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Catchment Restoration in Rwanda

CROM DSS: a GIS model to support decision making on catchment restoration

AfricaGIS 2019

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WATER for GROWTH RWANDA

Kingdom of the Netherlands

Integrated Water Resources Management Programme (2015-2019)

Funded by Embassy of the Kingdom of the Netherlands

Beneficiary: Water Resources Management Department of Rwanda Water & Forestry Authority, Ministry of Environment

Implemented by Mott MacDonald (lead partner), SHER, SNV

CROM DSS jointly developed by Mott MacDonald, Esri Rwanda, SHER, RWFA-WRMD

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esri Rwanda

SHER GROUPE ARTELIA

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The problem

Catchment degradation, soil erosion and downstream impacts

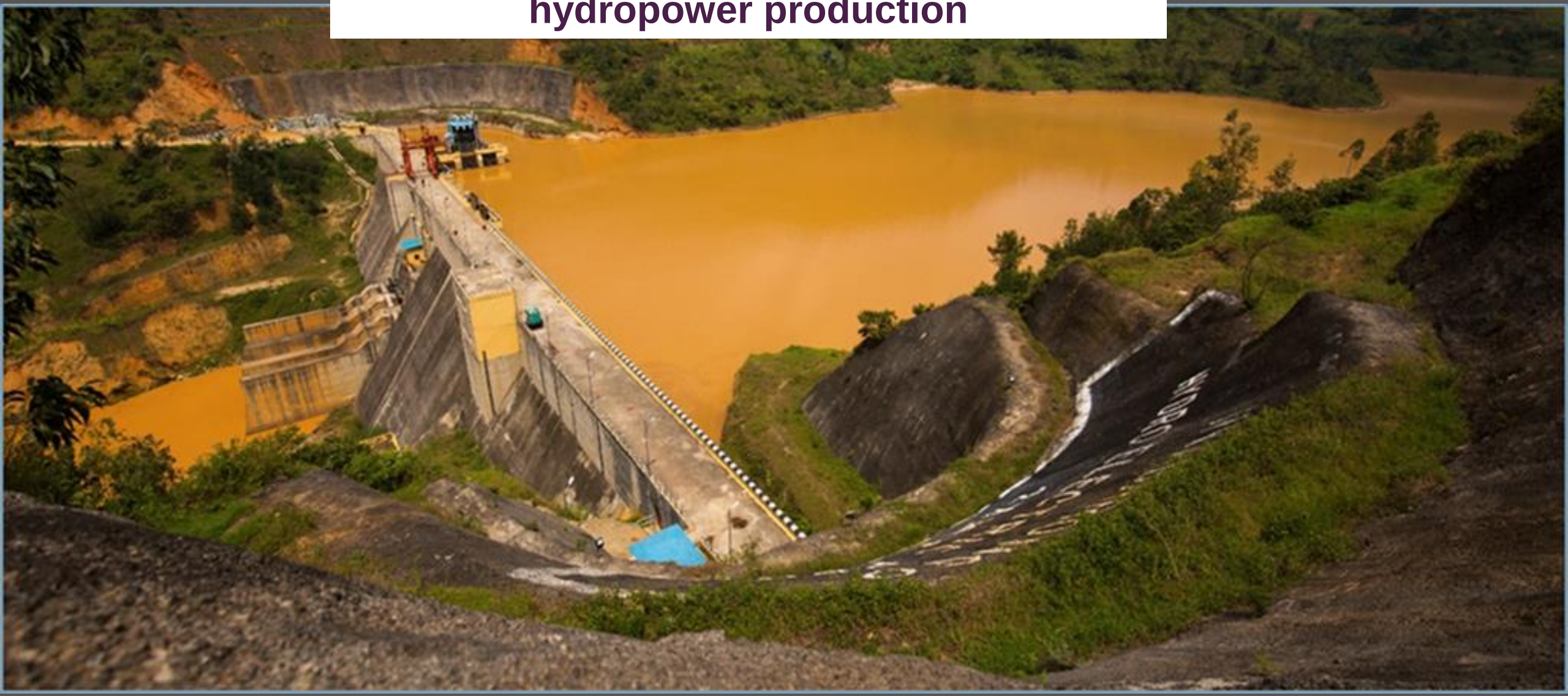

Deforestation

Seasonal tillage,
bare soils on steep slopes

Mining and gullies

Impact: silt build-up in reservoirs

Impact: high sediment loads hampering hydropower production



Food and Agriculture Organization of the United Nations

World Soil Day 2019

It can take
up to 1 000 years to produce just 2-3 cm of soil

lage

#StopSoilErosion

is key to the achievement of the

SUSTAINABLE DEVELOPMENT GOALS

SUSTAINABLE DEVELOPMENT GOALS

Thanks to the financial support of

European Commission

Ministry of Finance of the Russian Federation

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Ministry of Economic Affairs of the Netherlands

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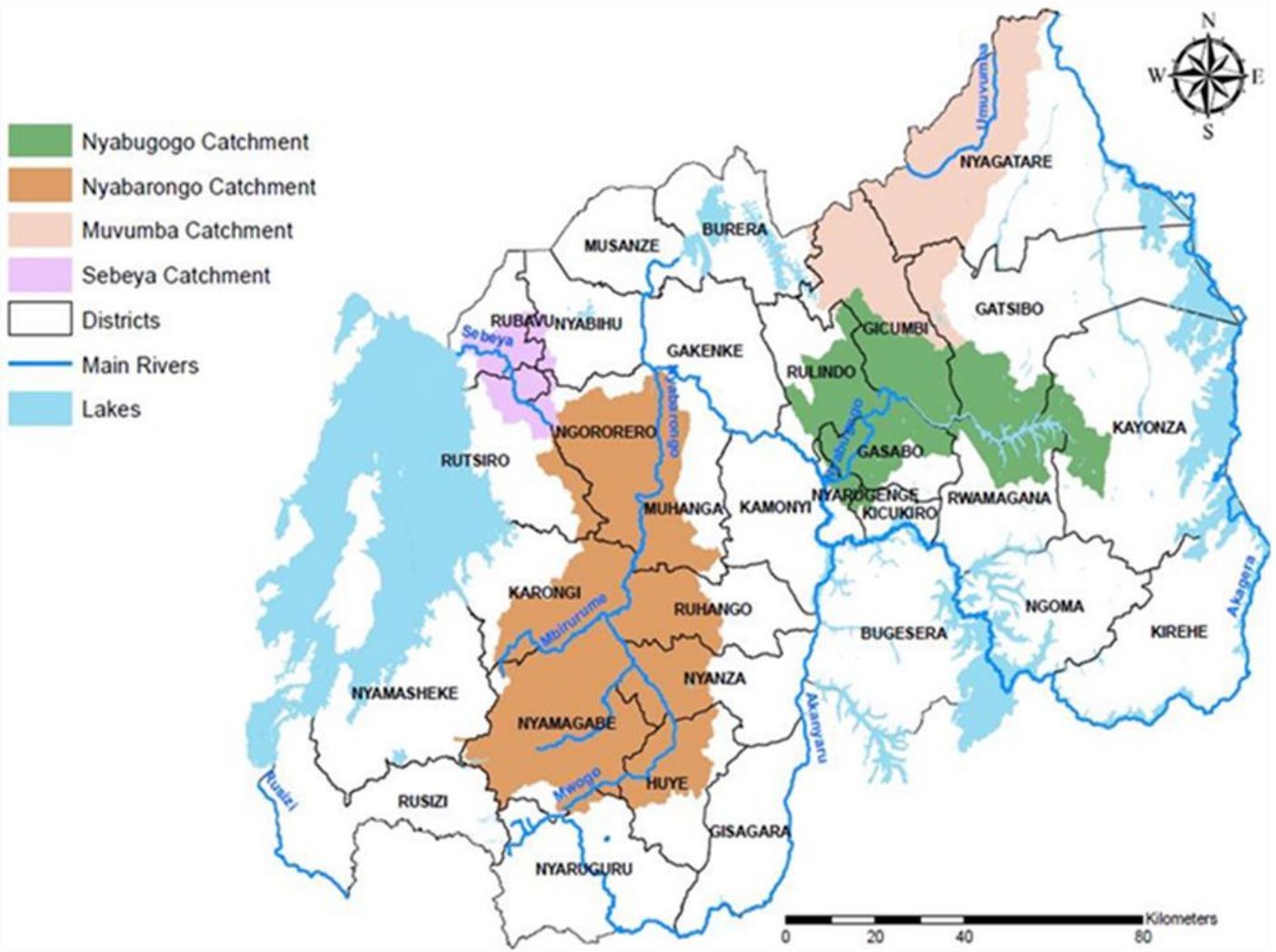
The request

Identify soil erosion control opportunities
in 4 catchments of Water for Growth Rwanda

Identify restoration opportunities in 4 catchments

IWRM programme ‘Water for Growth Rwanda’ (2015-2019)



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The response

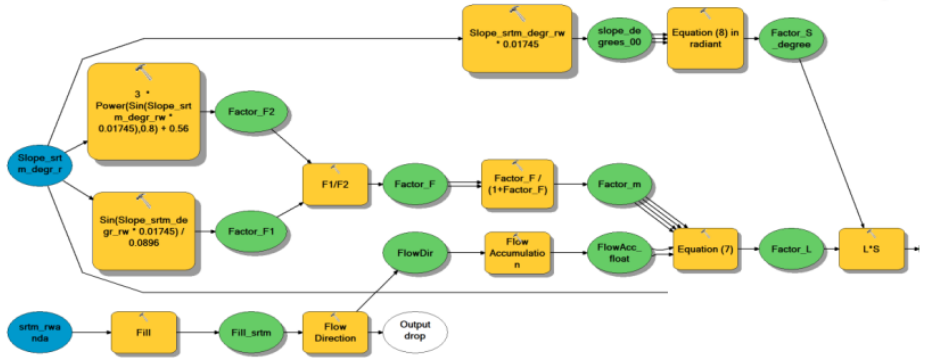
Integrated solution:

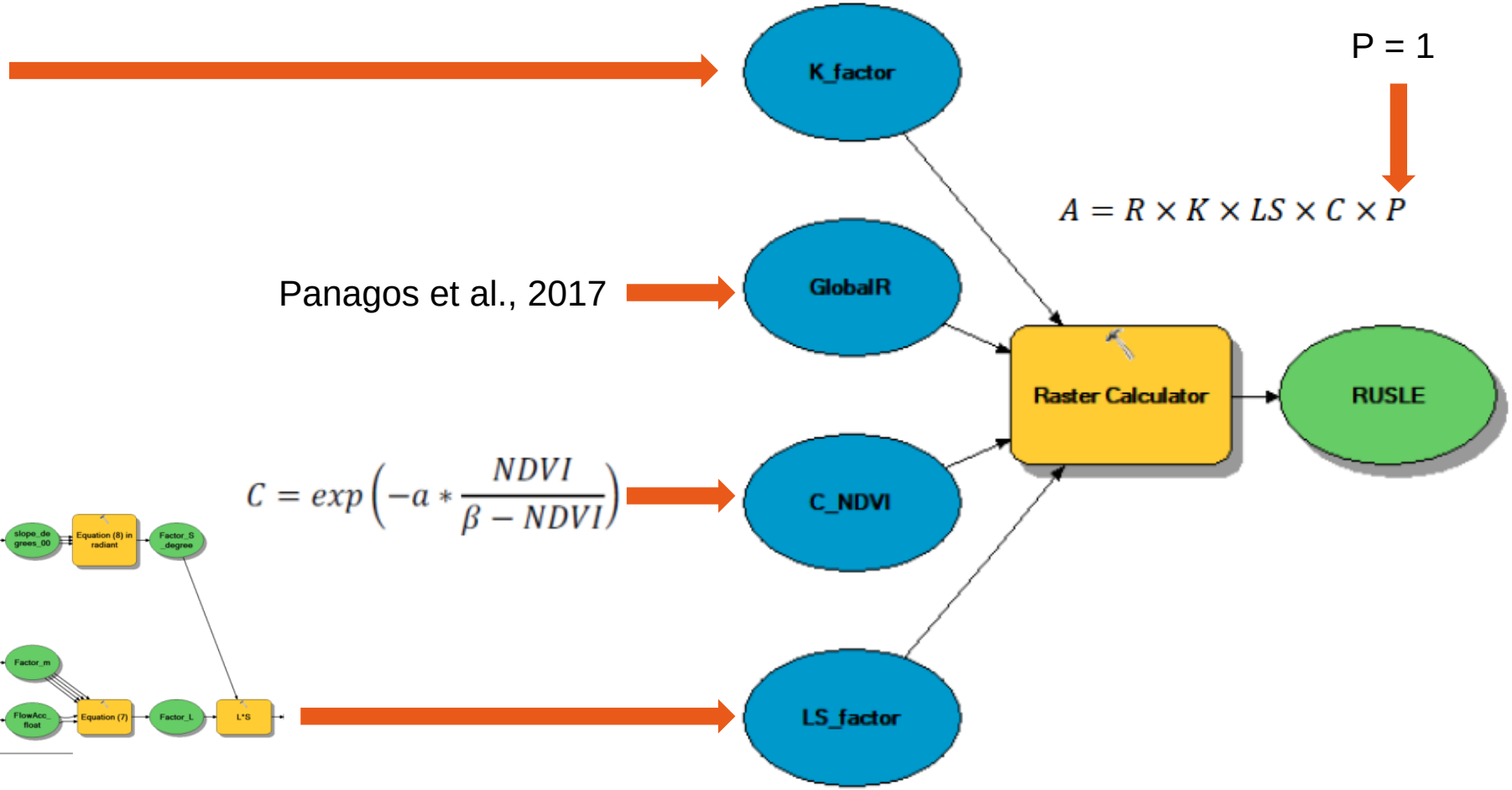
- spatial analysis instrument – bringing science to policy
- participatory process – locally owned solutions

Step 1: Identify soil erosion risks

Revised Universal Soil Loss Equation (RUSLE) in ArcGIS Model Builder

Soil	K factor
Entisols	0.02
Inceptisols	0.033
Histosols	0.03
Mollisols	0.012
Alfisols	0.015
Ultisols	0.015
Oxysols/Oxisols	0.015
Aridisols	0.033
Vertisols	0.025
Spodosols	0.025
Andosols/Andisols	0.012
Mining zones	0.05
Urban Zones	0.025
Lakes	0
Rock	0





CROM DSS

Catchment-based landscape Restoration Opportunities Mapping Decision Support System

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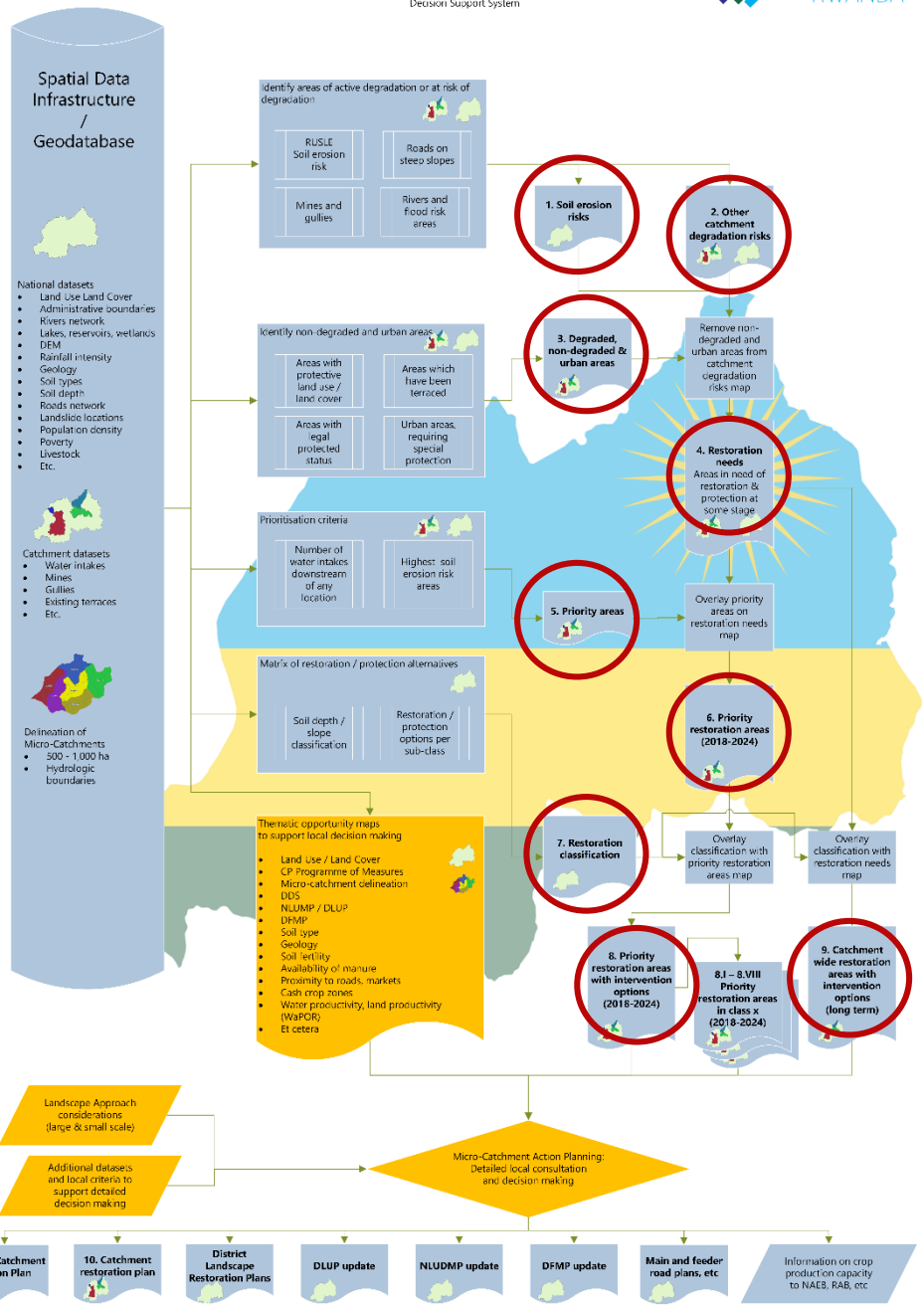
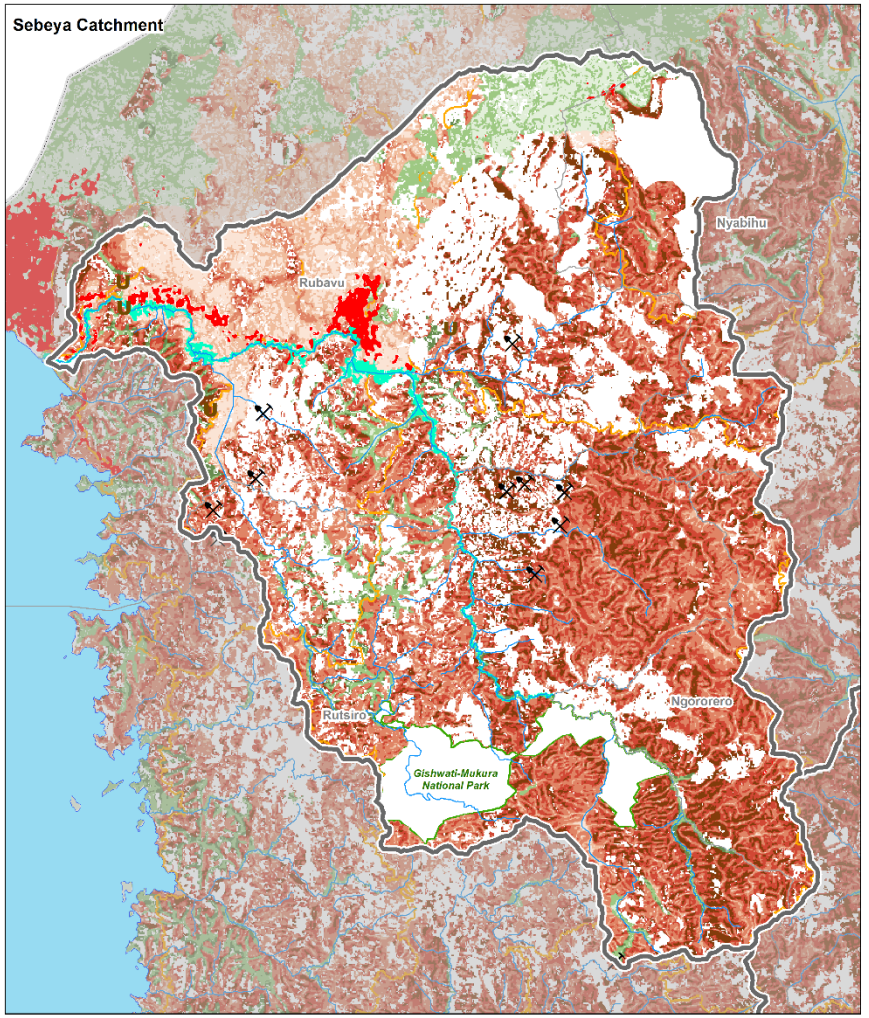
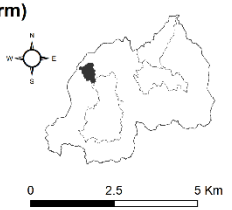


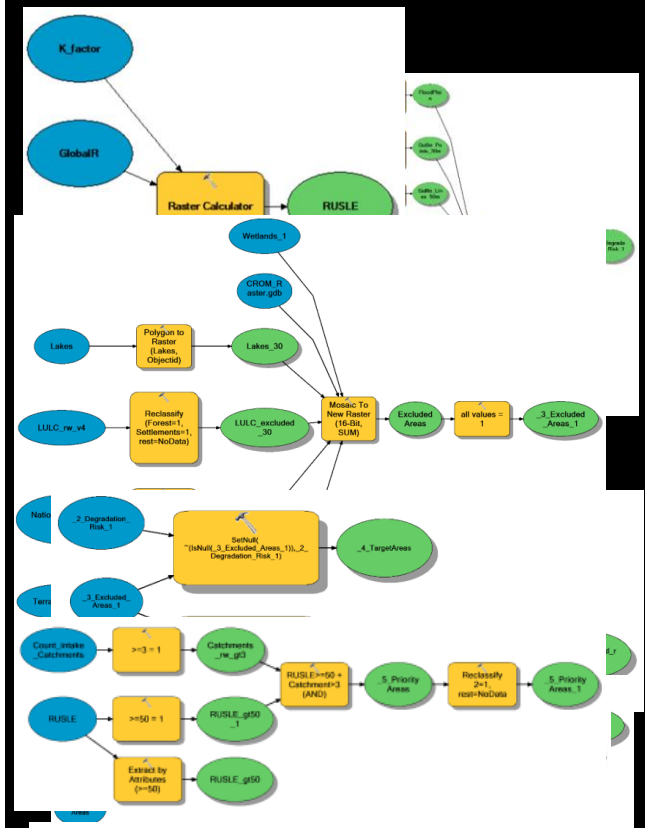


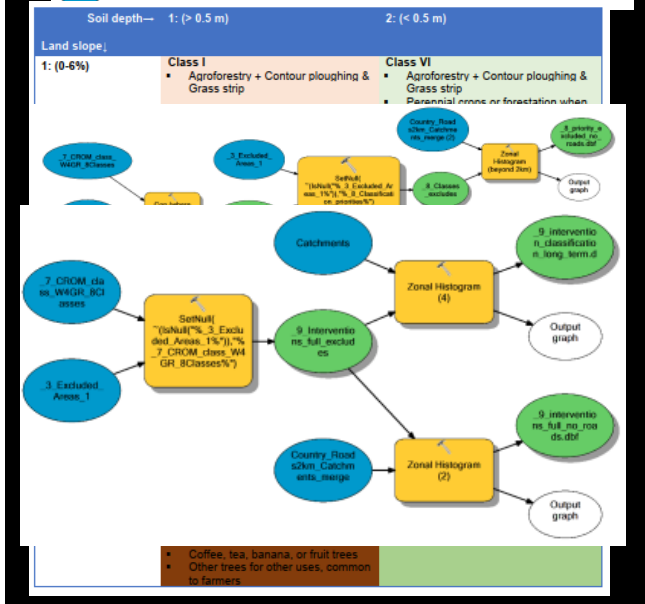
9. Catchment wide restoration areas with intervention options (long term)

Mining sites
Gullies
Roads on Slopes (>15%)
Rivers
Flood risk zones
Lakes
National Parks
Demonstration Catchment
District
Country

Soil depth→ / Land slope↓	>= 0.5 m	< 0.5 m
0 – 6 %	Class I	Class VI
6 – 16 %	Class II	Class VII
16 – 40 %	Class III	Class VII
40 – 60 %	Class IV	Class VIII
> 60 %	Class V	Class VIII

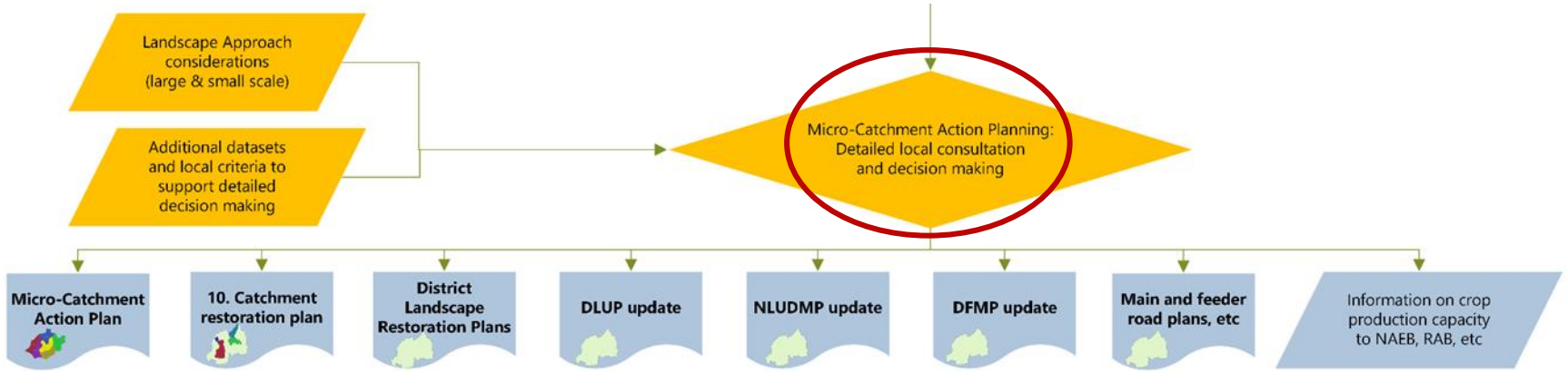


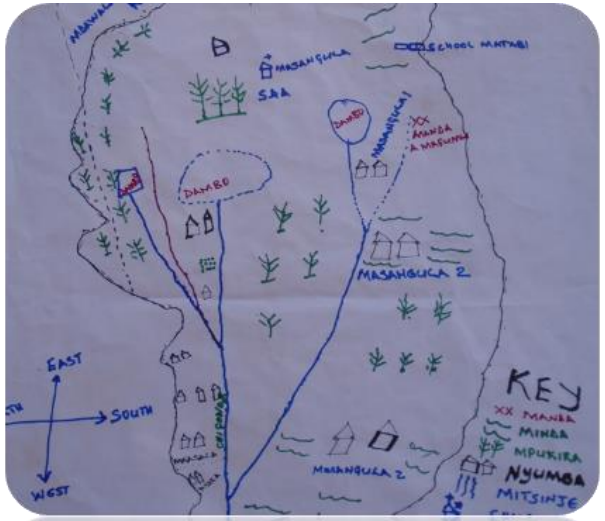




Participatory decision-making: Micro-Catchment Action Plans

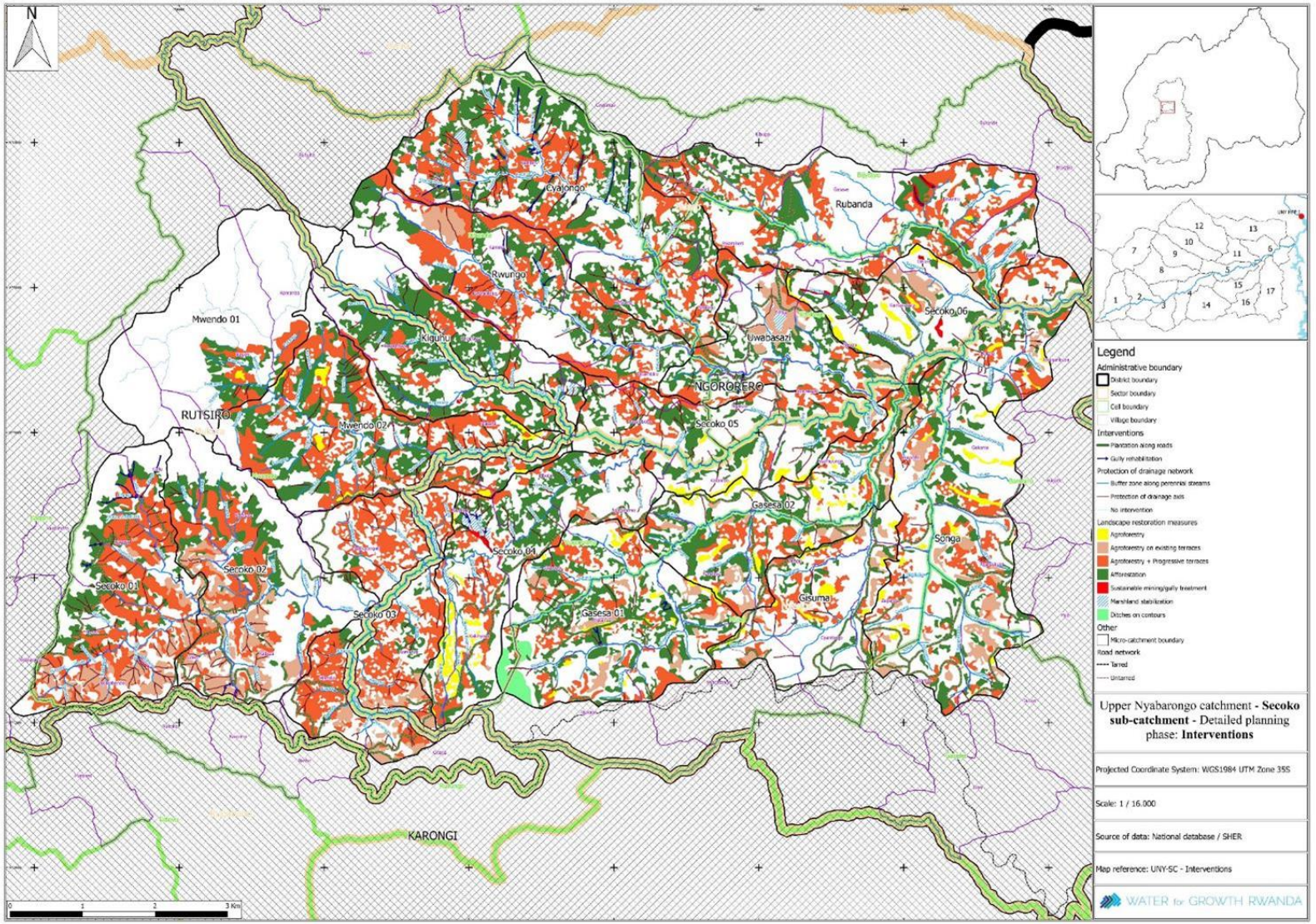
Global science, local solutions

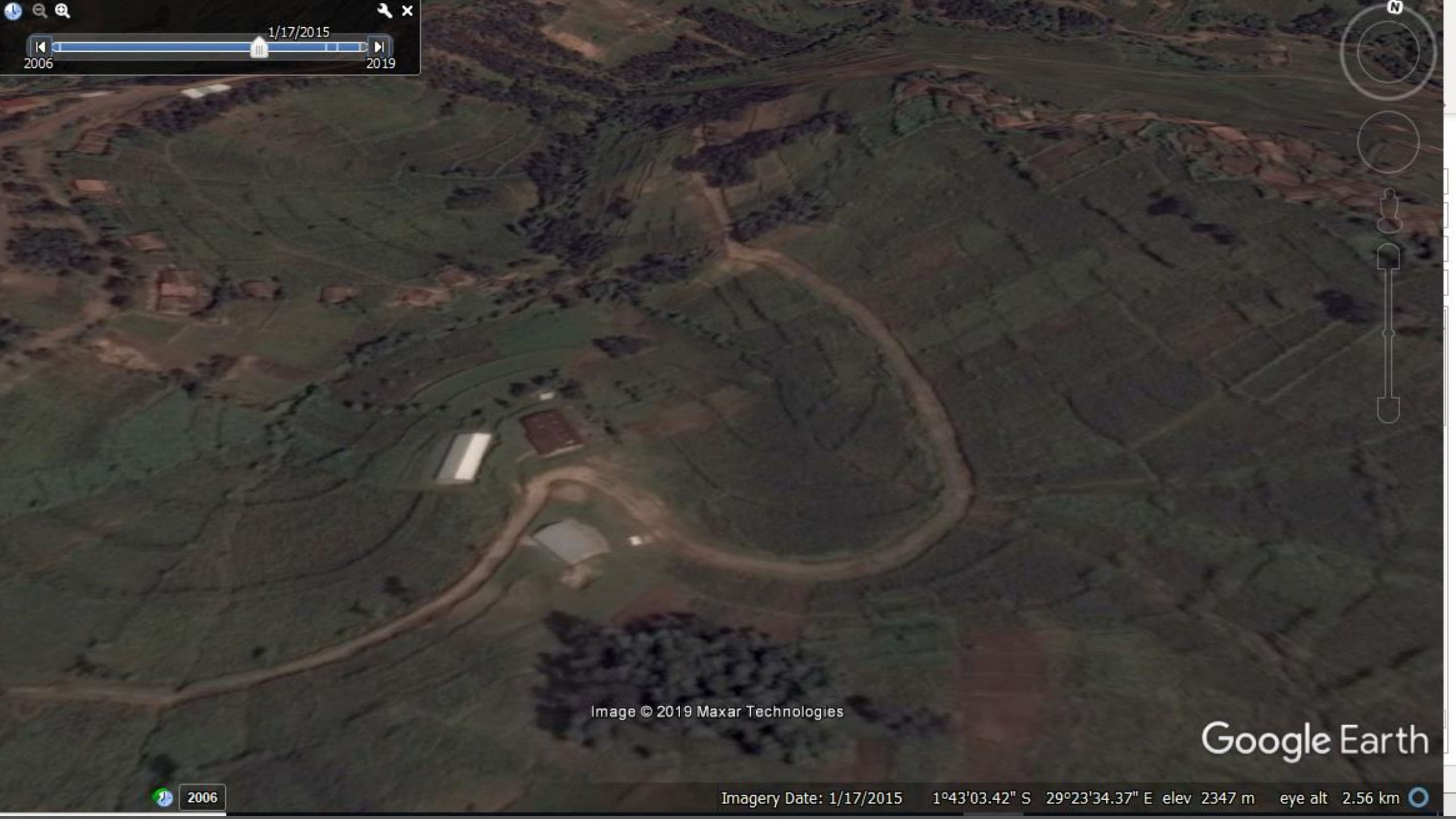




Micro-Catchment Action Plan

Result of participatory process with communities / land owners




1/17/2015
2006
2019
N
Image © 2019 Maxar Technologies
Google Earth
2006
Imagery Date: 1/17/2015 1°43'03.42" S 29°23'34.37" E elev 2347 m eye alt 2.56 km


7/2/2019
Image © 2019 CNES / Airbus
Google Earth
2006
Imagery Date: 7/2/2019 1°43'06.64" S 29°23'33.90" E elev 2346 m eye alt 2.56 km

Magnitude of the problem in Rwanda

Detailed analysis of medium – extremely high risk areas (20/30 districts analysed)

In North, West, South, 33% (467,000 ha) is at high – extremely high risk

67% of identified high erosion risk land is not to date protected and 61% of it is mainly located in Agricultural land

More details in presentation by Philippe Kwitonda, Rwanda Water Resources Management Department

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Institutional embedding

Initial take up and sustainable integration in Ministry of Environment and at Districts

Finally… evidence based decision making!

Hon. Vincent Biruta
Minister of Environment
June 2018, during development of CROM DSS

Institutional embedding

Water for Growth Rwanda supported full embedding in Government of Rwanda

Close collaboration with inter-ministerial task force on mitigation of landslides and soil erosion

MoE Report ‘Mapping of Erosion in Rwanda and Guidelines for Erosion Control’

MoE instructed districts to use GIS and CROM DSS in planning and reporting

W4GR trained all 30 districts of Rwanda in use of ArcGIS

Supported on-screen interpretation of 0.25 m Remote Sensing imagery for LULC and soil conservation measures in place

Supported firm institutional embedding of CROM DSS in Water Resources Management Department, and future Rwanda Water Resources Board

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Way forward

Ongoing and future actions

MoE WRMD updating to CROM DSS 2019

Incorporating new LULC data from detailed RS imagery (World View 0.25 m) (20/30 districts)

Consolidation of similar risk areas by merging values, followed by conversion to vector map

- Three (highest) risk classes
- Erosion features observable on World View images
- Existing land use / land cover classes
- Observed erosion control practices (**RUSLE P factor**)
- Recommendations for erosion control interventions (new or improved)

Quarterly updates from all districts of Rwanda

Planning

Reporting / Monitoring

Mott MacDonald incorporates CROM DSS in Nepal climate resilience project

Global challenge – GIS community action needed urgently

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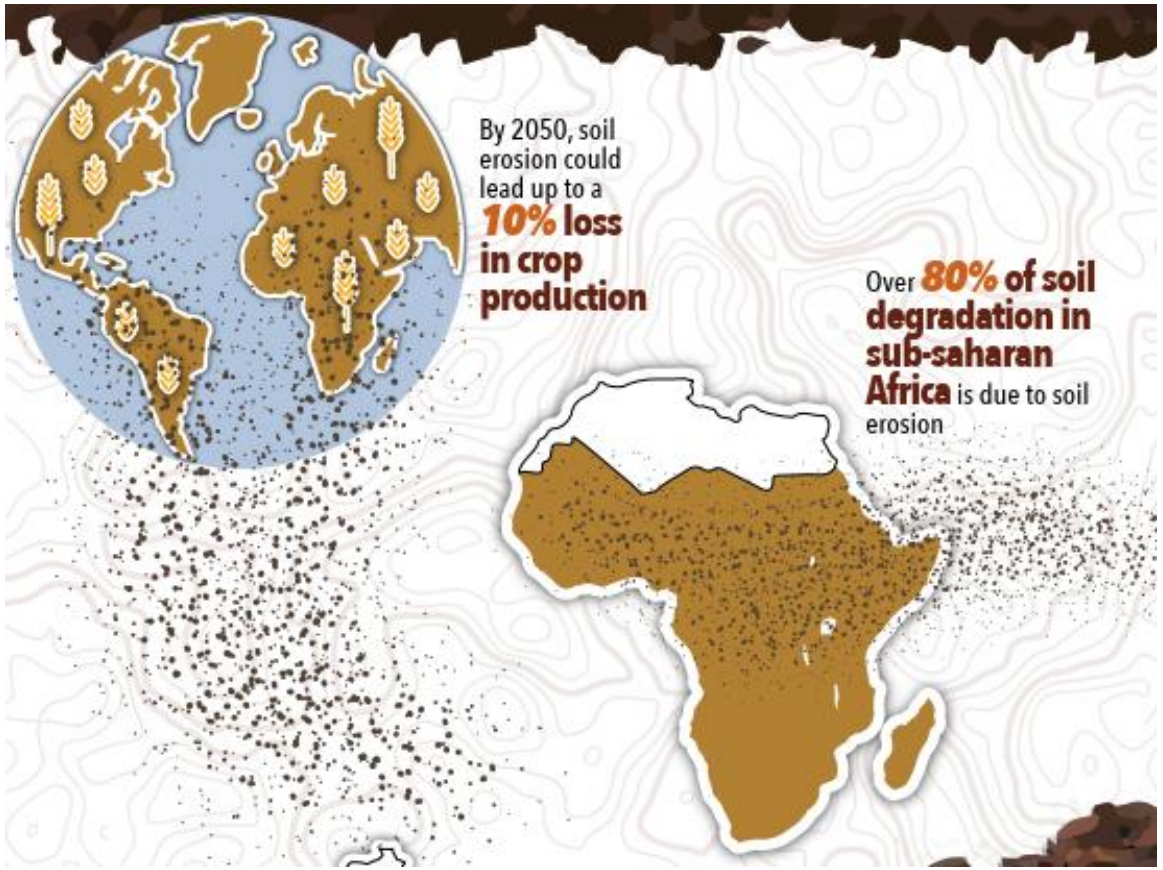

ArcGIS Model Builder helps replication, bringing science to policy

Mott MacDonald can help governments integrate soil erosion control in integrated spatial planning towards achieving SDGs

Murakoze cyane
Thank you

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