



**UNITED NATIONS**

DEPARTMENT OF FIELD SUPPORT  
DEPARTMENT OF PEACEKEEPING OPERATIONS

# Groundwater Assessment for peacekeeping camps

UN Cartographic Section (GIS Centre in UNLB, Brindisi Italy)

Presented by:

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## Groundwater Assessment for peacekeeping camps

### Project Background & Summary

To enhance the rate of success in drilling site selection for water supply, a methodology was developed and applied using GIS and satellite remote sensing technology coupled with hydro geological knowledge of the aquifers in the area

Selection of Locations of Interest (LOI's) with favorable geological conditions for groundwater storage were the primary target. Furthermore, a Site Investigation Strategy (SIS) was set for fieldwork verification.

The work was carried out in support of the peacekeeping mission in Darfur (UNAMID), assisting the GIS Section as well as the Engineering, Water and Sanitation Section of UNAMID in Darfur region (Sudan).

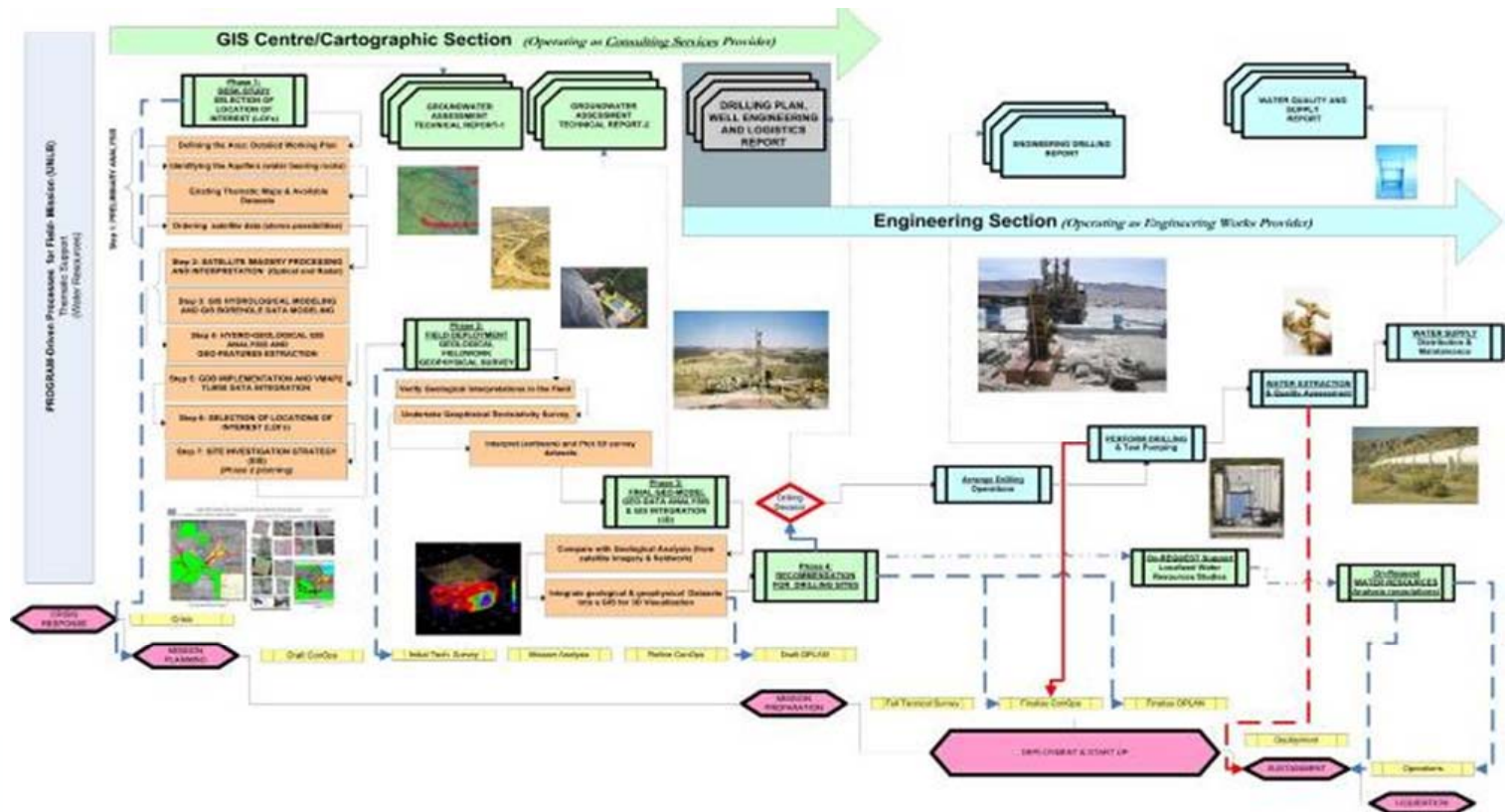


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## Groundwater Assessment for peacekeeping camps

### GW Assessment Workflow vs. PK Mission Life Cycle





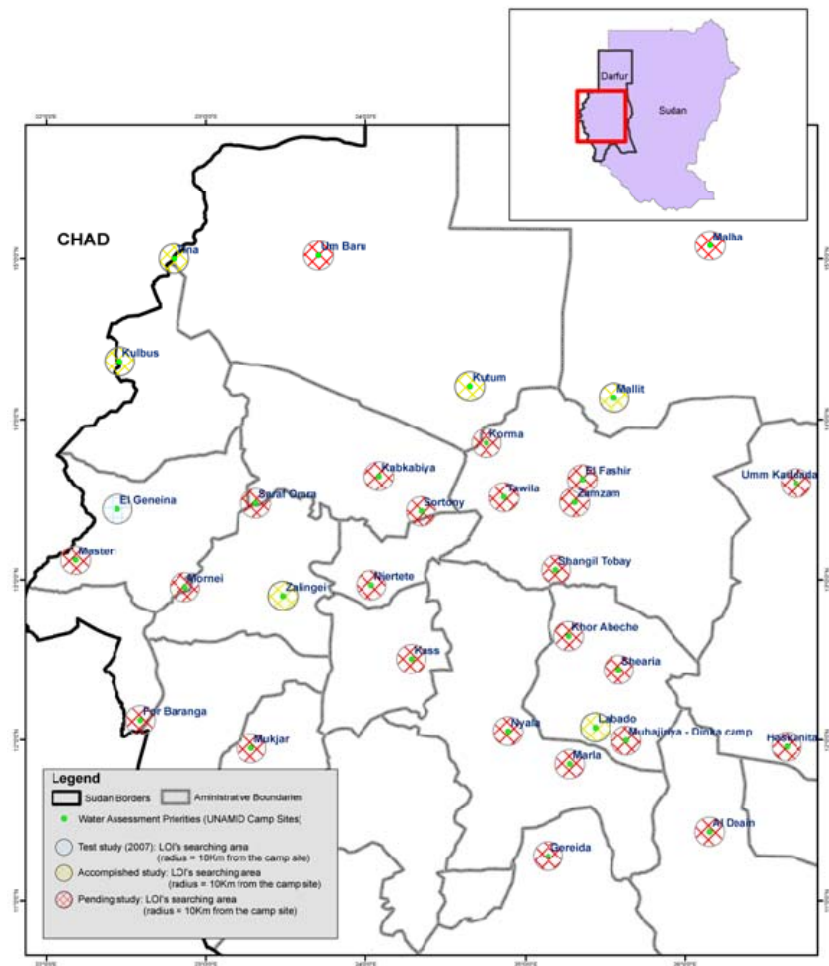
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### Groundwater Priorities

In order to support troop deployment a total of 34 camp sites were outlined for groundwater assessment





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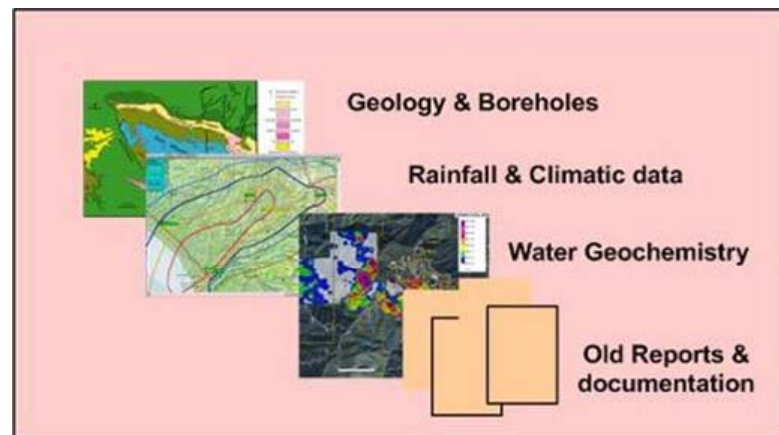
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## Groundwater Assessment for peacekeeping camps

### Phase1 - Step 1

Preliminary Analysis

(Existing Thematic Maps & Records)



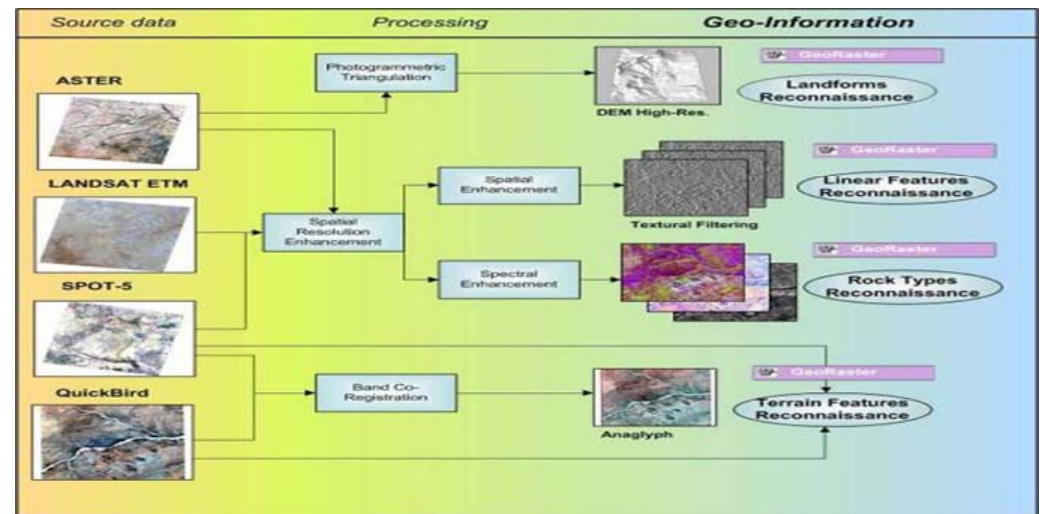


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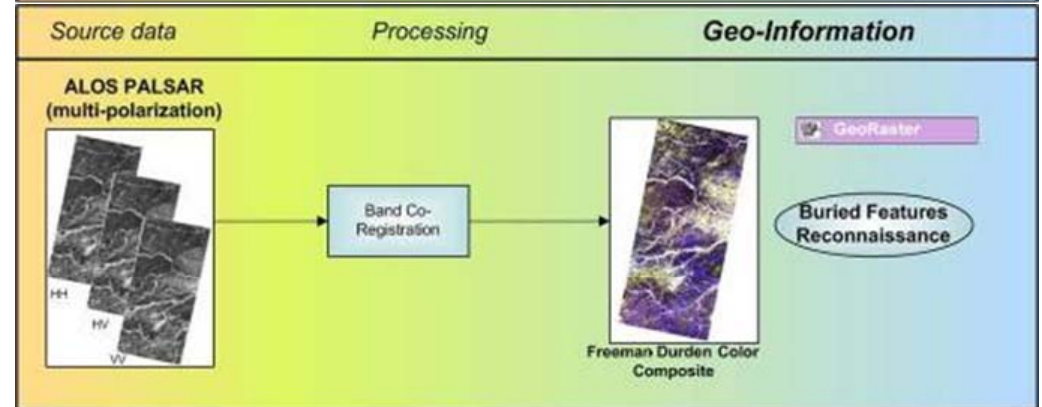
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## Groundwater Assessment for peacekeeping camps

Phase 1 - Step 2  
Satellite Imagery  
Processing and  
Interpretation  
(Optical)



Satellite Imagery  
Processing and  
Interpretation  
(Radar)





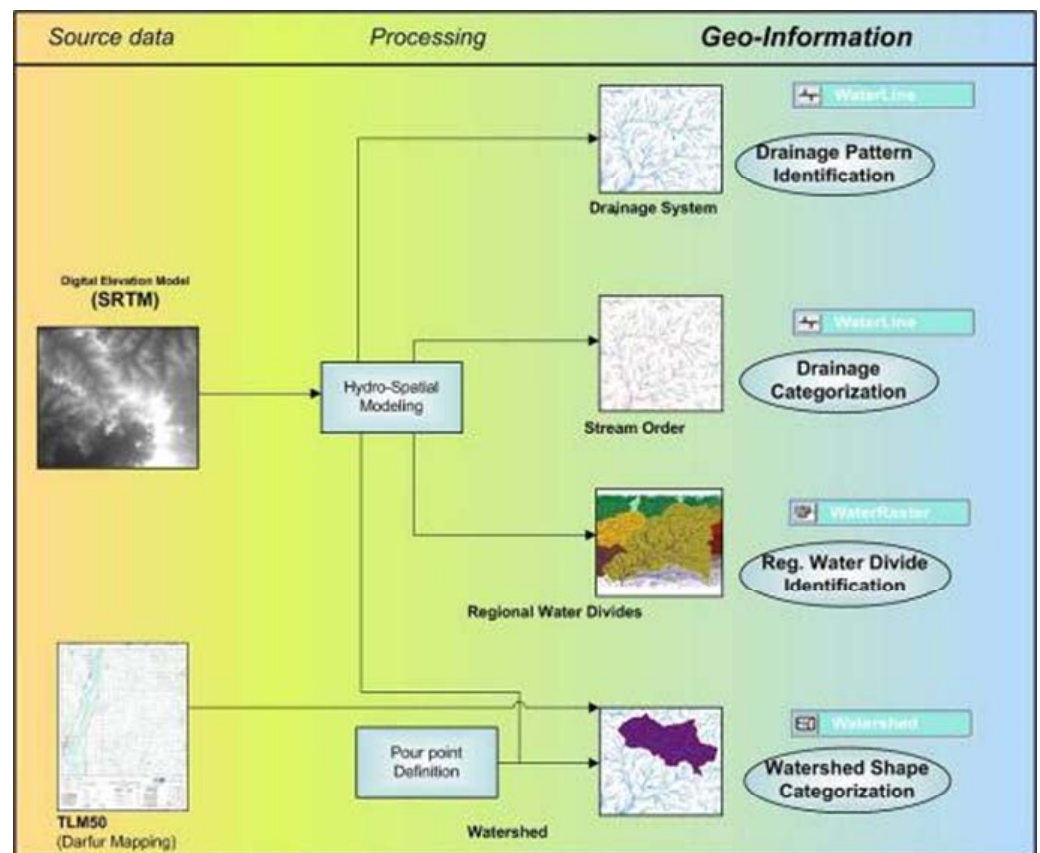
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## Groundwater Assessment for peacekeeping camps

### Phase1 - Step 3

#### GIS Modeling (Hydrological)





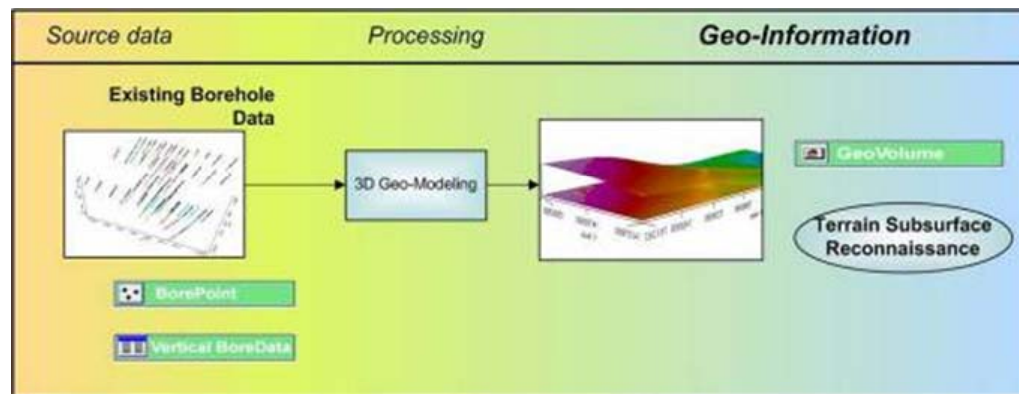
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## Groundwater Assessment for peacekeeping camps

### Phase1 - Step 3

#### GIS Modeling (Boreholes)





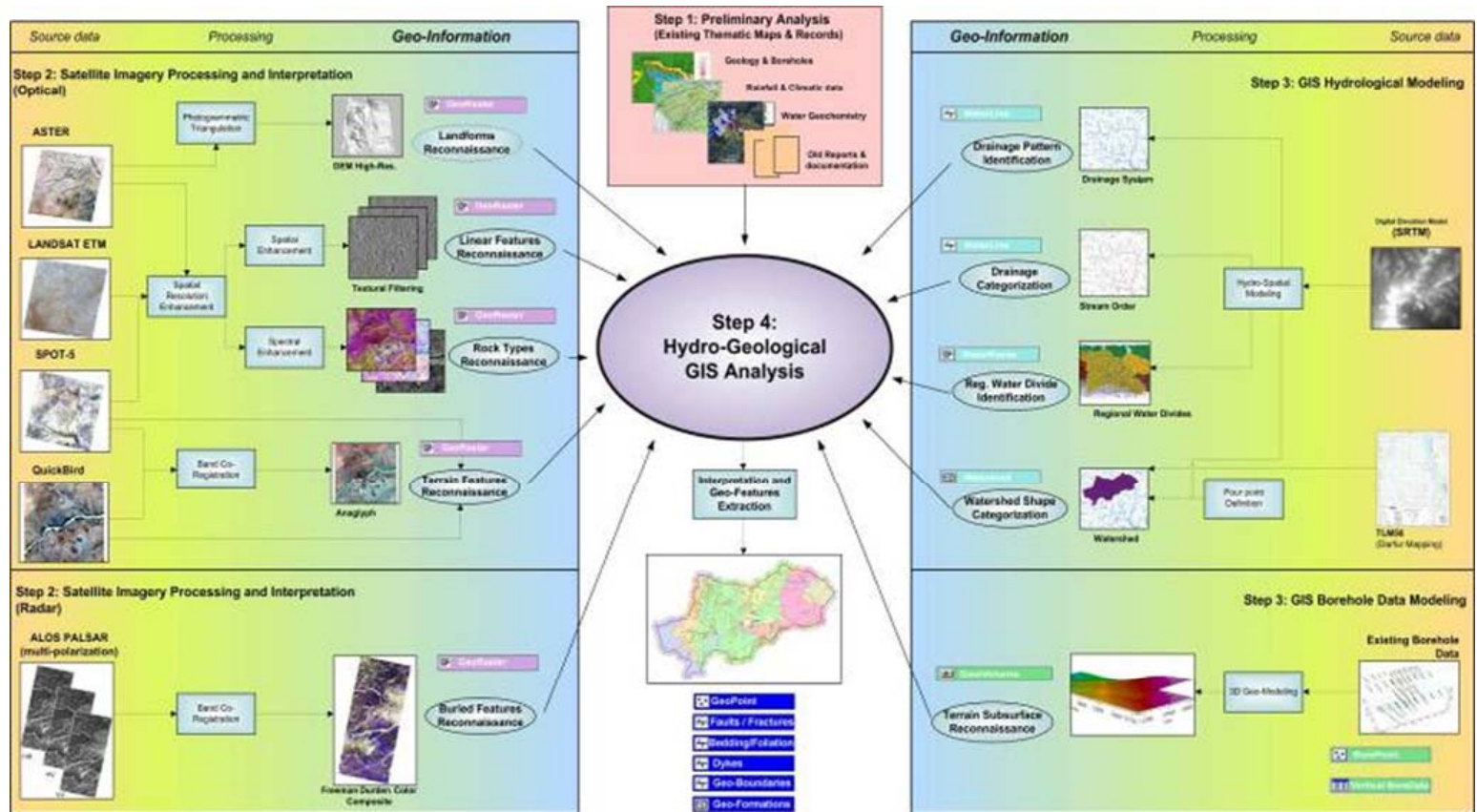


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## Groundwater Assessment for peacekeeping camps

### Phase 1 - Step 4





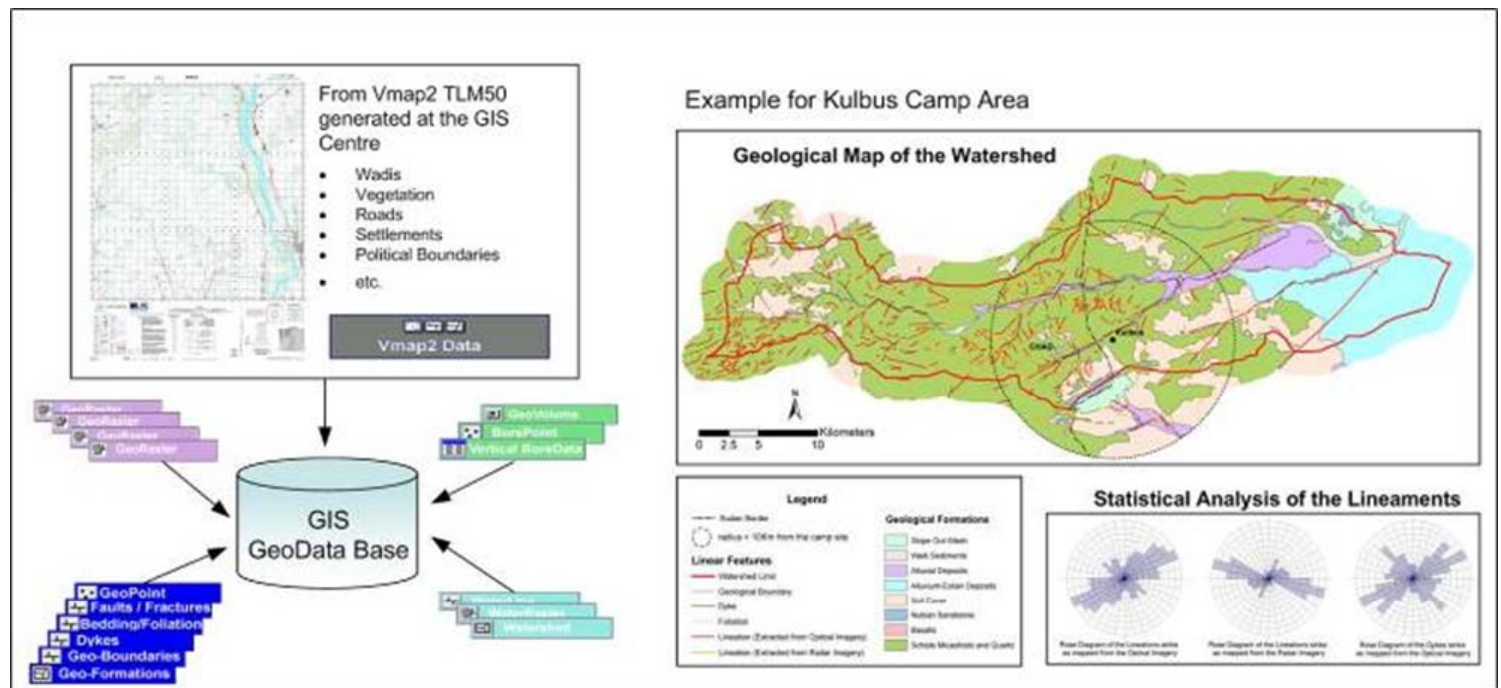
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## Groundwater Assessment for peacekeeping camps

### Phase1 - Step 5

GDB implementation and vmap2 TLM50 data integration





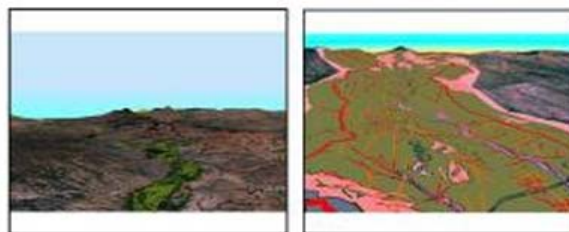
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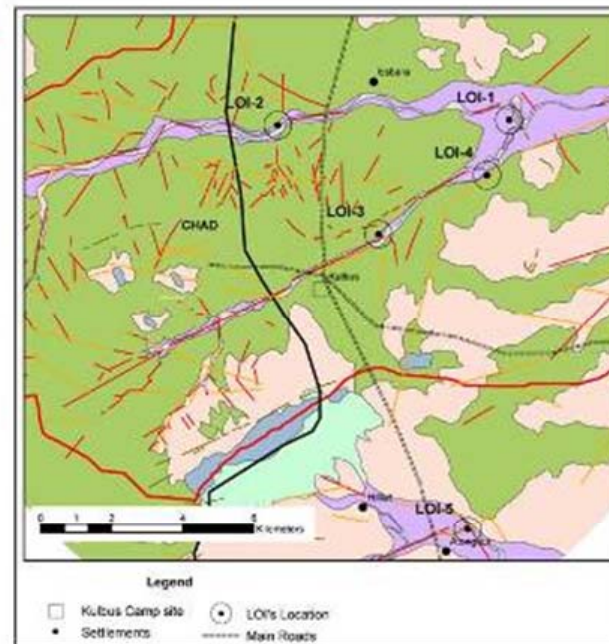
## Groundwater Assessment for peacekeeping camps

### Phase1 - Step 6

#### Selection of Locations Of Interest (LOI's)



**Identification of Locations with:**  
a) favorable geological conditions for groundwater storage  
b) Maximum distance of 10Km from the UN Camp Site  
c) minimum amount of fieldwork and geophysical survey required





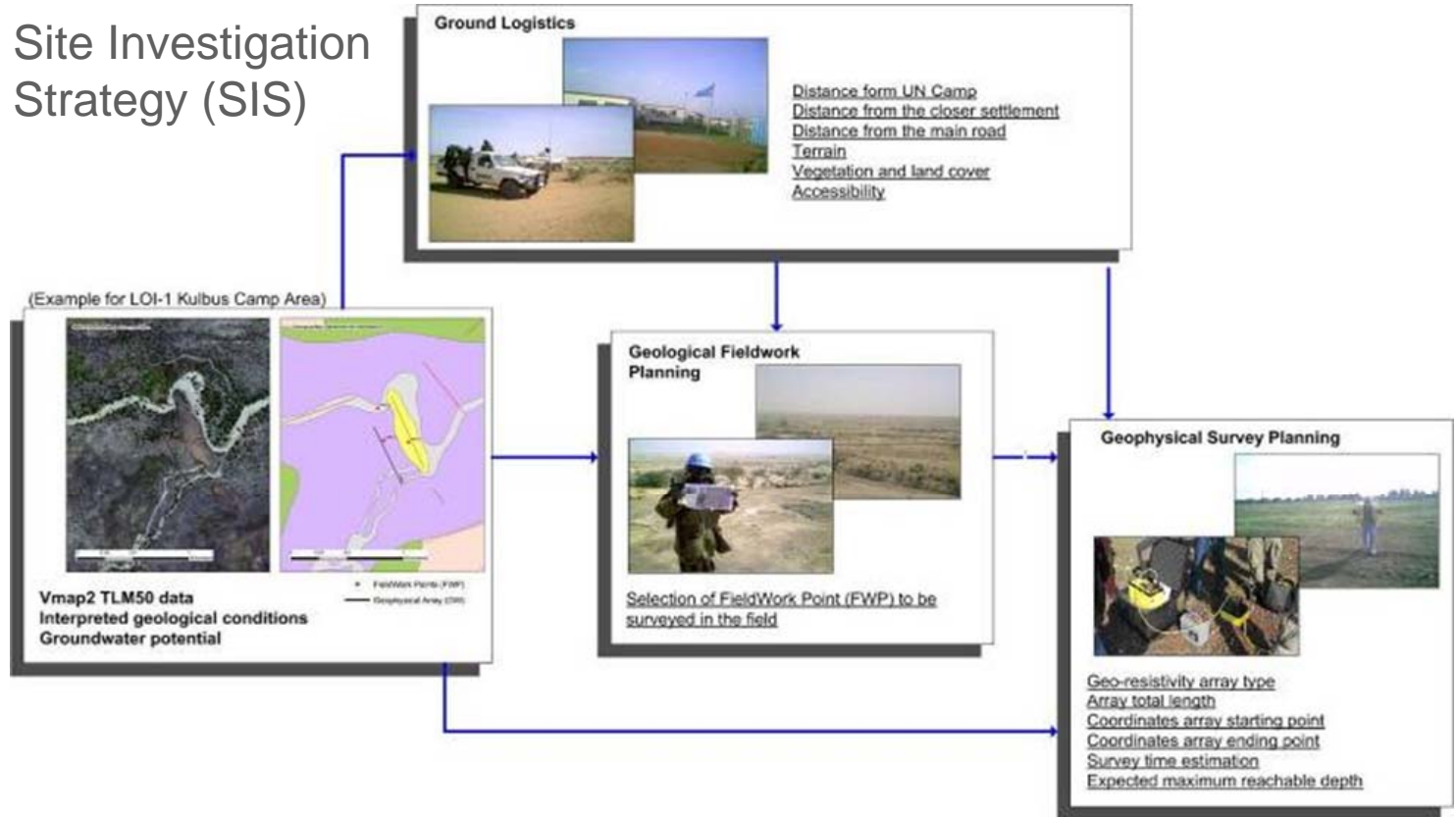
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### Phase1 - Step 7

#### Site Investigation Strategy (SIS)





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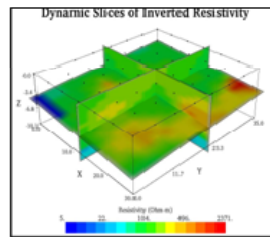
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## Groundwater Assessment for peacekeeping camps

### Next Phases

Phase2 - Field Deployment

#### Undertake Geophysical Resistivity Survey



Expanding the Hydro-geological knowledge of the site's subsurface

#### Undertake Geological Fieldwork



Verification of the RS-GIS Analysis and acquisition of additional terrain data

Integrate geological & geophysical Datasets into a GIS for 3D Visualization



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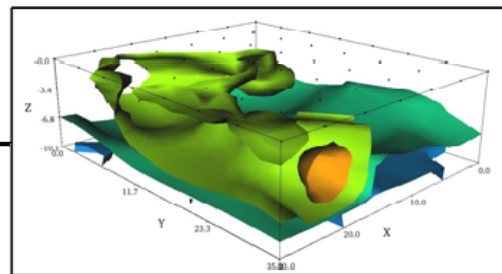
## Groundwater Assessment for peacekeeping camps

### Next Phases

Phase3 – Final Geo-Model

**Integrate geological & geophysical Datasets into a GIS for 3D Visualization**

### Integrated 3D Geo-Model



**Effective groundwater potential**

**Depth of the water table (if present)**

**Geo-Engineering site conditions**



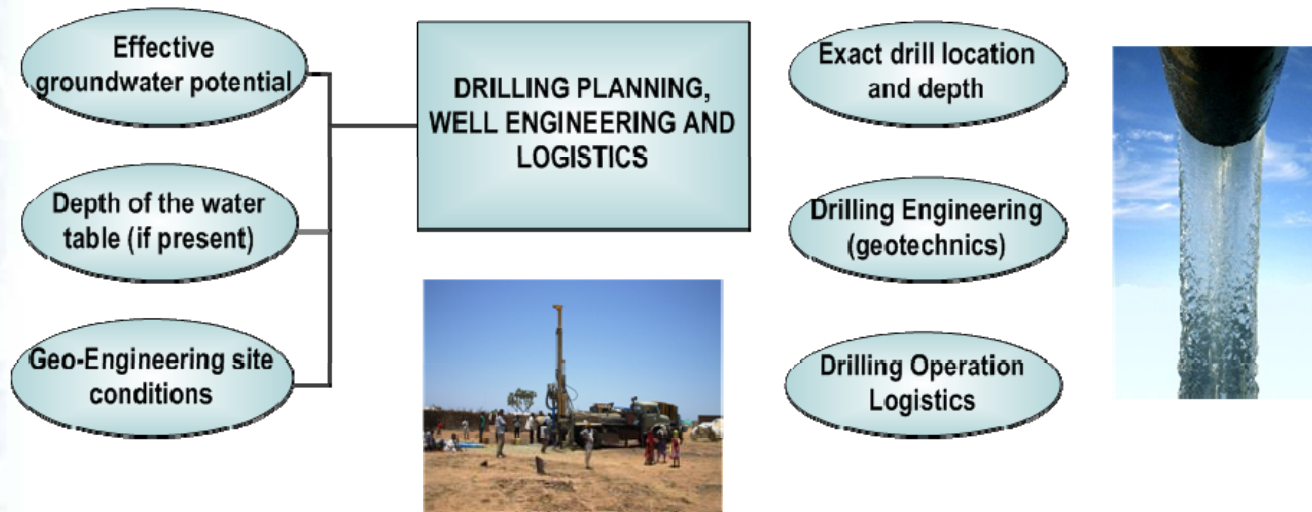
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### Next Phases

#### Phase4 - Recommendation for Drilling Sites





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### Final Remarks & Conclusions

The Phase 1 of the work was undertaken through a combination of RS processing and GIS analysis/modeling.

The final output defines LOIs with favorable conditions for groundwater in the surroundings of UNAMID Camp Sites and a description of the ground verification operations (Phase 2) for a creation of a final Geo-Model (Phase3).

The results of this GIS analysis (Phase 4) can drastically reduce drilling selection workloads, costs and time required for ultimately providing a sustained water supply to the camps

GIS analysis for GW potential can give a continuous support to Engineering, Water and Sanitation sector thought-out the entire mission life cycle (i.e. water resources/population analysis).