

Why Roads for Water?

- Large investment in road building and maintenance in developing countries for economic development as they 'unlock' areas
- Global road investment is 1-2 Tr USD/year
- Roads alter the hydrology, soil condition around, storage and recharge of water
- Roads mainly suffer from water related damage, enormous maintenance costs
- Roads and water are often enemies but we need to turn this around:
 - To 'fix' roads you need to 'fix' water
 - To 'fix' water you sometimes need to 'fix' roads
- Beneficial road water management have substantial benefits like improve climate change resilience to road infrastructure and road adjacent communities; productive use of water from road; less flood and erosion damage and enhance soil water moisture and recharge

Dream & Opportunity

- To create multi-functional roads, systematically used for beneficial water management.
- Linking water harvesting, infrastructure development and watershed management.
- Enhance food security and the safety of our infrastructures

Triple Win

- REDUCED WATER DAMAGE TO ROADS (-35%)
+ HIGHER RELIABILITY



+ WATER HARVESTED FOR PRODUCTIVE USE 400,000M3 PER KM

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

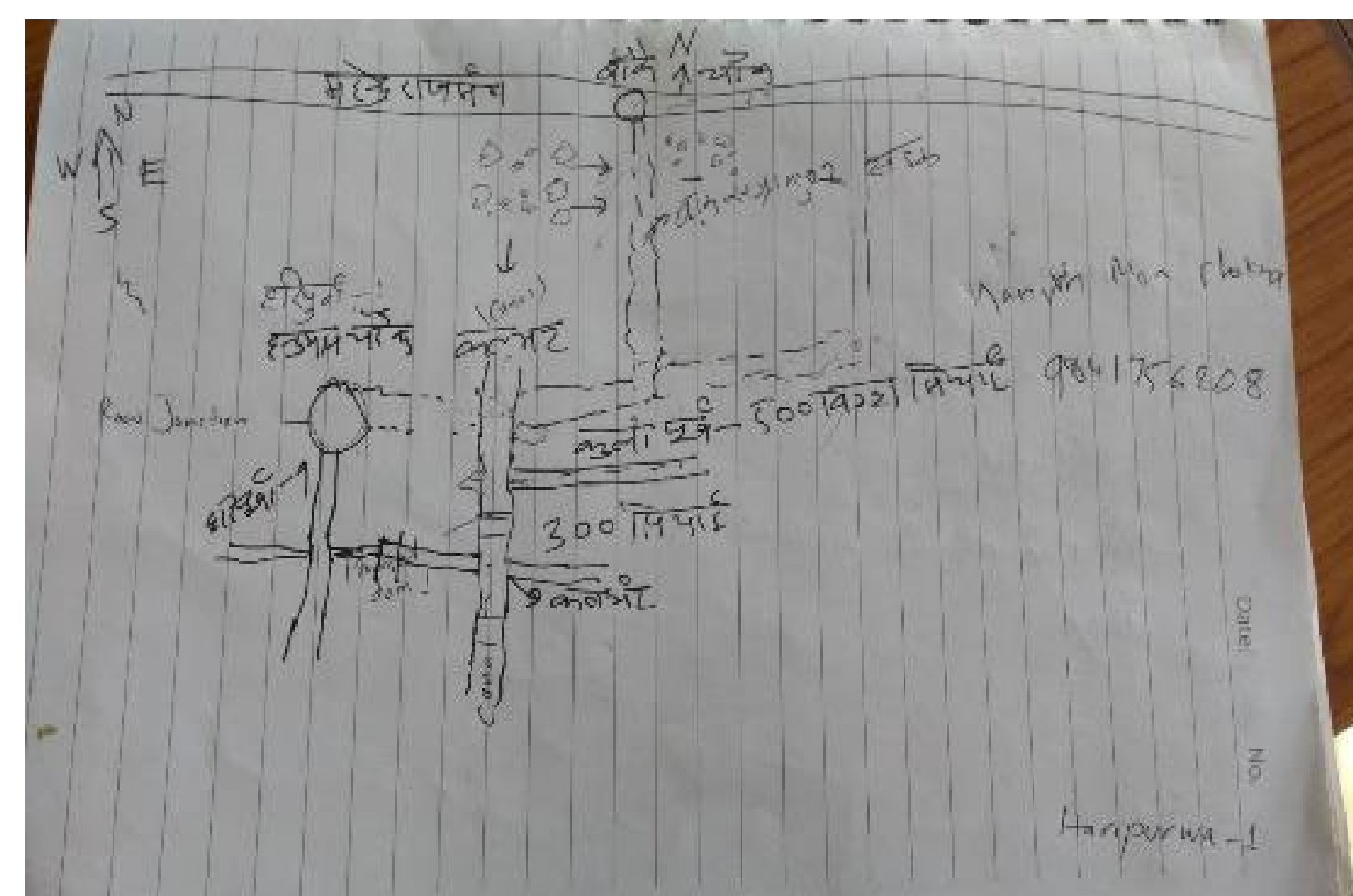
NOW 1.3 PROBLEMSPOT PER KILOMETRE

+ RISING GROUNDWATER LEVELS 1.9-5.8 MTR
+ INCREASED SOIL MOISTURE 30-100%

Methodology

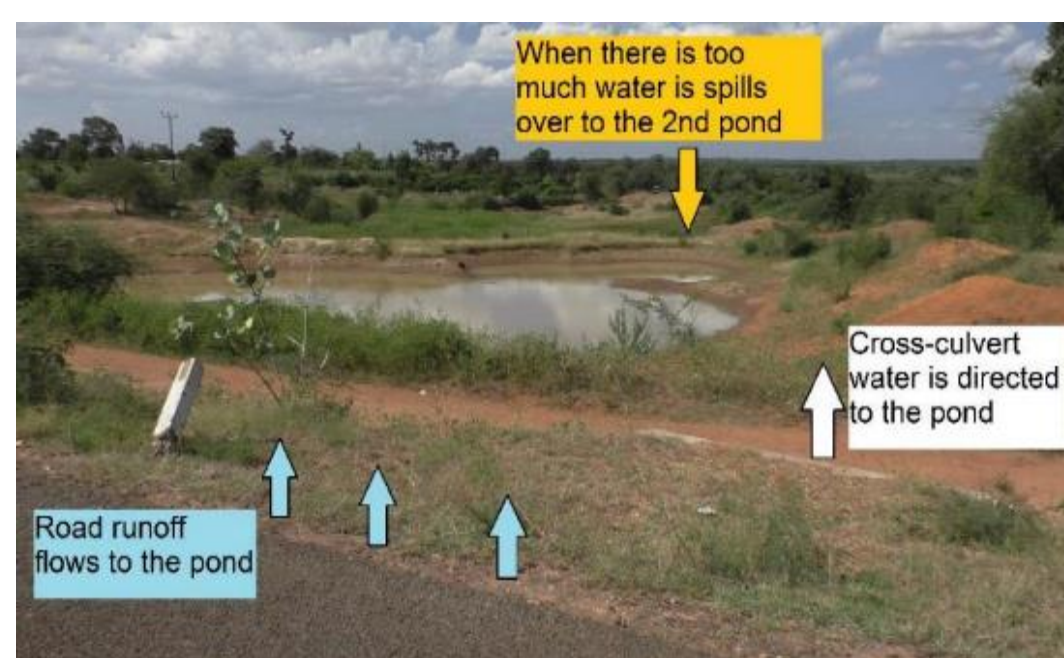
- Selection of Road Stretch and area:** Discussed with key stakeholders (road, water, agriculture and disaster sectors) in Ethiopia and selected a road where
 - Water related effect in the road
 - High variability of rainfall in time and space
 - Food security being major challenge in the adjacent area
- Transect Walk:** To assess the status and potential opportunities for beneficial road water management. It includes field observation, discussion with communities (FGD)

Examples of road water management in Nepal



Results: optimized road design

Component	Design Options
Road Surfaces	Harvest water directly from road surface from lead-off drains and rolling dips In flat areas use low filtrating stone bunds Storages and enhanced recharge structures on runoff paths Roadside vegetation to intercept some contaminants
Cross drainage and culvert	Divide the road runoff into smaller flows Prevent gullying of drainage stream with check-dams and armouring Direct the runoff to storage and recharge areas Flood compartmentalization and protection through gated culvert
Borrow pits	Use borrow pits for storage, recharge or as seepage ponds Access ramps and landscaping of borrow pits
Newly opened springs	Collect newly opened spring flows in cisterns or storage reservoirs that are adequately dimensioned and have spillways facilities
Fords/drift and flood water spreading weirs	Combine fords/Irish bridges with sand dams (groundwater recharge) Use fords to stabilize dry river beds Use access roads to create flood water spreading weirs
Roadside vegetation	Use vegetation (combined with filtrating bunds) to slow down runoff, control erosion, and increase infiltration Use vegetation to fix contaminants
Managing and harvesting sediments	Controlled sand harvesting from fords cum sand dams and from sand traps



Runoff from road surface and cross-culvert is diverted to stored in a converted quarry-pit



Runoff from culverts being channeled to deep trenches



Flood Compartmentalization and gated culvert



Gully plugging for recharge



Roads serving as embankments in flood prone areas



Water spreaders from culvert for supplemental irrigation



Road drift doubles up as sand dam for water retention



Roadside infiltration trenches in the large catchment



Bio-engineering protect the road-side slopes

Conclusion

- Both road design and its processes need to optimize the use of roads for local water management. The process need to consider hydrology around the construction area/zone.
- Road projects have the potential to endow road communities with additional water and soil resources with variety of water harvesting techniques combined with road building. Additionally location or placement of road structures like culvert or cross drainage, fords have impact on easy water harvesting and retaining from road to shallow aquifer.
- For multipurpose use of road, there is a need of close cooperation between road, agriculture and watershed management sectors. Moreover, local communities need to be involved from the design phase, to incorporate local water needs and to alert related authorities to opportunities and constraints for water capture along roads.
- Integrated, inclusive and dynamic framework for road planners and designers is required to systematically include water harvesting from roads

Join the Roads for Water Alliance!

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