Abstract 2612 - Session 7.06

Characterization of vulnerability to pollution and protection of potable water wells of karstics aquifers

With Application on the Middle Atlas aquifer-Morocco

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الملكة المغربية
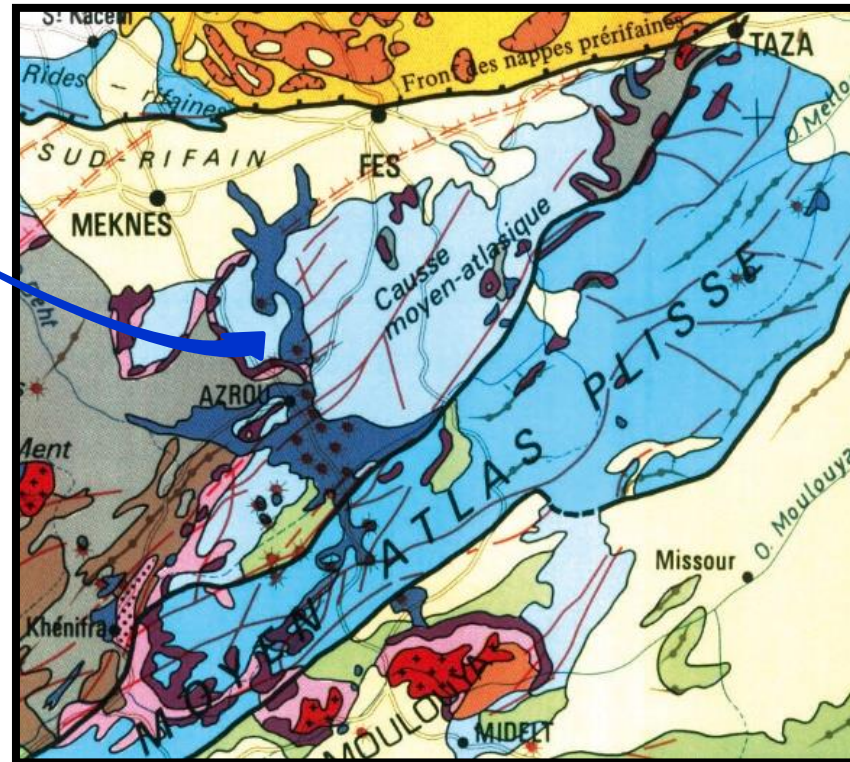Royaume du Maroc

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des Travaux Publics

الدرسة الحسنية للأشغال العمومية

Presentation of the subject and its context

The aquifer of the Middle Atlas of Morocco contains important quantities of groundwater that supplies multiple regions with potable water.

Ait Bittit spring (Flow= 1.4 m³/s)

Presentation of the subject and its context

➢ <u>The study area is characterized by</u>:
- the existence of limestones layers which are very fractured and karstified and very vulnerables to pollution;
- the existence of several sources of pollution, especially the agricultural activities.

Methods of assessing the vulnerability to pollution

➤ <u>It is in this context that we</u>:
- developed the card of the vulnerability to pollution of 500 km^2 area;
- estimated the risk to pollution of the Karstic aquifer;
- drawn the protection perimeters of potable water wells which feed water to the city of El Hajeb.

EPIK	RISK	RISKE 2	PaPRIKa
➤ Epikarst ➤ Protective cover ➤ Infiltration Conditions ➤ Karst network development	➤ Rock criterion ➤ Infiltration criterion ➤ Soil criterion ➤ Karstification criterion	➤ Rock criterion ➤ Infiltration criterion ➤ Protection criterion ➤ Soil criterion ➤ Epikarst criterion ➤ Karstification	➤ Protective cover ➤ Aquifer's rock nature ➤ Infiltration conditions ➤ Karstification degree

Vulnerability to pollution mapping and risk assessment (RISKE2 method)

Criterion	Mapping methodology
Rock **(R)**	<u>Lithology</u> of geological formations and <u>fracturation</u>
Infiltration **(I)**	<u>Karstic morphology </u>and land slope
Protection **P (S,E)**	Includes two sub criteria: ✓<u>Soil criterion </u>**S**: Soil thickness, texture and stones proportion ✓<u>Epikart criterion </u>**E**: Epikarst thickness, developpment and continuity
Karstification **(K)**	Karst developpment throught the catchment area

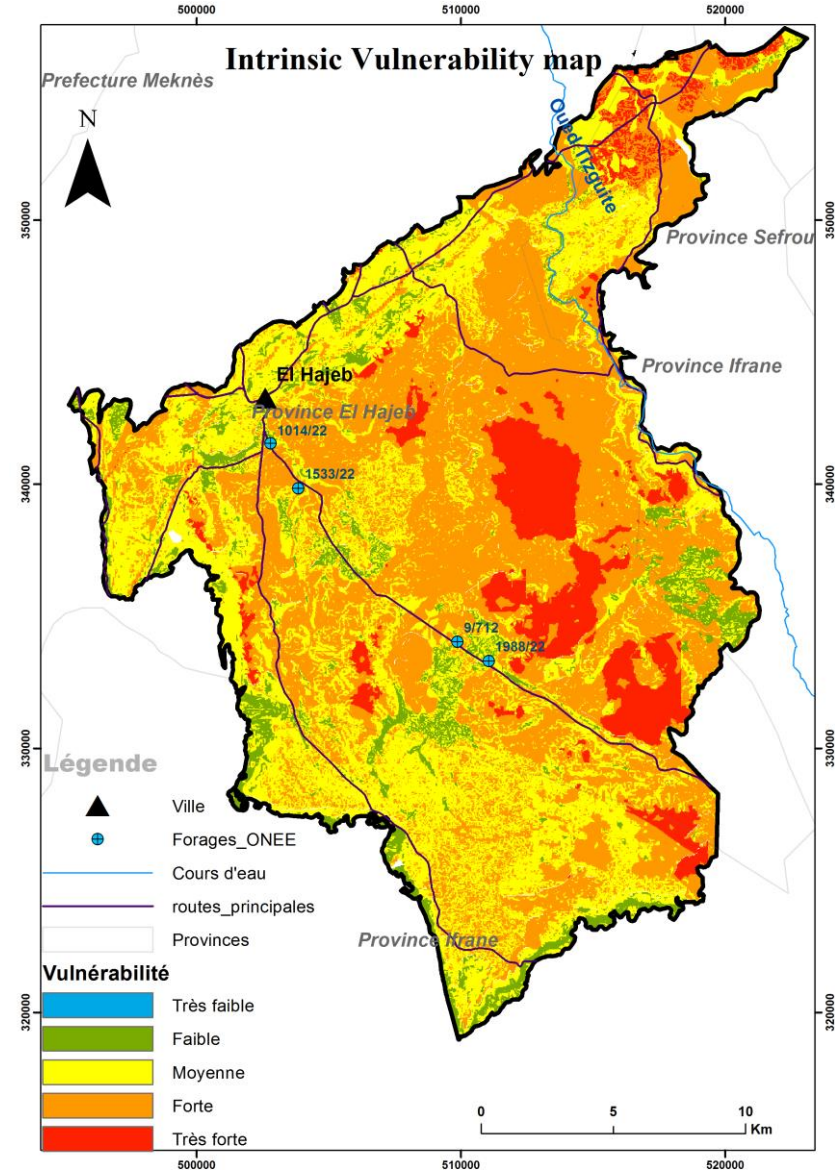# Global Vulnerability Index of the Middle Atlas aquifer (Morocco)
Developed with the use of the GIS

$$IgV = r\, R_{(0-4)} + i\, I_{(0-4)} + p\, P_{(0-4)} + k\, K_{(0-4)}$$

$$r + i + p + k = 1$$

r, i, p and k are respective indices for the criteria R, I, P and K

IgV	Vulnerability indexes reclassification
0 - 0,79	0
0,8 - 1,59	1
1,6 - 2,39	2
2,4 - 3,19	3
3,2 - 4	4

Delimitation of protection perimeters of potable water wells

Three protection perimeters were delimited:

➤ Perimeter I: Inner source protection area: required around the public water supply well;

➤ Perimeter II: Outer source protection area I: based on the intrinsic vulnerability map. Areas with high vulnerability and areas of karstic forms define this zone;

➤ Perimeter III: Outer source protection area II: consists of both the surface drainage and the groundwater drainage areas.

Delimitation of protection perimeters of potable water wells