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APBON
Asia-Pacific Biodiversity Observation Network

EO contributes to integrating Nature into Economic Activities

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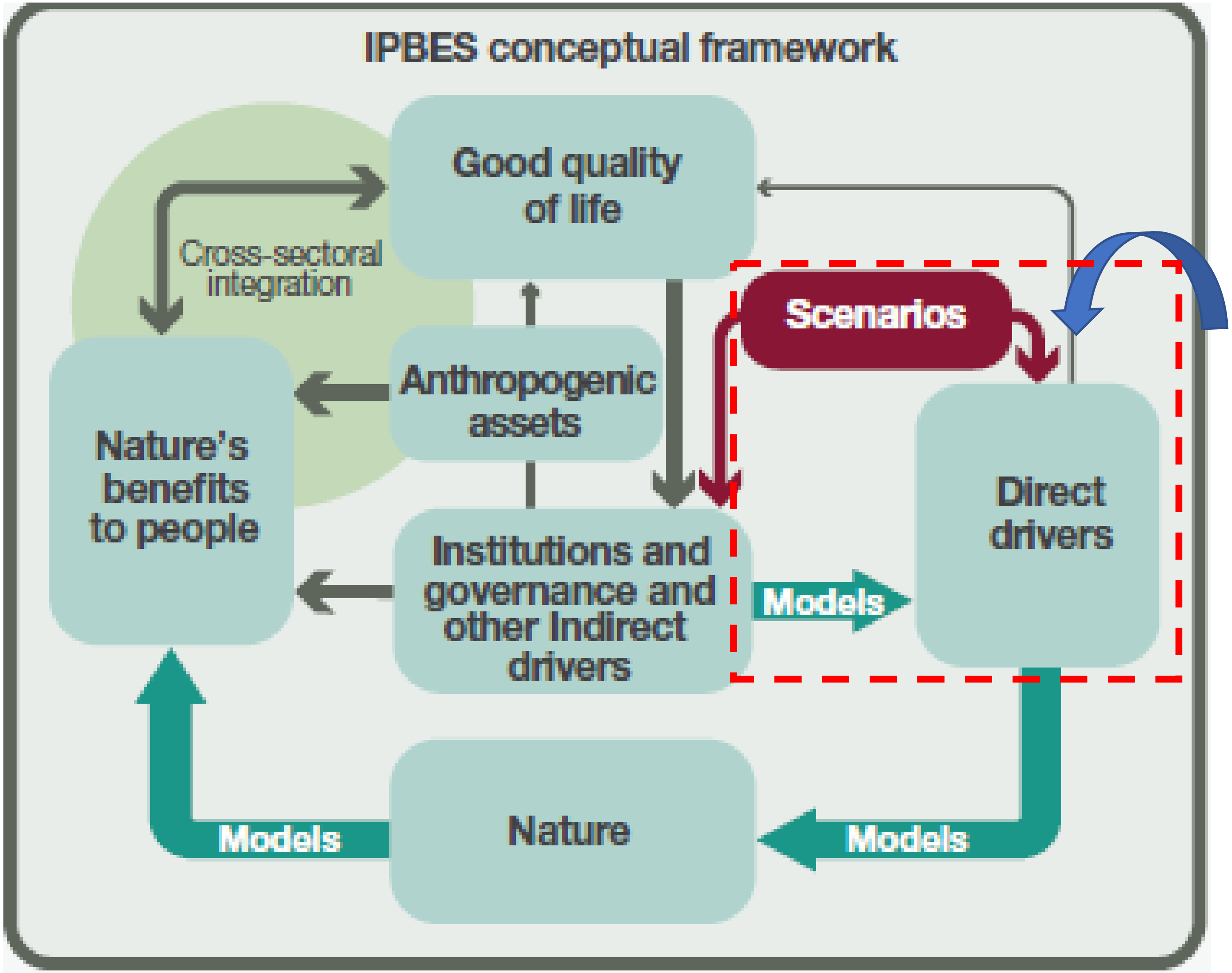
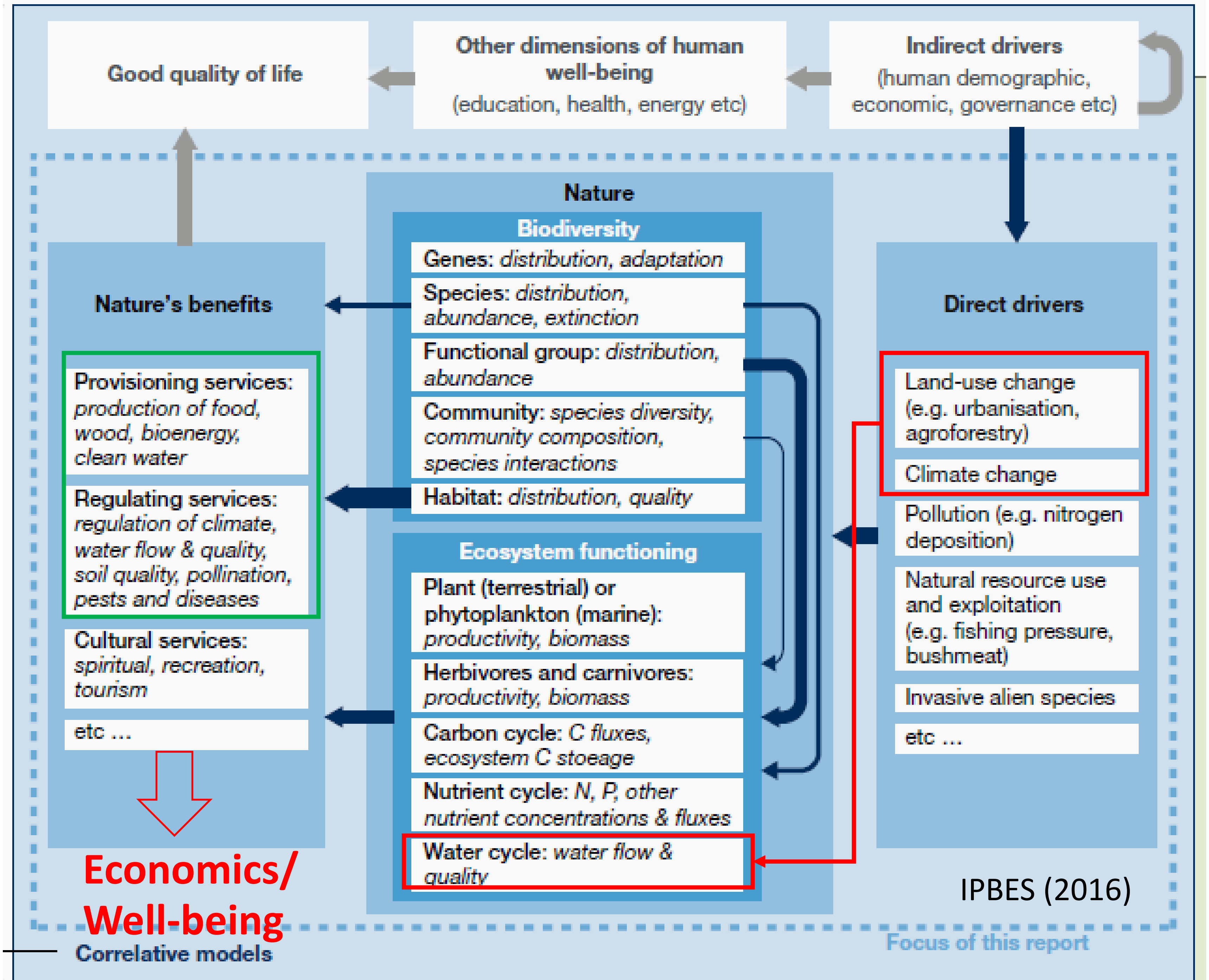
Biodiversity and Sustainable Society



EO contributes to integrating Nature into Economic Activities

IPBES (2016)


Good quality of life
Other dimensions of human well-being
(education, health, energy etc)
Indirect drivers
(human demographic, economic, governance etc)
Nature
Biodiversity
Genes: distribution, adaptation
Species: distribution, abundance, extinction
Functional group: distribution, abundance
Community: species diversity, community composition, species interactions
Habitat: distribution, quality
Ecosystem functioning
Plant (terrestrial) or phytoplankton (marine): productivity, biomass
Herbivores and carnivores: productivity, biomass
Carbon cycle: C fluxes, ecosystem C stoeage
Nutrient cycle: N, P, other nutrient concentrations & fluxes
Water cycle: water flow & quality
Nature's benefits
Provisioning services: production of food, wood, bioenergy, clean water
Regulating services: regulation of climate, water flow & quality, soil quality, pollination, pests and diseases
Cultural services: spiritual, recreation, tourism
etc ...
Direct drivers
Land-use change (e.g. urbanisation, agroforestry)
Climate change
Pollution (e.g. nitrogen deposition)
Natural resource use and exploitation (e.g. fishing pressure, bushmeat)
Invasive alien species
etc ...
Economics/
Well-being
IPBES (2016)
Focus of this report
Correlative models

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Case Study 1: Regional Level

Basin-Wide Assessment on Impacts of Climate Change on Rice production in the Lower Mekong Basin

Trisurat et al. (2018)

Mekong Basin

795,000 km^2:

Upper (24%)

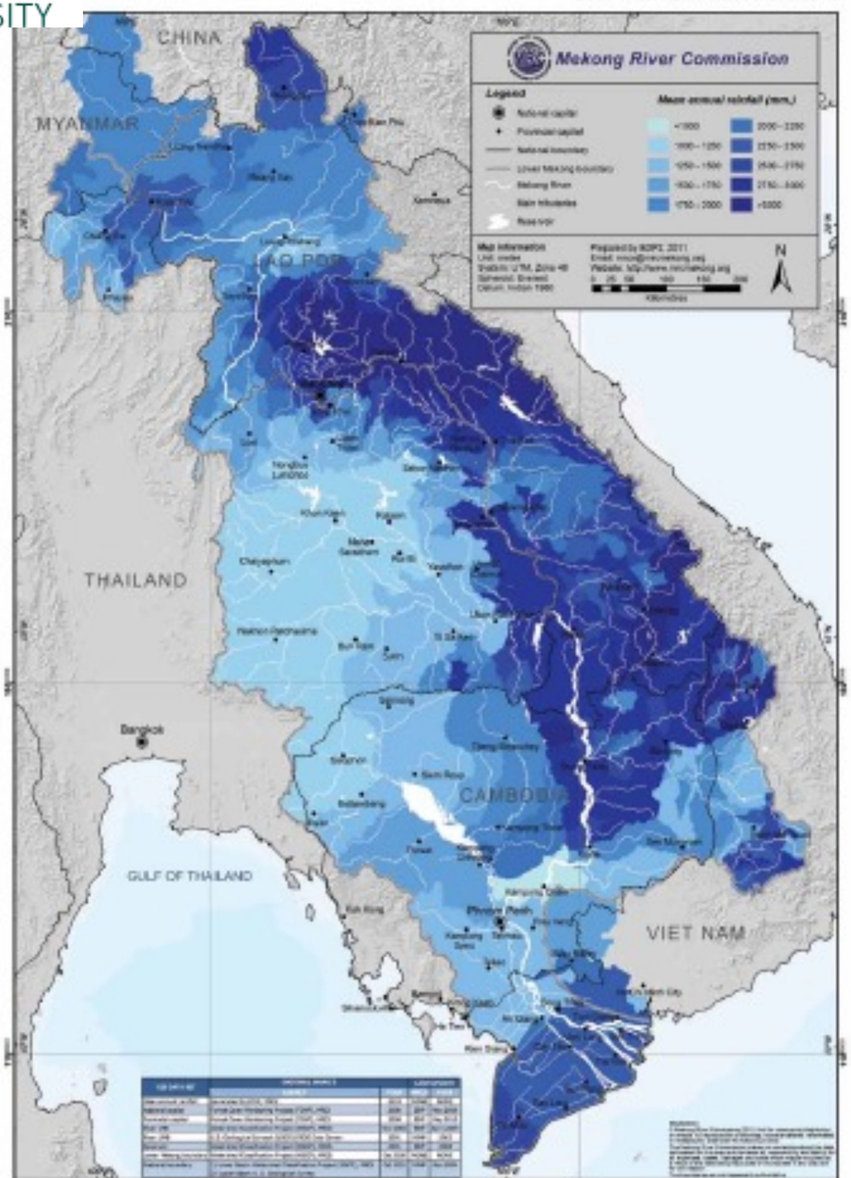
LMB (76%)

Population 60.6M (2010)

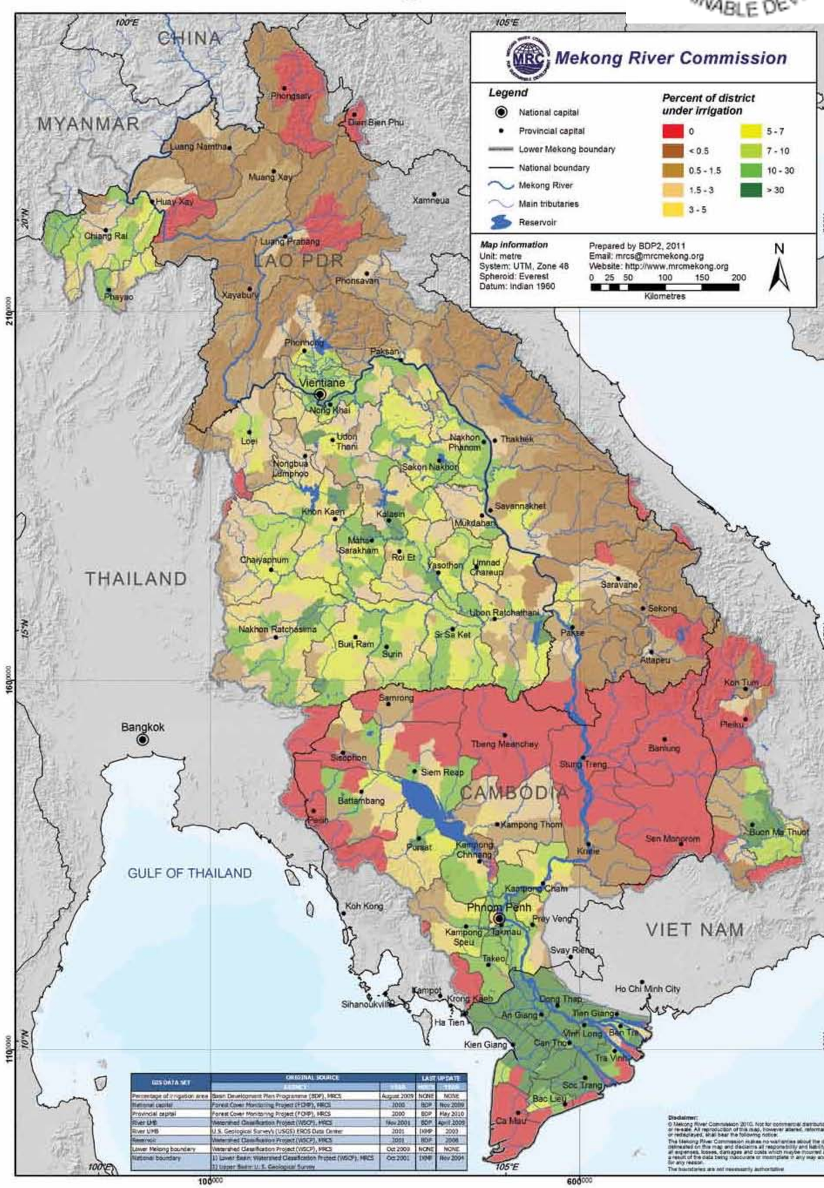
65 M 92020)

Rainfall and Irrigation (8%)

Mean annual rainfall



Percentage of district area



InVEST model input data

Climate

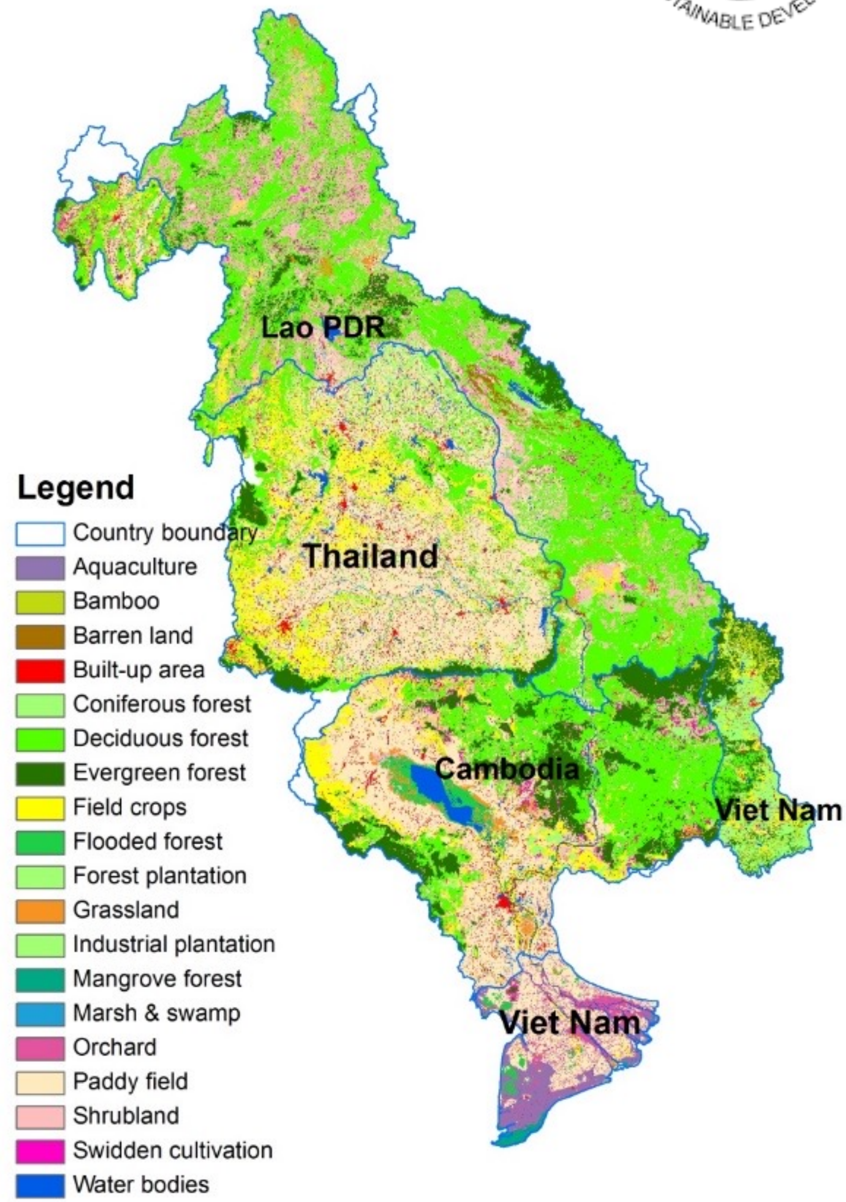
Precipitation, PET

Soils

Soil depth, PAWC

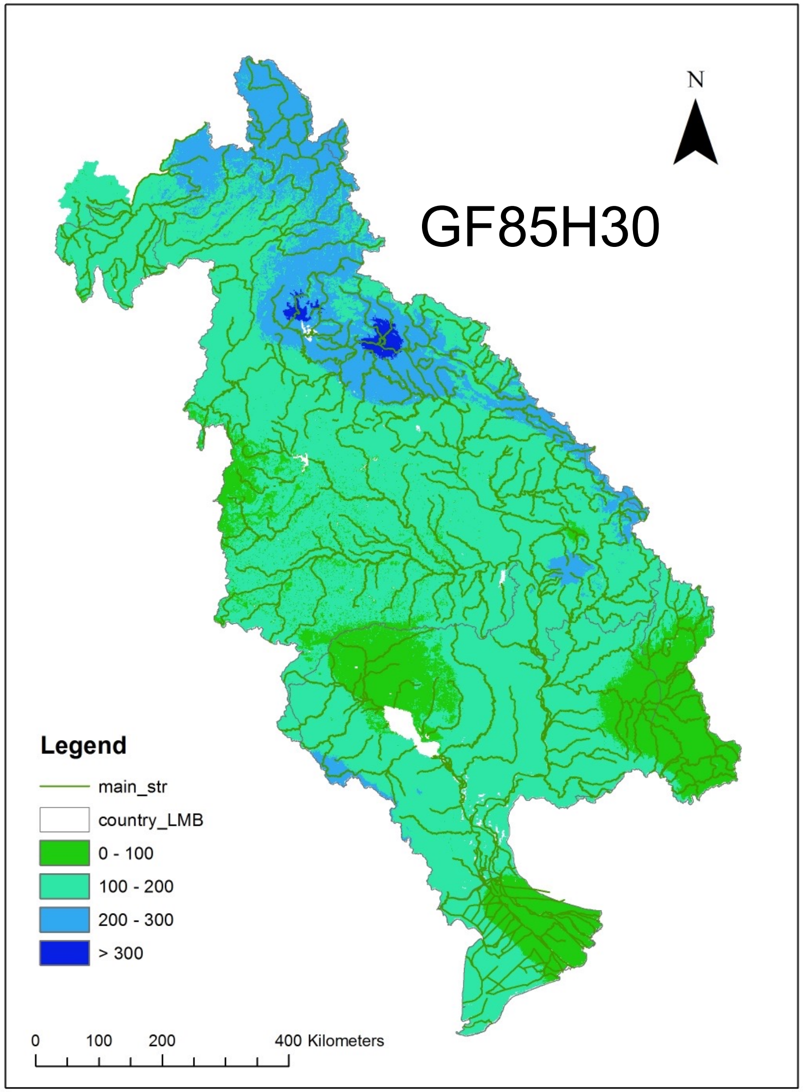
Land Use/Land Cover

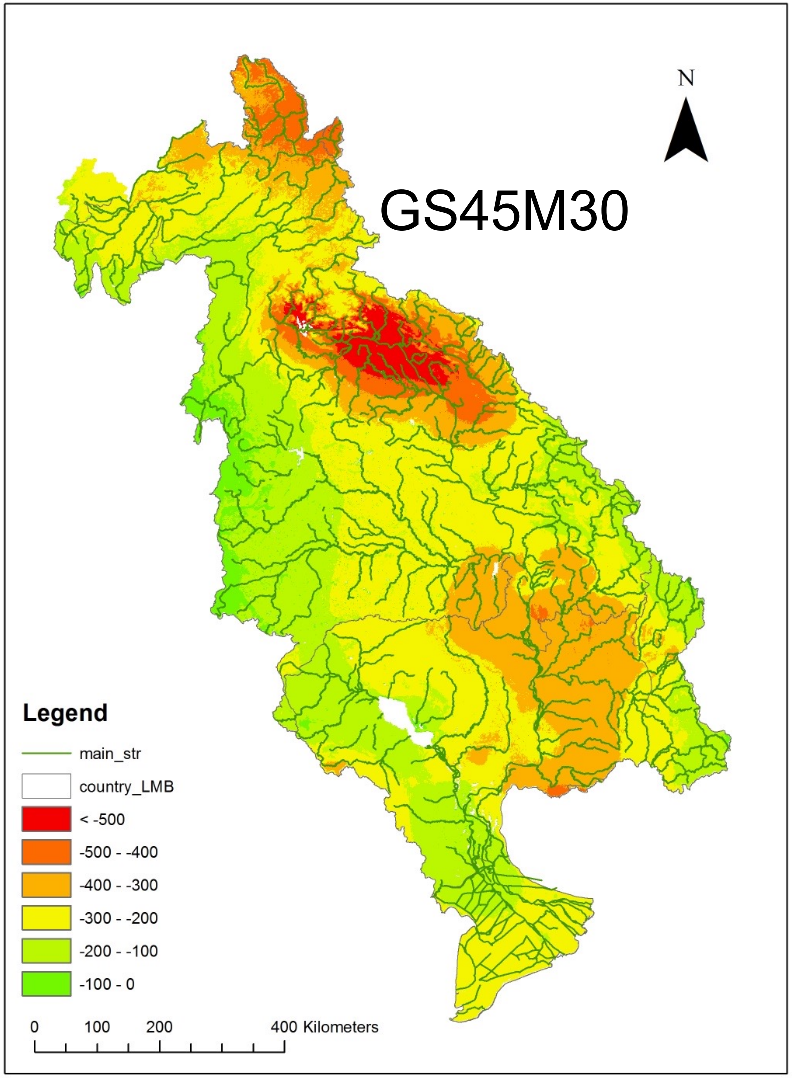
Root depth, evapotranspiration coefficient (Kc)



Predicted Water Yield and Changes

Water yield (mm) by pixel change from baseline

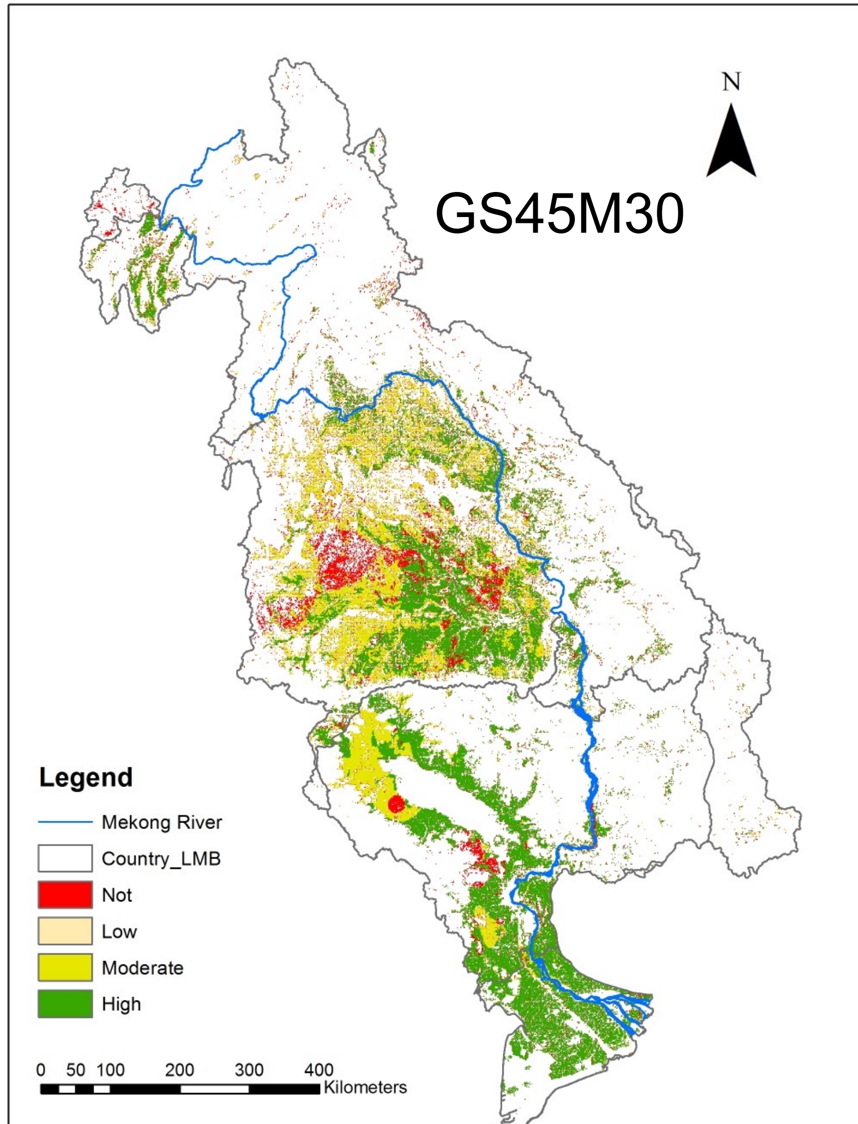




Implications: Food security

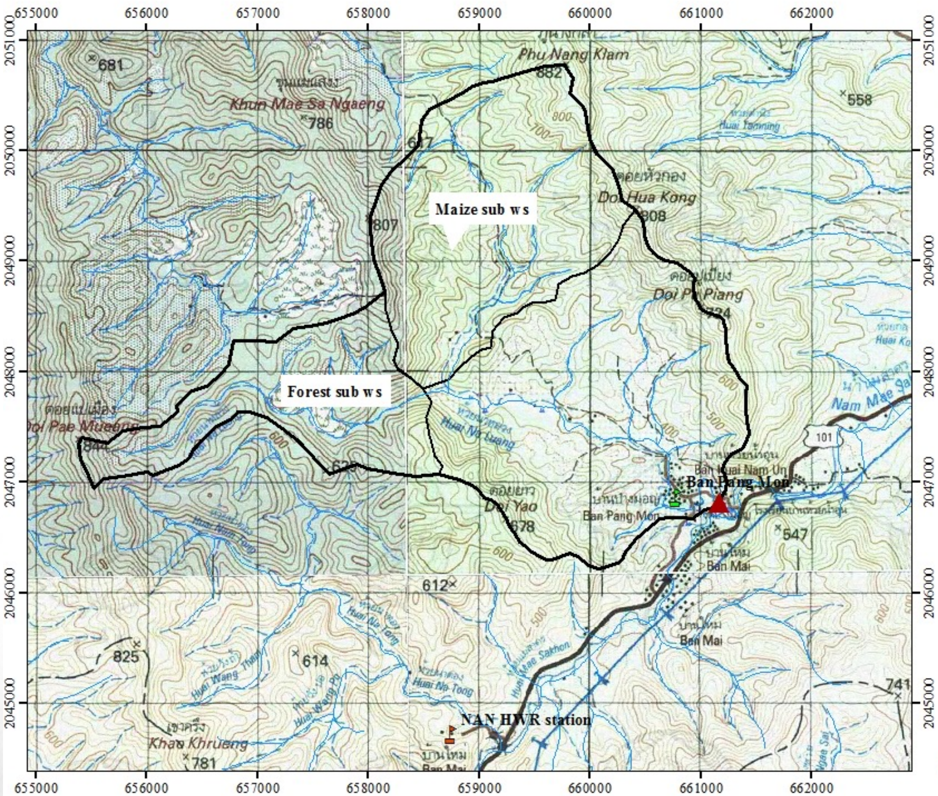
Suit. class	Baseline (%)	GS45M30 (%)
High (S1)	36.39	33.29
+irrigation	36.60	33.49
Mod (S2)	19.57	20.81
	19.41	20.66
Low (L3)	10.43	10.53
	10.44	10.54
N	33.61	35.38
	33.55	35.31

Rice productions are required to **increase up to 50%** in the next 30 years to meet the demand for a growing population (Cosslett et al., 2018; MRC, 2015)



Trisurat et al. (2018)

Case Study 2: Integrated LU planning at 2 small watersheds in northern Thailand



Watershed area

Na Luang sub-watershed = 1,245 ha

- Forest sub-watershed = 251 ha
- Maize sub-watershed = 427 ha

Physical characteristic

Average elevation : 550 msl.

Average slope : 31.40%

Climate characteristic

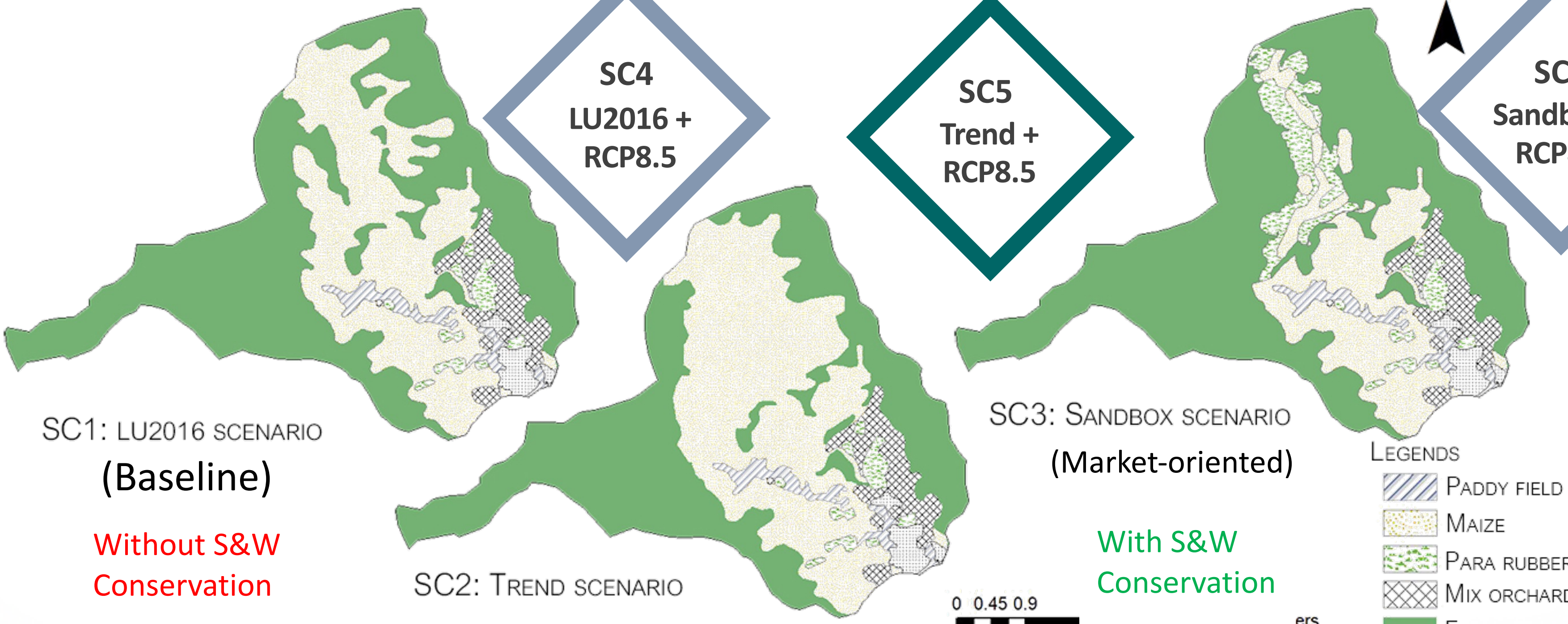
Total rainfall : 1,237.9 mm.

Average temperature : 24 ˙C

(TMD, 2017)

Phetcharaburanin (2021)

Land use scenarios 2030



SC4
LU2016 +
RCP8.5

SC5
Trend +
RCP8.5

SC6
Sandbox +
RCP8.5

SC1: LU2016 SCENARIO
(Baseline)

Without S&W
Conservation

Maize 34%
Forest 54%
Rubber 1%
Others 11%

SC2: TREND SCENARIO

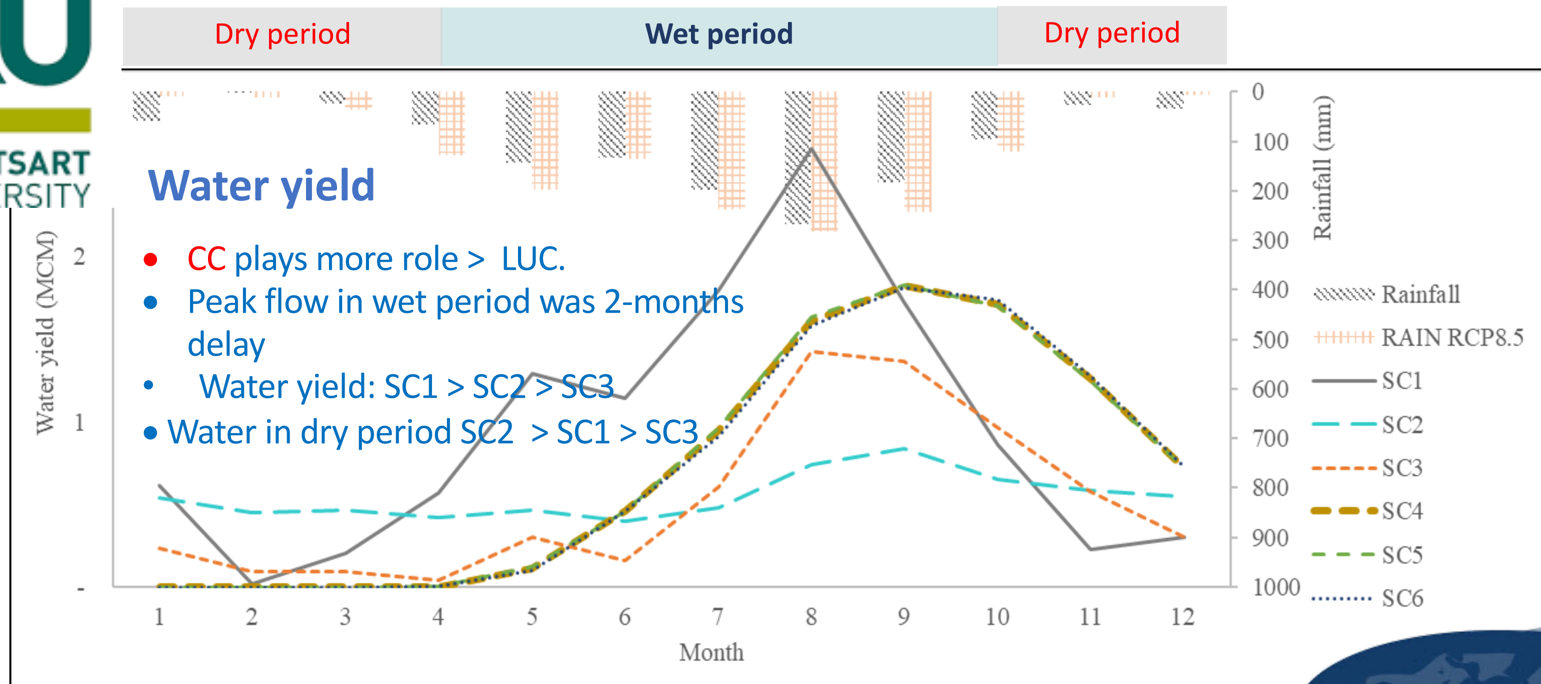
with S&W
conservation.

Maize 41%
Forest 47%
Rubber 1%
Others 11%

SC3: SANDBOX SCENARIO
(Market-oriented)

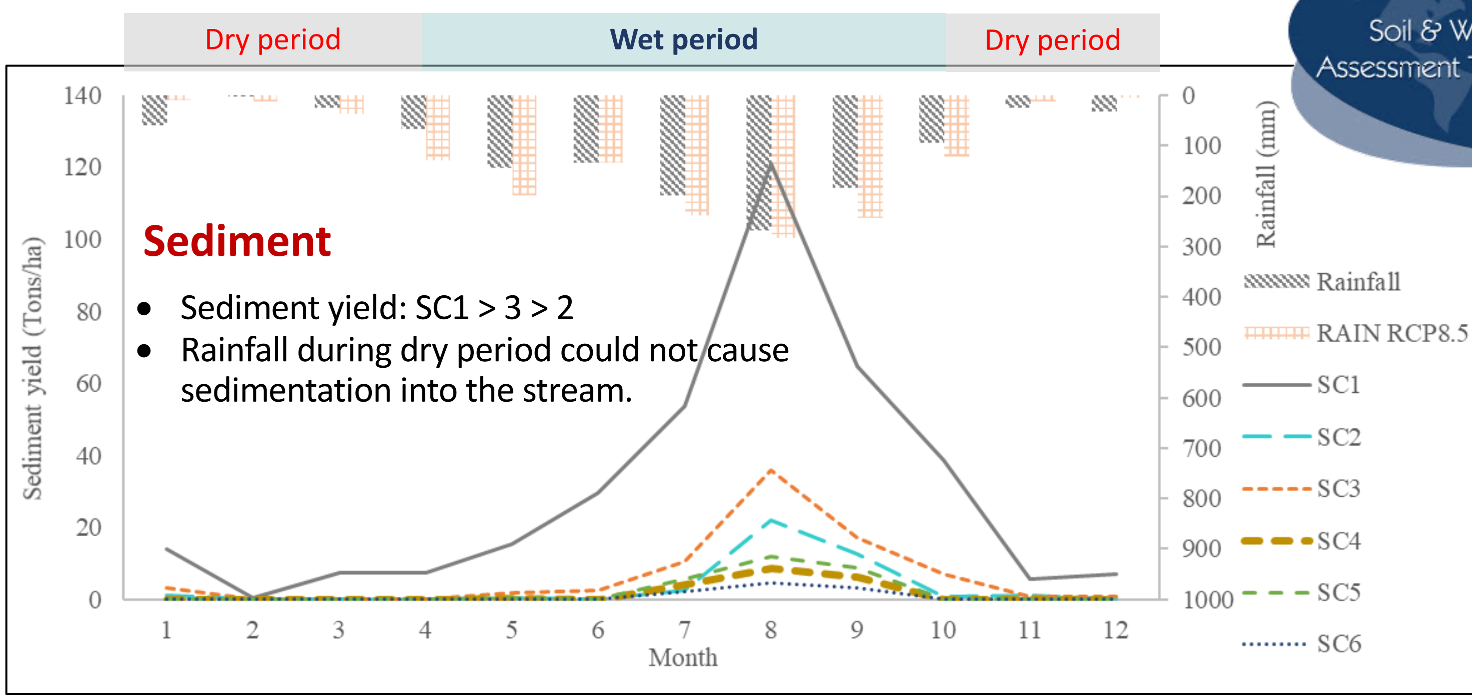
With S&W
Conservation

Maize 22%
Forest 60%
Rubber 7%
Others 11%



Water yield

- CC plays more role > LUC.
- Peak flow in wet period was 2-months delay
- Water yield: SC1 > SC2 > SC3
- Water in dry period SC2 > SC1 > SC3



Sediment

- Sediment yield: SC1 > 3 > 2
- Rainfall during dry period could not cause sedimentation into the stream.

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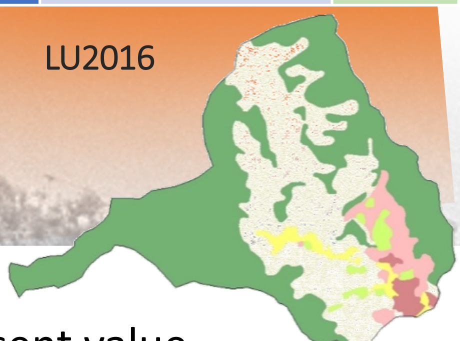
Economic value

(million baht)

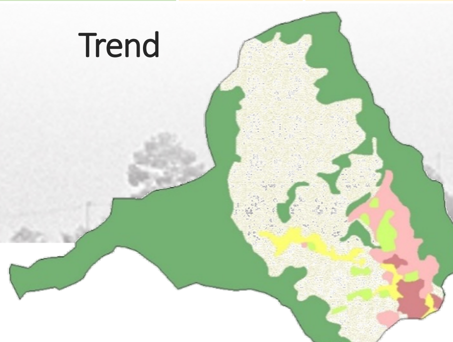
*22-years cultivation (rubber tree)

SC	Hydrological services value	PV income*		PV cost*		Net benefit	NPV	B/C ratio
		Maize	Para rubber	Maize	Para rubber			
SC1	**40.7**	**321.76**	9.82	263.45	4.03	23.37	13.74	1.08
SC2	6.2	384.13	9.82	314.60	4.03	69.18	15.57	1.21
SC3	**9.8**	202.05	**79.46**	165.45	32.57	73.71	40.63	1.35
SC4	3.9.	321.76	9.82	263.45	4.03	60.17	13.74	1.22
SC5	4.7	384.13	9.82	314.60	4.03	70.67	15.57	1.22
SC6	2.9	202.05	79.46	165.45	32.57	82.53	40.63	1.40

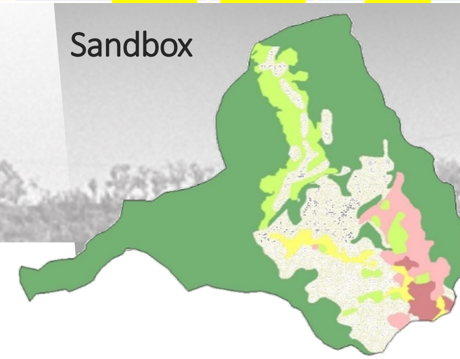
LU2016



Trend



Sandbox



PV = present value

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Using multicriteria decision analysis (MCDA)

Appraise
Land use planning

gical services
- Water supply
- Soil loss prevention

Economic criteria
- Water supply
- Dredging
- NPV for maize
- NPV for rubber

Appropriateness	SC1	SC2	SC3	SC4	SC5	SC6
Appropriate score	10.20	1.22	1.25	0.47	0.47	0.12
Land use appraisal level	Moderate	High	High	High	High	High

- **Baseline (SC1)**
  Not recommended due to lowest B/C ratio (1.08) and moderate suit.

- **Trend or BUA (SC2)**
  is appropriate for maize cropping only because of low investment cost. BUT soil and water conservation is required such as terracing to reduce surface runoff and sediment in wet season.

Sandbox (SC3)
is suitable to generate household income from maize and rubber plantations (B/C ratio = 1.35). In addition, water shortage in dry season and sedimentation is minimal.

Scenarios 4, 5, and 6 (RCP 8.5)
More rainfall is expected in wet season (200 mm). BUT water shortage in late dry season is predicted for all scenarios (less severe). Water storage such as pond and check dam are recommended.

Conclusions

EO is an important tool to define direct drivers (e.g., land use, climate change)

Changes in direct drivers will alter nature and biodiversity characteristics at local, national, regional and global scales.

Nature’s benefits and economic values can be quantified and smart decisions can be made based on science-policy interface for sustainable development.