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Characterization of shallow geology based on direct borehole data and field reports and identification of suitable zones for manual drilling in Guinea

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Based on previous experience carried out in other African countries by UNICEF, an improved methodology for the characterization of shallow geology and identification of suitable zones for manual drilling has been implemented in Guinea
A sample of an approximately 2500 borehole logs distributed in the different regions of Guinea have been collected from SNAPE (National Water Authority of Guinea), after correction of unreliable data, 1540 borehole data have been obtained; for each point the following parameters have been estimated:
- predominant lithology between 0 and 15 meters
- predominant lithology between 15 and 30 meters
- Depth of hard rock
- Depth of static water level
- Presence and thickness of lateritic crust

An estimated category of hardness and permeability has been assigned to each lithology recorded in the database, as well as an estimate class of suitability for manual drilling. Finally a series of maps have been produced with the distribution of the above mentioned parameters.
This information has been cross checked with direct field observation and meetings with drillers. Extrapolating these parameters the following output at country level have been produced:
- map of suitability between 5-15 m
- map of suitability between 15 and 30 m
- map of general suitability
- map of expected distribution and thickness of lateritic crust
- map of specific techniques for manual drilling applicable

The main procedure was a reclassification of the geological map: for each geological formation the predominant features for the parameters above mentioned were defined; this estimation was compared with the perception of those technicians who had direct experience of drilling in Guinea.
In the map of suitability for manual drilling in Guinea the main factors considered to assign the "class of suitability" are:
- thickness of unconsolidated layers
- hardness and permeability of shallow layers
- presence of hard lateritic crust
- depth of water

As the scale of the available geological map for the whole country (1: 1 million) was too general, in some areas different subunits were created on the basis of a visual interpretation of the distribution of parameters of shallow layers. Furthermore those zones with high slope were considered unsuitable as they present thin weathered layers. Depth of water level was in general not a limiting factor for manual drilling in the whole country

The results of the work allowed to identify 4 regions considered suitable for manual drilling:
- The southern part of Guinee forestiere, with thick unconsolidated materials overlaying the granitic and gneissic bedrock, and good sandy aquifers deeper than 20 m;

- the northern part of Guinee forestiere, with the same bedrock but with partially good sandy aquifers even shallower than 20 m;
- the north-western part of Guinee forestiere (zone de Faranah) with good sandy aquifers on top of granites, but with presence of lateritic crust that could oblige manual drillers to use percussion hammer
- the coastal band, with extremely good sandy deposits but high risk of saline intrusion