

Saltwater Intrusion Studies in the Cai River in the Khanh Hoa Province, Vietnam

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Abstract : Saltwater intrusion is a common problem in estuaries around the world, as it could hinder the freshwater supply of coastal zones. This problem is likely to grow due to climate change and sea-level rise. The influence of these factors on the saltwater intrusion was investigated for the Cai River in the Khanh Hoa province in Vietnam. In addition, the Cai River has high seasonal fluctuations in discharge, leading to increased saltwater intrusion during the dry season. Sea level rise, river discharge changes, river mouth widening and a proposed saltwater intrusion prevention dam can have influences on the saltwater intrusion but have not been quantified for the Cai River estuary. This research used both an analytical and numerical model to investigate the effect of the aforementioned factors. The analytical model was based on a model proposed by Savenije and was calibrated using limited in situ data. The numerical model was a 3D hydrodynamic model made using the Delft3D4 software. The analytical model and numerical model agreed with in situ data, mostly for tidally average data. Both models indicated a roughly similar dependence on discharge, also agreeing that this parameter had the most severe influence on the modeled saltwater intrusion. Especially for discharges below 10 m³/s, the saltwater was predicted to reach further than 10 km. In the models, both sea-level rise and river widening mainly resulted in salinity increments up to 3 kg/m³ in the middle part of the river. The predicted sea-level rise in 2070 was simulated to lead to an increase of 0.5 km in saltwater intrusion length. Furthermore, the effect of the saltwater intrusion dam seemed significant in the model used, but only for the highest position of the gate.

Keywords : Cai River, hydraulic models, river discharge, saltwater intrusion, tidal barriers

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