Training on

Roads for Water and Resilience

ROADS FOR WATER SECURITY
WATER FOR ROADS SAFETY

IMPROVING LIVELIHOOD
CREATING RESILIENCE

Dream and opportunity

To have roads for systematically used for recharge and retention and storage in Ethiopia and all over Sub Saharan Africa and creatre win-wins

Because

Roads investment in Sub Saharan Africa is 7-10 Bn USD annually

Annual increase 70,000 km

Water is 35% of damage (at least)

Roads have major impact on run-off – now often causing local flooding, water logging and erosion

Roads damage from water

This can be turned around in large potential for groundwater recharge, water storage and irrigation

Research 2013-2014

- Reconnaissance of 200 kilometer of roads in Tigray and Oromyia Regional State
- Research into socio-economic impact and road development governance
- Pilots
- Monitoring
  - Moisture levels
  - Groundwater levels
  - Water quality
  - Impact

Some results

- In 200 kilometers:
  - Erosion and sedimentation: 150 locations
  - Flooding of houses and land: 45 locations
  - Persistent waterlogging: 65 location
- Deficiencies in governance process
  - Missing from guidelines
  - No coordination
  - No interaction with road-side communities
- Social impacts
  - Damage to land and houses, dust
  - Poor – most vulnerable least access to potential
  - No compensation, indirect litigation

Catalyst grant – some results

- Pilots: high acceptance - prepared in all 30 districts of Tigray by Regional Bureaus and communities
- Monitoring
  - Impact specific to location and specific intervention, compared with base year in different locations
  - Soil moisture content increases Shallow groundwater levels
  - Control of flood run-off (discharge reduced Surface water storage
  - Water quality (not traceable)

Urgent need to turn things around

Urgent need to turn things around

Local flooding and erosion a number on problem

Triple Win

REDUCED WATER
DAMAGE
TO ROADS
(-35%)

REDUCED
DAMAGE FROM ROADS
THROUGH FLOODING,
EROSION AND SEDIMENT
DEPOSITION
(-30%)

WATER HARVESTED
FOR PRODUCTIVE USE
400,000M3 PER KM

RISING GROUNDWATER
LEVELS 1.9-5.8 MTR

INCREASED SOIL
MOISTURE
30-100%

NOW
1.3
PROBLEMSPOT
PER KILOMETRE

Triple Win

REDUCED MAINTENANCE COSTS
HIGHER RELIABILITY

REDUCED DISPLACEMENT
REDUCED LITIGATION

INCREASED PRODUCTION

HIGHER RELIABILITY

Many other opportunities to better use of roads for water!

Stage 1:

Adapting to the changed run-off generated

1. Spreading water from road surface
2. Harvesting water from culverts, side drains and depressions
   - Converted borrow pits
   - Infiltration ponds
   - Infiltration trenches/ pits
   - Swallows
   - Dug outs
3. Gully plugging for recharge
4. Spring capture

THE NETHERLANDS: SWALLOW for RECHARGE

YEMEN: ROAD SIDE CISTERNS

CHINA: ROAD SIDE PONDS

ITALY, SARDEGNA: SPRING CAPTURE

TIGRAY, MULEGAT: SPRING CAPTURE

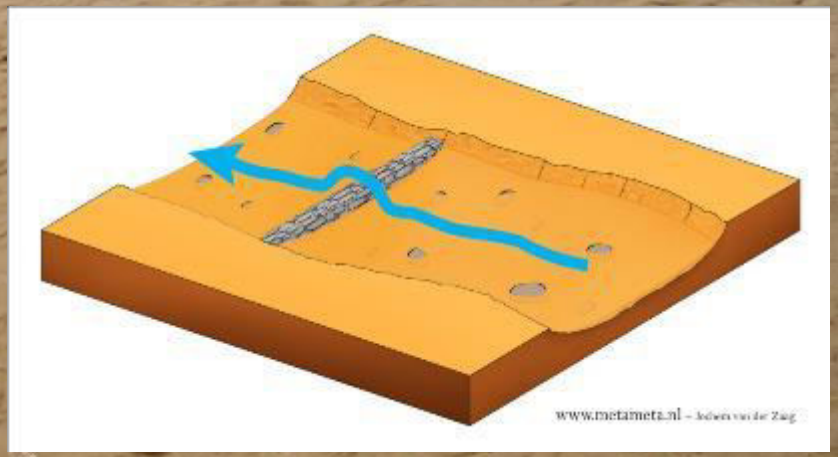
Many other opportunities to better use of roads for water!

Stage 2:

Optimizing road design for multiple functions

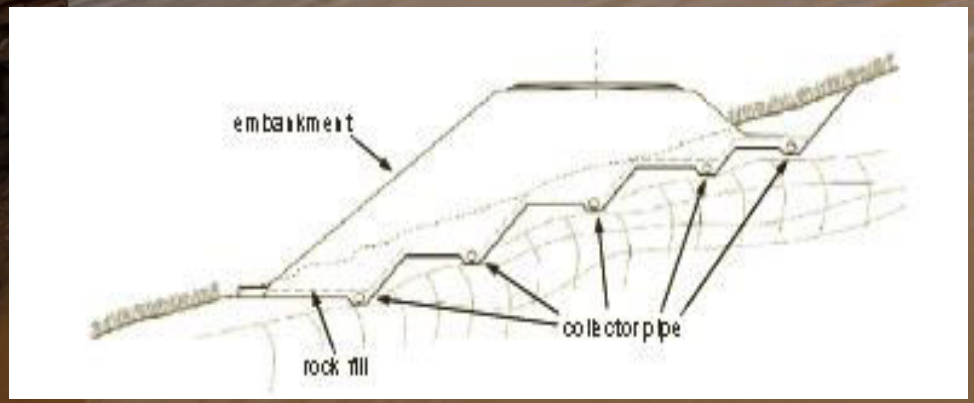
1. Irish bridges/ fords:
   - for flood water spreading
   - for river bed stabilization
   - acting as sand dams
2. Changing road alignment to recharge areas
3. Change culvert location
4. Permeable road foundations

PAKISTAN: ROAD = SPATE IRRIGATION BED STABILIZER



SOUTH SUDAN: CROSS DRAINAGE REGULATES SOIL MOISTURE, REGULATES BURNING AND REGENERATION: CULVERT PLACEMENT

WATER LOGGING CLOSE TO ROAD EMBANKMENT: NEED TO RETHINK CROSS DRAINAGE AND ROAD COMPACTION



Many other opportunities to better use of roads for water!

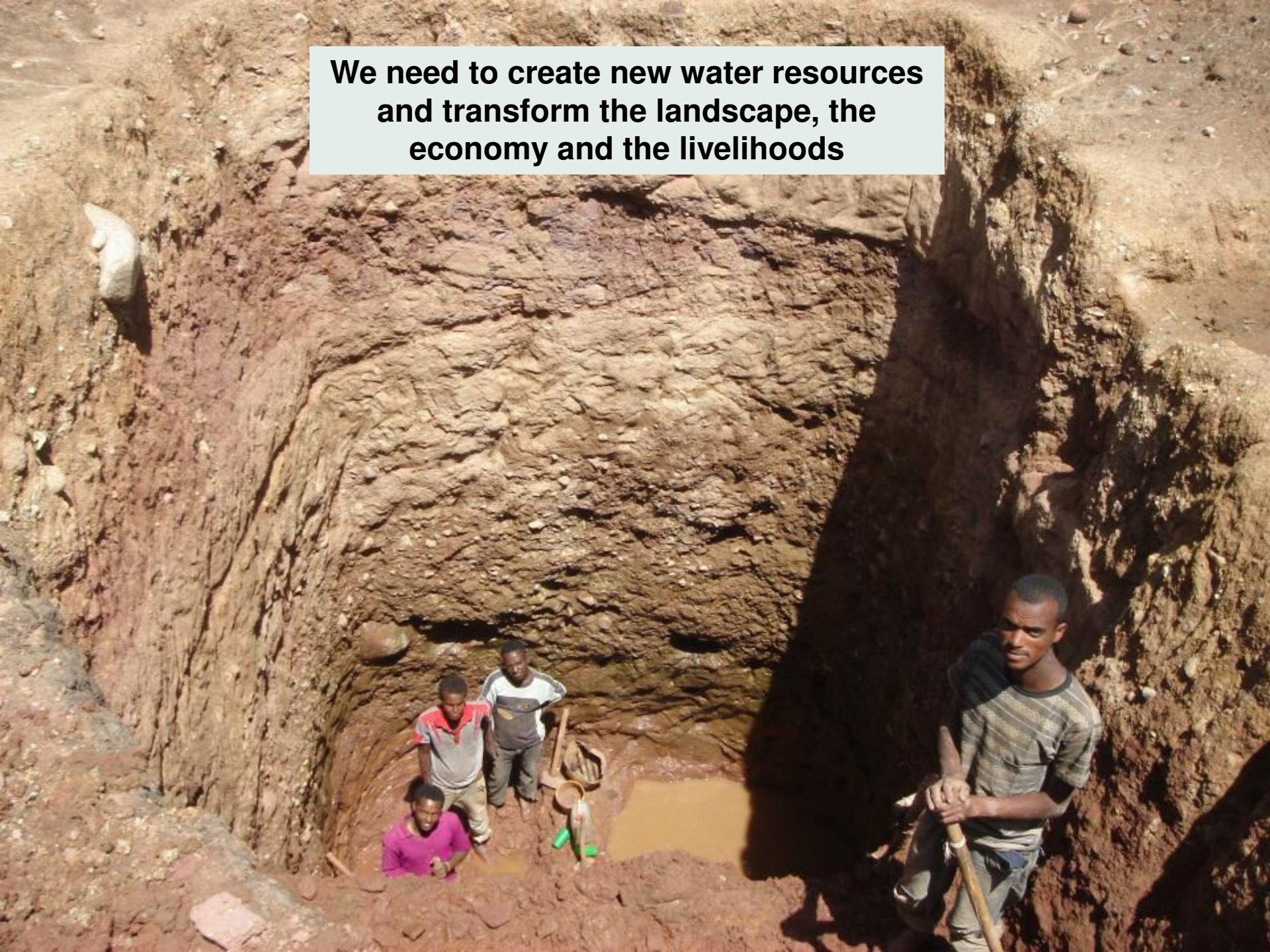
Additional

1. Reuse excavated bed material from roads for soil improvement
2. Sand harvesting along roads
3. Evacuation in times of floods
4. Road side tree planting

>> we can turn roads into development reservoirs

We need to convert a problem

into an opportunity


We need to create new water resources
and transform the landscape, the
economy and the livelihoods


Water and roads: friends not enemies

We need to change the governance

1. Integrate in road and water shed programs
2. Community engagement
3. Change procedures in roads development
   - Manuals
   - Investment budgets
   - Maintenance budgets
   - Cooperation
4. Capacity building
   - Short courses
   - Tools (run-off models)

Let‘s travel together

Supported by:

Developed by: