Geodata Management for the Environmental Assessment: a Case Study of Central Finland

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УПРАВЛЕНИЕ ГЕОДАННЫМИ ДЛЯ ЭКОЛОГИЧЕСКИХ ПРОЕКТОВ НА ПРИМЕРЕ ГИС ЦЕНТРАЛЬНОЙ ФИНЛЯНДИИ

GEODATA MANAGEMENT FOR THE ENVIRONMENTAL ASSESSMENT: A CASE STUDY OF CENTRAL FINLAND

Аннотация: Целью работы является организация эффективного управления пространственными данными для систематизации геоэкологических данных по финским экосистемам в структурированном виде репозитория для проведения дальнейших исследований по оценке состояния окружающей среды. Исследование проведено автором на стажировке в университете Куопио (Восточная Финляндия) на факультете естественных и экологических наук.
Ключевые слова: управление экологическими данными, пространственный анализ, ГИС.

Abstract: This research is focused on the effective management of spatial data: organizing geographical and environmental data of the Finnish ecosystems in a structured and systematical way for further environmental assessment. The research has been carried out on the Biogeochemistry Research Unit, Faculty of Natural and Environmental Sciences, Department of the Environmental Sciences, University of Kuopio (Eastern Finland).
Key words: environmental assessment, spatial analysis, GIS.

The study area is situated within central Finland and some data in the North Finland (Fig.1). The work is aimed on the structuring and management of spatial data for environmental assessment. The data were organized in an ArcGIS project. The data were collected during the last 20 years.

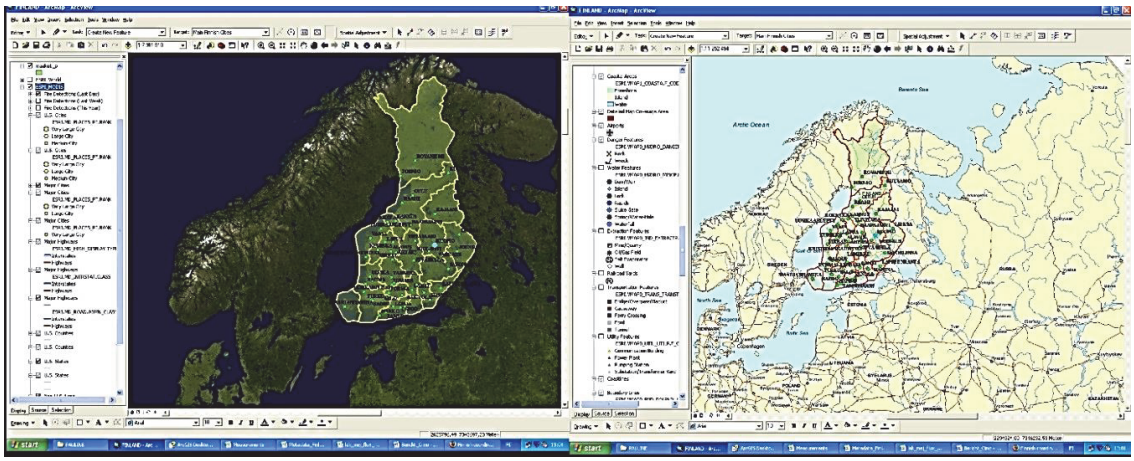

Fig. 1. GIS project of Finland: study area with neighboring countries and shaded relief

The data build up core environmental information cluster for the biogeochemical soil analysis of the ecosystem components. To represent data measurement placements within the study area and for additional spatial or thematic information: satellite imagery, shaded maps, pictures captures during the expeditions and any text describing the places. The mapping project FINLAND.mxd has been started using ArcGIS 9.1 software. The map of Finland in a vector .mxd format was used to start this project. The initial map had layers with main geographic information: cities, roads, lakes (polygon), lakes (contour), administrative regions

(polygon), administrative borders of Finland.

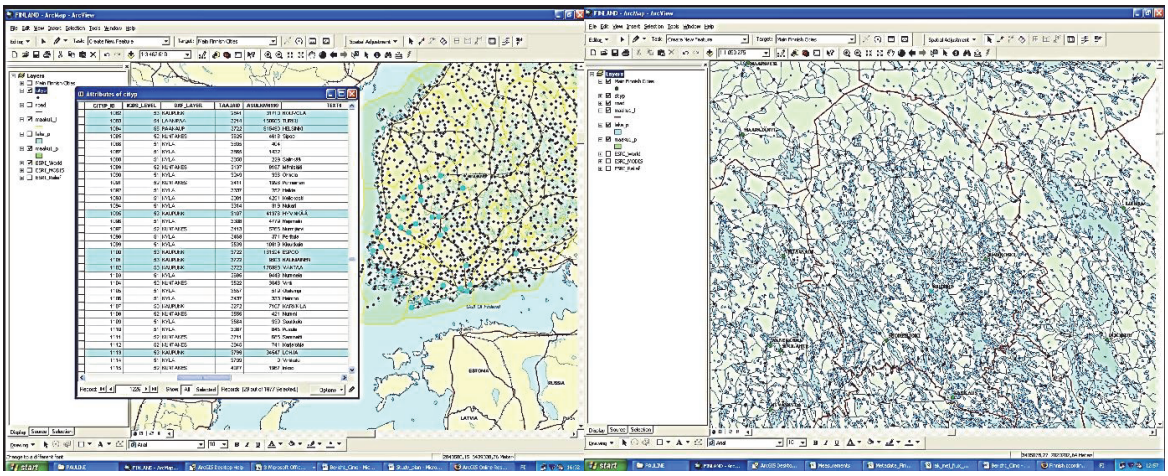

Fig. 2. Attribute generalization: selecting Finnish cities in the lacustrine area

Since the map was not initially geographically projected, the geographic projection was set up. I selected necessary geographic transformations tools to re-project data and to set the projection of a data frame in a Finland map document using the ArcCatalog. For that, the Finnish third mapping zone of the Gauss-Kruger projection was chosen.

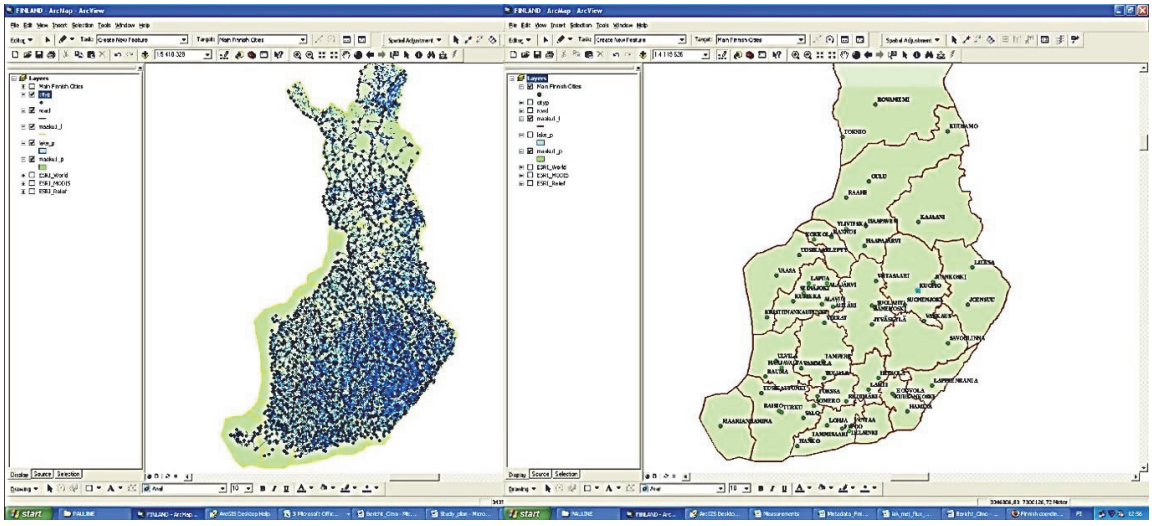

Fig. 3. Map of central Finland before (left) and after (right) generalization

All the shape-files were given, therefore, the following Geographic Coordinates code has been ajusted: [Projected Coordinate System: Finland_Zone_3 Projection: Gauss_Kruger False_Easting: 3500000,000 False_Northing: 0,000 Central_Meridian: 27,000 Scale_Factor: 1,000 Latitude_Of_Origin: 0,000 Linear Unit: Meter Geographic CoordinateSystem: GCS_KKJ Datum: D_KKJ Prime Meridian: 0 Angular Unit: Degree]. After adjusting the data into the same projection format they were opened in the ArcGIS project as following shape files: citiyp.shp, road.shp, lake_p.shp, lake_c.shp, maakul_p.shp. All contour .shp-files were then deleted from the project, as they doubled information, which is also contained in the polygon files topologically. To show only the cities that are necessary for the project, the attribute selection was made using the ArcGIS .shp-file attribute tables query. Now the layer Main_Finnish_Cities.shp contained only main cities of Finland and some settlements (Fig.3).

To show important places of measurement and expeditions made outside of Finland and to represent the location of Finland on the world map, the world maps were added to the

project using Internet resources. The ArcGIS maps were taken from the ESRI Resource Centre where the World Maps and satellite imagery are available: http://resources.esri.com/

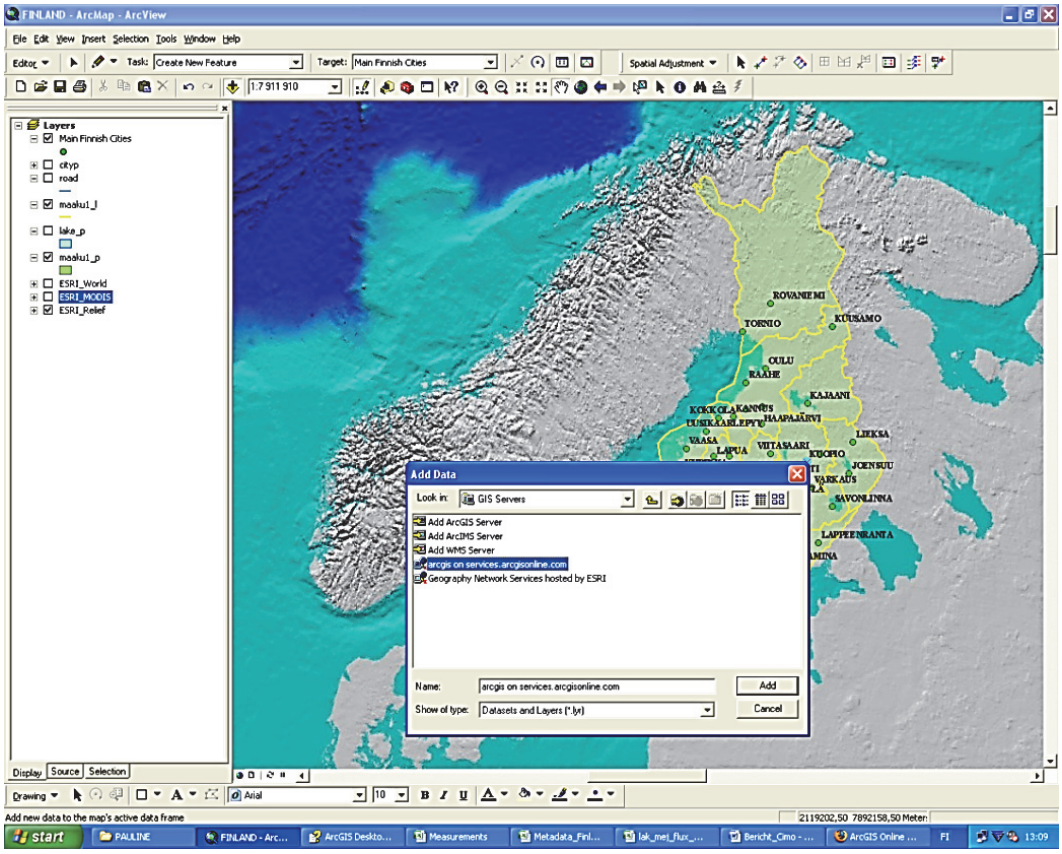

Fig. 4. Connecting to ArcGIS server to add a relief shaded World map into project

Using these web recourses the following spatial information was added to our project: 1. vector ESRI©World Map (maximal scale available: 1: 500.000) 2. ESRI©satellite MODIS imagery (good resolution possible until the scale 1: 50.000) 3. ESRI©shaded relief map. These data were also set up into the Finnish coordinate system, Gauss Kruger projection to fit perfectly the map of Finland. I added these additional maps to show places of measurements made by the university fieldwork students which is possible using vector ESRI©World map. Current research demonstrated effective management of spatial data and creating GIS projects from scratch for further data processing, spatial analysis and thematic mapping.

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