— GROUP 6 REPORT —

LAND USE AND LAND COVER CHANGE STUDY

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1. PUORPOSE OF OUR STUDY

The important purpose of our study is spatial and historical monitoring of land-use changes in the Amur River basin in 20th century and find the difference of land use and land cover in everal events. Our group attempted to visualize spatial the land use-land cover changes in the whole Amur River basin by means of topographic maps, satellite image interpretation, field work (ground trouth)and statistical analyses linking with geograpchic information system.

We tried to identify as following; 1)Finding the land use and historical changes in the Amur River basin, 2).Finding the social background of land use/land cover change, 3).Finding the remarkable land use change, 4) Impact of rapid land use change. Moreover, the land cover change was tried to identified in the view of geomorphologic structure.

2. DATA AND METHOD

The Land use map for 1930-1940s has been compiled through analysis of topographical sheets in various scales (1: 100, 000; 1: 200,000; 1: 250, 000; 1: 300, 000; 1: 420, 000, 1: 1, 000, 000). The map of the Chinese territory has been compiled through analysis of topographical sheets (scale 1:100,000), by the General Staff of Kvantun Army of Japan and the maps (scale 1:100,000-1:1,000,000) published by USSR. The Mongolian part was described compiled topographic maps in the scale 1:100,000, 1:200,000, 1:1,000,000 compiled in the USSR.

A set of satellite images of Landsat-7 (in USA) in 2000-2001 of the average resolution from 30 m and more mainly have been used in the work for drawing the map "Modern Land-Use in Amur River Watershed Area". More detail mapping, this work was described in our previous publication. Changes (trends of land cover change) for the most recent 19 years were analyzed using Pathfinder AVHRR Land datasets and satellite remote sensing techniques. Geomorphologick land classification map was prepared by satellite data and surface geologic field work.

3. RESULT OF LAND USE AND LAND COVER STUDY

Land use and historical land use changes in the whole Amur River basin were visualized by various temporal as well as spatial mappings as followings; land use maps, geological map, topographic map, and soil map. We succeeded in compiling land-use maps for both the 1930s and 2000 for the whole Amur River basin using GIS (geographical information system) system.

The changes (trends of land cover change) for the most recent 19 years were analyzed using Pathfinder AVHRR Land datasets which show there were significant changes on the Sanjiang plain where approximately 10,000 km^2 of wetland was reclaimed as paddy fields from 1980 to 2000 and irrigation paddy field, and Harbin city and the surroundings because of urbanization. Aerial changes of Russian forest were not very significant in the above periods but the quality of the forest is considered to be deteriorating mainly owing to frequent forest fires.

The rapid increase in timber exports to China and poor forest policy is considered to accelerate forest degradation. On the Sanjiang plain, there was a rapid development of paddy fields in accordance with governmental policy. Farm management has improved in recent 20 years, but a lack of water for large paddy fields has become a serious issue in Sanjang plain and the excessive pumping of ground water has caused the rapid lowering of the ground water table on the Sanjiang plain and surrounding. Distribution of paddy field and its changes were extracted from China 1km Mesh Land use Map in circa 1990 and circa 2000. Jamusi and Baoqiong regions were two major regions where the area of paddy field was increased. Landsat TM data were used to detect paddy field by using seasonal change in NDWI(Normalized Difference Wetness Index), and confirmed the results by China 1km Mesh Maps.

NDVI (Normalized Difference Vegetation Index) data by SPOT/VEGETATION satellite data were used to detect paddy field from 1999 to 2006 by using the sharp NDVI increase in early summer that was the characteristics of rice vegetation. As a field survey result, increasing the trend of the area of paddy field in Sanjiang Plain was made to be clear, however, the area in every year was somewhat different from the data in statictical year book. More reliable paddy field detection algorithm was necessary. Our important finding is the features of wetland on each geomorphologic land scape. The wetlands have been decreasing on the flood plain along the rivers in recent 20 years. The quality of wetland has been also changing in the view of vegetation.

In order to reconstruct the long-term hydrologic environment change, which accompanies the land cover change, in the Amur River basin, we investigated the floodplain deposits around the Sanjiang Plain, which is located at the middle reach of the Amur River. We also constructed a geomorphological classification map and investigated the late Holocene topographic development history of the Sanjiang Plain. Then, we investigated the modern floodplain deposit along the Amur River, Songhua River, Usury River, and the branches of the rivers centered along the Sanjiang Plain. We recognized the sandy parts, which are coarser than the lower parts, were at the top of the floodplain deposits in most localities. The

thickness of the coarse-grained part varied from 30 cm to 70 cm depending on the location. The measurement of the radionuclide contents of cesium-137 and lead-210 excess confirmed that the upper coarse portions of the sediment were deposited during the recent several decades. The reason behind such coarsening of the deposit was considered to be the development of farmland and deforestation in the Amur River basin.

Our result is as followings; 1).Land use map and the historical changes in the whole Amur River basin were visualized. Geologic map, topographic map, and soil map were visualized with GIS. 2). Compiling land-use maps for both the 1930s and 2000 for the whole Amur River basin and comparing with each land use map for finding remarkable change. 3).Land cover changes for the most recent 19 years were visualized and anlyzed using Pathfinder AVHRR Land datasets and satellite remote sensing techniques. Using NDVI values, the significance areas of changes were categorized for trends of gevetation cover with social economical background. 4). Geomorphologic land classification map was described and the recent land degradation zone on the surface was identified related with land cover change. 5). Impact analysis is done for wetland decreasing and identified the wetland historical processes on the Sanjang plain in each geomorphologic land form. 6).Land degradation was found and the evaluated by sedimentation on the surface along the rivers and channels. 7) Identify of the flood flow directions in flooding periods in the view of fluvial geomorphology.

4. FUTURE ISSUE

It is assumed that such hydrological change and coarsening of floodplain deposits has considerable effects on the floodplain environment and the environment of the wetlands is expected to undergo considerable changes when they are buried in highly permeable sand.

We have to investigate the influence of such environmental change on the iron supply from the wetland in the floodplain. The records of floods in the Songhua River suggest that there has been an increase in large-scale floods since 1950. We need to investigate the relationship between the land cover change and flood risk in the Amur River basin. The changes of the cultivated areas before 1980 were not clarified. It will be tried to clarify the changes of the cultivated areas before 1980. The argument should need the cross-check of the relationship between geomorphology and effluence of Fe ion.