



STUDY NAME

Optimizing Road Development for Groundwater Recharge and Retention

RESEARCH
ORGANISATIONS

MetaMeta Research (MMR), Mekelle University (MU), Institute of Development Studies (IDS)

RESEARCH TEAM

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RESEARCH AIM /
HYPOTHESIS

To investigate how road development programmes in Sub-Saharan Africa can protect, and where possible improve, the groundwater sources of the poor living within 10 kilometres of any stretch of road.

STUDY DESCRIPTION

Roads have a major but little-researched impact on hydrology and local groundwater availability. The aim of the project is to improve the planning and design of roads in rural areas for the recharge and retention of groundwater, so that there is secure and equitable use of shallow groundwater. This should contribute to more resilience to climate change and lead to poverty reduction and socio-economic development.

The volume of road building in Africa is enormous and combining road building in rural areas with managed groundwater recharge can have a major impact on secure shallow groundwater supply at no or low additional cost. The research will take place in rural Ethiopia.

The specific research questions concern both social and technical issues:

- 1) how do on-going road programmes impact groundwater recharge and retention;
- 2) how does the current process of road design affect multi-functionality, equity and targeted poverty alleviation;
- 3) what technical improvements can be incorporated in road design that will help to optimize the impact with respect to local groundwater recharge and retention; and
- 4) how can the process of road development and design be modified so as to be inclusive.



The research will try to identify opportunities to increase access to shallow groundwater; these could include for instance:

- 1) taking on-board local women's and men's perspectives and experiences of roads and their impacts on groundwater;
- 2) carefully planning road alignments, affecting the speed of surface run-off as well as the routing of run-off towards specific infiltration/recharge areas;
- 3) planning cross drainage to impede and direct run-off to recharge zones and on the downstream side of the road prevent gullyng;
- 4) rethinking road foundation/compaction so as not to interfere with the base-flow to shallow wells;
- 5) considering the use of the concentrated runoff from the road surfaces to recharge and retention areas, including small recharge ponds;
- 6) carefully constructing road crossings through low causeways or *Irish bridges* in dry river beds so that they retain groundwater upstream of the road crossing and increase bank infiltration, serving as proxy sand dams;
- 7) systematically using excavation ponds as recharge ponds; and
- 8) spring capture where roads are made in deep cut. Optimized designs can particularly improve the availability of very shallow groundwater within the suction depth of low cost pumps (less than 7 metres). More secure water availability here makes it possible to support local productive and consumptive uses by small farmers.

The project is expected to result in recommendations on improved inclusive road development planning procedures (incl. community engagement) - set within the Ethiopian political and institutional context - and suggestions for innovative designs which can be included in existing manuals on Road Design.

WHERE?



Ethiopia

WHERE TO FIND OUT MORE:

metameta.nl/

www.thewaterchannel.tv/