Innovations in Monitoring Changes in Land Use Based on GeoAI, Means of Utilization

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1> (Concept) Monitoring changes in land use: ① identify status of land use at regular intervals; ② detect changes in land use due to human activity or natural phenomena, and; ③ forecast land demand and changes.

2> (Problem) Maps of land usage and cover used to monitor changes in land use have traditionally required large amounts of time and funds for their production, but due to low temporal and spatial consistency, their utilization in field operations is low.

3> (GeoAI) Technology utilizing artificial intelligence (AI), or deep learning, is used to extract or classify meaningful information from image data (aerial photos and satellite imagery), facilitating identification and detection of changes in land use status.

4> (Innovation's benefits) The application of deep learning techniques to normal aerial photos is expected to provide, relative to conventional methods: 1) better accuracy in classifying land use; 2) shorter processing times due to the reuse of learning data, and; 3) cost savings in data building alongside innovations in time-series data building and changes in detection through comparison

5> (Challenges) Selection of deep learning algorithms suitable for classification purposes and imagery types; high-performance computing environments including GPUs; substantial time and effort put into implementation of initial training dataset; collaboration with Ministry of Land, Infrastructure and Transport and Ministry of Environment; verifying reliability of results due to inability to explain analytical processes employed in deep learning techniques

Policy proposals

① (Method of data production) Introduction of GeoAI to minimize costs for building and updating land use data; production of temporally and spatially consistent data, and change detection and forecasting based on accumulated time-series data

② (Data building and joint utilization through collaboration between Ministry of Land, Infrastructure and Transport and Ministry of Environment) Consolidation of land use maps with standards and items for land cover classification; use of aerial orthophotography and land observation satellites to build sub-category data on land use; editing of data to produce information organized into categories and sub-categories to reduce costs and time required for implementation

③ (Implementation of monitoring platform for land use change) Phase 1: Issue review (pilot project); Phase 2: Main project for teaching dataset and algorithm development; Phase 3: Utilize sustainable monitoring system for land use change through establishment of image collection systems and features of semi-automated development of teaching dataset and development of change detection model

④ (Potential uses) Use of land observation satellites and GeoAI could allow inter-Korean infrastructure connections and provide basic data for all types of inter-Korean cooperation in forestry, agriculture, water resources, and urban development; the use of drones with GeoAI will allow an immediate policy response to areas struck by catastrophes and natural disasters (e.g., flood, drought, forest fire or earthquake)