Measuring ecosystem services in Rwanda

Virtual Expert Forum on SEEA Experimental Ecosystem Accounting 2020

Presented by Evariste RUTEBUKA
Peter KATANISA
Email:ruteva07@gmail.com

WAVES

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NISR
NATIONAL INSTITUTE OF STATISTICS OF RWANDA

Rwanda ecosystems and uniqueness

Population pressure

1st in Africa by its Density of 499 inhab /sqkm

Population increased 75% of 1990 in 2019

Country of thousands hills

- Agriculture the backbone of the economy,
- 39 percent of gross domestic product (GDP),
- 80 percent of employment,
- 63 percent of foreign exchange earnings,
- 90 percent of the country's food needs WB 2013

Photo credit: Shutterstock

Why ecosystem account and which services in priority?

- Turbine erosion has led to a 60% reduction in potential production in Keya Hydropower Plant, Rwanda (Omar 2012).
- The soil nutrient balance in Rwanda is one of the most negative in Africa (World Bank; CIAT; 2015) (Rwanda SCD)
- Water utility Company in Rwanda (WASAC) reported that turbidity levels are negatively impacting its ability to supply water (WASAC 2019).

(almost 1% of national budget 2014/2015) was required to deal with water related disasters.

Rwanda ecosystem accounting process

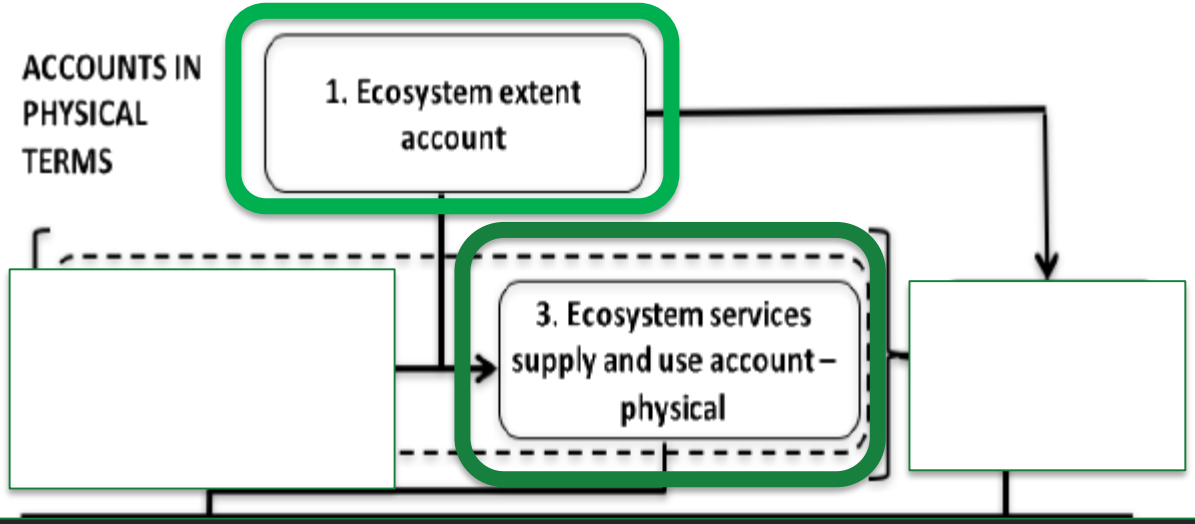
Ministry of Finance and Economic Planning
Ministry of Environment
Ministry of Agriculture
National Institute of Statistics
Rwanda Environment Management Authority
Rwanda Water and Forest Authority
Rwanda Land Use and Management Authority
Rwanda Metrological Agency

Full list of potential ecosystem services proposed

Screening based on government priorities

1. Soil erosion (Erosion control proxy)
2. Sediment export (Soil loss and water quality proxy)
3. Baseflow (Water recharge proxy)
4. Quick flow (Flooding and infrastructure damage proxy)
5. Carbon storage and sequestration (tempted but not reported)
6. Forest sub-account (tempted but not reported)

SEEA framework and what Rwanda has achieved

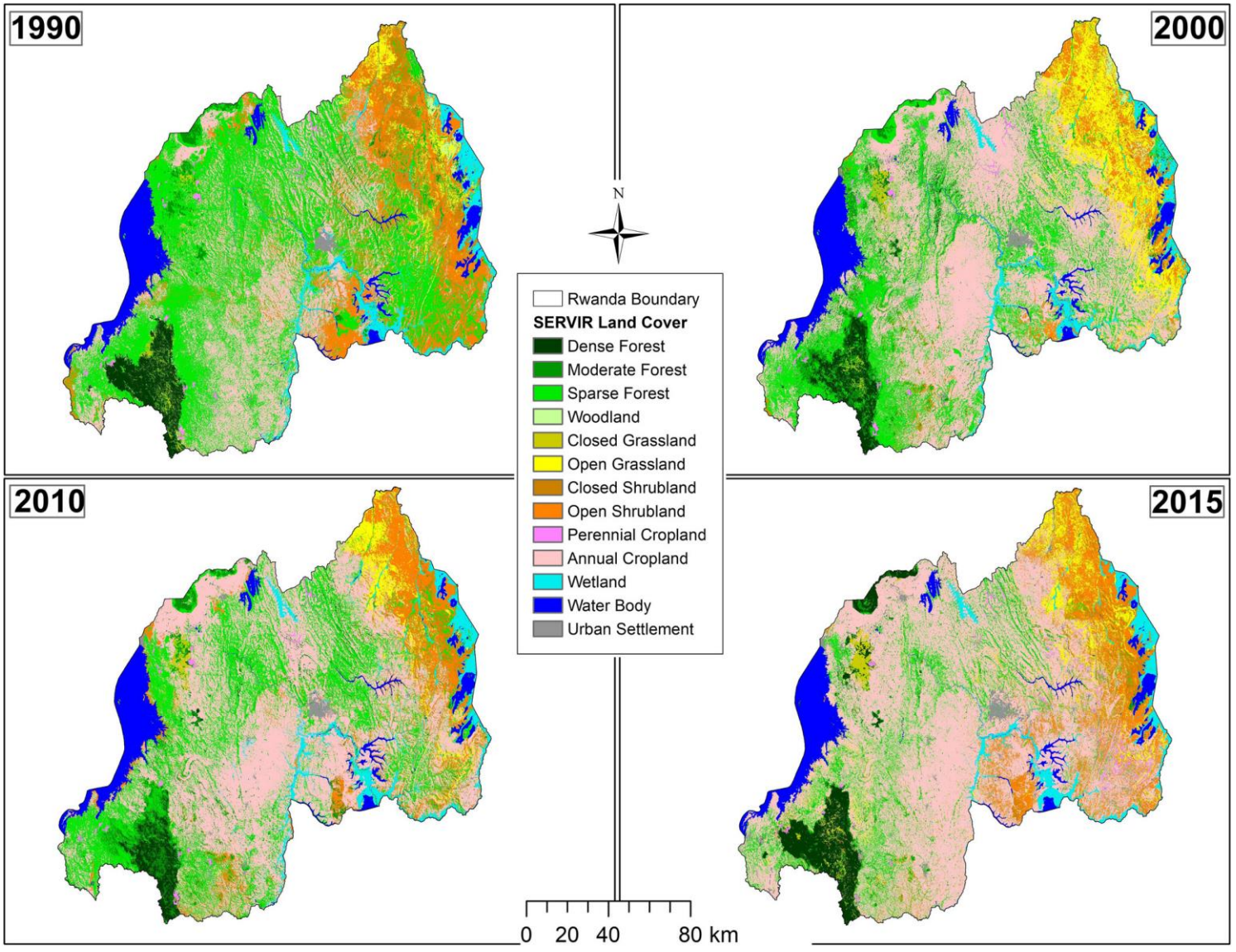


1. Soil erosion (Erosion control proxy)
2. Sediment export (Soil loss, water quality and energy security proxy)
3. Baseflow (Water recharge and dry season water flow proxy)
4. Quick flow (Flooding and infrastructure damage proxy)

Method for measuring ecosystem services

- Follows the UN Statistics Division's System of National Accounts.
- The Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) models were used.
- Accounts tables were produced at national, provincial, catchment and district levels.
- Flows of services' estimates are based on available data and past research, and easily repeatable.
- Consensus on data inputs achieved through discussions with REMA, NISR, RWFA, RLUMA, Meteo and MoE and MINECOFIN.

Rwanda ecosystems extent (from Land account)

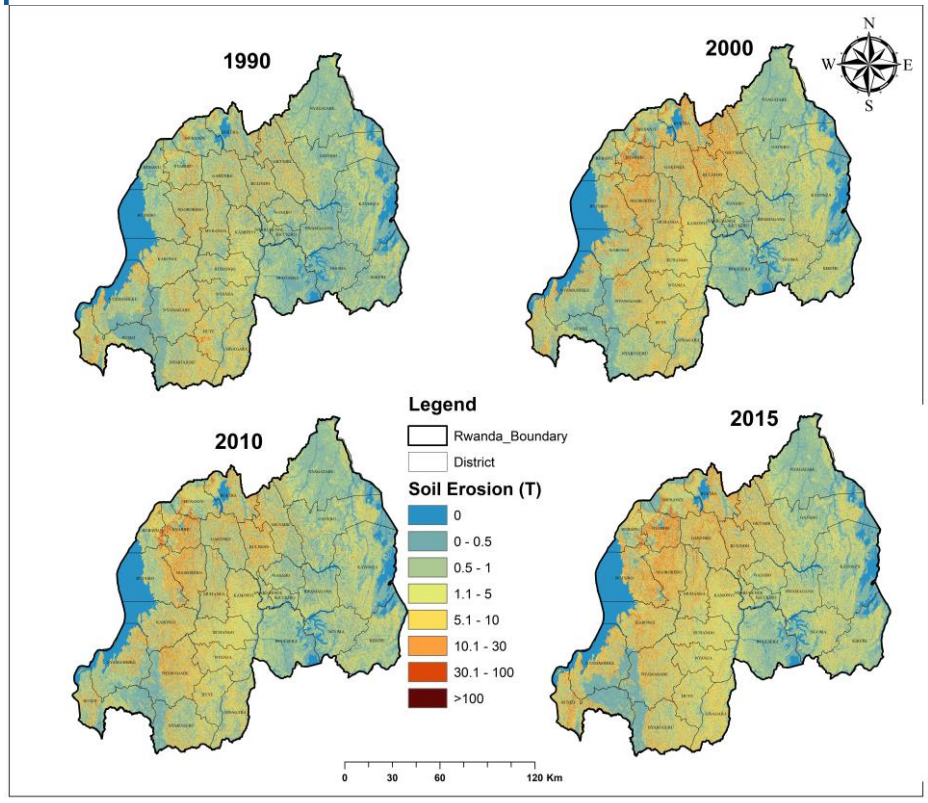


Source: Land accounts 2018

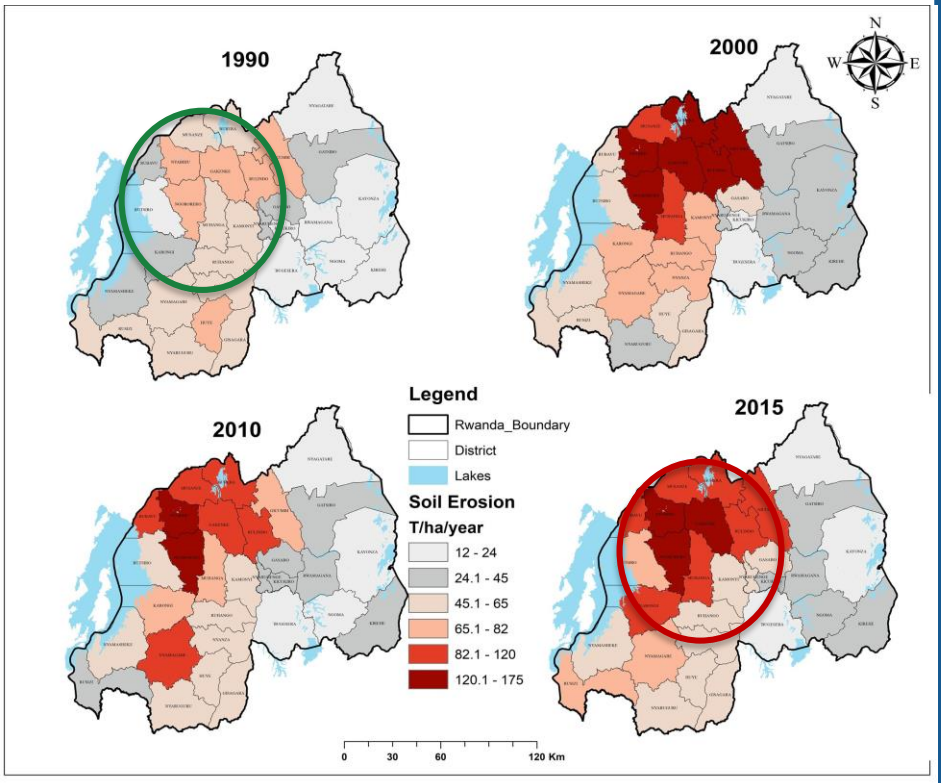
Key results

Results: Soil erosion (erosion control proxy)

National level spatial soil erosion distribution



District level soil erosion aggregated per hectare



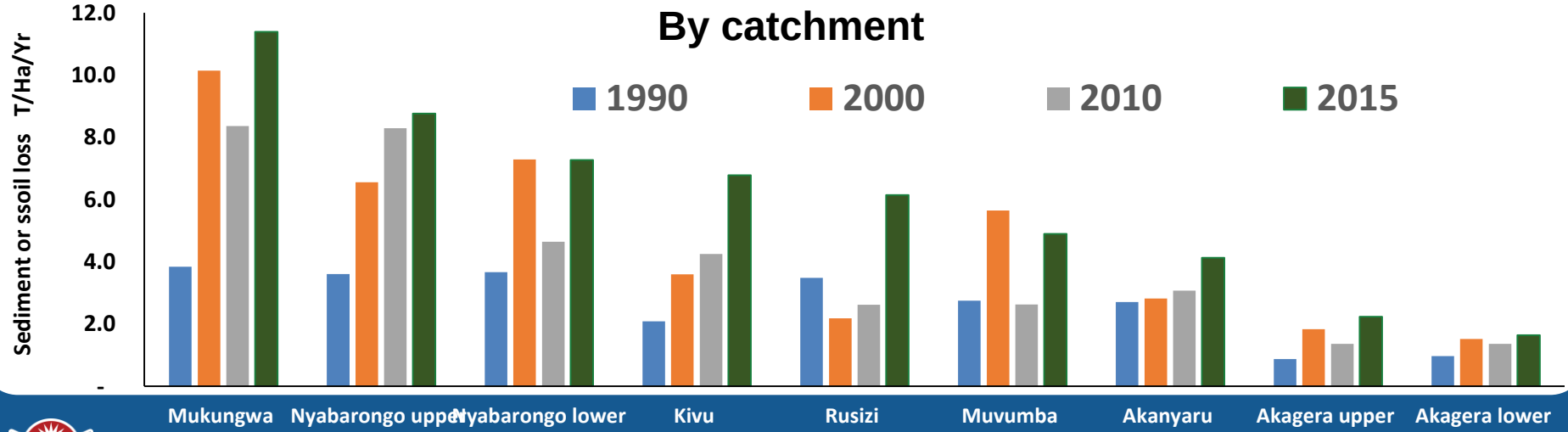
National trend in soil erosion (T/Yr)

National soil erosion (T/Yr)		Soil erosion change against baseline of 1990	Change in soil erosion from previous period
1990	102,450,911		
2000	157,652,121	54%	54%
2010	135,960,937	33%	-14%
2015	158,166,230	54%	16%
Change, 1990-2015	55,715,319		54%

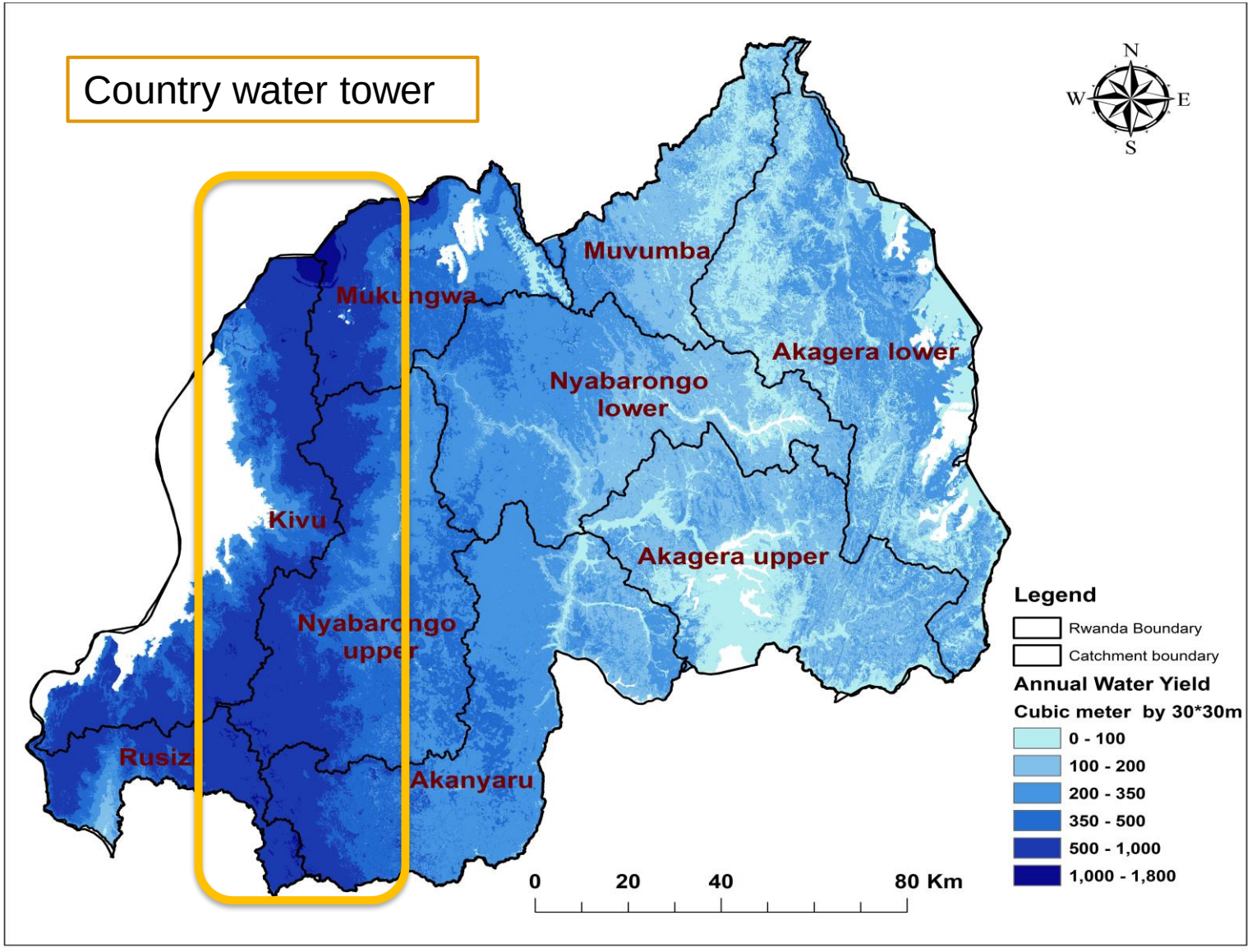
- In 2015 the average annual erosion of topsoil was 62 tonnes per hectare

National soil loss (T/Yr)		Change of sediment against 1990 baseline	Change sediment export from previous period
1990	6,294,485		
2000	11,088,279	76%	76.2%
2010	10,107,983	61%	-8.8%
2015	14,039,860	123%	38.9%
Change, 1990-2015	7,745,375		123.1%

Of the 62 tonnes of topsoil eroded per hectare in 2015, some 5.5 tonnes reaches the rivers – largely as fine material and nutrients.



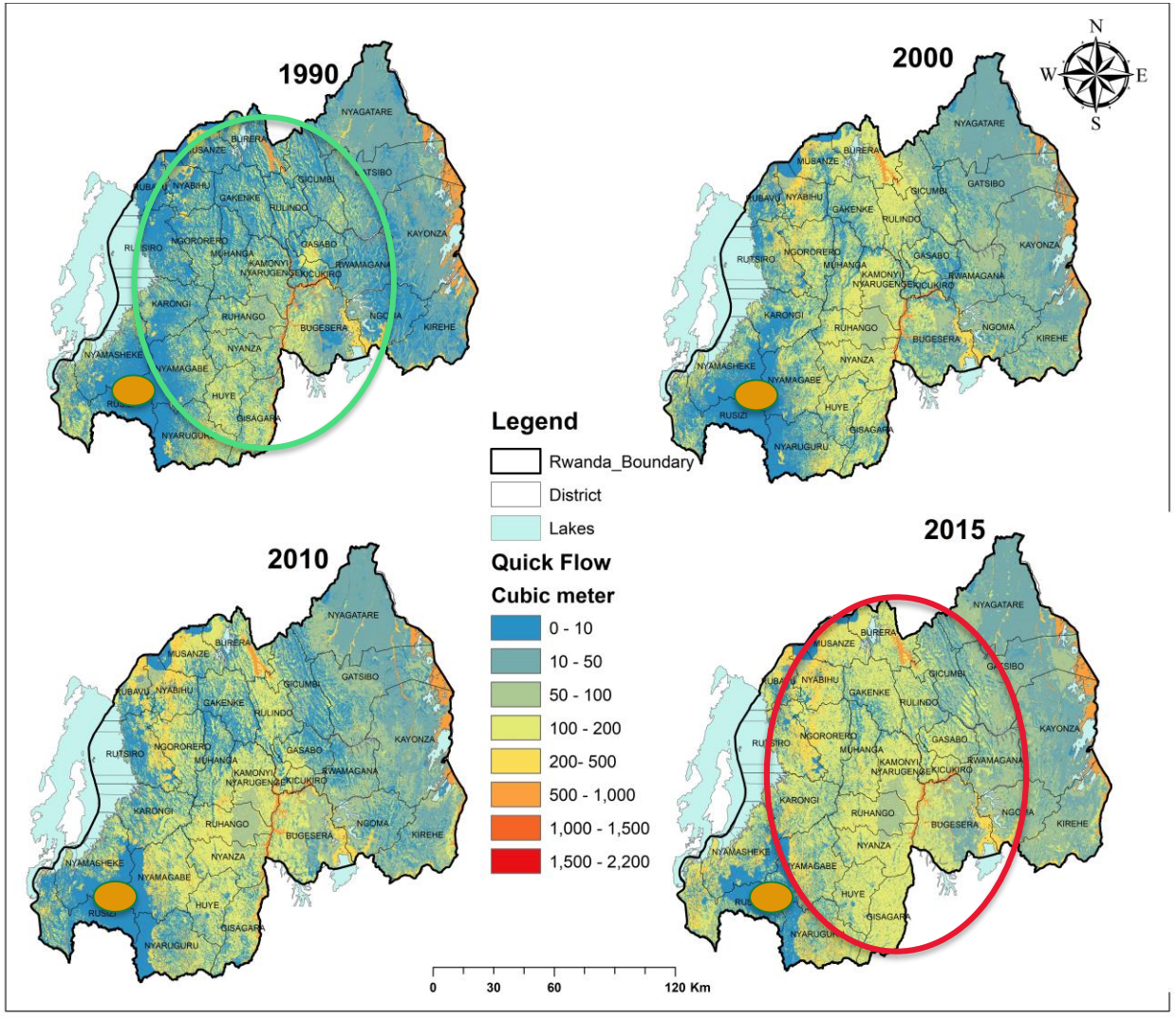
National annual water yield



National annual water yield

National annual water yield (m^3/yr)		
	National yield	Change in yield from previous period
1990	7,928,109,461	
2000	7,793,320,618	-1.70 %
2010	7,962,700,158	2.17 %
2015	8,249,488,807	3.60 %
Change, 1990-2015	321,379,346	4.1%

National quick flow (flooding and infrastructure destruction proxy)



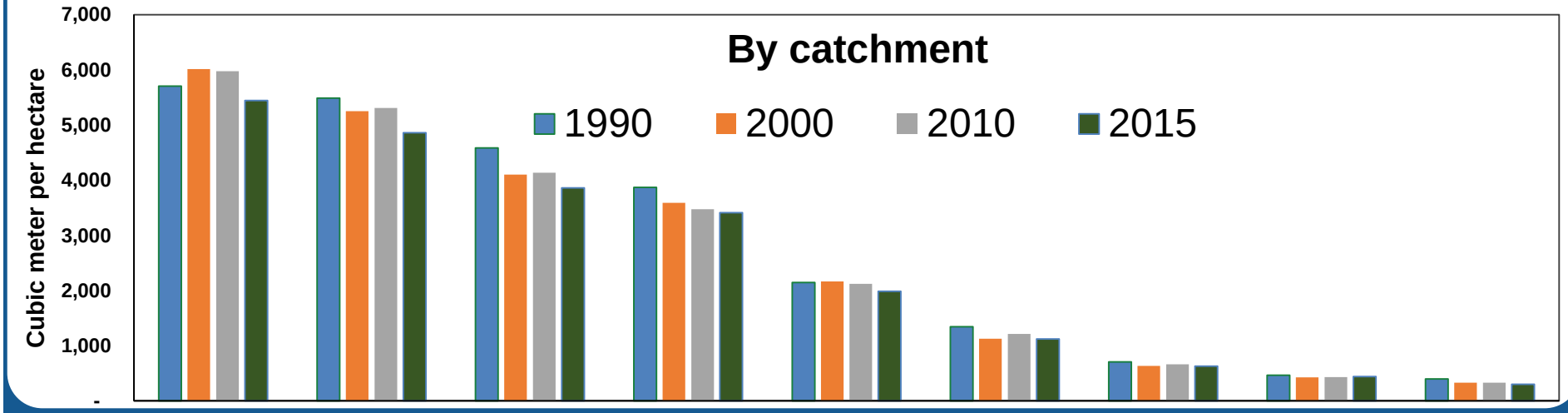
National Quick flow (flooding and infrastructure damage proxy)

National quickflow (m^3 water/yr)		Change of quickflow against 1990 baseline	Change in quickflow from previous period
1990	2,391,447,164		
2000	2,781,146,534	16%	16%
2010	2,928,383,754	22%	5%
2015	3,227,117,062	35%	10%
Change, 1990-2015	835,669,898		35%

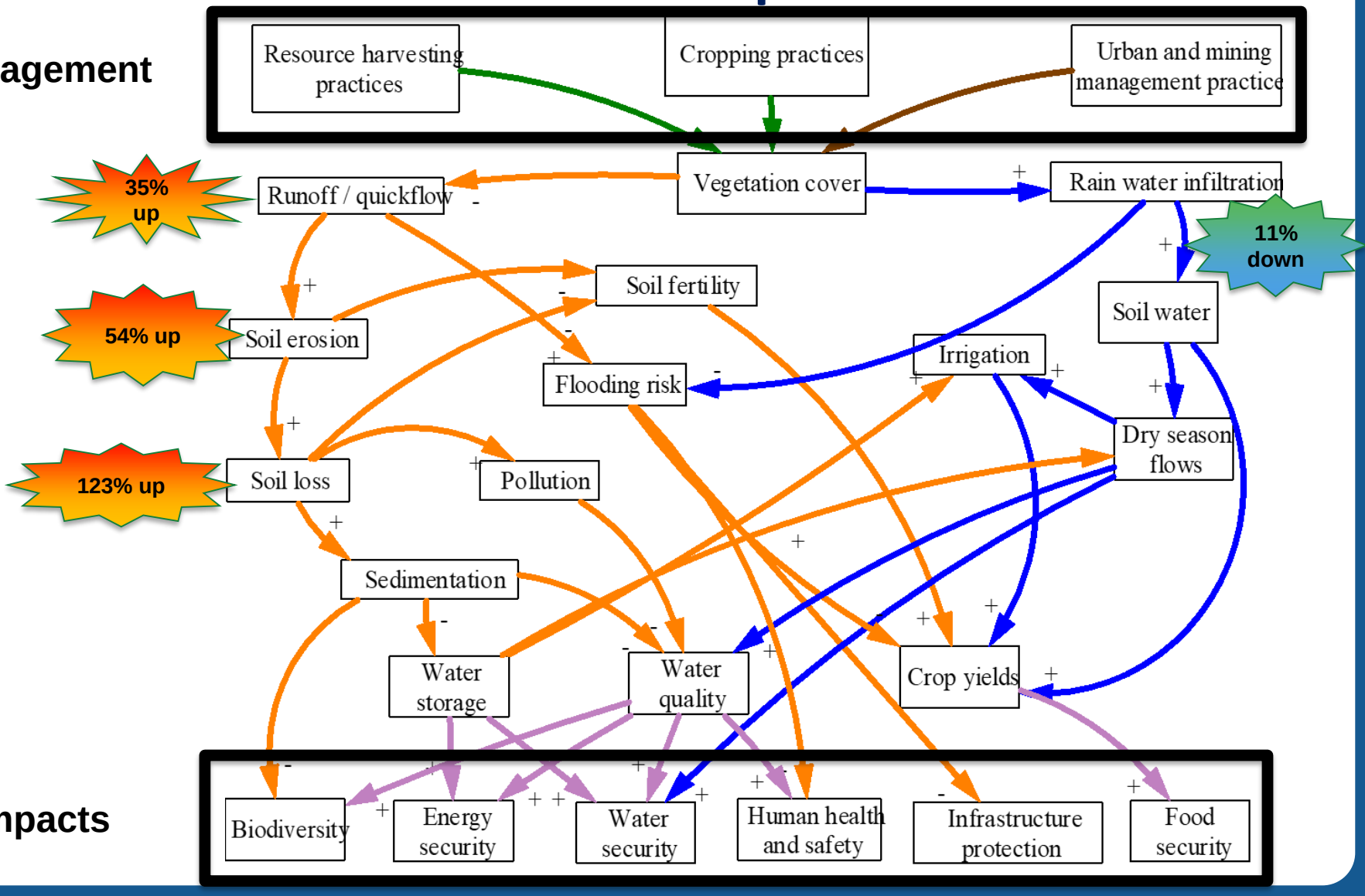
- The danger is that destructive quick flow has grown by 35%.

National baseflow (water recharge proxy)

National baseflow	(m^3 water/yr)	Change in baseflow against 1990 baseline	Change in baseflow from pervious period
1990	5,072,284,215		
2000	4,783,300,582	-5.7%	-5.7%
2010	4,780,294,682	-5.8%	-0.1%
2015	4,492,574,435	-11.4%	-6.0%
Change, 1990-2015	-579,709,780		-11.4%



Changes ecosystem services in 25 years and policy relationship



Identified challenges and opportunities in ecosystem accounting services flows in Rwanda

Challenges

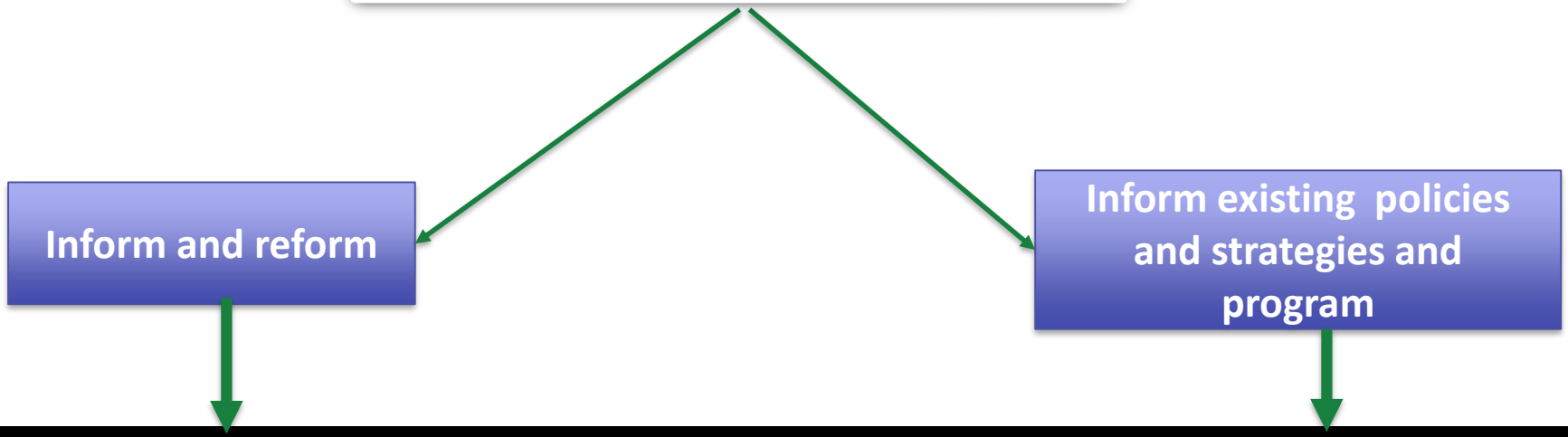
- A weakness of accessing a wide range of data over a long period of time
- Existing data scatted in different institutions and measured different units
- Some data were relatively old or outdated, such as relying on a vegetation cover management factor estimated by Clay in the 1990's.
- In addition, practice factor such as progressive and radical terraces, have not be broadly mapped

Opportunities

- Enabling environment where government is keen to advance the ecosystem accounting
- Existing policies in line with NCA and results uptake for updating and restructuring these policies
- High level policy makers were engaged and actively participate in process (Minister of Finance and Economic Planning and Minister of Environment)
- Unanswered questions were highlighted and were given a research priority
- Institutionalisation of NCA in Rwanda

How government is using the ecosystem account results

Ecosystem services results



- Seven Years Government Program: National Strategy for Transformation(NST1) 2017-2024
- Establishment of Rwanda Water Resources Board (Lunched 2020)
- Rwanda Green Growth and Climate Resilience: National strategy for climate change and low carbon development 2011(undergoing revision)
- National Determined Contribution Plan on Paris Agreement and climate change _UNFCCC, submitted May 2020
- National Environmental and Climate Change Policy, adopted in 2019
- National Land Use and Environment Master Plan 2020 -2050 (Adopted May 2020)
- Rwanda strategic plan for agriculture transformation 2018-2024
- Rwanda National Forestry Policy 2018

Key reference publications

1. Government of Rwanda (NISR). 2019. Rwanda Natural Capital Accounts: Ecosystems , Version 1.0. Kigali-Rwanda.
2. Bagstad KJ, Ingram JC, Lange GM, Masozera M, Ancona ZH, Bana M, Kagabo D, Musana B, Nabahungu NL, Rukundo E, Rutebuka E. Towards ecosystem accounts for Rwanda: Tracking 25 years of change in flows and potential supply of ecosystem services. People and Nature. 2020 Mar;2(1):163-88.
3. Banerjee O, Bagstad KJ, Cicowiez M, Dudek S, Horridge M, Alavalapati JR, Masozera M, Rukundo E, Rutebuka E. Economic, land use, and ecosystem services impacts of Rwanda's Green Growth Strategy: An application of the IEEM+ ESM platform. Science of the Total Environment. 2020 Apr 28:138779.
4. Rukundo E, Liu S, Dong Y, Rutebuka E, Asamoah EF, Xu J, Wu X. Spatio-temporal dynamics of critical ecosystem services in response to agricultural expansion in Rwanda, East Africa. Ecological Indicators. 2018 Jun 1;89:696-705.

Thanks!