

Hazards to Groundwater: Quarries

Protection of Jeita Spring

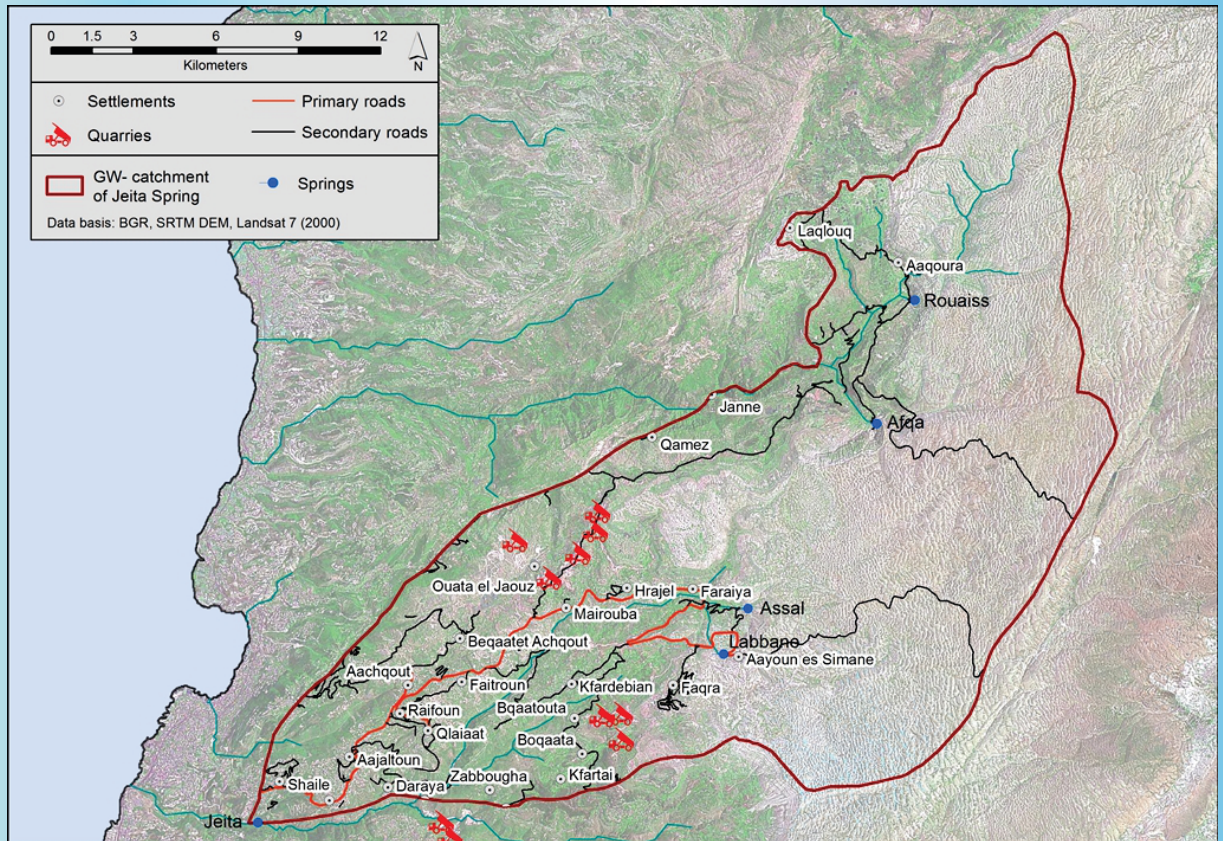
I. Introduction

- Due to rapid urban development and reconstruction, demand for construction materials has increased over the past 20 years.
- Eight quarries located in the groundwater (GW) catchment (+two close by, outside).
- Four major categories of extraction:
 - Dimension stones;
 - Decoration rocks;
 - Aggregates (gravel);
 - Sand.
- Three major categories of materials:
 - Limestone;
 - Sand;
 - Gravel.
- Coverage of demand within the absence of governmental control.
- Improper management causes environmental- and safety problems.
- Negligence of water resources protection.

II. Problem Statement

- Eight quarries within the GW catchment work on an unclear renewal of old operation permits. They are operated without legal permits. They pose a high contamination risk to Jeita spring.
- Storage and handling of fuels and lubricants for operation of machines are likely to contaminate GW.
- An extraction efficiency of usable material of 75% causes high rates of tailings, and requires a relevant land surface for storage, circulation and set back.
- Generated waste (gravel, sand, dust) is illegally dumped in the environment.
- Tailings and sludge, reaching surface waters, increase their turbidity.
- Turbid surface water (SW) infiltrates into GW. Turbid GW is difficult to treat (chlorination becomes ineffective).
- Non-compliance with law to rehabilitate quarries after extraction. Abandoned quarries often used as landfills.
- GW pumping (conducted to cover water requirements or to allow quarrying operations) is a potential qualitative (intrusion of hazards) and quantitative (over-abstraction, lowering of GW table) threat to GW.
- Change of GW and SW flows.
- Blasting operations increase cracks and fissures in the karst network.
- Potential of collapse of karst caves and dolinas.
- High erosion potential causes mobilization of fine material and washout towards streams.
- Lack of hydrogeological information and knowledge prevents environmental sound management of quarries.
- Governmental negligence of municipalities' and public society's complaints about extraction practices.

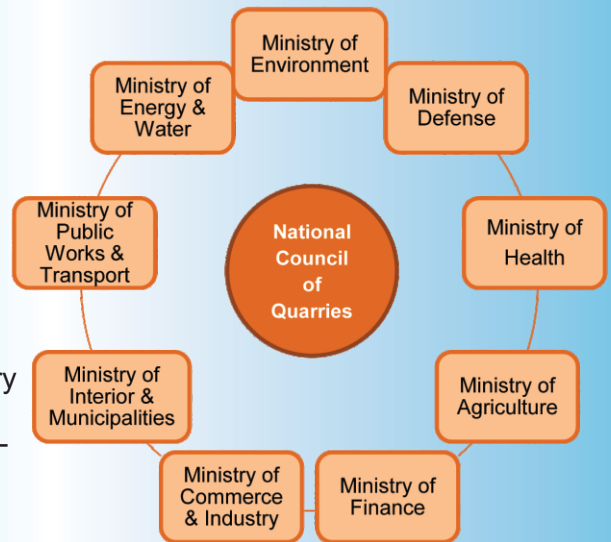
Eight quarries are located within the catchment, directly threatening the groundwater. Two quarries in the south, outside the catchment boundaries threaten Jeita's aquifer through potential surface water pollution - and intrusion to groundwater.



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III. Legal Framework & Stakeholders

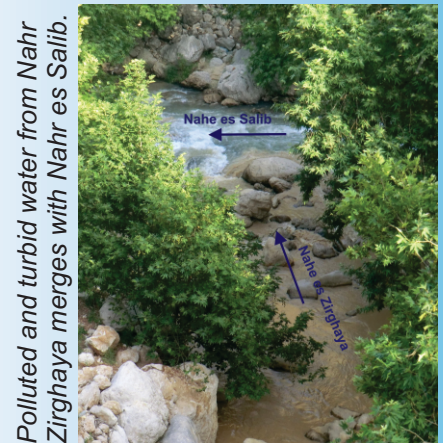
- Quarry sector first institutionalized by decree 8803/2002 (amended by decree 16456/2006 and 1735:
 - Definition of permitting requirements (EIA, blasting activities, storage and transport of rocks and wastes, reporting by responsible staff).
 - Sector controlled by the National Council of Quarries.
- National Council of Quarries:**
 - Consists of general directors of 9 ministries.
 - Provides strategic planning, incl. definition of quarry areas.
 - Granting permissions, together with related municipalities.
 - Permit is allocated by the governor following the decision of the Council and municipalities.
 - Multiplicity of actors/ responsibilities hinders efficient policy making.
 - Non-transparent decision making: Even though any quarry activity within the Jeita GW catchment is prohibited, currently eight are operated.



Ministries that are represented in the National Council of Quarries (through the general director).



Ponds, containing silt, clay and sand are released to dispose these tailings - increasing the turbidity in affected surface waters.



Polluted and turbid water from Nahr Zirghaya merges with Nahr es Salib.

IV. Recommendation

- Introduction of compelling management and operation policies that consider:
 - GW vulnerability: No permits above sensitive aquifers that are abstracted/ tapped for domestic supply.
 - Urbanization: No quarrying close to urban areas (buffer 500 m).
 - Environmental sound engineering practices.
- Modern technology and hydrogeological science need to be integrated into strategic governmental quarry planning (definition of quarry areas).
- Hydrogeology needs to be considered in management practices due to potential GW pollution during operation.
 - Create an easy accessible hydrogeological database to allow conduction of required EIAs (Environmental Impact Assessment).
 - Introduction of sustainable waste management for by-products: reuse, recycling or proper dumping of tailings.
 - Quantity of on-site GW water abstraction must be limited to a sustainable rate that considers GW recharge rate and other users of the aquifer.
 - GW abstraction (method and quantity) must be controlled by the government.
- Control rehabilitation of quarries after closure.
- Enforce ban on waste dumping in abandoned quarries and on operating quarries that dump into the environment.
- Public and governmental awareness on potential hazards of rock extraction to GW must be raised.
- Improvement of law enforcement: need for significant penalties for any non-compliance with guidelines.
- Need for an environmental police for law enforcement.
- Dumped material, used for landfills must comply with a standard, not to pollute GW.

