International Symposium on Mangrove Habitat Dynamics and Sea-level Change in Relation to the Global Environmental Change

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With recent advances in research, and also increased interest in environmental problems globally, it is beginning to be recognized that mangrove ecosystems are an important component of land and ocean interactions. The mangrove forest is also very important as a buffer zone between land and ocean. Despite their significance, the function of the mangrove ecosystem as a system remains poorly understood, with research up to the present having been concerned mostly with the study of the individual components within the system. In contrast, this symposium emphasizes a multidisciplinary approach. The mangrove ecosystem is a typical biogeomorphological system. Forest biomass production and mangrove peat accumulation are components of a cyclical process. This cyclical process varies between geomorphic situations, and is influenced by sea-level change. The dynamics of mangrove ecosystems and environments should be analyzed and synthesized in terms of forest dynamics, biomass production, mangrove peat accumulation and erosion, material transportation, environmental changes in the surrounding intertidal area, sea-level fluctuation and related human activities. Such an approach will lead to more comprehensive knowledge of the mangrove ecosystem and permit the prediction of its response to future environmental change.

The symposium is planned to discuss and summarize the activities of an international joint project entitled "Mangrove habitat dynamics and sea-level change" and promote further mangrove researches.

It is feared that the extent of mangrove ecosystems will be diminished by a rapid sea-level rise due to greenhouse effects.

The research project has revealed the structure of habitat dynamics and has evaluated the effects of the rapid sea-level rise based on the biogeomorphological, interdisciplinary field research in Thailand and Malaysia. The summarized conclusion of a part of research activities is as follows.

The present-day mangrove habitat has developed either since 2,000 yrs. B.P. accompanying a gradual rise of the sea-level, or has developed since 1,000 yrs. B.P. under a stable sea-level. During the gradual sea-level rise, the mangrove habitat has been able to keep the vertical location within the intertidal zone through the accumulation of organic sediment. During the phase of stable sea-level, in the last 1,000 years, and particularly in deltas and estuaries, the habitat has shifted its location from the midto higher portion of the intertidal zone. The stable sea-level in the last 1,000 years is very important for the evaluation of the survival of the habitat during a rapid sea-level rise. In macrotidal areas, such as the Andaman Sea coast mangroves, the habitat is located at 0.5 to 2 meter above the
mean sea-level because of the high sedimentation rate and the large tide amplitude.

It is needless to say that the mangrove habitat can survive between the mean water and the highest high water level. As a result, the mangrove habitats located in macrotidal areas have preserved in spite of great change in the inner structure of mangrove forest through a 50 cm rise in sea-level in 100 yrs, because of the higher location of the habitat and the gradual accumulation of mangrove organic material.

In contrast, the effects of a rapid sea-level rise are relatively severe in microtidal areas. The reason is likely to be that the narrower extent of the upper intertidal zone is more sensitive to a rapid sea-level rise. Three factors which play a great role in the estimation of habitat change are as follows: (1) the rate of sea-level rise, (2) the tidal amplitude and (3) the rate of sedimentation. The tidal amplitude is more or less 2 m in almost all the coastal area of the world. In case of a sea-level rise of less than 50 cm (5 mm/yr.) mangrove habitats can survive in almost all the area. In such a case the mangrove forest can accumulate organic material. It means that mangrove forest has a role of CO₂ sink and that mitigates global warming.

With a sea-level rise of more than 50 cm almost all of the mangrove forest will be impacted severely. At the same time, the accumulated organic material might be decomposed and diffused in the shallow marine area. So the mangrove forest acts as a major source of CO₂ in the global environment. According to our estimation the mangrove ecosystem performs a double role in the decreasing and increasing atmosphere CO₂, so, can either mitigate or aggravate effects of global warming. Therefore, the mangrove ecosystem is like a pendulum of global environment.

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