MAKING ROADS WORK FOR WATER: INTERNATIONAL EXPERIENCES

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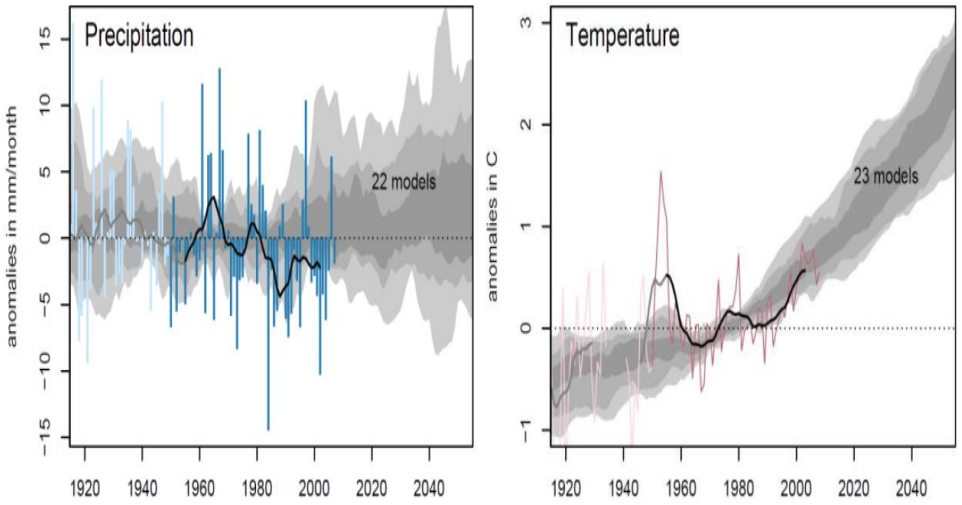
WORLD BANK GROUP
META
RDA
Roads for Water

Dream and opportunity

To have roads for systematically used for water management all over the world, especially in Sub Saharan Africa and Asia and create win-wins

Why Sub Saharan Africa and Asia?

- Water scarcity (and excess in some cases) is one of the critical challenges to ensure food security Predicted extreme events to come (IPCC, 2007)
- Road construction is one of the biggest investments globally – 1-2 Trillion USD
  - Road network in SSA to increase to 2.8 M kilometer ni 2025



Findings from assessment in Tigray, Ethiopia

Erosion in 62% of culverts

Sedimentation: 11% of culverts

Waterlogging: 5 location/10 kilometer

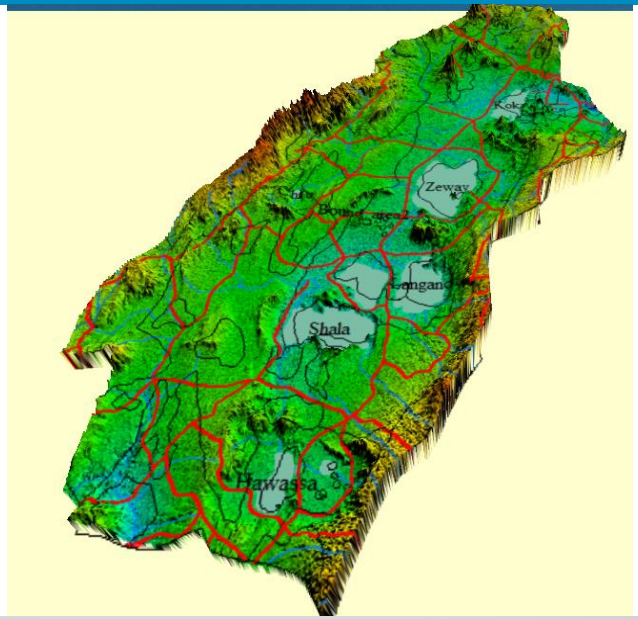
Local flooding: 5 location/ 10 kilometer

Why Sub Saharan Africa and Asia?

- Reduce maintenance burden among others by uphill watershed protection,
- Reduce damage from uncontrolled run-off on unpaved roads (a major issue) and reduced risk of gully damage

Why Sub Saharan Africa and Asia?

- **For better consideration of the hydro-ecosystems**
- Reduced flow to the reservoirs
- Damage to the roads, particularly in such high rainfall years



- Less chance of wetland development in Areas with more vertical GW movement

- More chance of wetland development in Areas with less vertical GW movement

Water damage triggered by roads can be huge (Arsi, Ethiopia)

Avoid human suffering..

Urgent need to turn things around

- Reduce risk of road induced flooding and water logging
- Reduce erosion and sedimentation

Triple Win

REDUCED WATER DAMAGE TO ROADS (-35%, -80%) AND INCENTIVE FOR FEEDER ROAD MAINTENANCE

REDUCED DAMAGE FROM ROADS THROUGH FLOODING, EROSION AND SEDIMENT DEPOSITION

WATER MANAGED FOR PRODUCTIVE USE

RISING GROUNDWATER LEVELS

INCREASED SOIL MOISTURE

WATER RETENTION

FLOOD MANAGEMENT

Making Roads Work for Water –Why It is Important

Big scale and impact

Roads have major impact on (surface) hydrology and flood patterns

Relatively low cost

Measures are low cost in comparison to total road investment (<5%)

In fact, compensated by reduced costs of maintenannce: thus reduce pressure on this (inadequate) budget

Many measures even save investment costs (lower road embankments)

Starting in with harvesting water from roads in Ethiopia in 2014

- Storing high rainfall for dry period as groundwater, soil moisture or surface water
- Adequately dealing with 2015 El Niño
- Engaged> 2.25 M people in 2015/7 campaigns
- Benefitted 1.1 M people
- Guidelines being prepared
- Outscaling now to Kenya, Sudan, Uganda, Bangladesh, Malawi

ROAD WATER HARVESTING CAMPAIGN ETHIOPIA

- The implementation of water harvesting with roads in Ethiopia has gone beyond piloting programs.

- The technologies applied are variable, depending on site condition.
- The technologies were implemented in all districts since 2014 and more than 4 million people involved

THREE APPROACHES

1. Making use of the road as it for water managment
2. Modifying design of the road
3. Additional measures

ETHIOPIA: ROAD SIDE INFILTRATION TRENCHES

KENYA: ROAD WATER FARM TRENCHES

MALAWI: IRRIGATING RIDGES

CHINA: ROAD SIDE PONDS

YEMEN: ROAD SIDE CISTERNS

ETHIOPIA: CONVERTED BORROW PIT

UGANDA – CONTROLLING RICE IRRIGATION WITH CULVERTS

KENYA – ROAD DRIFTS FOR WATER RETENTION

BUILDING SAND DAM UP IN STEPS

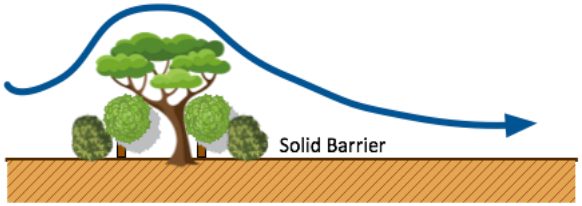
MALI – ROAD EMBANKMENT = RESERVOIR

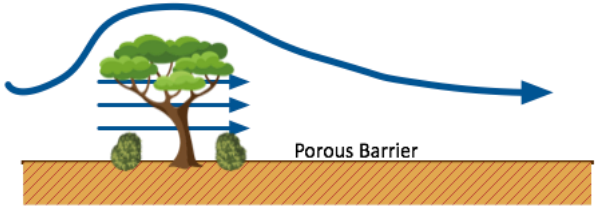
PAKISTAN – STABILIZING RIVER BED WITH ROAD DRIFT

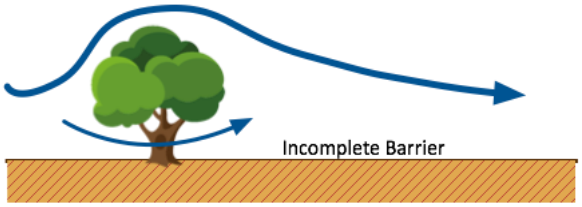
BANGLADESH: ROADS AS POST FLOOD SHELTERS

BANGLADESH REGULATING WATER LEVELS WITH ROADS

PROMOTING ROAD SIDE TREE PLANTIG







MADAGSCAR – PROTECTING AND ECONOMICALLY USING THE ROAD BERMS

Solution: work with farmers to replace annual crop systems with a Vetiver-based, sustainable crop system that protects and stabilizes vulnerable batters

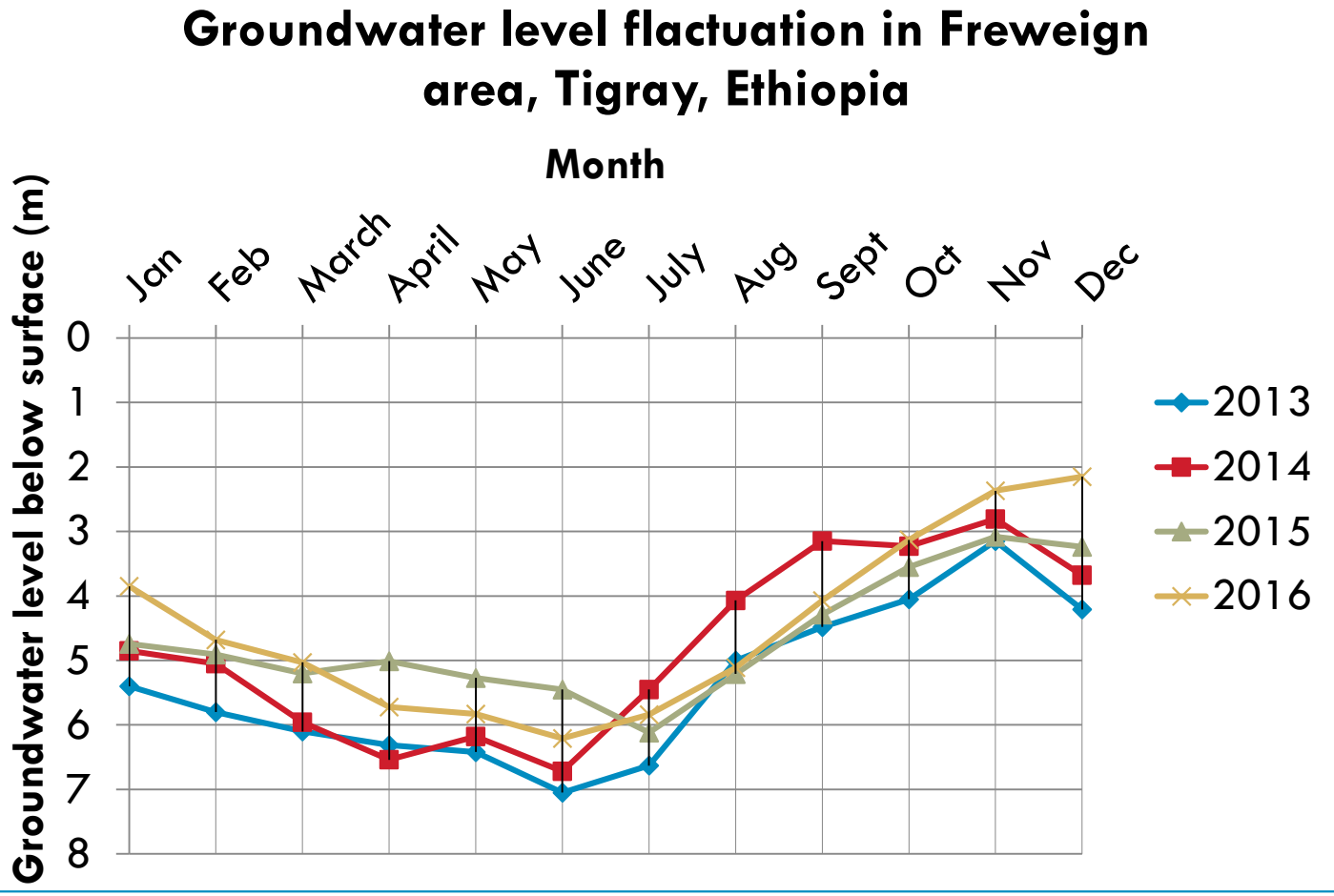
Impacts

Yield impacts of road for water in Sinqata

Effects on groundwater level

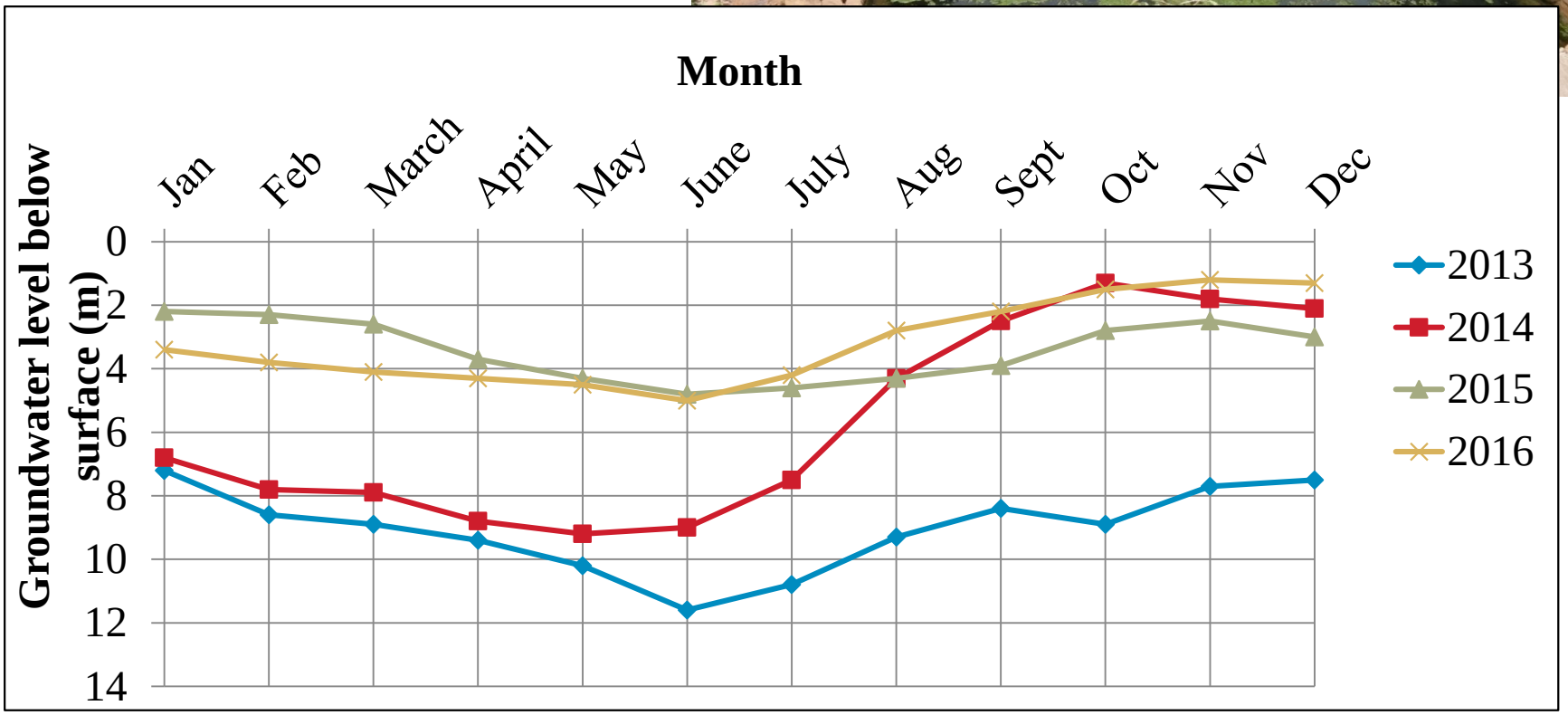
Water from a culvert and road side drainage channeled into a pond:

- Enhanced the shallow groundwat er

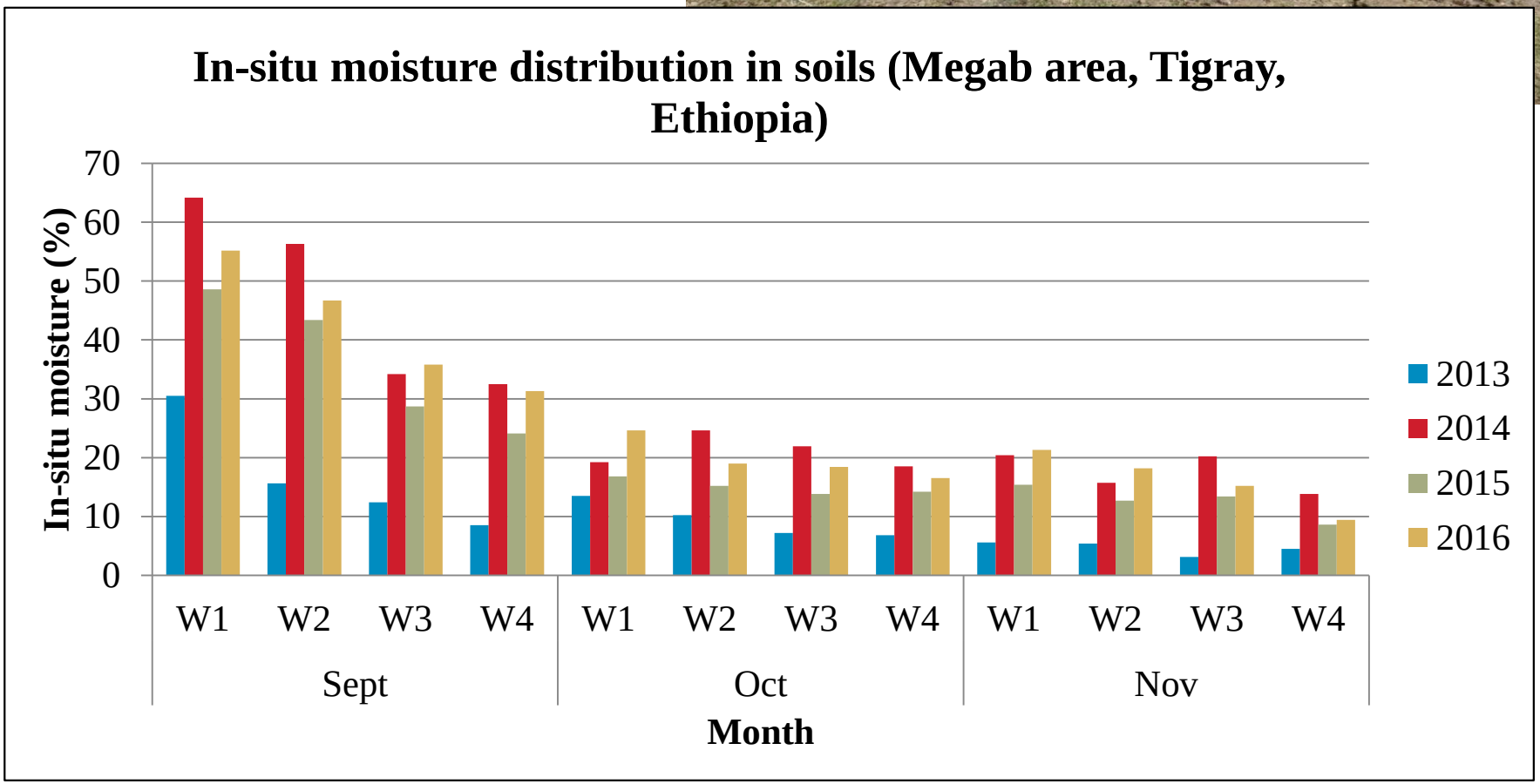


Note: Borrow pit was used as water storage in the month of July 2014.

Effects of check-dams

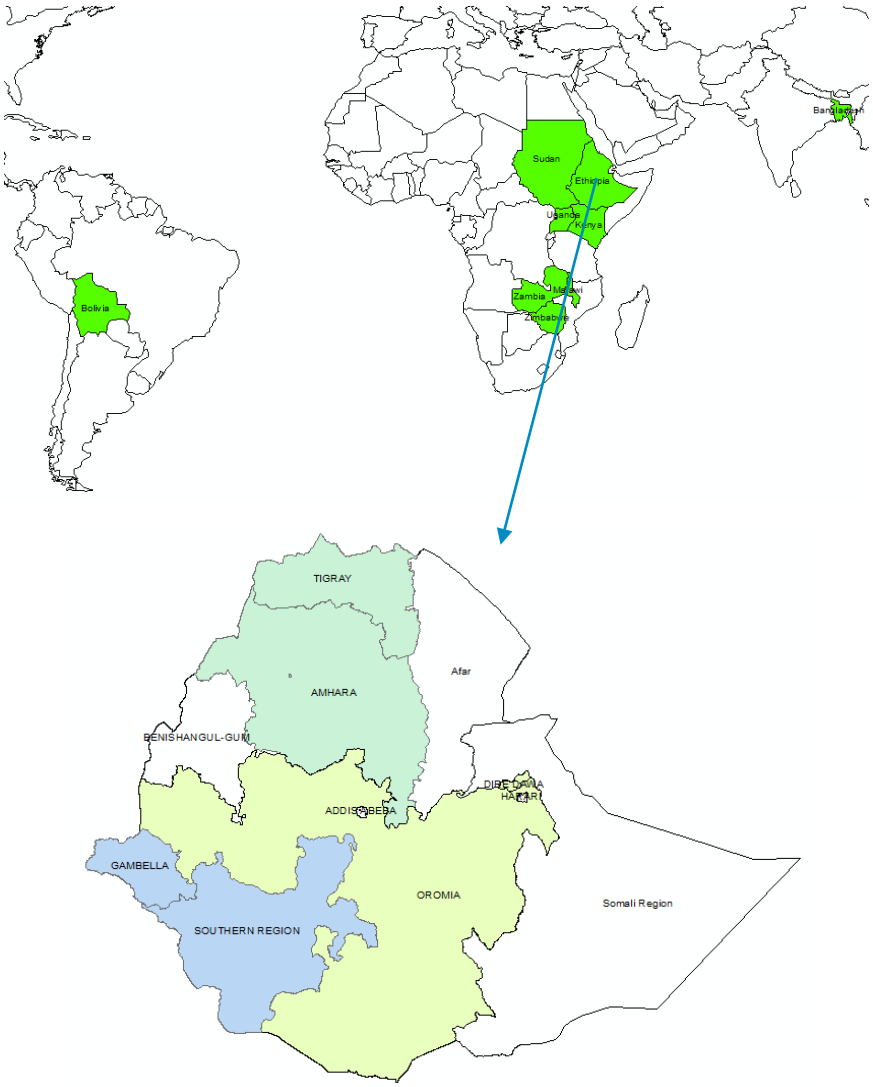


Effects on soil moisture from road spreader



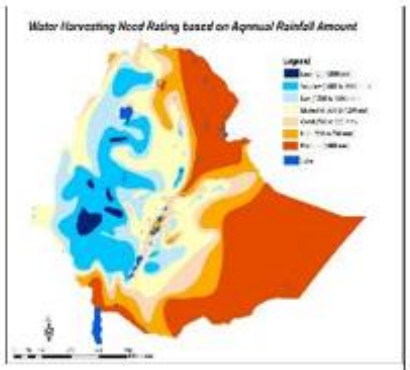
Lessons learned

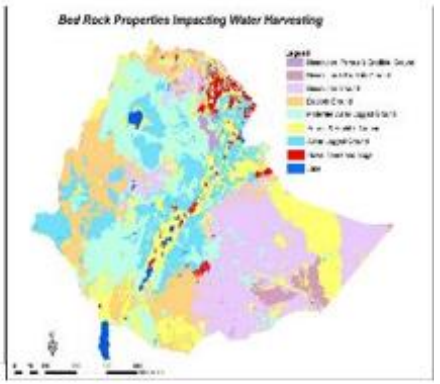
- Climate resilient roads should not mean making more costly and weather-proof roads, but (at zero net cost)
- Institutionally there was no link among water, road and land sectors but this should change and it changing
  - Need to In modified guidelines and designs
  - In budget procedures
  - In capacity building and governance
- create in different condition close linkages
- Better understanding of the need for ‘road water management’ in its new form in various parts of the world

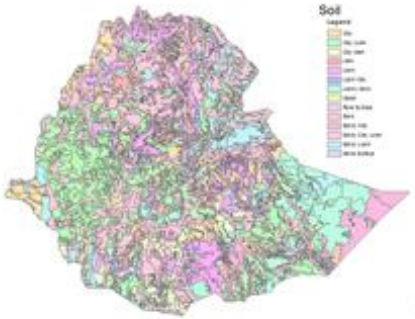


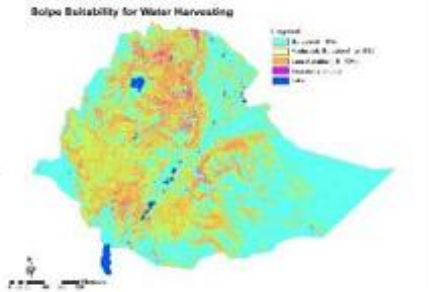
Lessons learned….

- Identification of **homogenous 'road water management' units** is important to design GLs in accordance to specifics of these units
- Agreement on the 'dissipate water' approach supported by the existing functional GLs by the road sector is not preferred option.
- The need to incorporate 'road water management' guideline to be one of the road sector GLs
- The widely varying hydrogeomorphic and agro-ecological conditions of Ethiopia make the GL easily replicable in other sub-Saharan African countries
- The leaning alliance is creating more awareness and attracting people and countries to adopt the approach









Learning alliance

1. Work with road/water/ agriculture programs
2. Work on optimized practices
   - Guidelines and designs
   - Investment budgets
   - Maintenance practices
   - Social interaction and cooperation
3. Capacity building
   - Short courses
   - Guided learning
   - Tools (models)
   - Research
4. www.roadsforwater.org

PLEASE JOIN THE QUEST