

Mapping mangrove changes using satellite imagery: Time-series analysis of mangrove changes in Mekong Delta

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1. Backgrounds and research objectives

Mangrove forest ecosystems play a vital role in coastal environment and provide a number of services for coastal marine species and human beings. Severe mangrove loss was reported in Asian countries because of the conversion to shrimp ponds. The Mekong Delta, Vietnam, is one of the areas which experienced severe mangrove loss due to the damage from the defoliant during the Vietnam War and conversion of mangroves to agricultural land, salt pans, and aquaculture ponds. Land use changes usually occur with human activities. It is important to know reasons of mangrove changes, including social backgrounds, so that the successful plantation projects and management are performed.

Many studies about relationships among mangroves, aquaculture farms, local people's livelihoods, and governmental policies were conducted and published. They reveal the history and causes of mangrove loss and relationships among mangrove changes, shrimp farming, and governmental policies in Vietnam. However, they lack spatial information. Mangrove mapping was performed using remote sensing techniques by international organizations and researchers, but information was rarely updated. Even though it was updated, methodologies to detect mangroves were different. Mangrove changes cannot be compared among different studies. Also, previous studies in remote sensing field are not deeply focus on the social backgrounds and causes of mangrove changes. Thus mangrove changes should be analyzed from the both remote sensing field and social science field. This research approaches mangrove changes from the two fields, remote sensing and social science. In this study, mangrove changes in the Mekong Delta are detected, and relationships among mangrove changes and their possible causes, including people's livelihoods, their activities, and Vietnamese governmental policies and decisions, are figured out.

2. Methodology

Mangrove extraction methods using remote sensing technique are developed by using Landsat imagery of Iriomote Island, Japan. Then the developed method was applied to detection of mangroves in the Mekong Delta, Vietnam. Mangrove changes could be detected from 1964 to 2009 using topographic maps and satellite images. The possible causes of the mangrove changes which were detected from the analysis of satellite images were discussed in national level and regional level based on previous studies conducted in the social science field.

3. Conclusions

Detection of mangroves using satellite images could show mangrove extent in Vietnam. Severe mangrove loss after 1980s is mainly due to the conversion to shrimp farms. Governmental policies, such as the amendment of Land Law, largely affected the land use patterns in Vietnam. Shrimp ponds were expanded rapidly. International market for shrimp also accelerated conversion of mangroves to shrimp ponds. Responding to the mangrove loss, mangrove plantations projects were undertaken by Vietnamese government, international institutions and organizations, and private sectors. Most mangrove plantations were conducted by local people. Area of mangroves increased successfully in some regions, but other regions repeated mangrove decrease and increase.

Each region has the different condition of mangroves and people's livelihoods. Although the social backgrounds were slightly different in each region in Vietnam, it was found as a common point that the national governmental policies directly affects the local governmental policies which affects how people behave. Appropriate governmental policies and local people's understandings about mangroves and cooperation for plantation projects are essential to recover and protect mangroves in Vietnam.