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| Activity Title:     | Strategic Action Programme (SAP) Demonstration Activities on improving biodiversity management of the tidal mudflats south of Ganghwa Island in the Yellow Sea |
| Lead Organisations: | Anyang University, Aqualab System, Academy-Industry Cooperation Foundation   |

To improve the management of the tidal flat in Ganghwa Island, Republic of Korea (ROK), a variety of demonstration activities have been implemented in a comprehensive manner, including biodiversity survey, policy development for pollution control, capacity building and public awareness, and socioeconomic study. This document describes those activities, highlighting their processes and results.

### Ganghwa and its ecosystem problems

The tidal flat of Ganghwa, located on the west coast of ROK, provides people with various resources and opportunities. About 100,000 people visit this area every year to enjoy seafood, scenery, recreational activities, and bird-watching opportunities that the tidal flat provides.

The tidal flat is a major habitat of the last remaining populations of Black-faced Spoonbill (BFS) (Fig. 1). This species is listed as one of the endangered species in the IUCN Red List of Threatened Species. There are only 1,700 BFSs in the world, and more than 50% of them breed in Ganghwa Island.

Without management, there is a serious concern that the tidal flat environment will continue to degrade due to human impacts such as the release of untreated sewage and pollution. The current benthic macroinfauna community of the Ganghwa southern tidal flat has been surveyed, and the results show a significant (52%) decline in species diversity from the last survey made in 2003, and a dramatic shift in species composition with polychaetes indicative of pollution and other

opportunistic species becoming dominant in both density and biomass. Significant increases in dissolved inorganic nitrogen concentration since May 2003 resulting in mean DIN concentrations of 136  $\mu\text{M}$  suggests that the community change may be associated with deteriorating water quality, which could have serious consequences for the upper trophic organisms that depend on the food supply from the benthic environment. The seawater quality is degraded to the level that is suitable for industrial use, but not for swimming. The level may cause damage to not only the ecosystem, but also human health.



Fig. 1: Black-faced Spoonbill in Ganghwa

### Improved management of the tidal flat

The United Nations has implemented a pilot project to improve the management of the tidal flat ecosystem. The benthic biodiversity has been surveyed with the following possible drivers assessed: nutrient pollution, solid wastes, and tidal power plants and associated reclamation (Fig. 2).



Fig. 2: Experiments to assess the impact of sewage contamination on the tidal flat ecosystem

The results of examining pollution loads (produced loads and discharge loads) into the habitat and nearby Gyeonggi Bay from the three watershed regions show that the habitat quality of the tidal flat is heavily influenced by the discharge from the Han River, downstream of which the tidal flat is located (Fig. 3). The discharge loads of biochemical oxygen demand (BOD) are higher in the watersheds of Han River and the Shiwa Lake area than in off the coast of Incheon metropolitan city.

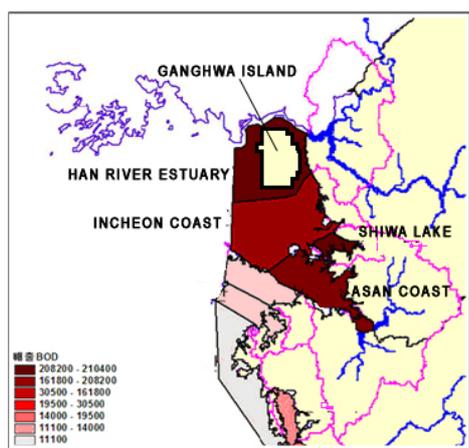


Fig. 3: BOD loadings in the water bodies surrounding the Ganghwa tidal flat

To improve the surface water quality in the habitat, it is necessary to reduce the nutrient inputs to the tidal flat. Based on the study results, a new management plan has been developed with proposed actions such as the introduction of total maximum daily load and the construction of a centralised sewage-treatment plant to prevent pollutants from entering into the tidal flat.

A stakeholder meeting has been organised in the Ministry of Land, Transport and Maritime

Affairs to introduce the management plan. The plan has been favourably received, and will be revised according to the comments received.

In conjunction with the above demonstration activity, capacity building programs, public awareness activities, and a socioeconomic study have been conducted as follows.

The capacity building efforts have aimed to train local residents and stakeholders such as pension managers, farmers, and fishermen to become ecotour guides. A series of trainings has enabled the stakeholders to be integrated into the process of conserving the tidal flat. Trained guides will actively participate in environmental activities such as pollution monitoring and waste collection.

The Ganghwa Tidal Flat Center has produced a number of information materials on the importance of this habitat to improve public awareness of the tidal flat. Using BFS as a flagship species, the materials explain, for example, how this endangered species uses the tidal flat as a habitat.

The socioeconomic analysis has examined the benefit of preserving the biodiversity as suggested by the proposed management plan. The analysis aims to estimate the change in economic value of recreational opportunities that the tidal flat provides, collecting relevant socioeconomic data from visitors to the site. On-site and face-to-face questionnaire surveys have been conducted, and early results indicate that improving the tidal flat management with the introduction of the proposed plan would generate economic benefits (Fig. 4).



Fig. 4: An interviewer conducting a survey with visitors to Ganghwa