

# **Analyzing the changing morphology of the lower Abra River and the adaptations of the flood-prone communities of Santa, Ilocos Sur: a geo-historical perspective**

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## **ABSTRACT**

Abra River is the 6<sup>th</sup> largest river basin in the Philippines. With its location along the high-frequency track of tropical cyclones that make landfall in Luzon, the river is subjected to heavy rains that would set off flooding in the lowland areas as well as on its floodplains. One of the low-lying communities situated on this river delta is Santa, Ilocos Sur. Based on historical records used in this study, the municipality of Santa was found to have changed its location multiple times in response to the changing morphology of the lower Abra River and/or associated flooding. This study, using historical maps and satellite images available, analyzed the spatio-temporal changes of the lower Abra River by examining its morphometric and morphological parameters from 1903-2016 using Geographic Information Systems (GIS) tools. The possible causes of these morphological changes and consequent flooding were also determined. Further, the study investigated the adaptive strategies that the residents of Santa employed to address the changing landscape of their municipality and lessen their vulnerability toward the flooding hazard based on archival documents and key informant interviews (KII). From 1903 to 2016, the most important morphological changes of the lower Abra River were the formation and development of the delta, shifts in the position and width of the river mouth, and the migration of the river channel from north to south. Both natural (typhoons, delta vegetation, topography, and bathymetry) and anthropogenic (deforestation and mining activities) factors have contributed to these changes. The river's geomorphological changes and the associated major flooding events led to both historical and current adaptation strategies of Santa's flood-prone communities such as: migration to and occupation of available lands, shift in livelihood, reliance on infrastructures, communication capabilities, and policy/operational measures. Historical evidence showed that floods have always occurred, and the causes of these flooding events remain the same. A better understanding of the historical behavior of a river is therefore indispensable in estimating future flood hazards. Also, insights into the historical societal adaptation strategies is essential to understand persistent mistakes and learn from the past.

*Keywords: Abra River, Santa, Ilocos Sur, flooding, river morphological changes, adaptation strategies*