

# A Novel Approach in Estimating and Managing the Groundwater Resources in the Kingdom of Saudi Arabia

**Martin Keller**



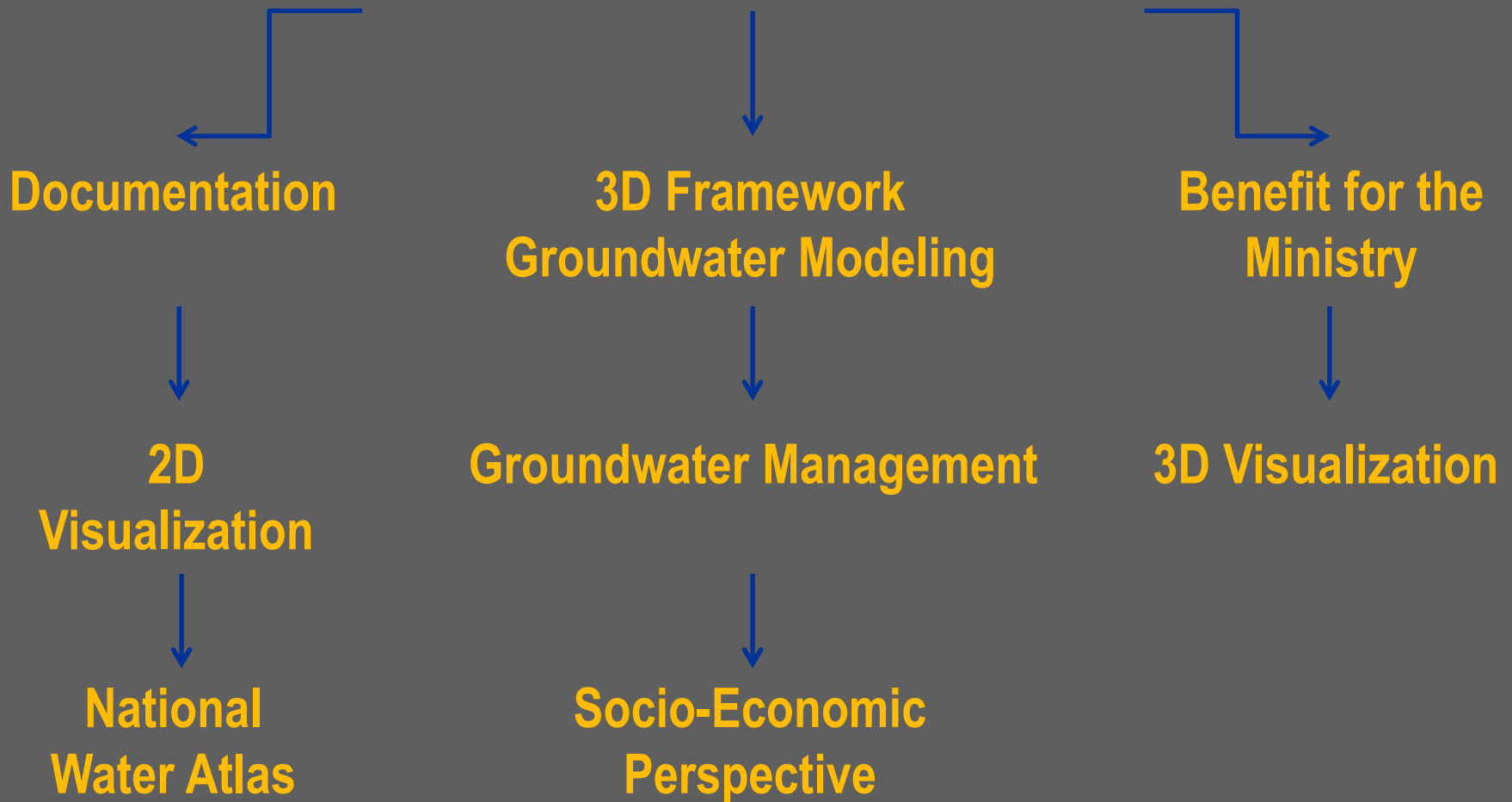
# Background Groundwater Resources Management

- Assessment of the entire non-renewable groundwater reserves
- Distribution of the groundwater reserves, their quality
- Assessment of reservoir properties for all aquifers
- Economic classification



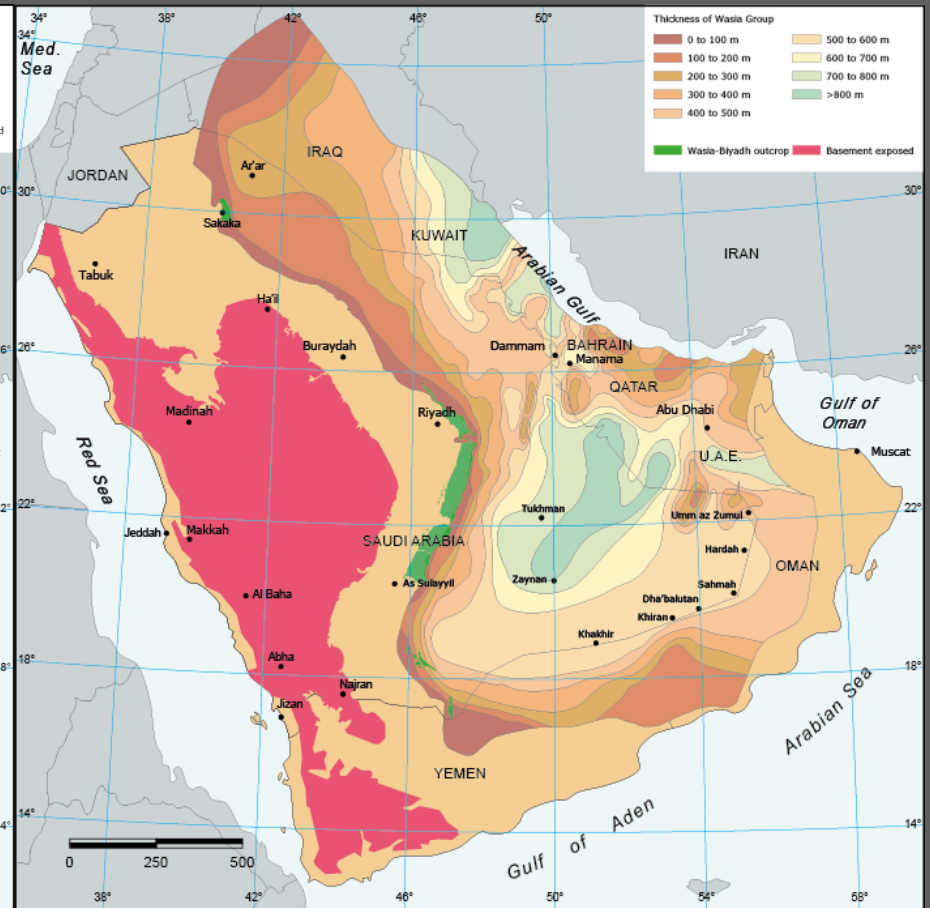
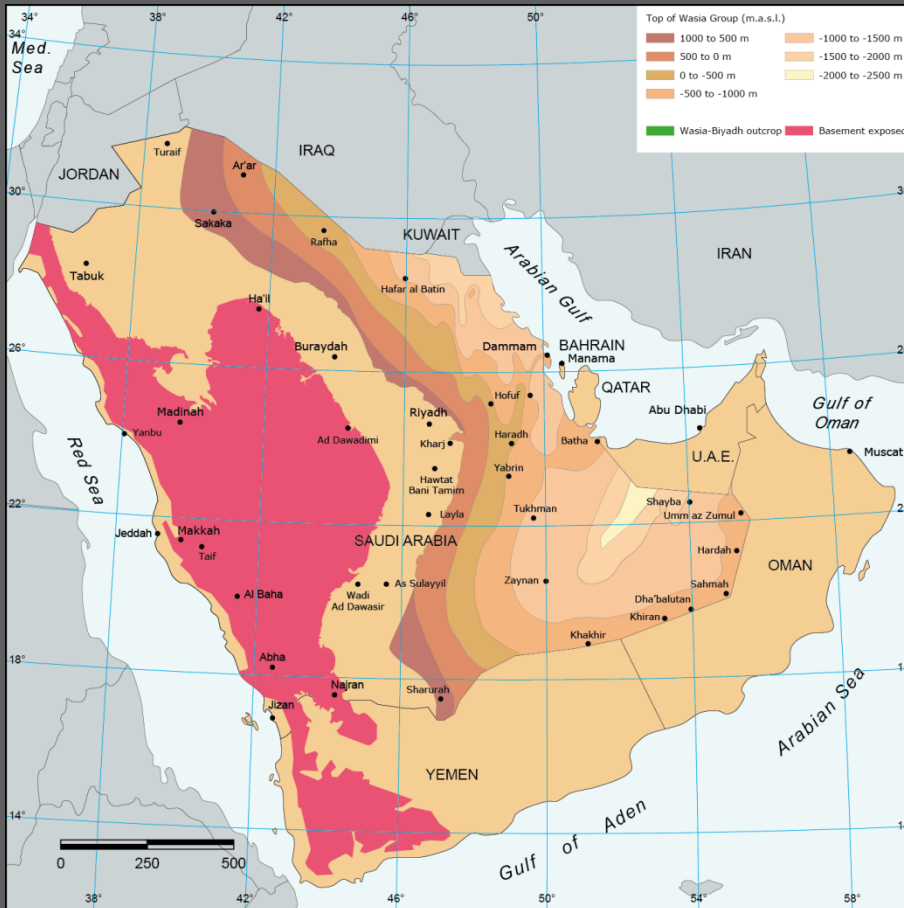
- MEWA Study of all aquifers on the Arabian Platform
- MEWA Study of Western Coastal Plain and Harrats + Wadis

# Overall Goals GWRM



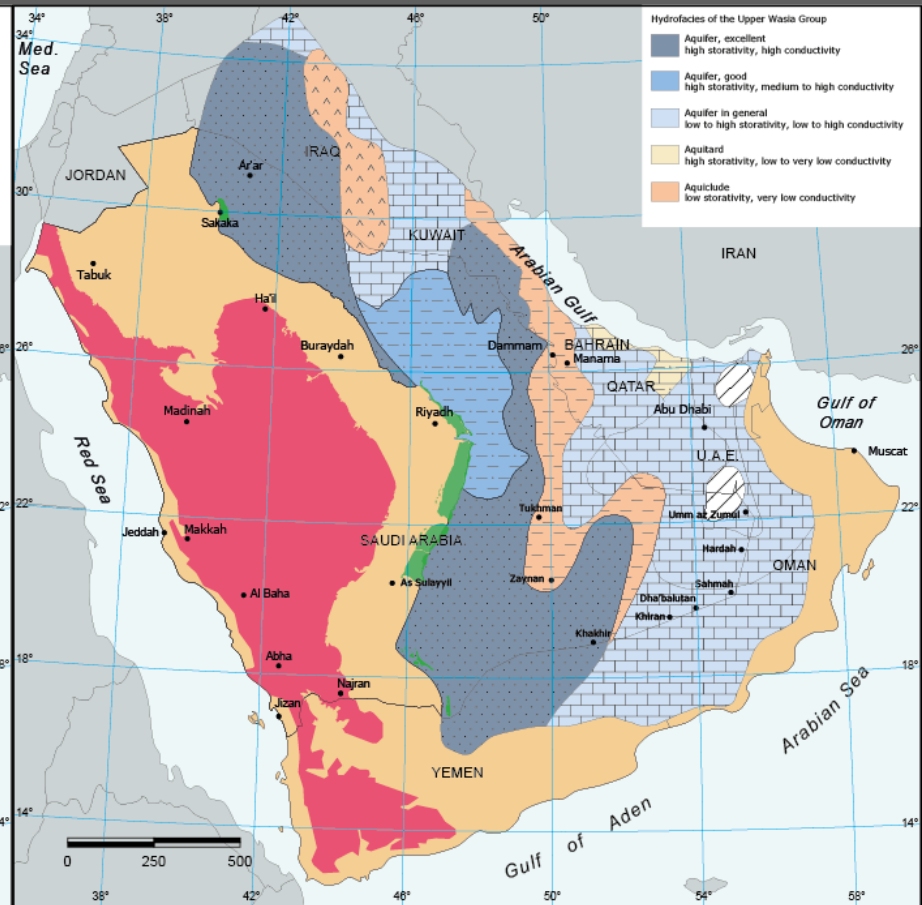
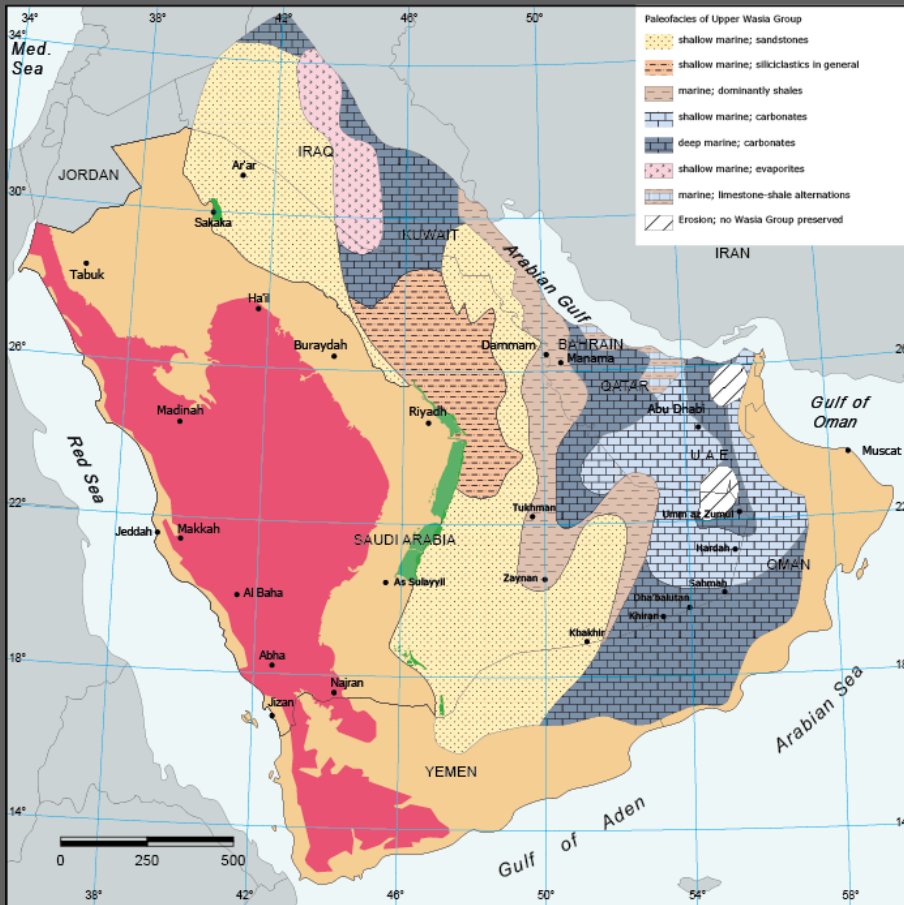
# Top of Wasia Group

# Thickness of Wasia Group

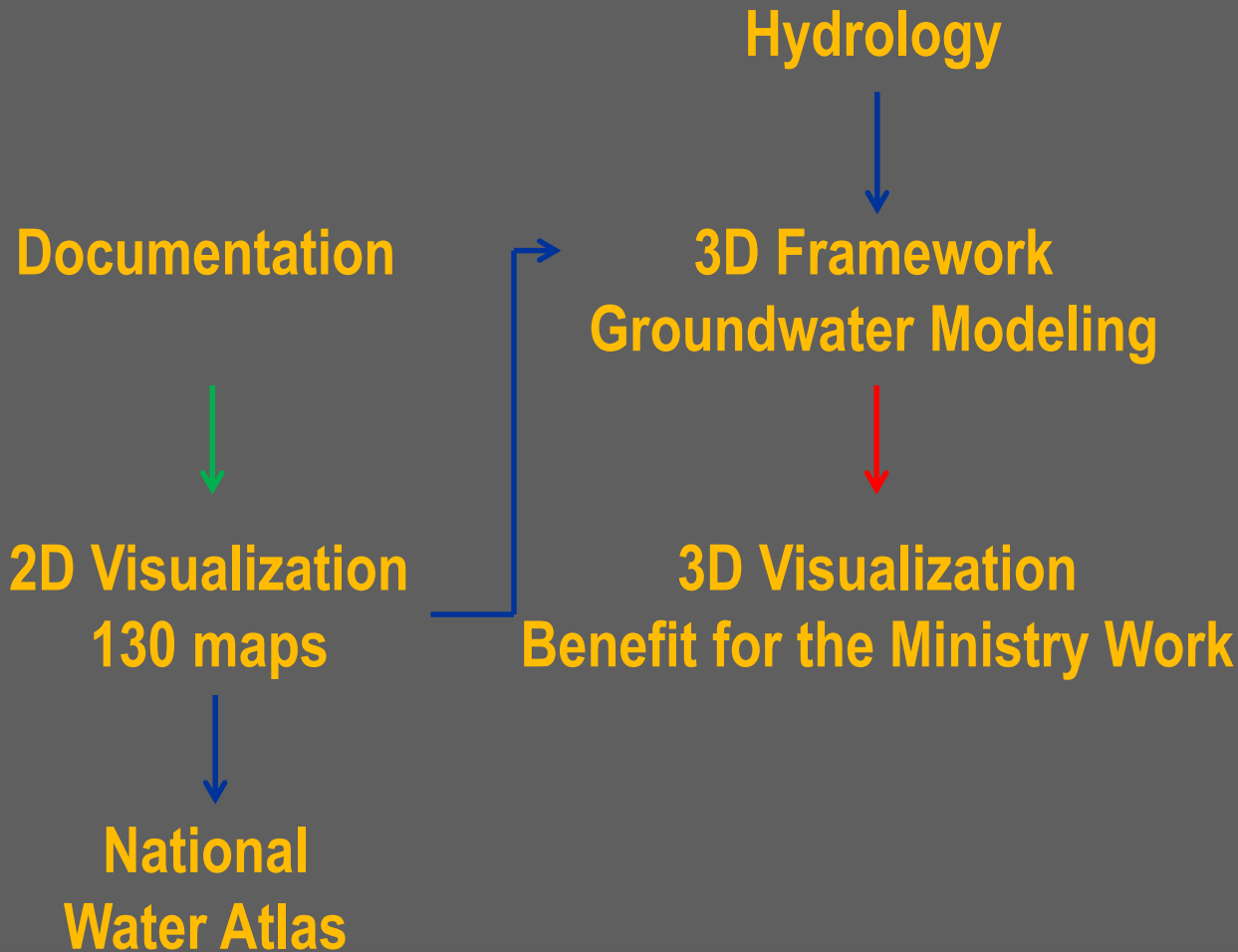


# Rock Distribution upper Wasia Group

# Hydraulic Parameters upper Wasia Group



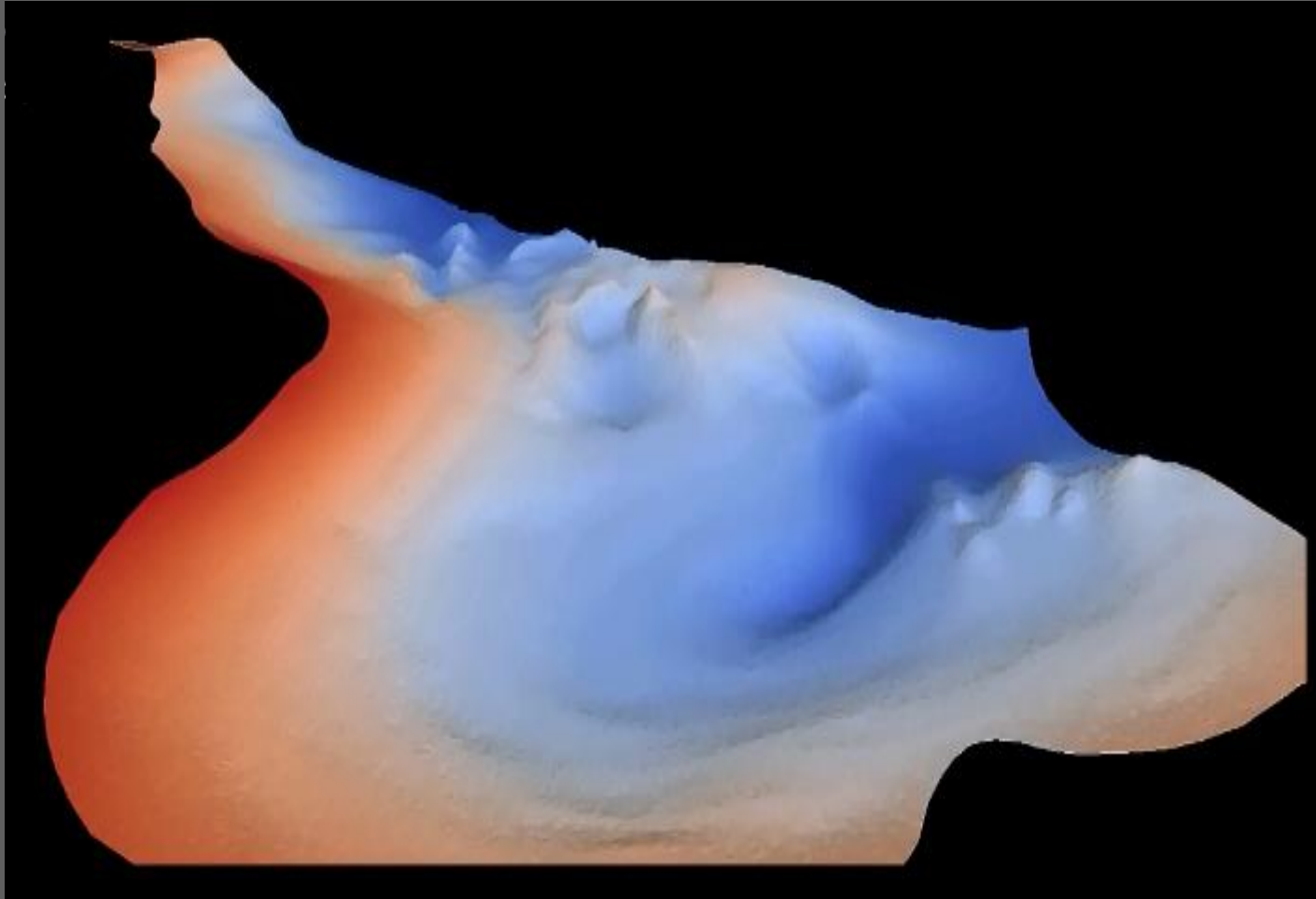
# Overall Goals: 3D Visualization



# Output of the Studies: Benefit for MEWA

- 3D Visualization of Reservoirs:
  - Structure Contour Maps & Digital Elevation Model (DEM)
  - Software creates georeferenced 3D surface
  - combination of 3D surfaces → 3D geological framework
  - software visualizes the reservoir

# 3D-Visualization of individual Surfaces

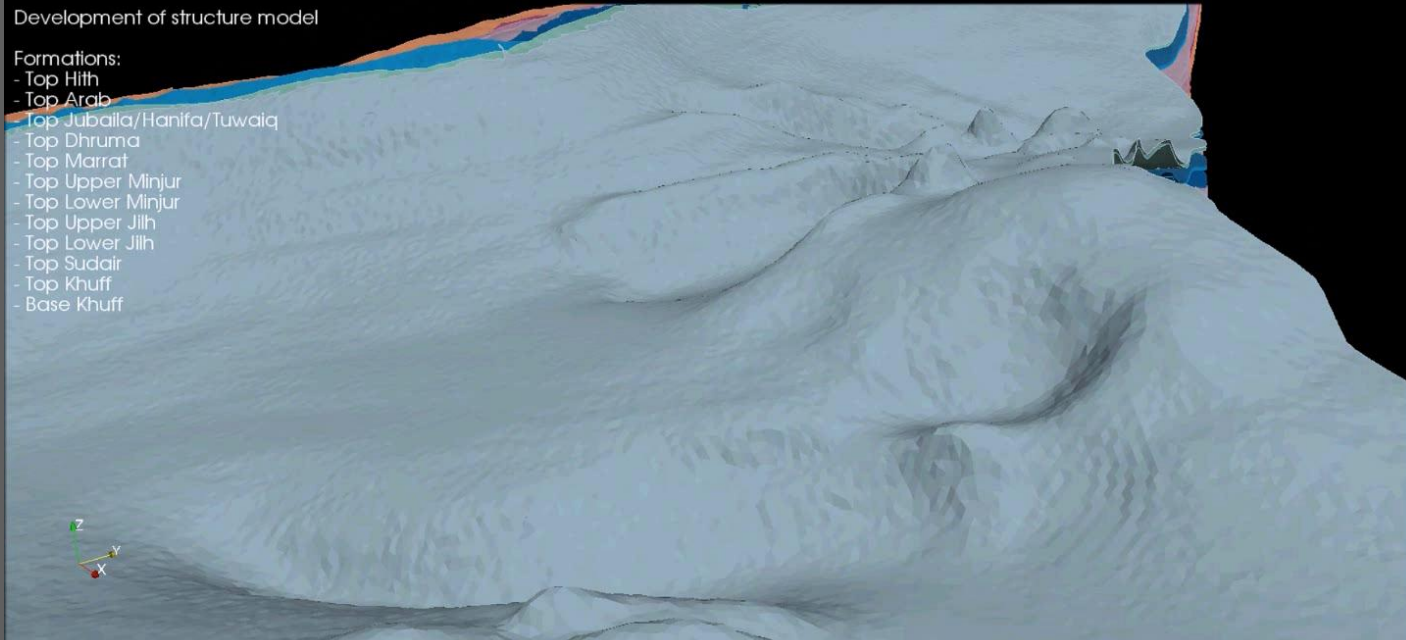




Development of structure model

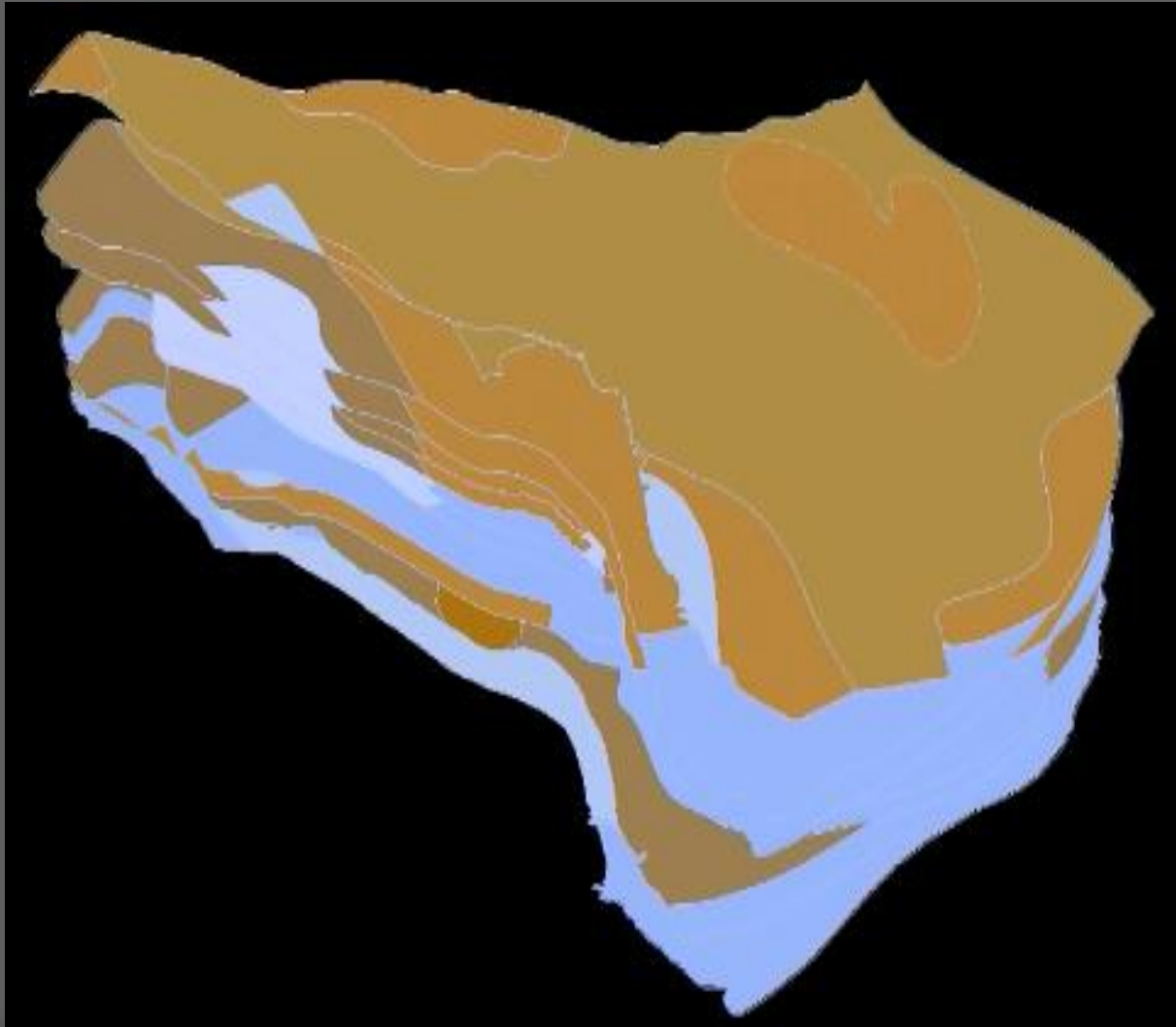
Formations:

- Top Hith
- Top Arab
- Top Jubaila/Hanifa/Tuwaig
- Top Dhurma
- Top Marrat
- Top Upper Minjur
- Top Lower Minjur
- Top Upper Jilh
- Top Lower Jilh
- Top Sudair
- Top Khuff
- Base Khuff



Superelevation: 45

# 3D-Model of Groundwater Reservoirs



# Overall Goals: 3D Visualization Management

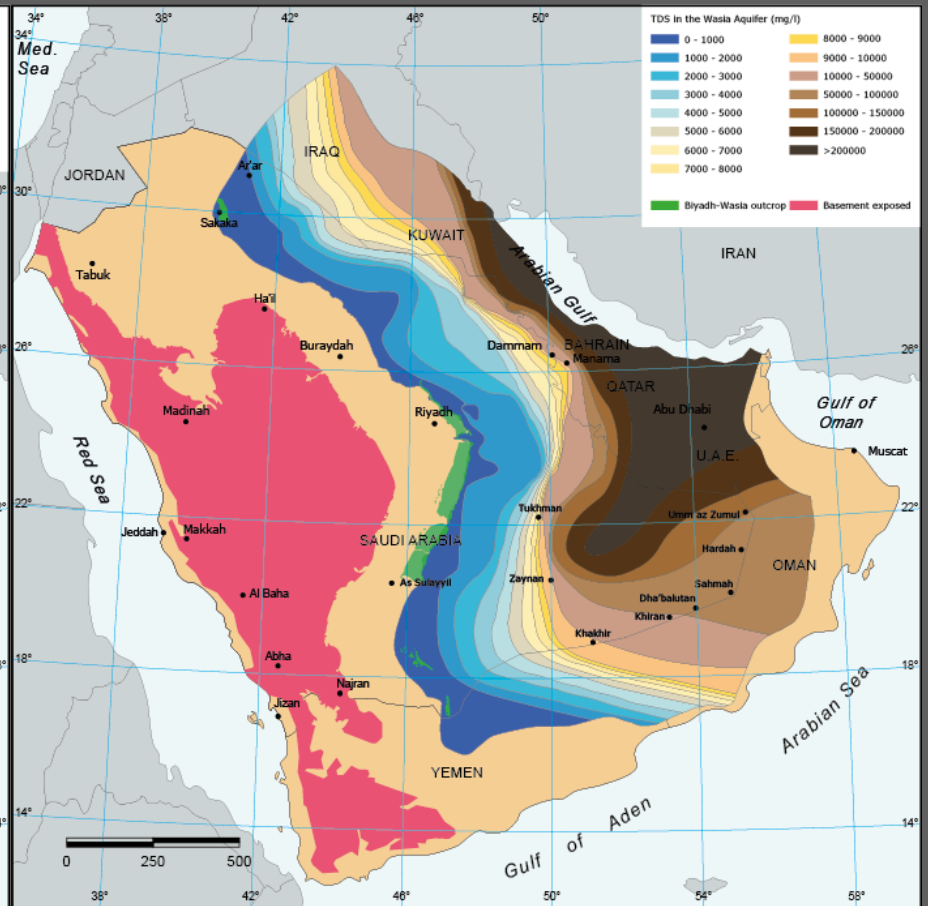
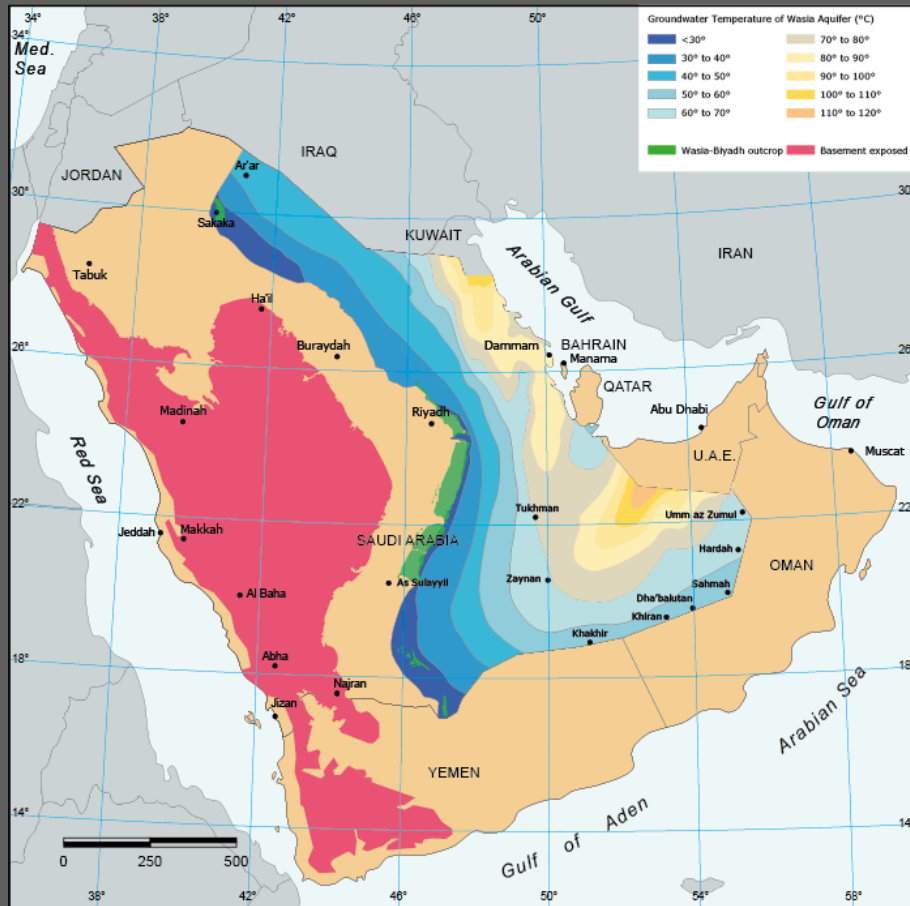
3D Visualization



Groundwater Management  
Socio-Economic Aspects

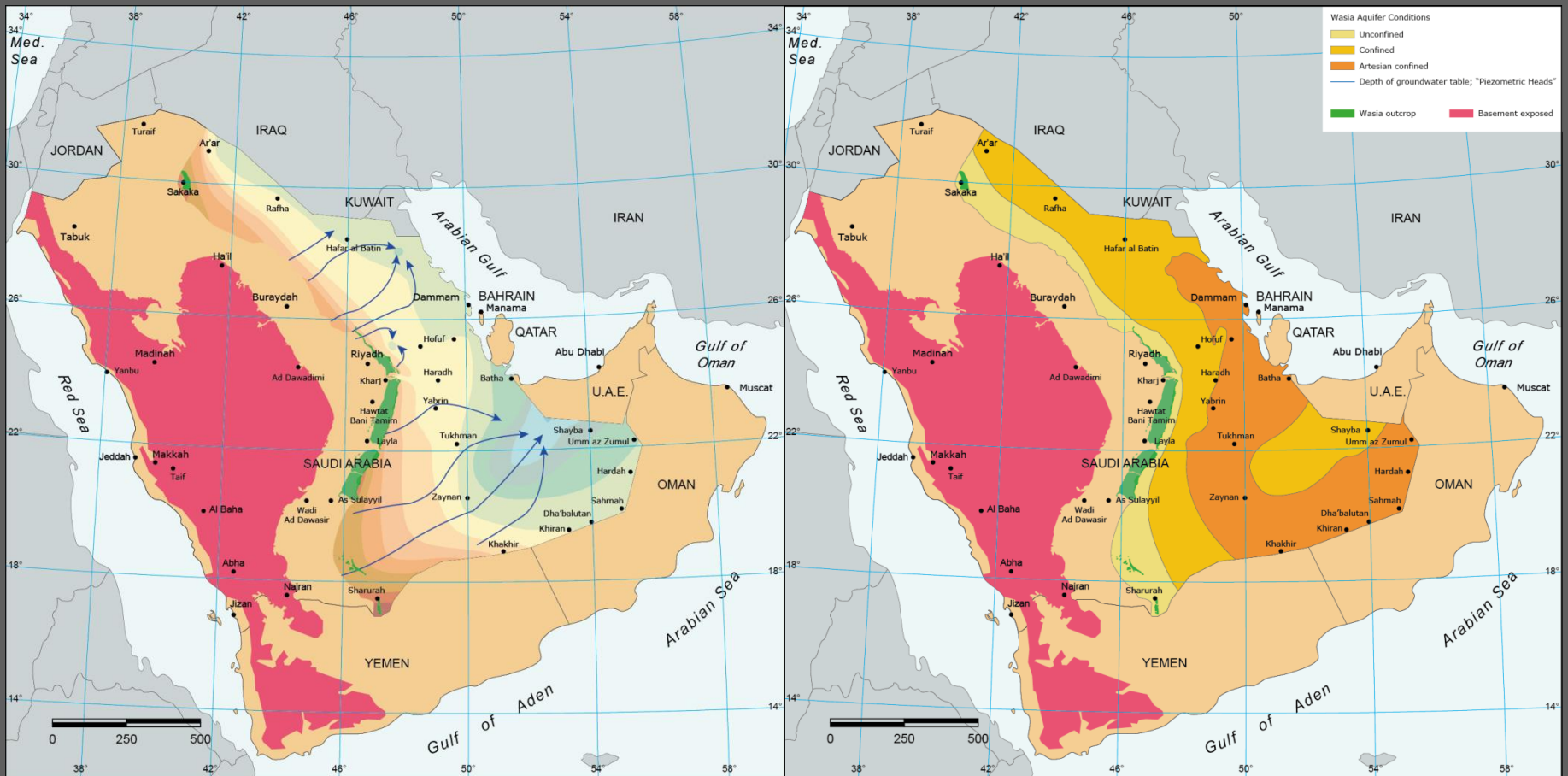
# Temperature Distribution Wasia Group

# Salt Content (TDS) Wasia Group

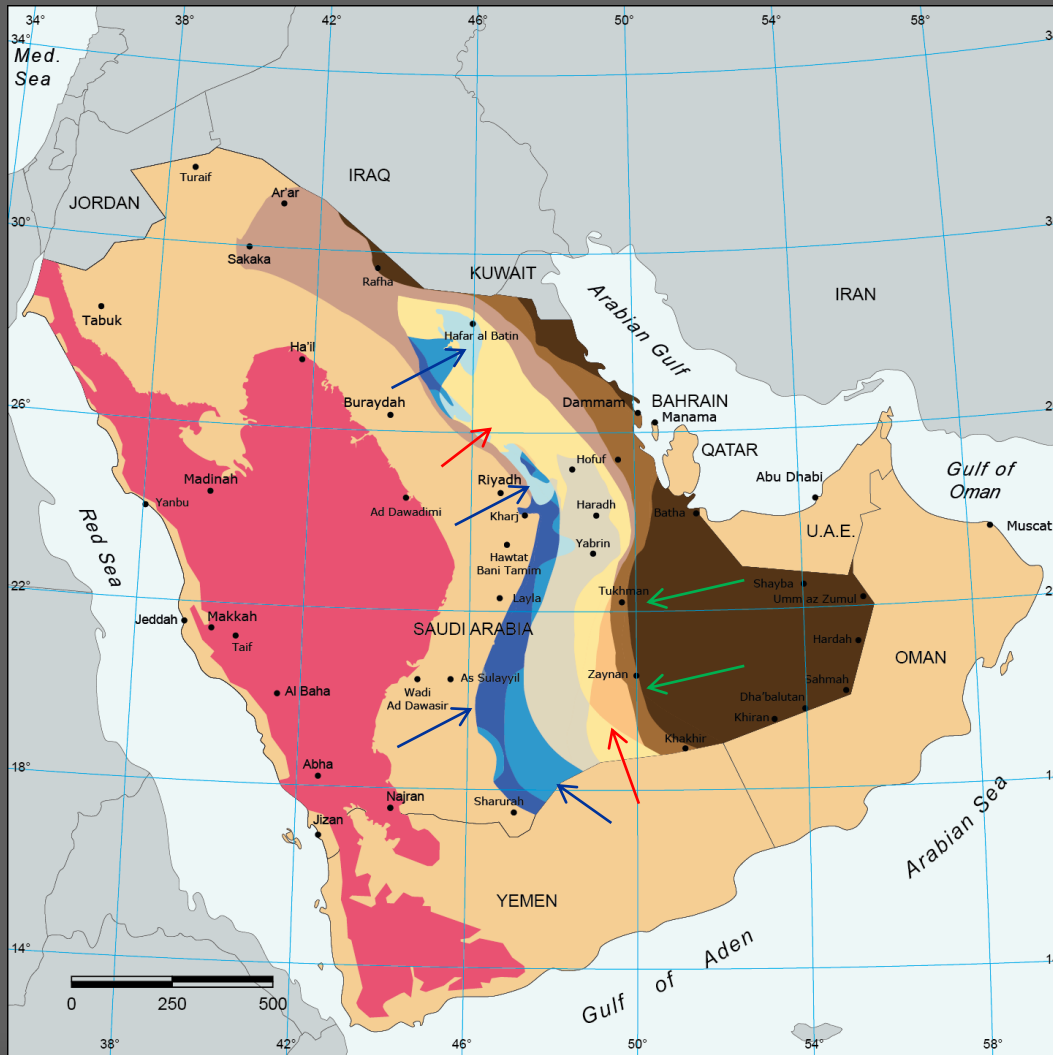


# Depth to Groundwater Table Wasia Group

# Aquifer Conditions Wasia Group



# Groundwater Management Zones and Socio-Economic Potential



Boundary conditions

TDS < 5000 mg/l

Drilling Depth < 2000m

Pumping Height < 300m

Distance to consumer

Property availability