Water and Environment Centre

Evaluating the potential of road rain water harvesting in Yemen

A case study of the Maghrabah Manakah Bab Bahil Road, Sana'a Governorate

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Problem Background

In Yemen the water affect the road infrastructure and the environment also affected by road construction especially in rural area's as a result of neglecting the effect of water to the roads and consequently the effect of construct and maintenance of roads to the nearby environment.

Road surfaces may act as a great catchment area in rainy seasons especially in rural areas thus we can established harvesting structures along the alignment of the road near to the right of the road and at the same time prevent the road body from deterioration by the accumulated water throw the road surface and side ditches, and also protect the entire environment and the degradation of soil because of the water at the outlets of the culverts and spillways in term of an integrated approach relate the whom will be the beneficiaries of this structures (local communities, specialist roads engineers and road authority) who have direct interface to the overall landscape along the pathway.

Study Area

a large part of the main proposed asphalted roads in this area required protection and culverts works to protect the road from water problems (scour?).

The local people living near the road already practice road water harvesting using several techniques.

There are also other road surfaces used in this area, like tertiary (stone paved?) roads and rural stone paved feeder roads.



Maghrabah Manakah Bab Bahil Road (Bani Al-Gail)



Jabal Awi – Hasaban Road



Examples of Water Harvesting Maghrabah Manakah Bab Bahil Road & Jabal Awi Road

Objectives

Main objectives

Optimize the benefits of water from roads for the local communities in socio-economic development and for the environment protection focusing on the road of Maghrabah Manakah Bab Bahil Road and the linked rural road Jabal Ekbari and Jabal Awi Road Sana'a Governorate

Other objectives

Suggest alternative strategies in geometric road designs to manage water from roads due to **Integrated Water & Roads Management**

Check the awareness of roads engineers (designers and executioners) and decision makers and donors and contractors on the importance of **Integrated Water & Roads Management**.

Develop Geometric & Environmental guidelines for road construction and maintenance***.***

Research question

Main research question

What is the water harvesting potential of the road (Maghrabah Manakah Bab Bahil Road and the linked rural road Jabal Ekbari and Jabal Awi Road***) in water storage volume and the beneficial reuse of additional captured water?***

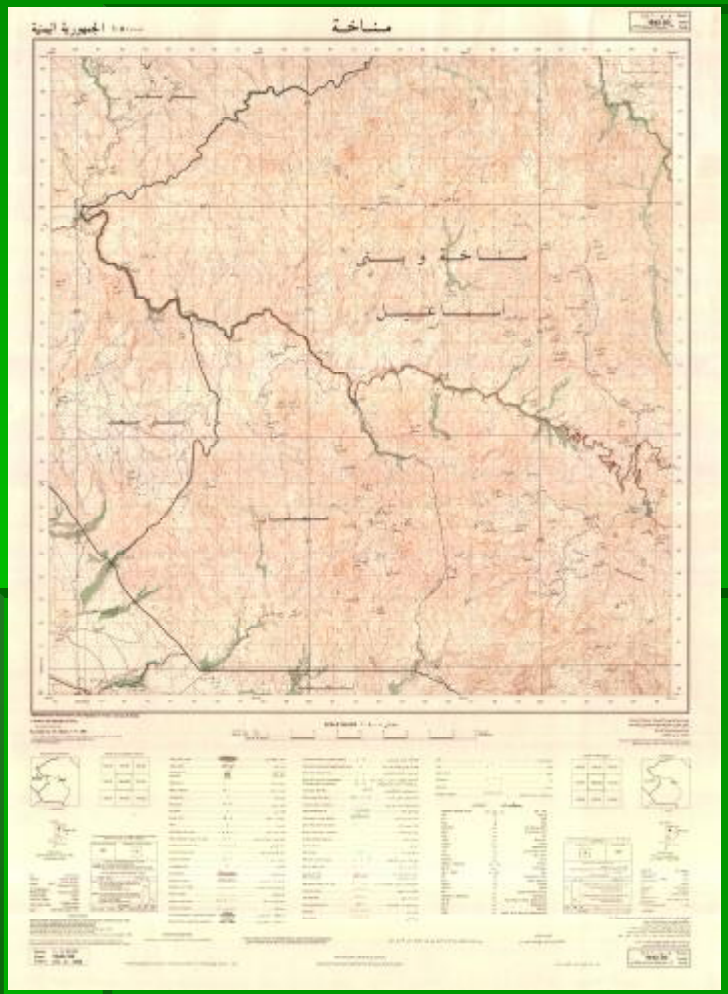
Sub questions

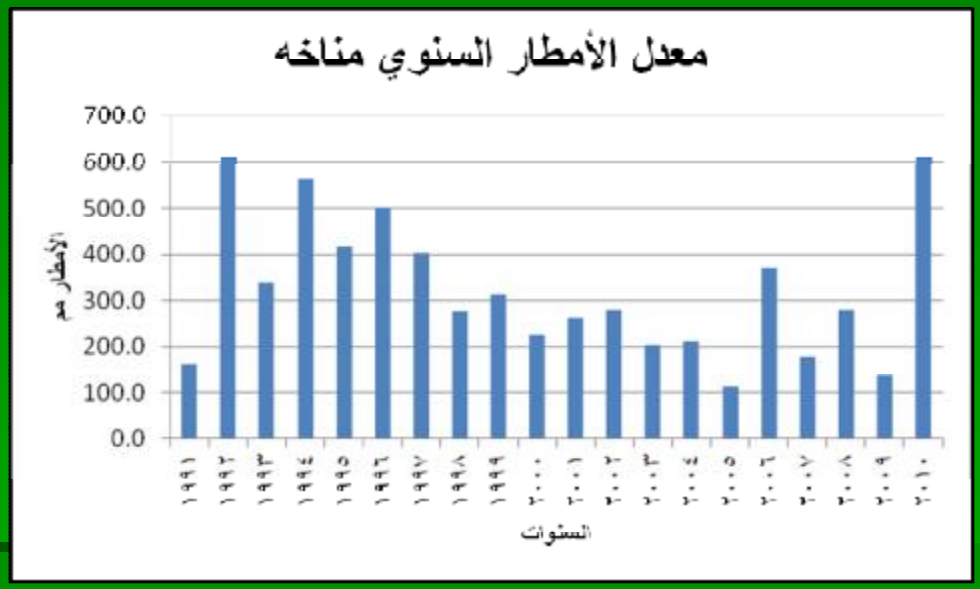
What is the role of geometric design of the road to enhance the water harvesting from the road

What is the knowledge and awareness of roads engineer to the subject of harvesting water from roads.

Methodology ***Research Plan***

1 - **Literature review and Base line data collection**





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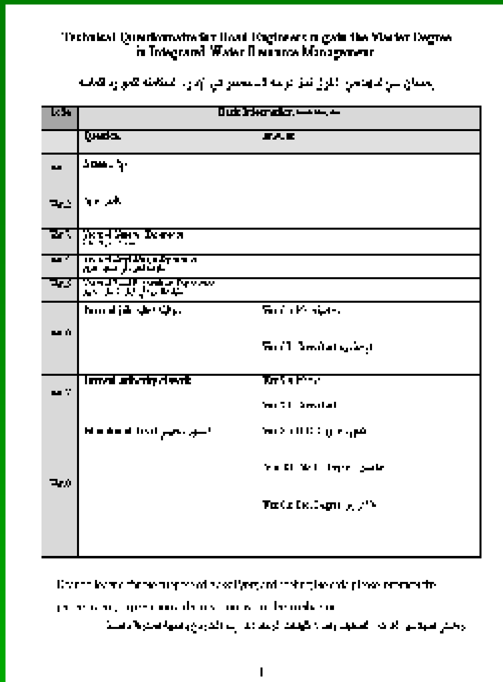
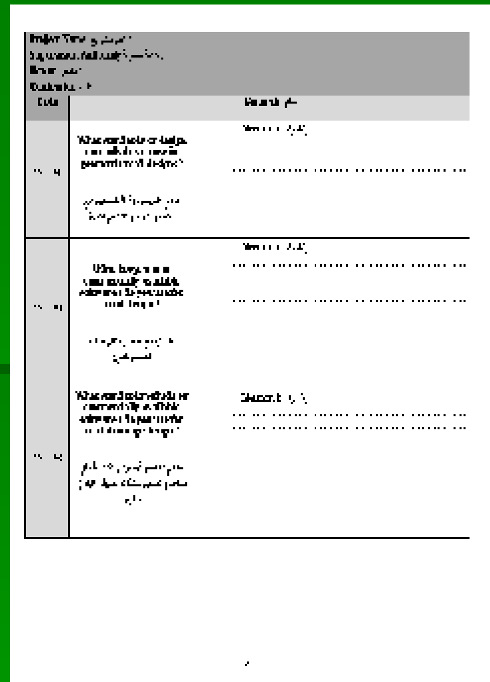
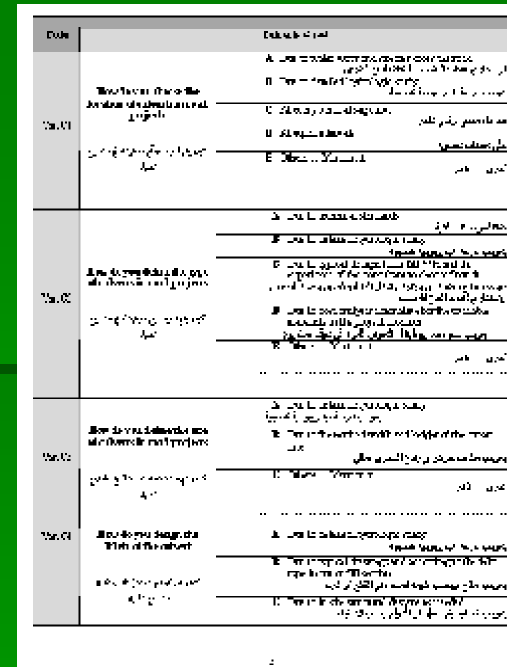
Methodology ***Research Plan***

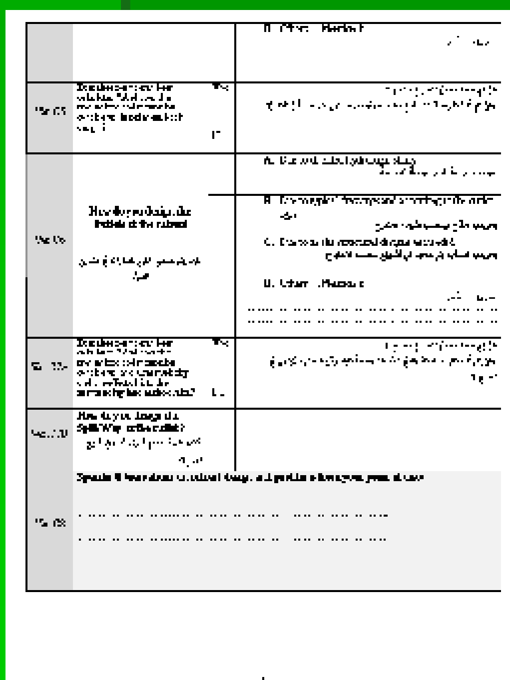
2. Design of Questionnaires

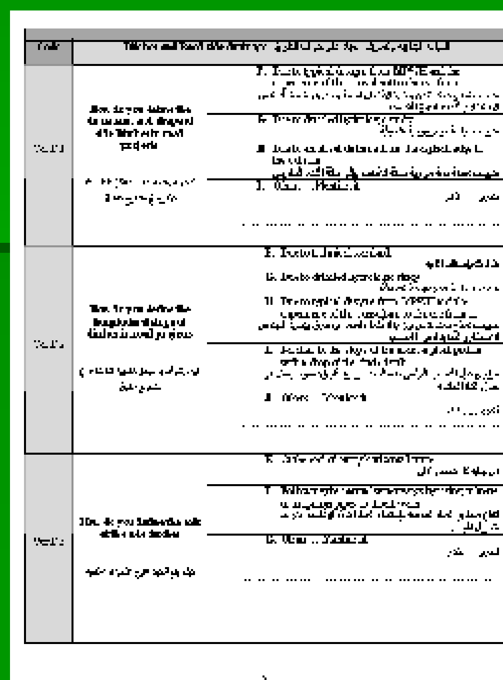
The questionnaire will be designed to find out the following:
-Water harvesting from roads and how to benefit from it.
-Water effects to the roads under construction and after construction.
-Solution to the effect of water to the roads and vise-versa.
-Roads construction effect to the environment.
-The study will take a questionnaire to the specialist's engineers who are responsible for the design, supervision and maintenance of roads.
-The study will take a questionnaire to the beneficiaries.

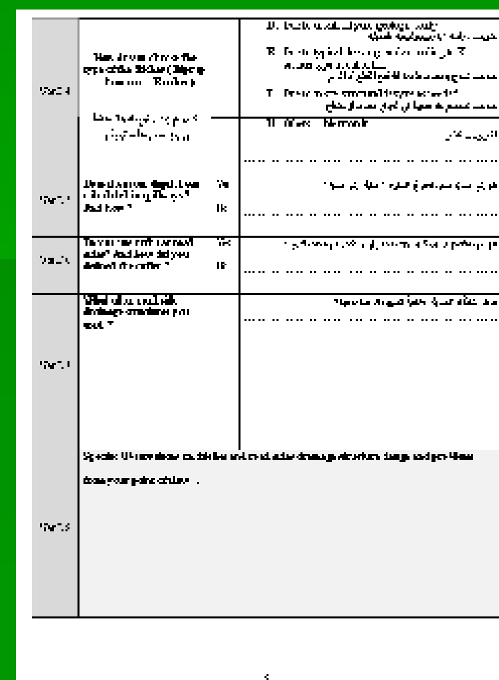

Technical Questionnaire for Road Engineers to gain the Master Degree
in Integrated Water Resource Management

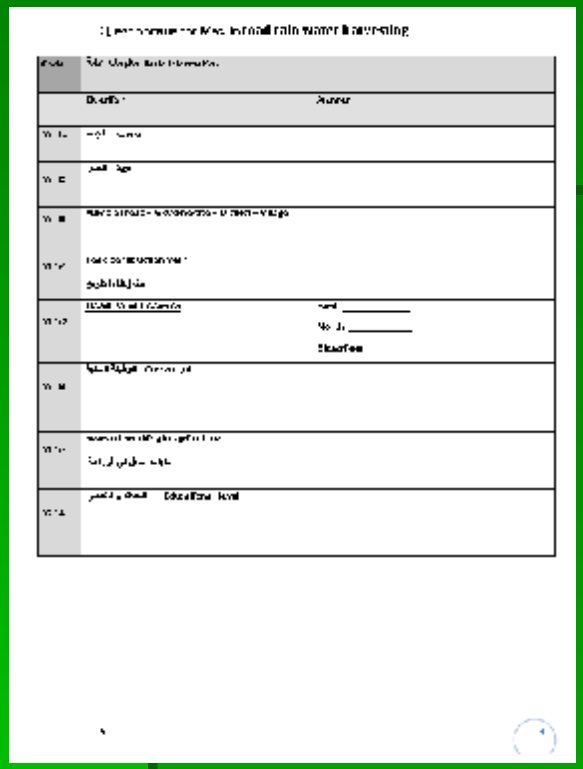


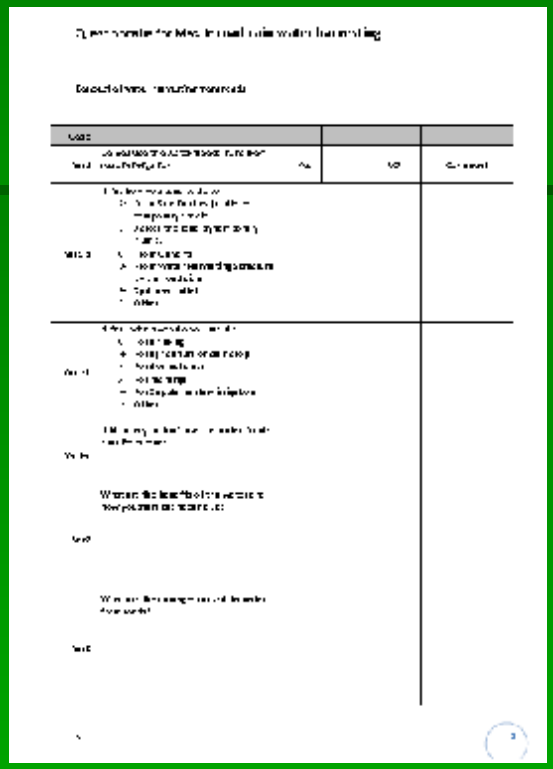


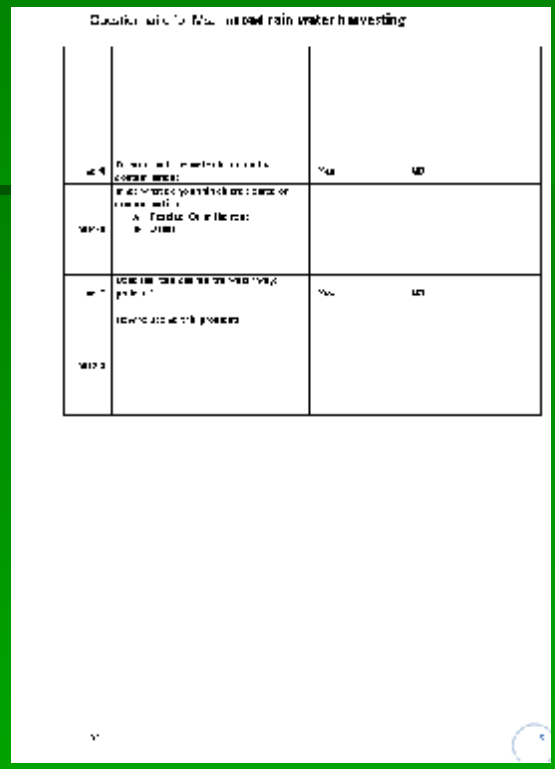












Methodology ***Research Plan***

3. Field research

Oriented experience exchange sharing of road engineers, watershed specialists, contractors and water harvester's from roads.

Detailed interviews and discussions with some examples of harvesting water from some selected areas.

Development of and testing of basic integrated package, for calculation of road impact on local water harvesting , location of roads in watershed; road material; road length, width/bends; height road ridge; type of embankment; location of culverts; ditch infiltration; locating Irish bridges and length of longitudinal slope .

Sampling of road water quality.

Methodology ***Research Plan***

4. Data analysis and interpretation

- Questionnaire data will be analyzed using Statistical Package for Social Science (SPSS) Program and the results will be discussed to evaluate the situation and prepare the proposed sustainable strategies to be implemented.

- Discussion and technical review of standard designs and suggestions for modification to existing manuals for best integrated design

- Scientific paper summarizing the research findings

Methodology ***Research Plan***

5. Report Preparation

- The final report will be prepared containing a broad view in current water and roads management and the main recommendation to implement the best strategy to WR in an integrated way, the report will include tables and figures which obtained from the study.

- Scientific paper summarizing the research findings.

Thank you for your Attention