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Environmental change on tidal flat induced by anthropogenic effect around west coast of Korean Peninsula

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Tidal flats are valuable ecosystem by a productive flora and fauna which support large populations of birds, form nursery and feeding areas for coastal fisheries, provide intrinsic values such as aesthetics and education (Costanza et al., 1997; Goodwin et al., 2001). The half of the world's coastal wetlands will submerge during this century in response to sea level rise although salt marsh has a capacity to adjust to sea level rise change. However, tidal flats have been changed because of several coastal construction projects that had not been considered sustainable over the last 30 years in Korean Peninsula. The total area of tidal flats decreased from approximately 2,800 km^2 in 1990 to 2,393 km^2 in 2005 due to the land reclamations and dredging in South Korea. Many researchers investigated topography, sedimentation changes and local hydrodynamics for this area in the early 1990s. However, they are limited to the temporal and spatial scale because field surveys in the tidal flats are restricted due to the difficulties in accessing. The aim of this study was to examine environmental change in tidal flat in a large scale for long-term based on the remotely sensed data as well as in situ measurements. This study focused on the tidal flat that not only had been affected by reclamations on a large scale such as Ganghwa and Saemangeum but also had been indirectly affected by reclamations such as Hwang-do and Gomso-bay.

In this study, changes in morphology and sedimentary facies in tidal flats were estimated. Digital elevation models (DEMs) in early 2000 and 2010 were generated based on the Landsat TM/ETM+ images using a waterline method. Morphological change was estimated based on the differences of DEMs and sedimentary facies was investigated based on the calculation of image-derived PCA coefficient. Results of the morphological change in tidal flats interestingly showed that large amount of areas had been deposited whereas the other areas were eroded. Area with deposited tendency showed increase in fine sediments whereas area with eroded tendency showed increase in coarse sediments. This result was compared with the tidal current speed estimated from a hydrological model.