiements pour les services écosystèmiques globaux peuvent-ils réduire la pauvreté?

Hydrological research of p4ges 11 September 2015



Streamflow affects our daily lives low flow periods





Streamflow affects our daily lives flooding





Local and regional water resources

- Too much water flooding and loss of crops
- Too little water not enough water for irrigation and rice production





Land use affects local and regional water resources





Land use: disturbance and recovery cycles





P4GES Hydrological Research: Objective

 To determine hydrological impacts of land-use changes incentivized under alternative PES approaches





Hydrological research: Hypotheses

- 1. Land degradation leads to more surface runoff, higher peak flows and lower dry season flows
- 2. Reforestation can reverse this trend







This work is part of the larger p4ges project

Integrated biophysical research: Key questions

- How does the process of loss and recovery of hydrological function, carbon stocks, biodiversity and wild harvested products differ between deforestation and restoration?
- 2) How can investment in avoided deforestation/restoration be optimized for delivery of Ecosystem Services?



Biodiversity







Integrated biophysical data collection

- Measurements in 4 land uses + interventions:
 - Closed canopy forest
 - Tree savoka
 - Shrub savoka
 - Tany Maty
 - (Reforestation)



TM







What we are doing I:

- Three zones of interest across CAZ Measurements of:
- Soil properties
- Soil infiltration rates (at 3 depths)
- Preferential flow pathways







Preliminary results Infiltration







Blue dye experiment to determine how water flows into the soil





What we are doing II:

Three plots (forest, tree savoka and tany maty) to measure:

- Hydrological fluxes (precipitation, interception, transpiration, surface runoff)
- Changes in soil moisture and groundwater





Weather stations

to determine the evaporation rates and the amount of precipitation





Runoff plots to determine how much water flows over the surface





Initial results: Surface runoff Nov 2014-May 2015





Additional measurements in forest Rainfall measurements under the forest canopy Measurements of tree water use





Initial results: Throughfall Nov 2014-May 2015





Upscaling from these small plots to CAZ

- These small plot measurements help us understand hydrological processes
- We use this data to test hydrological models and use these models to test the hydrological impacts of different land use scenarios
- The model has to scale up the field science to policy relevant scales and allow the application of scenarios and policy options to understand impacts at the landscape scale





Map data @2015 Google Imagery @2015 Cnes/Spot Image, DigitalGlobe 200 m



base



WaterWorld - turning science & big data into policy support



Detailed, process based, since 1998 Spatial (1ha or 1km spatial resolution) All required data (140 inputs) supplied for anywhere globally Fast (full analysis in 30 minutes) Uncertainty and validation tools Sophisticated scenarios and intervention tools Simple to use (web-based, firefox or chrome) Results downloadable in GIS formats Free for non-commercial use. Free training programme. 1200 users, 1029 orgs. 141 countries Local data (e.g. that collected in p4ges) can be uploaded to improve model results

What are your views on the most likely scenarios?

•Will recent deforestation rates remain the same, decrease or increase under business as usual to 2050?

•What level of conservation investment (in \$\$\$ or ha) is likely to 2050?

•What level of afforestation investment (in \$\$\$ or ha) is likely to 2050?

What determines where in the CAZ these will occur?

Business as usual based on last 12 years deforestation projected forward for 50 years (with ineffective protected areas)

Min: 0 Max: 96 Mean: 35 Sum: 130,000,000 Count: 3,700,000 Min: 0 Max: 96 Mean: 8.4 Sum: 31,000,000 Count: 3 700,000



How many times the current (unverified) reforestation will be possible? Hydrological footprint of current reforestation:



Downstream influence of refor_merged_maskedzip [uploaded] (per-cent)

Training - WaterWorld as part of your investment planning toolkit

- P4GES would like to offer training in the P4GES WaterWorld application Who? would be interested in training
- **What?** Baseline hydrology? BAU scenarios? Protection scenarios? Reforestation scenarios. Using your own input data? (each would take 1 hr)
- How long? 2 hrs? When?
- What might organisations use the P4GES WW application for?



The field visit

- We will visit the Tany Maty site
- From the car, it is about 15 minutes to walk up to the site
- We will visit:
 - Infiltration experiments
 - Blue dye experiments
 - Runoff plots
 - Weather station
 - And discuss remote sensing data and model scenarios



The field visit

- 4 stations 12 minutes per station
- I Weather station (Maafaka)
- II Infiltration and surface runoff (Chandra)
- III Blue dye experiment (Ilja)
- IV Modelling and remote sensing (Mark)

Time	Group 1	Group 2	Group 3	Group 4
13:15-13:40	Travel to field site			
13:40-13:52	Ι	II	III	IV
13:55-14:07	II	III	IV	I
14:10-14:22	111	IV	I	II
14:25-14:37	IV	I	II	III
14:40-15:00	Travel back			





Acknowledgements



