



GROUNDWATER SALINITY DYNAMICS IN THE COASTAL AREAS of Vietnam

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Saltwater intrusion is a global phenomenon which is becoming more urgent as some impacts of climate change scenarios are becoming a real fact. The occurrence of an increase of water salinity in groundwater aquifers close to coastal areas can already be observed in reality. Particularly near the coastal areas where intensive freshwater pumping for irrigation occurs, and other natural and anthropic effects, as overpopulation stress, are observed. The lessen rainfall and the higher demand in these areas lead to severe saltwater intrusion when it is coupled with sea level rise. According to IPCC (2013), when it comes to longer period of time in the future under climate change context, the sea level rise may increase at the average rate 0.4 - 0.63 m in the period of 2081 – 2100. The project shows about 70% of the coastlines worldwide could experience sea level change of around 20% of the global mean sea level change.

The Red River delta is the second largest river delta in Vietnam and it experiences the anthropic pressure of the rapid urbanisation in its Northern part. The river though is very abundant during the high season but is facing a high potential of seawater intrusion at downstream areas due to high water demand from upstream (uncontrollably groundwater exploitation) and invaded seawater. Since most of the activities in the areas are dominated by agriculture and the dramatic growth of population recently, the pressure on water resources has also escalated. As a result, the groundwater vulnerability is increasing as also under climate change context in the future due to higher exploitation rate or natural process like sea level rise. A very comprehensive research by (Deviene 2006) on the Red River delta throughout 50 years of changes had also pointed out a substantial saltwater intrusion during the dry season in the coastal areas, especially during the high tide period. Nevertheless, there are still few researches upon this issues, complicated by the data collection and modelling challenges.

The research presented here shall first provide an overview of groundwater salinity dynamics along with its severe effects in the Red river delta throughout the years. The groundwater salinity changes will be analysed using statistical analyses as well as vulnerability assessment. Hence, on the basic of those statistical analysis, an integrated 3D groundwater-2D river hydraulics model, taking into account the interaction between surface and subsurface water, is applied to determine climate change and sea level rise impacts on seawater intrusion.