Incorporating Ecosystem Services Scenario Results into ICM Planning

Adrian L. Vogl

Stanford University & The World Bank
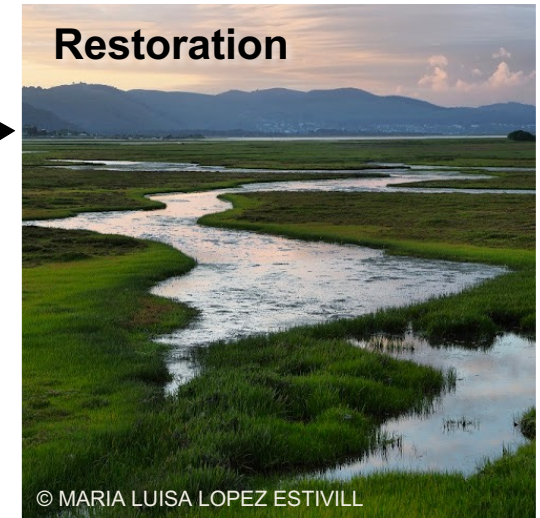avogl@worldbank.org

What are Scenarios?

- Scenarios are simplified representations of possible futures

- They can be in the form of narratives, numbers, maps, etc.

- Modeling scenarios:

Narratives		
Maps	GIS processing	Land Cover
Projections		Rainfall

Tables + Parameters

description	lucode	Kc_1	Kc_2	Kc_3	Kc_4	Kc_5	K
Urban	111	0.4	0.4	0.4	0.4	0.4	
Pasture	231	0.75	0.75	0.75	0.75	0.75	
Mosaic	241	1.2	1.2	1.2	1.2	1.2	
Secondary Vegetation	323	0.87	0.87	0.87	0.87	0.87	
Barren	333	0.4	0.4	0.4	0.4	0.4	
Water	413	1.05	1.05	1.05	1.05	1.05	
Wetlands	512	1.05	1.05	1.05	1.05	1.05	
Crops	2211	1.2	1.2	1.2	1.2	1.2	
Forest	31111	0.88	0.88	0.88	0.88	0.88	
Grasslands	32112	0.75	0.75	0.75	0.75	0.75	
Mangroves	600000	1.02	1.02	1.02	1.02	1.02	
Seagrass	610000	0	0	0	0	0	

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ICM Demo Scenarios

To demonstrate how InVEST sediment, water, and carbon models can inform catchment planning, we devised 2 demonstrative scenarios:

Business as Usual

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Today

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Restoration

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Business as Usual

Business as Usual
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- Poorly managed catchments continue to degrade
- Gullies expand and threaten more areas
- Grazing lands lose vegetation and soil cover
- Croplands lose fertile soils and productivity

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4

Restoration Scenario

Restoration

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- Catchments are managed to restore vital ecosystem services

- Gullies are restored

- Grazing management practices improve vegetation cover and soil

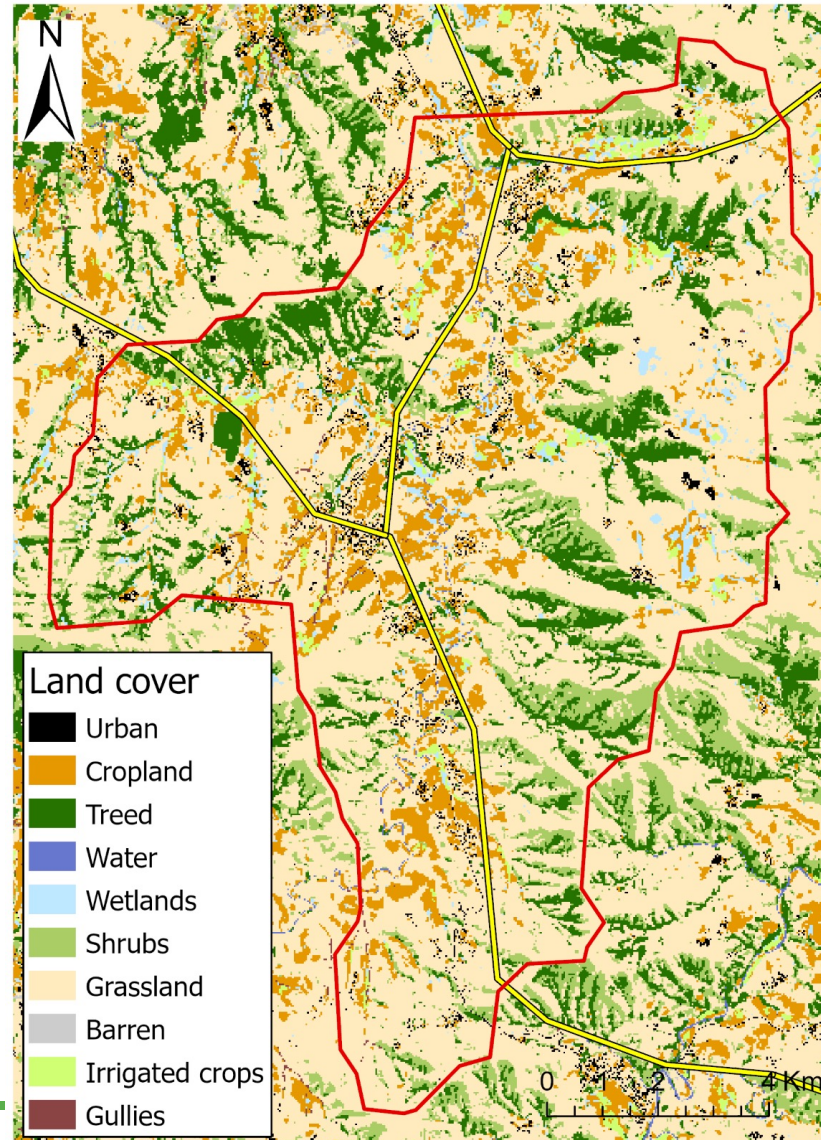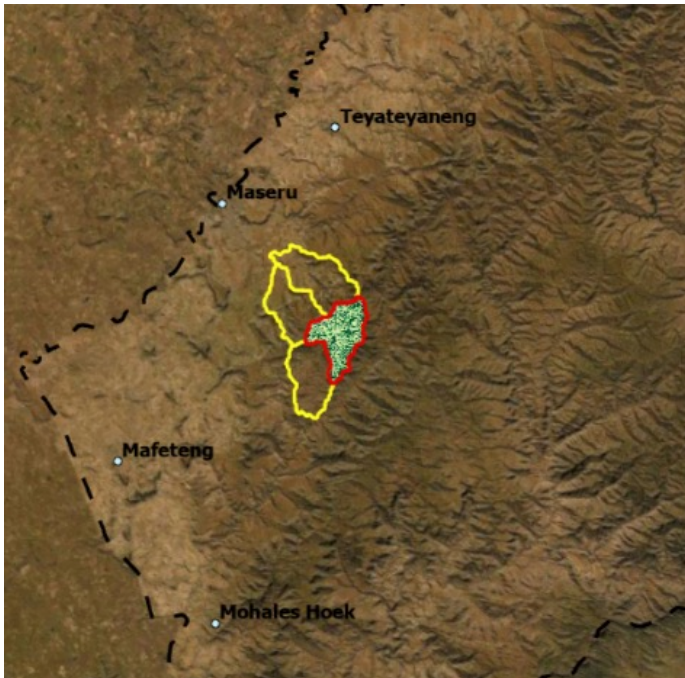- Best management practices in croplands retain fertile soils and improve productivity

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Climate Change

Climate Change Knowledge Portal
For Development Practitioners and Policy Makers

Projected Mean-Temperature
Lesotho; (Ref. Period: 1995-2014), Multi-Model Ensemble
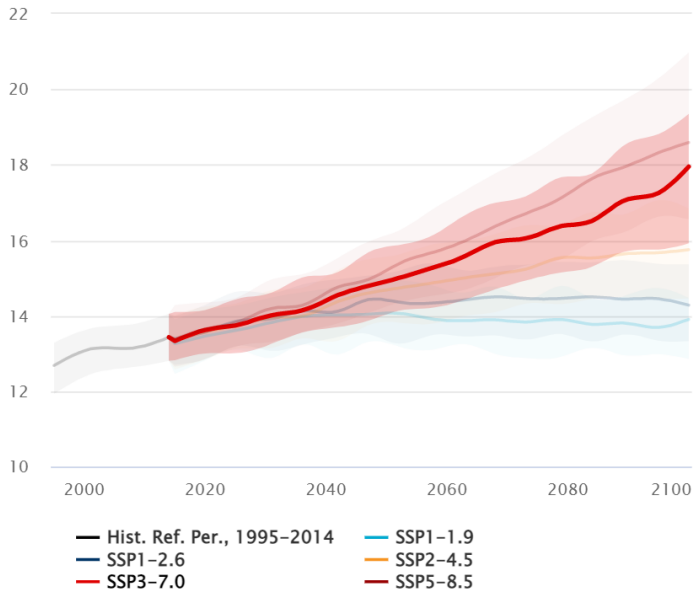
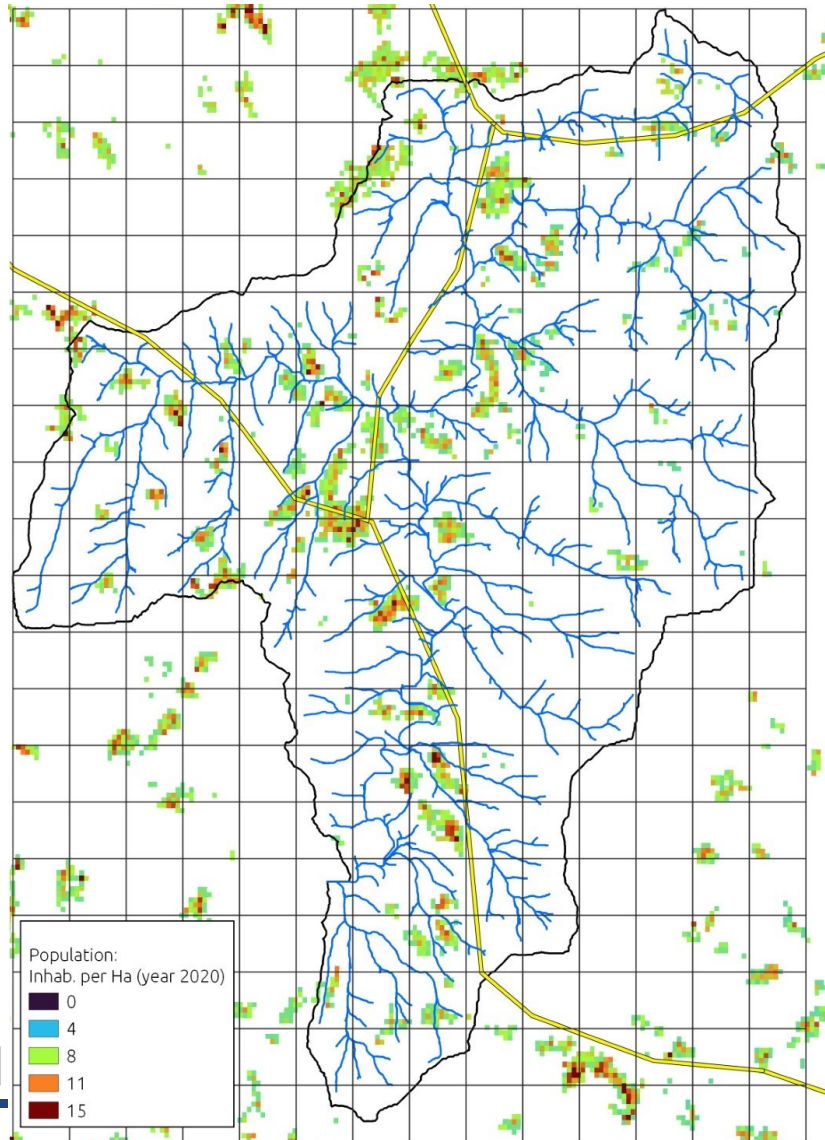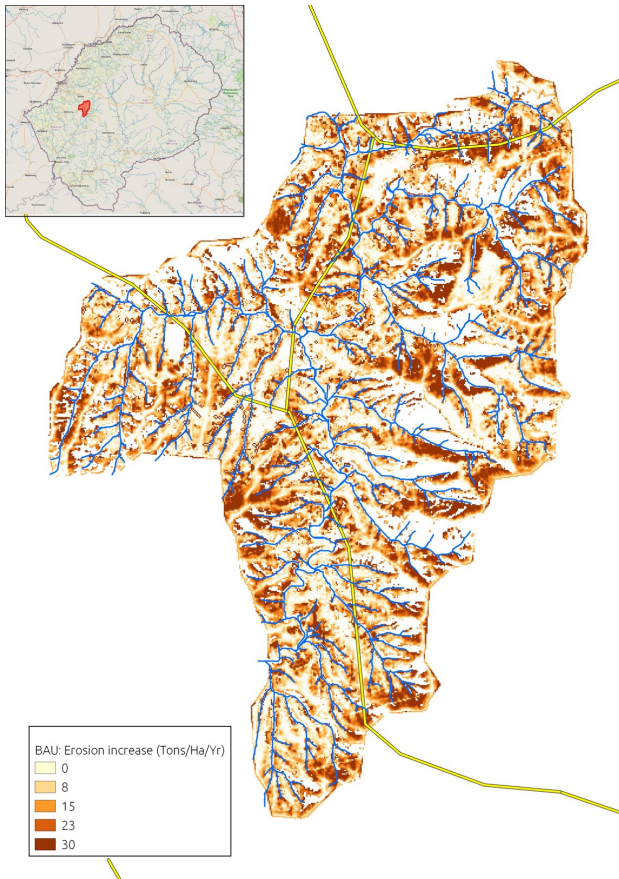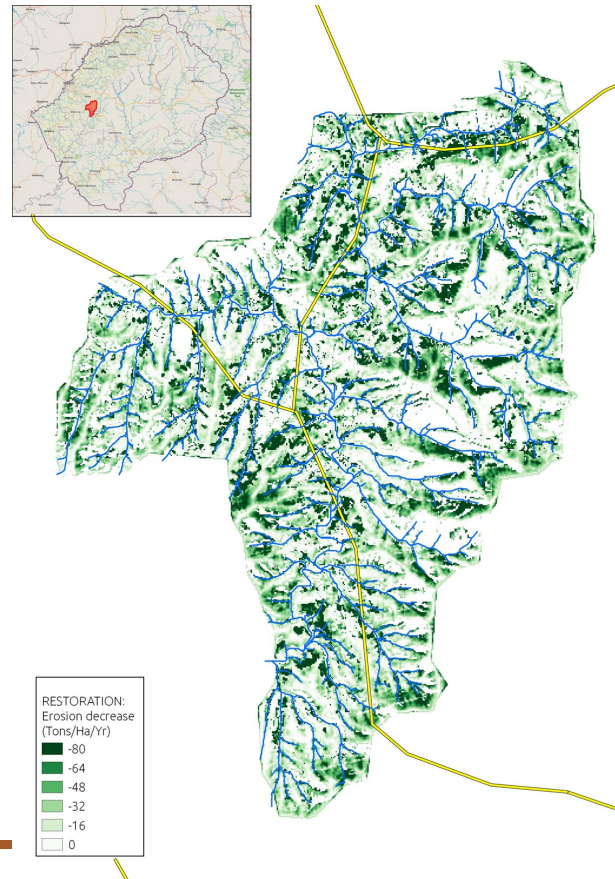|	Units: %	2020-2039				2040-2059			
		DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
SSP1-1.9	Country: Lesotho	1.34 (-7.09,9.08)	1.00 (-16.09,11.13)	-6.46 (-26.11,7.01)	-3.82 (-18.68,10.43)	0.60 (-8.52,8.36)	-7.97 (-14.26,13.28)	-10.96 (-26.52,9.97)	-5.78 (-25.03,7.60)
	Highest: Qacha's Nek	1.75 (-8.25,8.10)	0.79 (-17.71,11.89)	-7.94 (-20.12,7.72)	-1.98 (-17.85,9.59)	-0.01 (-7.55,6.81)	-6.47 (-11.95,11.57)	-7.61 (-23.28,11.85)	-5.10 (-20.44,9.98)
	Lowest: Mafeteng	0.18 (-6.52,10.20)	1.38 (-23.06,15.37)	-8.96 (-24.03,5.91)	-9.06 (-19.71,10.15)	-3.06 (-17.68,6.87)	-9.08 (-18.80,12.51)	-12.52 (-29.11,7.07)	-13.45 (-24.34,0.28)
SSP2-4.5	Country: Lesotho	0.77 (-8.39,9.72)	-0.74 (-15.61,13.04)	-5.76 (-19.78,20.17)	-2.48 (-13.24,7.62)	3.44 (-5.19,13.44)	0.18 (-10.17,11.53)	-3.85 (-27.26,17.47)	-3.39 (-14.08,6.04)
	Highest: Quthing	-0.79 (-10.64,10.67)	0.69 (-10.98,11.53)	-4.87 (-19.66,14.78)	-1.79 (-10.39,11.01)	2.52 (-9.01,11.43)	-0.82 (-9.36,12.41)	-3.82 (-19.45,21.57)	-2.58 (-16.41,8.77)
	Lowest: Mafeteng	0.27 (-11.58,10.24)	0.99 (-17.28,10.73)	-5.02 (-22.91,17.49)	-4.62 (-13.53,6.94)	2.71 (-6.76,11.53)	-0.80 (-14.18,9.87)	-8.08 (-29.14,16.50)	-5.45 (-20.34,3.28)
SSP3-7.0	Country: Lesotho	1.43 (-4.81,8.45)	1.73 (-8.99,14.08)	-2.83 (-19.51,9.67)	-1.07 (-17.41,10.40)	3.71 (-4.73,13.04)	-0.47 (-13.62,12.74)	-5.32 (-28.34,11.65)	-3.46 (-15.90,6.97)
	Highest: Qacha's Nek	1.12 (-6.52,8.80)	2.27 (-8.69,12.46)	-0.71 (-15.21,13.86)	-1.19 (-14.99,10.62)	2.73 (-6.29,10.74)	2.41 (-12.49,11.86)	-4.20 (-23.85,12.46)	-2.66 (-14.40,7.27)
	Lowest: Mafeteng	0.70 (-8.74,9.81)	1.34 (-9.43,10.68)	-2.78 (-21.16,9.53)	-1.19 (-20.63,12.87)	1.35 (-5.03,14.94)	-2.01 (-16.08,12.36)	-11.33 (-28.97,9.48)	-4.15 (-19.26,8.02)

Study Area

Land cover
- Urban
- Cropland
- Treed
- Water
- Wetlands
- Shrubs
- Grassland
- Barren
- Irrigated crops
- Gullies

Population: 2020

Population:
Inhab. per Ha (year 2020)
- 0
- 4
- 8
- 11
- 15

Source: www.worldpop.org

Results

Sediment: Erosion

Business as Usual

Restoration

BAU: Erosion increase (Tons/Ha/Yr)
- 0
- 8
- 15
- 23
- 30

RESTORATION:
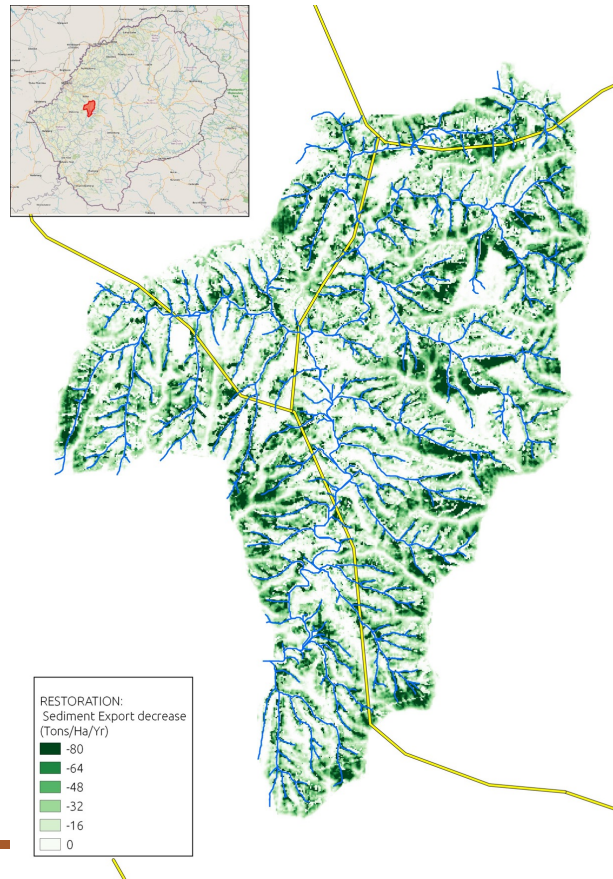Erosion decrease
(Tons/Ha/Yr)
- -80
- -64
- -48
- -32
- -16
- 0

* Maps for demonstration purposes only. Not for use in planning.

10

Sediment: Transported to Streams

Business as Usual
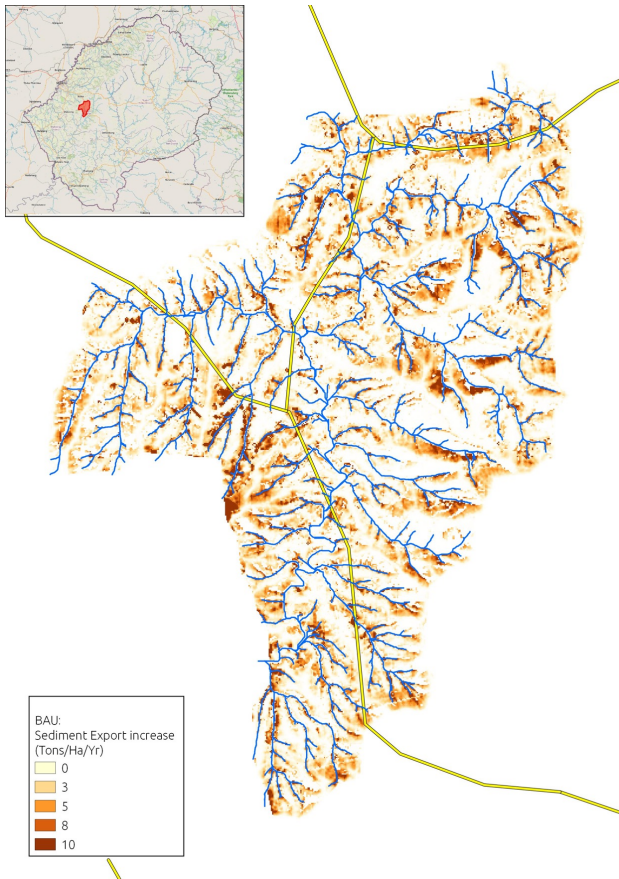
Restoration

BAU:
Sediment Export increase
(Tons/Ha/Yr)
- 0
- 3
- 5
- 8
- 10

RESTORATION:
Sediment Export decrease
(Tons/Ha/Yr)
- -80
- -64
- -48
- -32
- -16
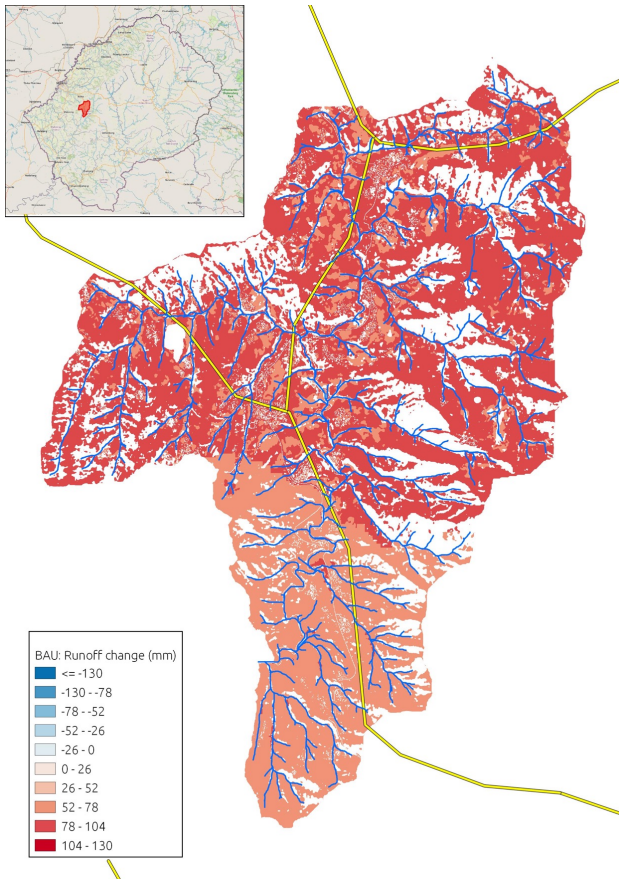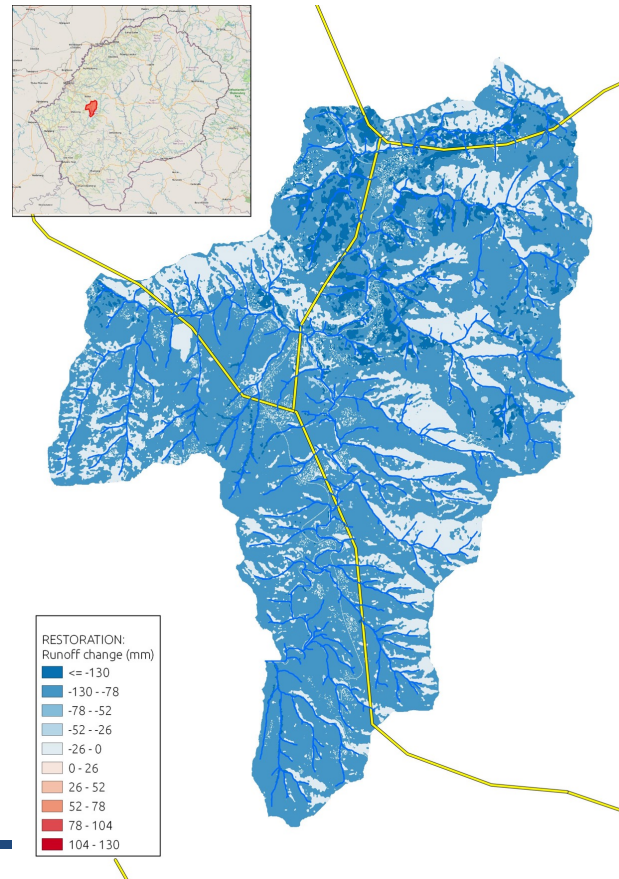- 0

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11

Water: Surface Runoff

Business as Usual

Restoration

BAU: Runoff change (mm)
- <= -130
- -130 - -78
- -78 - -52
- -52 - -26
- -26 - 0
- 0 - 26
- 26 - 52
- 52 - 78
- 78 - 104
- 104 - 130

RESTORATION:
Runoff change (mm)
- <= -130
- -130 - -78
- -78 - -52
- -52 - -26
- -26 - 0
- 0 - 26
- 26 - 52
- 52 - 78
- 78 - 104
- 104 - 130
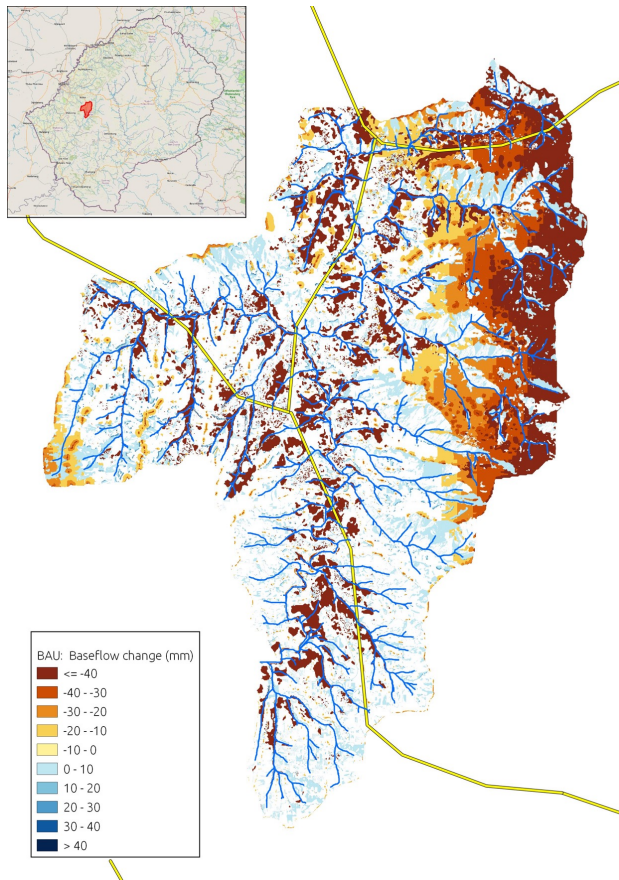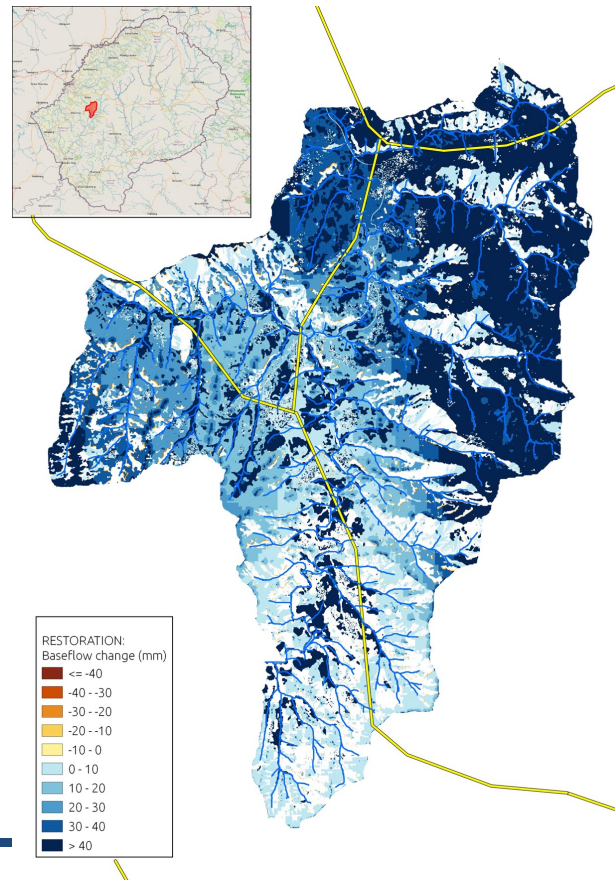
* Maps for demonstration purposes only. Not for use in planning.

Water: Baseflow Contribution

Business as Usual

Restoration

BAU: Baseflow change (mm)
- <= -40
- -40 - -30
- -30 - -20
- -20 - -10
- -10 - 0
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

RESTORATION: Baseflow change (mm)
- <= -40
- -40 - -30
- -30 - -20
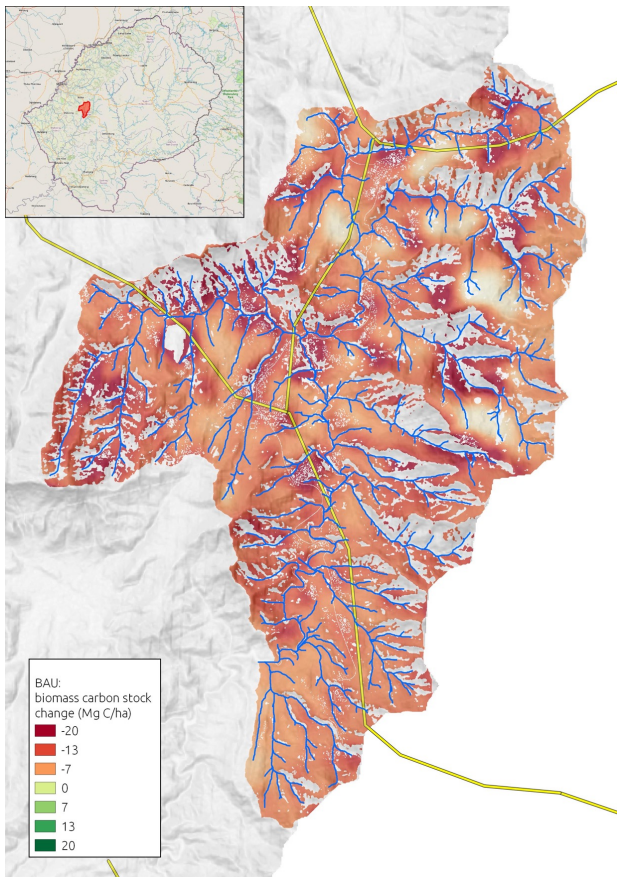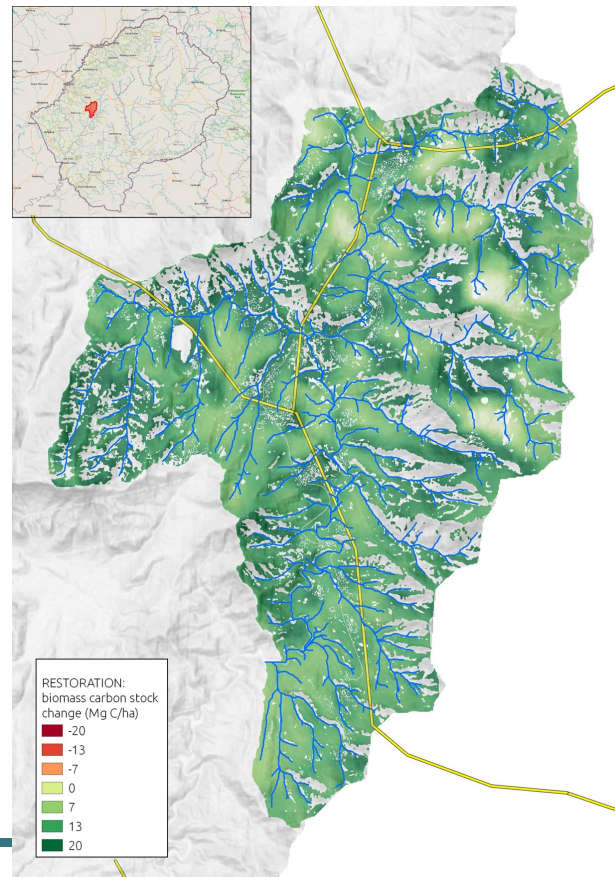- -20 - -10
- -10 - 0
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

* Maps for demonstration purposes only. Not for use in planning.

13

Carbon Stored in Vegetation

Business as Usual

Restoration

BAU:
biomass carbon stock
change (Mg C/ha)
- -20
- -13
- -7
- 0
- 7
- 13
- 20

RESTORATION:
biomass carbon stock
change (Mg C/ha)
- -20
- -13
- -7
- 0
- 7
- 13
- 20

* Maps for demonstration purposes only. Not for use in planning.

14

Group
Activity

Questions for Discussion

- What are the implications of not acting, allowing the catchment to further degrade (e.g., projected degradation scenario)?

- Where are restoration activities predicted to be most effective – e.g. croplands vs rangelands, in which different parts of catchment?

- Considering what you know about potential interventions, their costs and resource requirements, where are restoration activities likely to be most cost-effective?

- The catchment management plan will follow a phased approach, reaching 10% of the catchment area in the first 5 years. Where exactly would you recommend that implementation begin? Pick 10 cells to start, trying to maximize all the benefits that we analysed.

- What other information would you want to consider before making final recommendations for the catchment plan?