

## THESIS INFORMATION

Title: **Impact of climate change on raw water supply and forecasting medium-term water demand in Ho Chi Minh City**

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Ho Chi Minh City (HCMC) is the most populous city and also is the place that dynamic economic activities, leading the country in terms of economic growth; Accordingly, the water supply system for HCMC is also the largest system in Vietnam today, with nearly 1,400,000 water meters, with supply 1,900,000 m<sup>3</sup>/day for consumption. However, with HCMC being one of the top 10 cities in the world with a population that could be most severely affected by climate change and sea level rise (ADB, 2010), the water supply will face urgent problems with raw water sources such as: saline intrusion due to sea level rise, decrease in upstream flow due to changes in rainfall, temperature... These effects may be combined with the continued increase in water demand due to the city's continued growth, which will cause serious harm.

From that, it is necessary to study and evaluate the impact of climate change on raw water supply combined with the study of water demand future forecasting for HCMC under uncertain conditions is necessary; for to determine the extent and scope of influence, from which to develop adaptive solutions to ensure safe water supply, to ensure sustainable development goals for the entire region with a water resource management strategy. Accordingly, the topic "*Impact of climate change on raw water supply and medium-term water demand forecast in Ho Chi Minh City*" was selected to conduct doctoral thesis research.

The overall objective of the study is to determine the effects of climate change & sea level rise on raw water supply in HCMC, and calculate and forecast the medium-term future water demand in HCMC in the uncertainty conditions; then synthesize the results to make predictive assessments of insufficient scenarios for the supply of raw water to HCMC, as well as propose some solutions to minimize the impact.

In order to research, the PhD student used research methods including: inheritance method (inheriting studies done on Dong Nai river basin), collection and synthesis method for documentation of water supply data, maps, hydrology, tides; methods of building GIS maps, methods of using mathematical models of hydrological flow (ArcSwat), mathematical model of river hydraulics (Telemac), Artificial Neural Network and finally is the method of synthesis and analysis.

The result of the thesis research can be summarized as follows:

1) The study built a forecast model of water demand and provided a table of forecasted values of water use in different cases in the years 2030 and 2050 for HCMC. The forecast data takes into account SAWACO's roadmap and nonrevenue water scenarios. Forecasting with the model is based on historical data of water meter growth, water price, GRDP and urban population and forecasts the growth of these components in the future.

2) The study has presented scenarios of saline intrusion on Dong Nai river at raw water supply locations for HCMC, calculated from river hydraulic model with variation of discharge margin from scenarios. Change in flow due to climate change is determined from the hydrological model of rain - runoff and combined with the sea level rise scenario. The results of the problem provide boundary intrusion scenarios according to scenarios at locations supplying raw water to HCMC with warnings about the extent and duration of continuous salinization that can be to the supply of raw water.

3) Assessing the problem of shortage / sufficient and quantifying the shortage of raw water for HCMC according to the forecast scenarios of supply and demand, giving warning cases of continuous prolonged water supply suspension period at Water treatment plants; thereby proposing recommendations for the water supply planning of Ho Chi Minh City in ensuring the safety of raw water supply, including the following main solutions:

1. Proposing the location and size of raw water reservoirs in proportion to the volume of water shortage according to the calculated climate change & sea level rise scenarios;
2. Proposal to relocate raw water intake at locations not affected by saline intrusion according to all calculated climate change & sea level rise scenarios, as well as route raw water transmission pipes back to existing water treatment plants;
3. Proposing necessary discharges to supplement on river sections to push saline boundary out of Raw Water Pumping Stations according to calculated climate change & sea level rise scenarios.

The results of the study can be used as a reference for other related studies such as the problem of water supply planning, change in raw water supply, research on improving water storage capacity for HCMC as well as studies on forecasting the effects of pollution transmission on raw water supply locations for HCMC.

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