Climate change and vulnerability of western Normandy's coastal aquifers with respect to salt water intrusions

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GIECC Models today show that climate change in Normandy will probably induce greater precipitation events in winter time, dryer summer, to which must be added the relentless sea water level rise. At the same time, pressure on coastal water ressources is increasing as the demographic center of gravity tends to move toward the coast lines.

The coast of west Normandy extends over more than 450 km and shows a variety of geologic settings, thereby hosting numerous coastal aquifers, This area is also affected by the presence of low lands several of which may extend over great distances in land.

In 2015, the West normand authorities decided to launch a regional study to assess vulnerability of coastal aquifers to salt water intrusion, so as to set in place an appropriate coastal water resources management plan at the regional scale. Salt water intrusion which generally extends from the bottom of the aquifer up to the fresh/salt water interface, depends on the nature and geometry of the reservoir and can greatly be enhanced through sea waler level rise under climate change and pumping for human needs, irrigation or more generally, economic purposes. This process tends to modify the content of disolved elements, and more generally water chemistry and often leads in turn to disastrous consequences for drinking water production and economic activity.

The study notably revealed that the west normand coast is highly vulnerable to future salt water intrusion, particularily in urban areas and in estuaries under low tide conditions, and that the deep extension of the salt wedge inland will in some cases become dramatic for drinking water production, but also for the general economic activity of western Normandy. This already prompted the establishment of a large scale regional water resources plan for the « Manche département », one of the 3 regions constituting western Normandy.

This paper intends to present and discuss some aspects of the general methodology used, notably to (1) caracterize the fresh/salt water interface and the reservoir geometry, (2) identify the components of the context which may exert a significant influence on the intensity of the phenomena, (3) determine aquifer vulnerability and (4) to simulate salt water intrusion using BRGM's MARTHE model. It will also present the main results of the study.