Green Roads for Water Training in Sudan

Wad Madani, 15-20 January 2023

Experience from the Horn and Other Countries

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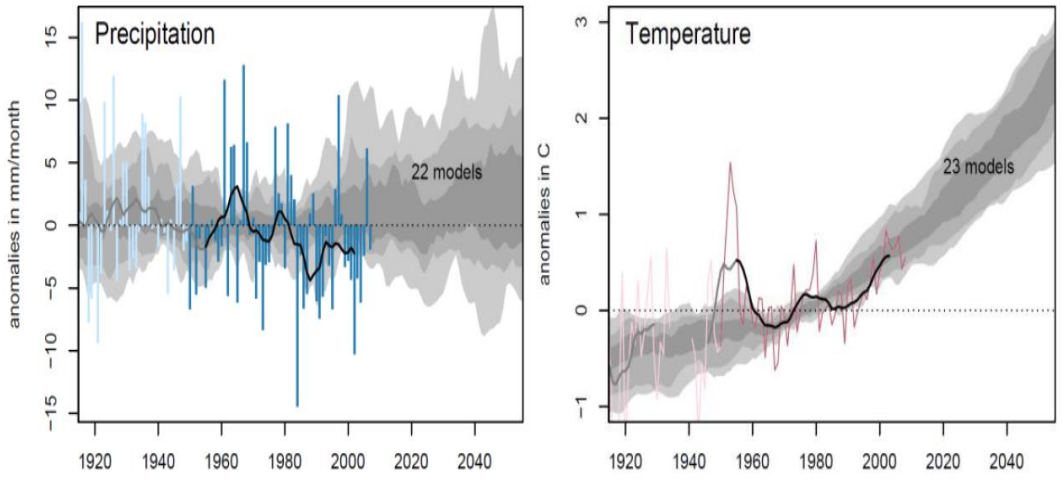
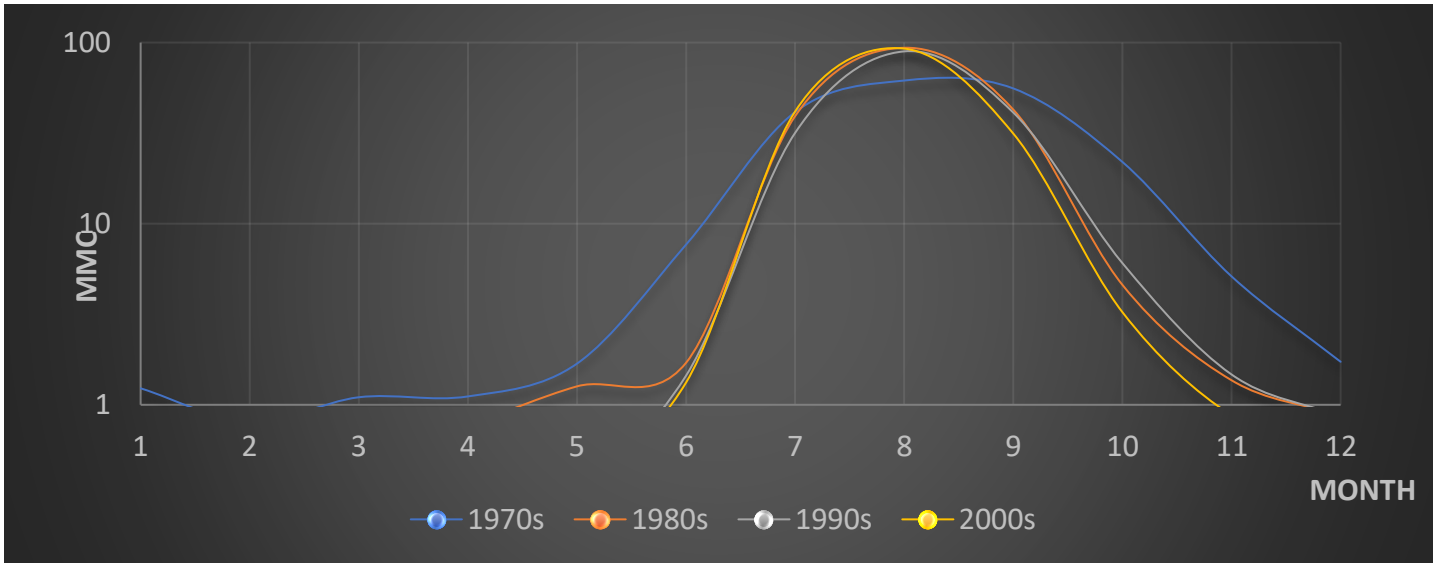
What if we continued- business as usual?

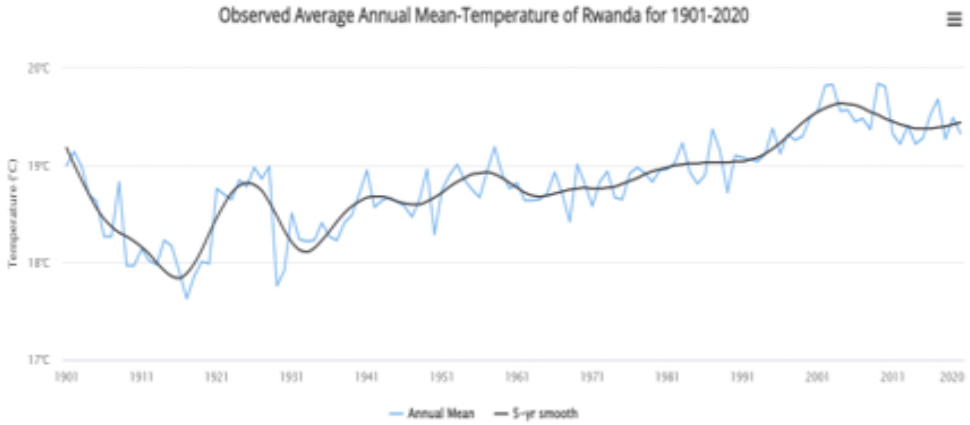
Increasing anthropogenic pressure and climate variability

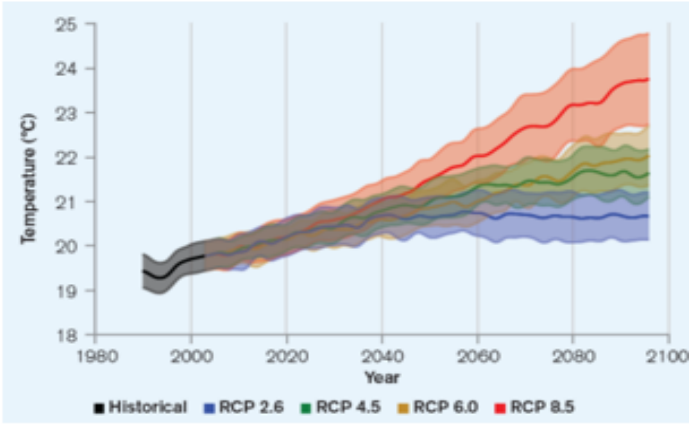


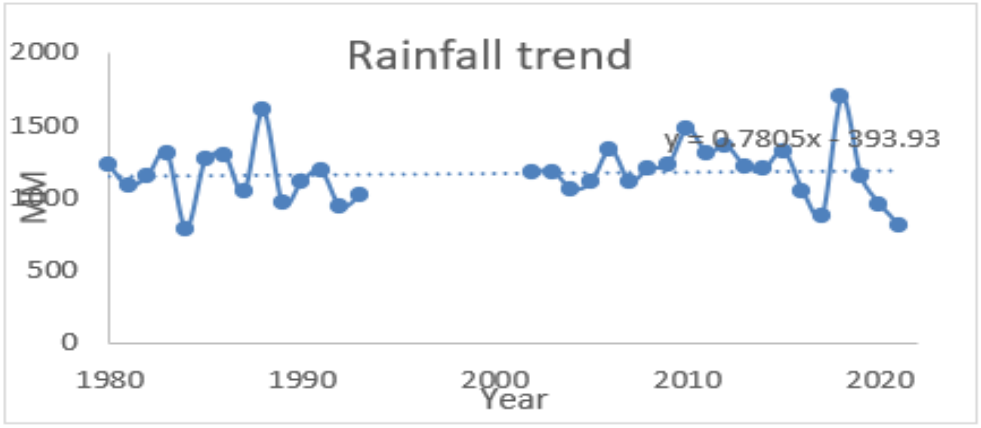


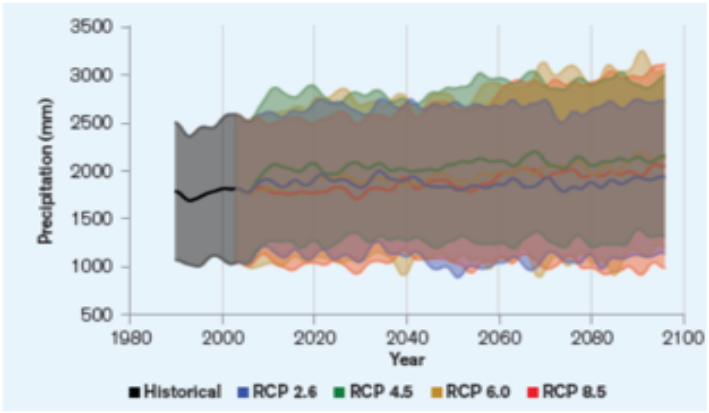
Reducing river flow duration

What if we continued- business as usual?









What if we continued- business as usual?

- Increasing population => Increasing demand
- Increasing poverty
- Limited and dwindling resources, particularly land that demand increased productivity of land
- Increasing frequency of drought and its impacts

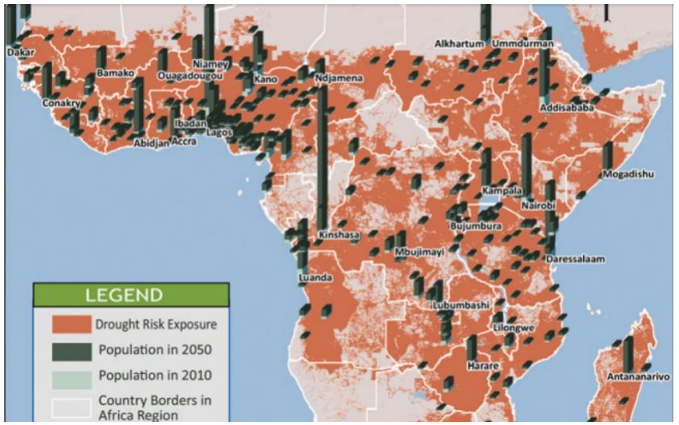
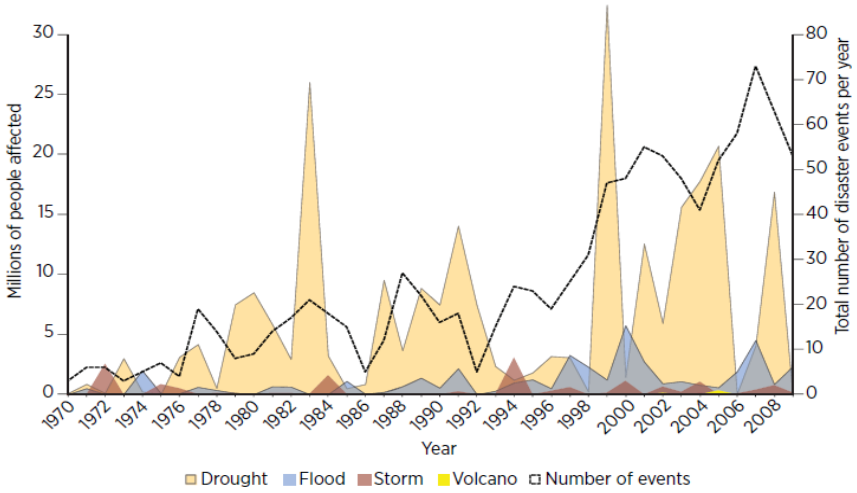
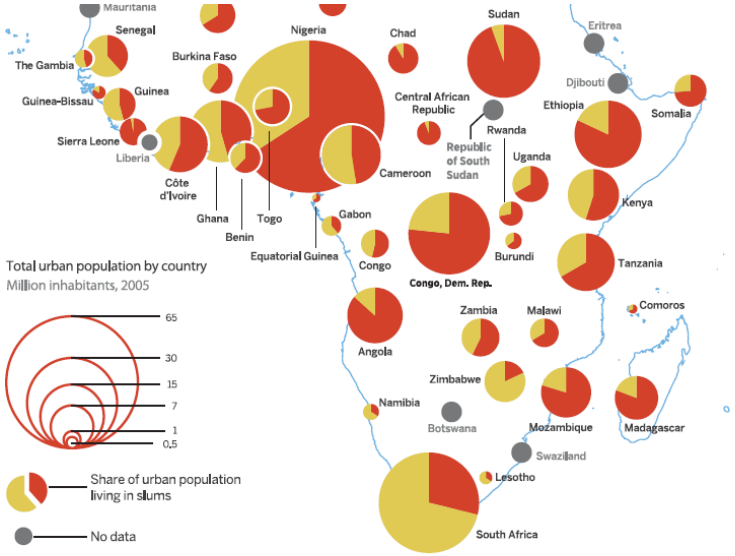


Figure 1.13 Increased Frequency and Impact of Reported Disasters in Africa



Source: World Bank, 2010c, based on EMDAT Emergency Events database 2010.



Source: World Bank, based on figure by Pravettoni and UNEP/GRID-Arendal, 2011 with data from UNDESA, 2010.

The Triple Win

REDUCED MAINTENANCE COSTS
HIGHER RELIABILITY

REDUCED DISPLACEMENT
REDUCED LITIGATION

INCREASED PRODUCTION
HIGHER RELIABILITY

Annual watershed management Campaigns

Employment opportunities for rural communities on road construction

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Harvesting fodder from culvert run-off

Figure 3.4. Use of check-dams to manage water from roads in northern Ethiopia: (a) channeling water from a culvert into a check-dam pond, and (b) channeling water from a bridge into a series of gabion check-dams for groundwater recharge.

Shallow groundwater development upstream of Irish bridges: Irish bridges have multiple functions: they allow road traffic to cross the dry riverbed, and act as sand dams, trapping sediments behind them and creating small local aquifers that can store and retain water (Neal, 2012). Several hand-dug wells are developed upstream of Irish bridges for water supply and small-scale irrigation in northern Ethiopia (Figure 3.5).

Figure 3.5. A shallow groundwater well (for water supply) developed upstream of an Irish bridge in northern Ethiopia (a) Upstream view and (b) downstream view.

Spring capture from roads

Though not commonly used, spring capture from road cuts is practiced in Ethiopia for water supply purposes (Figure 3.6a) and small-scale irrigation (Figure 3.6b).

Figure 3.6. Spring developed from a road cut in northern Ethiopia: (a) for rural water supply and (b) for small-scale irrigation purposes.

Shallow groundwater upstream and downstream of road embankments. In different parts of northern Ethiopia, a number of scenarios were noted in relation to road construction and downstream-upstream groundwater conditions. In some places, road upgrades increased the

Figure 3.2. Channeling water from roads into a series of deep trenches for enhancing soil moisture and recharging groundwater in Ethiopia: (a) water from a culvert channeled into a deep trench, and (b) deep trenches to store roadside runoff.

Channeling water from culverts and roadsides into farmlands: Diverting runoff (from roads i d e s and culverts) into farmlands (Figure 3.3) is one of the technologies implemented in arid to semi-arid areas where the rainfall is not high. The purpose is to enhance the availability of water for crop production by enhancing soil moisture.

Figure 3.3. Diverting roadside runoff into farmlands as part of moisture conservation in northern Ethiopia (left), and one of the ponds from road water used for commercial irrigation in CRV (right)

Channeling water from bridges, culverts, and roadsides into check-dams: Though check-dam construction is a common water harvesting and gully treatment technique in Ethiopia, linking water from roads with check-dams is a new development. Check dams are constructed with the purpose of storing water from culverts, bridges and roadsides and enhancing groundwater recharge in many parts of Ethiopia (Figure 3.4).

Rift Valley- Ethiopia

Reusing borrow pits and quarries for water harvesting

Use of borrow pits to water storage structures

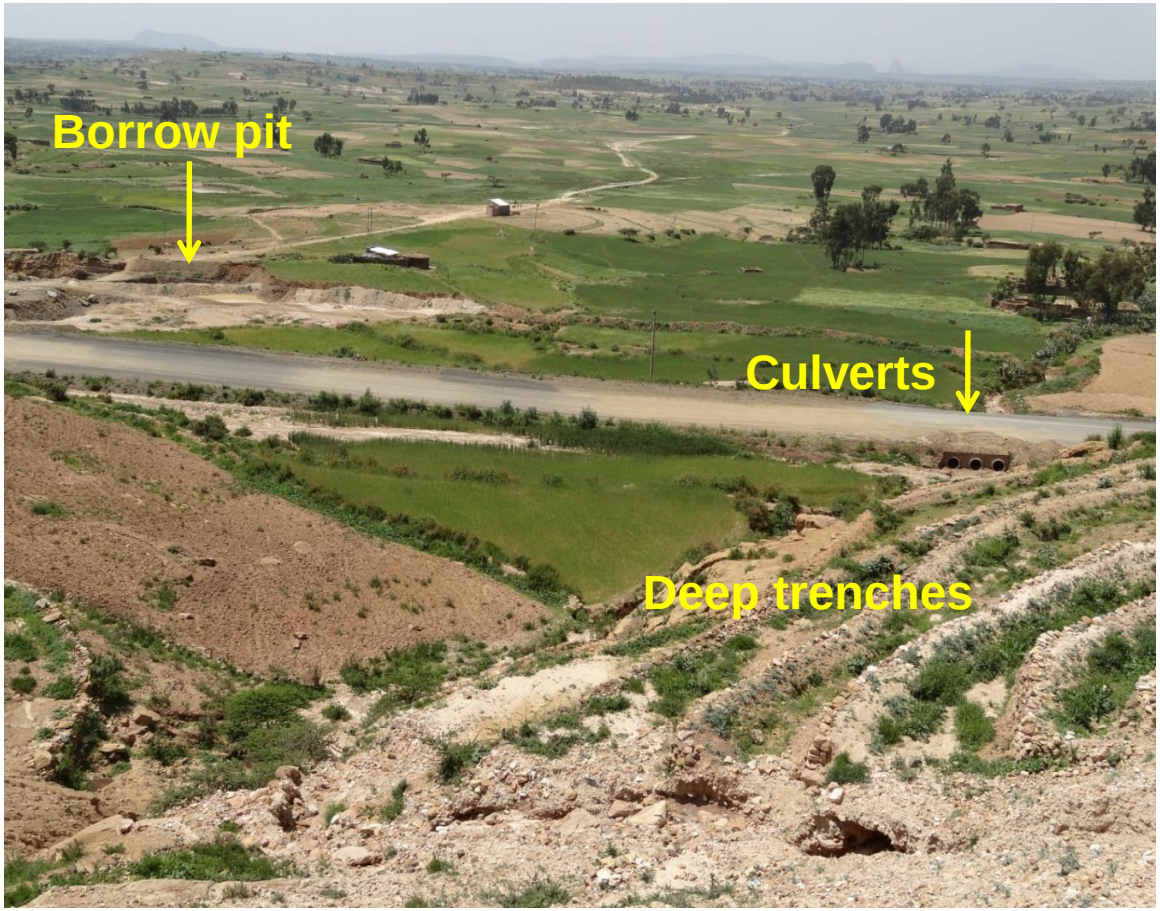
- Rather than backfilling or leaving them unattended, the borrow pits may be systematically converted into storage structures

Pond formed from borrow pit (Mekelle-Hewane)

Pond or micro basin flow from Road-side drain and culvert (Moricho-Dimtu)

(G) Runoff from a town (Freweign) is managed through a number of options:

- Construction of deep trenches to reduce runoff and enhance groundwater recharge.
- Diverting water from culverts into a borrow pit for surface water storage and groundwater recharge.



Communities which used to have been affected by flooding are saved from flooding.

(j) Water from a bridge is spread into series of deep trenches and percolation ponds to recharge groundwater.

- *Hand-dug well which used to be dry became productive after the intervention.*

(k) Roadside drainage connected to percolation pond for groundwater recharge.

Community managed pond

Community managed pond in Arsi Zone, Oromia: *Pond water is the only source of domestic water supply and livestock watering during prolonged drought years. The area has high amount of rainfall that can be harvested using ponds dug in the dominantly clayey soils. Groundwater sources and springs couldn't be developed due to the poor aquifer nature of the rocks. These factors forced the communities and well-to-do-families to develop their own ponds. Most ponds get their water from floods diverted from roads. There are stringent laws and O&M fees to protect and manage community ponds. The type of use and amounts allocated to a family vary with severity of drought. As the problem worsen, most affected families can get free water from family ponds.*

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Formation of deep gully at side drain tarmacked road and Suspended culvert along a rural road

A community pond was built while a new road construction

Road affecting the hydroecosystem

Inundation in the rift valley – blocked inflow to the lake, CRV, Ethiopia

New wetland formation upstream of a road (Gambela, Ethiopia)

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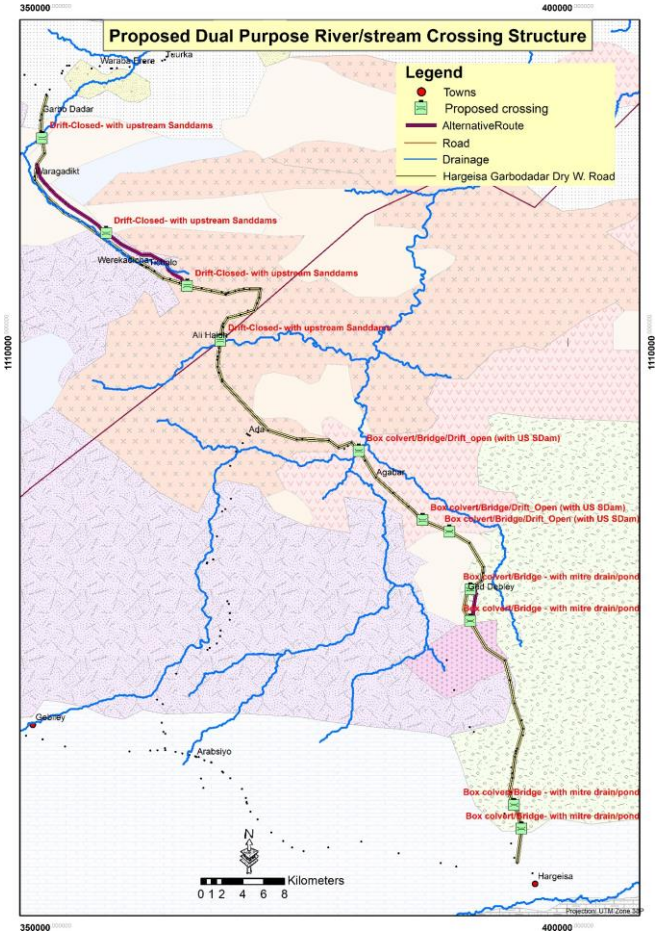
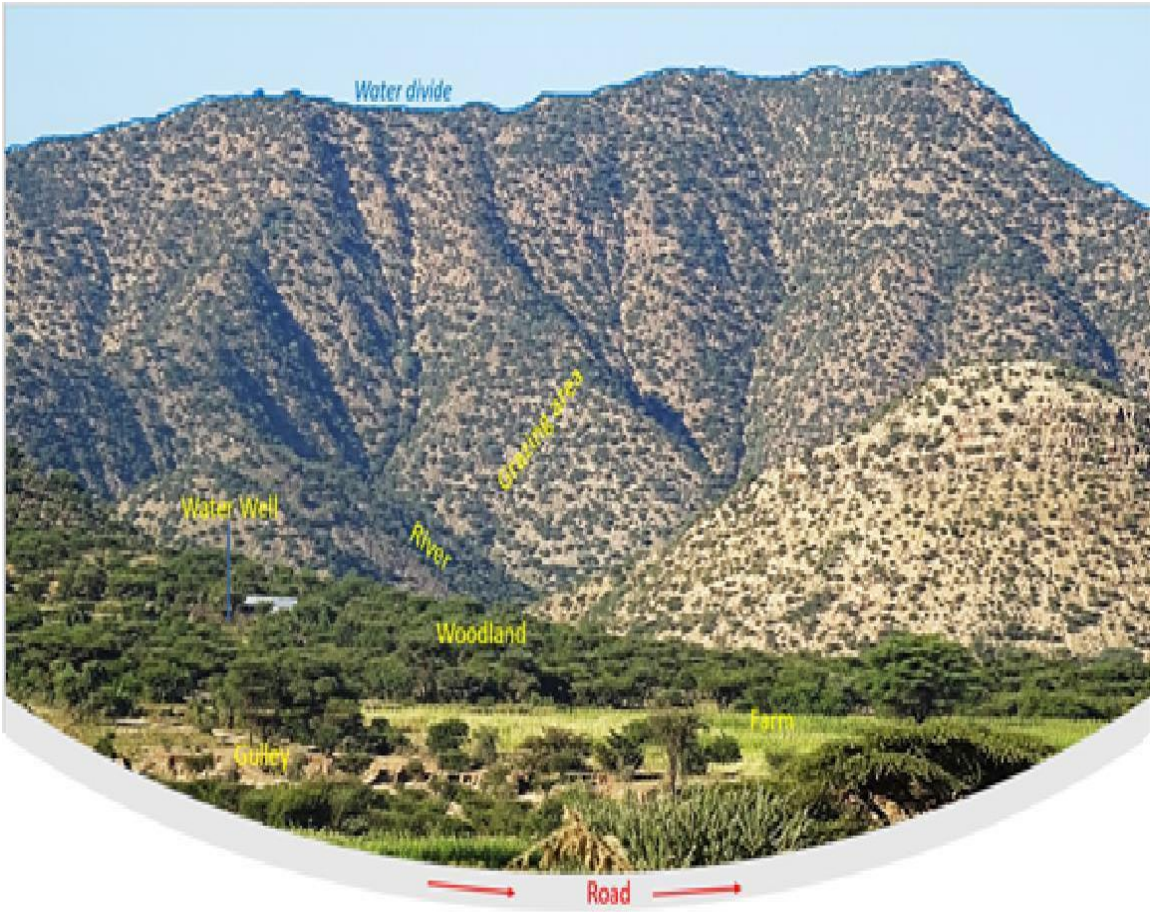
Somaliland

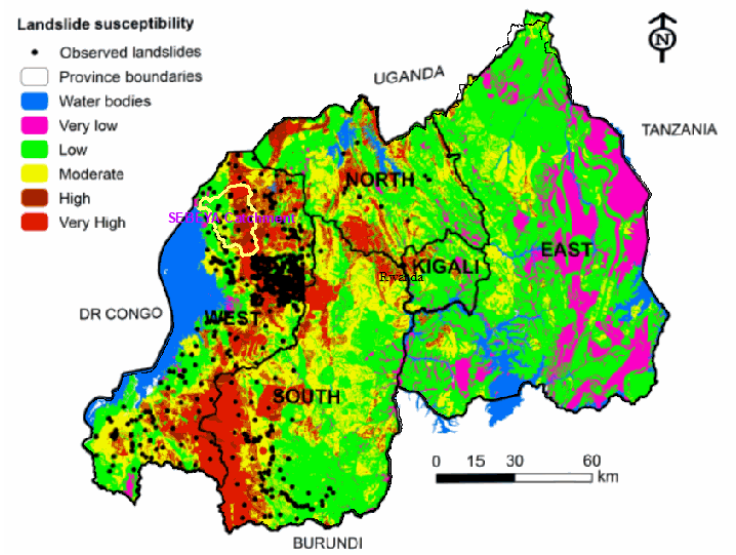
Somaliland



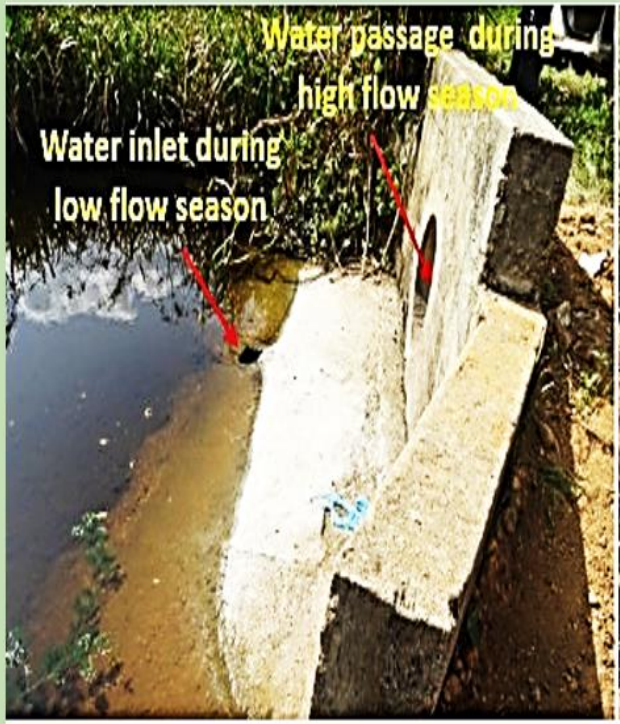


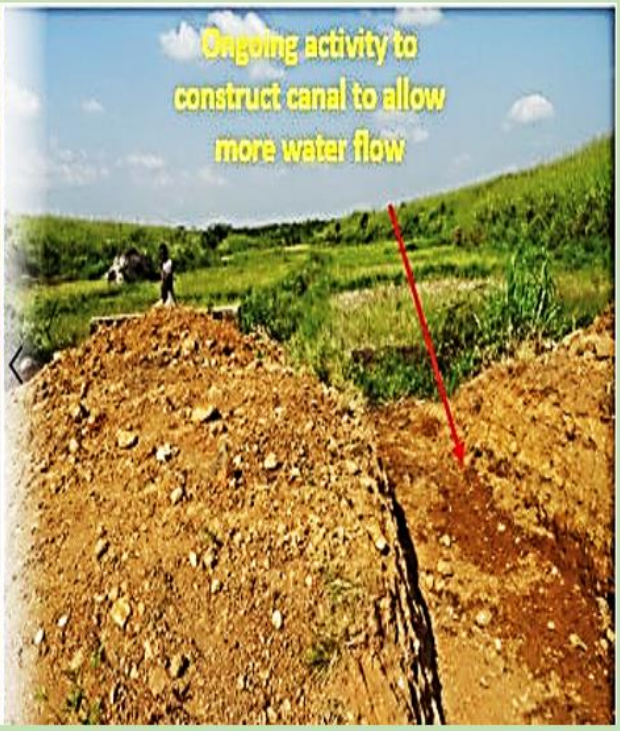
Model Watershed

Rwanda: Landslides aggravated by roads



Liberia- GR4W in wetland areas

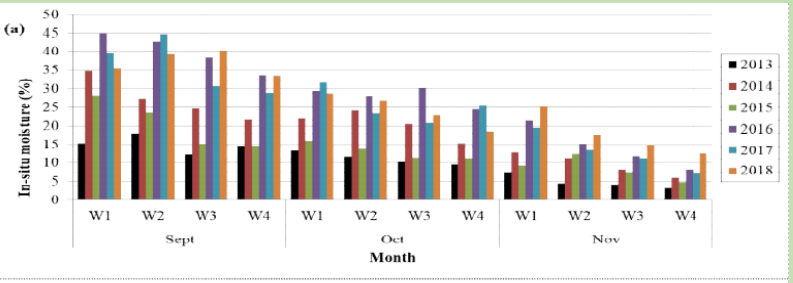


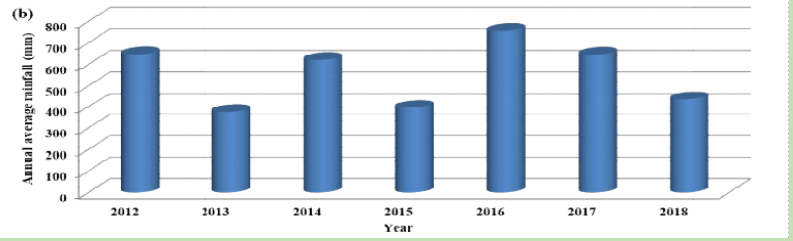


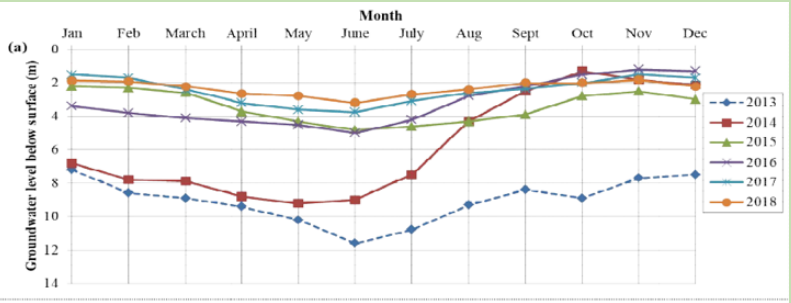
Our contributions

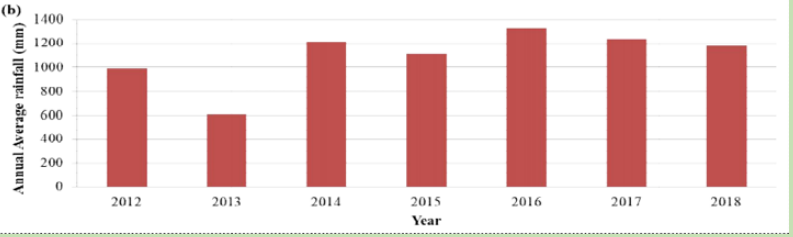
- **Road water assessments** – identifying the best options for GR4W along selected roads
- Working with engineers and implementers to **design better practice**
- **Developing guidelines** appropriate to specific to the country and situations
- **Training and coaching** towards a change in culture and governance for GR4W
- **Developing strategies** to optimize the wider socio-economic benefits of road development and road construction.

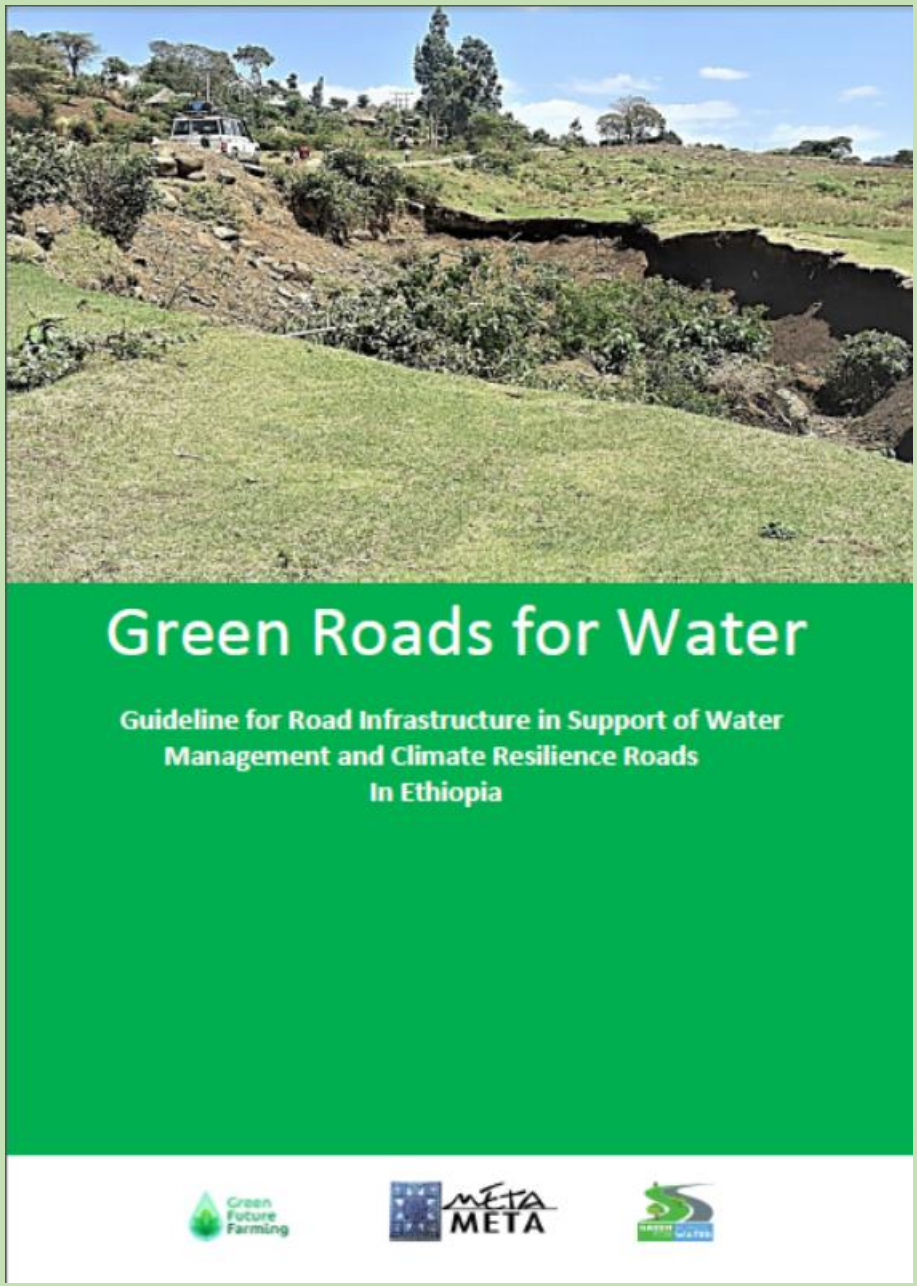
Our contributions











Thank you!

For more information visit www.roadsforwater.org
or send an email to adeligianni@metameta.nl