IGIT Project

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Integrated geo-spatial information technology and its application to resource and environmental management towards GEOSS

FP7-PEOPLE-2009-IRSES

General Data

- **Project Title:** Integrated geo-spatial information technology and its application to resource and environmental management towards GEOSSGEOSS
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- Duration: 2011-2014 (4 years)
- Total Budget: 410 400 Eur

- **Program call**
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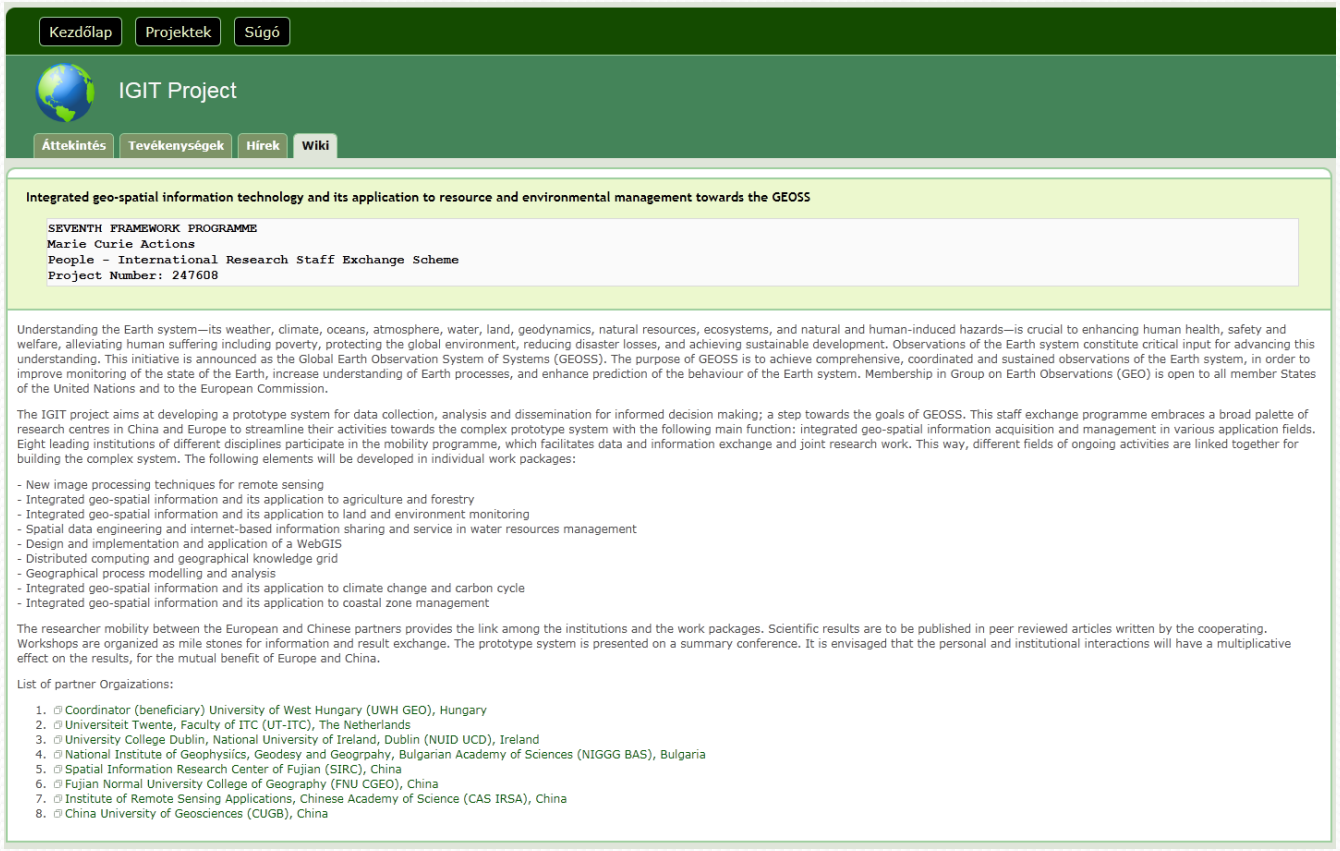
- PEOPLE - MARIE CURIE ACTIONS
- International Research Staff Exchange Scheme
- Call: FP7-PEOPLE-2009-IRSES

The consortium contains the following institutions:

- (Coordinator):Faculty of Geoinformatics, University of West Hungary, Hungary
- Universiteit Twente, , Faculty ITC, The Netherlands
- School of Computer Science and Informatics, University College Dublin, National University of Ireland, Ireland
- National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences, Bulgaria
- Spatial Information Research Centre of Fujian, Fuzhou University, P.R. China
- College of Geography, Normal University of Fujian, P.R. China
- Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, P.R. China
- China University of Geosciences, Beijing, CUGB, P. R. China

IGIT webpage

- http://igit.geo.info.hu



Kezdőlap | Projektek | Súgó

IGIT Project

Áttekintés | Tevékenységek | Hírek | Wiki

Integrated geo-spatial information technology and its application to resource and environmental management towards the GEOSS

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SEVENTH FRAMEWORK PROGRAMME
Marie Curie Actions
People - International Research Staff Exchange Scheme
Project Number: 247608
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Understanding the Earth system—its weather, climate, oceans, atmosphere, water, land, geodynamics, natural resources, ecosystems, and natural and human-induced hazards—is crucial to enhancing human health, safety and welfare, alleviating human suffering including poverty, protecting the global environment, reducing disaster losses, and achieving sustainable development. Observations of the Earth system constitute critical input for advancing this understanding. This initiative is announced as the Global Earth Observation System of Systems (GEOSS). The purpose of GEOSS is to achieve comprehensive, coordinated and sustained observations of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behaviour of the Earth system. Membership in Group on Earth Observations (GEO) is open to all member States of the United Nations and to the European Commission.

The IGIT project aims at developing a prototype system for data collection, analysis and dissemination for informed decision making; a step towards the goals of GEOSS. This staff exchange programme embraces a broad palette of research centres in China and Europe to streamline their activities towards the complex prototype system with the following main function: integrated geo-spatial information acquisition and management in various application fields. Eight leading institutions of different disciplines participate in the mobility programme, which facilitates data and information exchange and joint research work. This way, different fields of ongoing activities are linked together for building the complex system. The following elements will be developed in individual work packages:

- New image processing techniques for remote sensing
- Integrated geo-spatial information and its application to agriculture and forestry
- Integrated geo-spatial information and its application to land and environment monitoring
- Spatial data engineering and internet-based information sharing and service in water resources management
- Design and implementation and application of a WebGIS
- Distributed computing and geographical knowledge grid
- Geographical process modelling and analysis
- Integrated geo-spatial information and its application to climate change and carbon cycle
- Integrated geo-spatial information and its application to coastal zone management

The researcher mobility between the European and Chinese partners provides the link among the institutions and the work packages. Scientific results are to be published in peer reviewed articles written by the cooperating. Workshops are organized as mile stones for information and result exchange. The prototype system is presented on a summary conference. It is envisaged that the personal and institutional interactions will have a multiplicative effect on the results, for the mutual benefit of Europe and China.

List of partner Orgaizations:

1. Coordinator (beneficiary) University of West Hungary (UWH GEO), Hungary
2. Universiteit Twente, Faculty of ITC (UT-ITC), The Netherlands
3. University College Dublin, National University of Ireland, Dublin (NUID UCD), Ireland
4. National Institute of Geophysiics, Geodesy and Geogrpahy, Bulgarian Academy of Sciences (NIGGG BAS), Bulgaria
5. Spatial Information Research Center of Fujian (SIRC), China
6. Fujian Normal University College of Geography (FNU CGEO), China
7. Institute of Remote Sensing Applications, Chinese Academy of Science (CAS IRSA), China
8. China University of Geosciences (CUGB), China

General Goal

- The IGIT project aims at developing a prototype system for data collection, analysis and dissemination for informed decision making; a step towards the goals of GEOSS. This staff exchange programme embraces a broad palette of research centres in China and Europe to streamline their activities towards the complex prototype system with the following main function: integrated geo-spatial information acquisition and management in various application fields.

Main research goal

- The IGIT project aims at developing a prototype system for data collection, analysis and dissemination for decision making;

- Main goal: Integrated geo-spatial information acquisition and management in various application fields. This way, different fields of ongoing activities are linked together for building a **complex system**.

Research Topics

- New image processing techniques for remote sensing
- Integrated geo-spatial information and its application to agriculture and forestry
- Integrated geo-spatial information and its application to land and environment monitoring
- Spatial data engineering and internet-based information sharing and service in water resources management
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- Geographical process modelling and analysis
- Integrated geo-spatial information and its application to climate change and carbon cycle
- Integrated geo-spatial information and its application to coastal zone management

WP1 - New image processing technologies in Remote Sensing

- Pre-processing of different data sources like digital terrain models, LIDAR data, aerial images, WorldView-2 images, topographic maps and hyper-spectral images.
- Optimized quantitative index derivation to describe city environment status mainly using remote sensing data.
- New Vegetation Index named HJVI and establishment of models of LAI inversion with remote sensing based on the HJVI.

WP2 - Integrated geo-spatial information and its application to agriculture and forestry

- New solutions for storage of raster data in server-client environment.
- Build test environments with open-source software applications.
- Development of new algorithms and applications.
- Experimenting the model of Soil Canopy Observation Photochemistry and Energy fluxes (SCOPE)
- Basic procedures and methods for optical data processing for agriculture and forestry
- Monitoring and measuring the structural parameters based on LIDAR data which can help understand the growth of fruit trees and other plants.
- 3D modelling of isolated trees based on the structural parameters and LiDAR data sets.

WP3 - Integrated geo-spatial information and its application to land and environment monitoring

- Eco-environment mapping of Lake Velence in Hungary.
- Compilation of the vegetation maps, the biologic activity map and the tree map of Székesfehérvár (Hungary) based on LIDAR data and NIR orthophoto.
- Discovering common research areas in GIS. Building GIS database using common data sources. Determination of the planned functionality, input and output data, actors (users, external resources) of Eco-environmental evaluation.
- Study on Regional Eco-environmental Factors of Quantitative Remote Sensing Monitoring.
- Evaluation of eco-environment with RS Background Value Model for monitoring land cover changes in Fujian, China
- Performing a change detection analysis of land use to set up base database for different scales of society, geography and ecology.
- Multi-scale characteristics of eco-environmental indicators by use of RS data.
- Processing of TM images for multi-scale analysis in 2D in ENVI.
- Analysis of spectral features for different land covers types.

WP4 - Spatial data engineering and information sharing and service in water resource management

- Estimation of evapo-transpiration of the Yinchuan plain from 2000-2010.
- Environment Geology affecting the development of city.
- Engineering Geology on the Yinchuan Plain.
- Wetlands interpretation and analysis of area change of wetlands from 1999 to 2009.
- Land use. Six types of land use were interpreted in the Yinchuan plain, includes vegetation, urban area, bare soil, water body.
- Water Balance Analysis.
- Time series analysis of vegetation cover in the Yinchuan plain during 2000 to 2010 based on MODIS NDVI.
- Investigation on the Integrated Land and Water Information System (lLWIS)

WP5 - Design, implementation and application of WebGIS

- Building multi-scale model based on CEBERS, SPOT and Landsat TM images.
- New methods for metadata conversion in order to study the metadata of ILWIS operations and OpenGIS WPS specification.
- Development of two grid nodes as WebGIS Map servers.

WP6 - Distributed computing and geographical knowledge grid

- Encapsulation of typical data mining algorithms in a GeoKSGrid architecture.
- Algorithms for hyper-spectral band selection.
- Methodology on distributed computing and geographical knowledge grid including the storage and management in distributed environment, distributed data mining on grid platforms, spatial decision support system (SDSS) based on grid platforms).

WP7 - Geographical process modelling and analysis

- Intelligent classification technology combined with the artificial interpretation land use change (including agriculture land change) monitor technology.
- Investigation on the multi scale properties of eco-environmental indicators (NDVI, Wetness Index, Brightness Index), generated from remote sensing data.
- Spatial Mechanism Analysis of the Development of the Population-Economic System of China

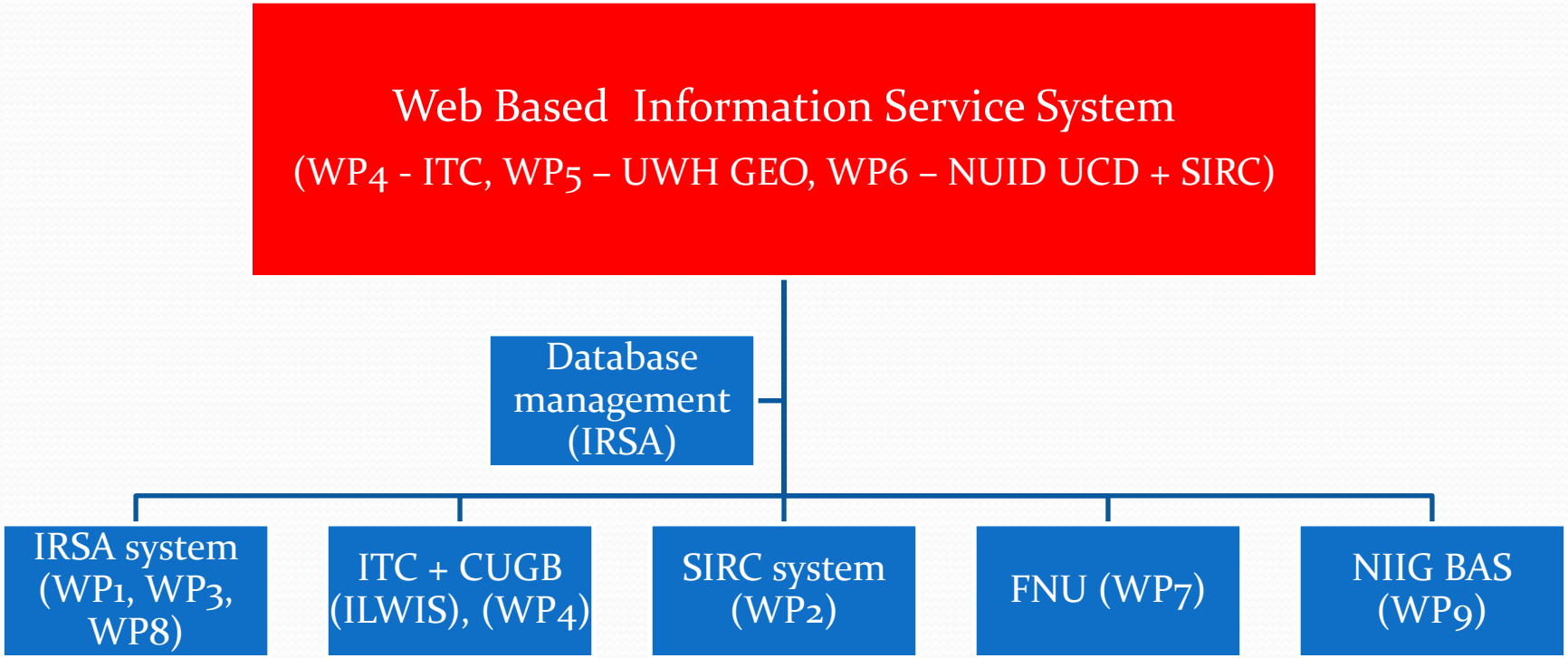
WP8 - Integrated geo-spatial information and its application to Climate change and carbon cycling

- Overview of relevant publications on Climate and carbon cycle models.
- Investigation on the Bulgarian mountains air temperatures and precipitation—statistical downscaling of global climate models and some projections.

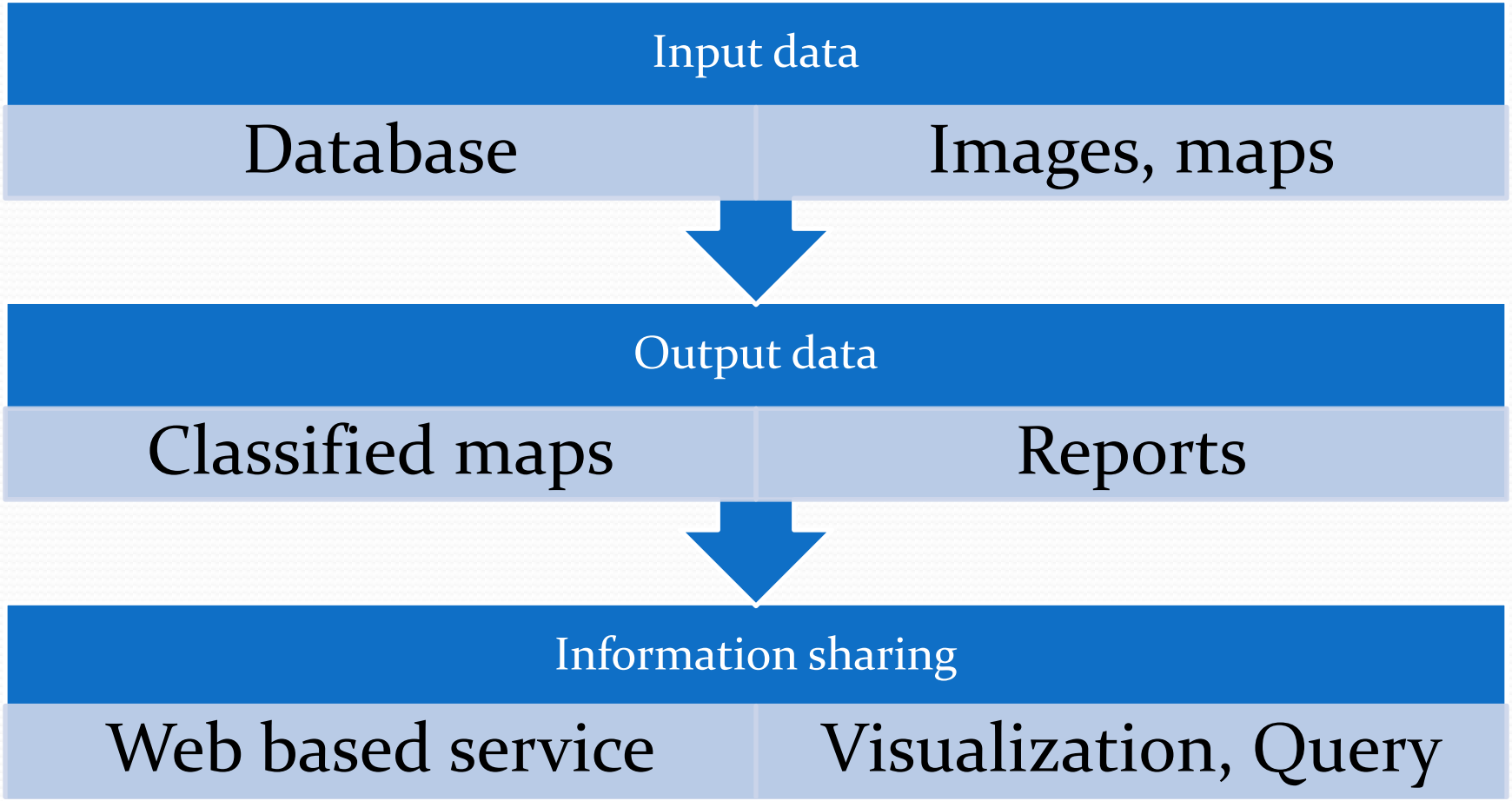
WP9 - Integrated geo-spatial information and its application to coastal zone management

- Inventory of data, information and users for eco-environmental evaluation
- Choosing and measurement of indicators for sustainable development of coastal zone.
- Land use/cover change monitoring and mapping based on multi sensors remote sensing and GIS data.
- Coastal zone monitoring and database updating.
- Impacts on coastal systems: identification of priority factors, including urbanization, coastal waters contamination and biodiversity loss, and key economic sectors.

Prototype system



Main idea of information sharing



Some results

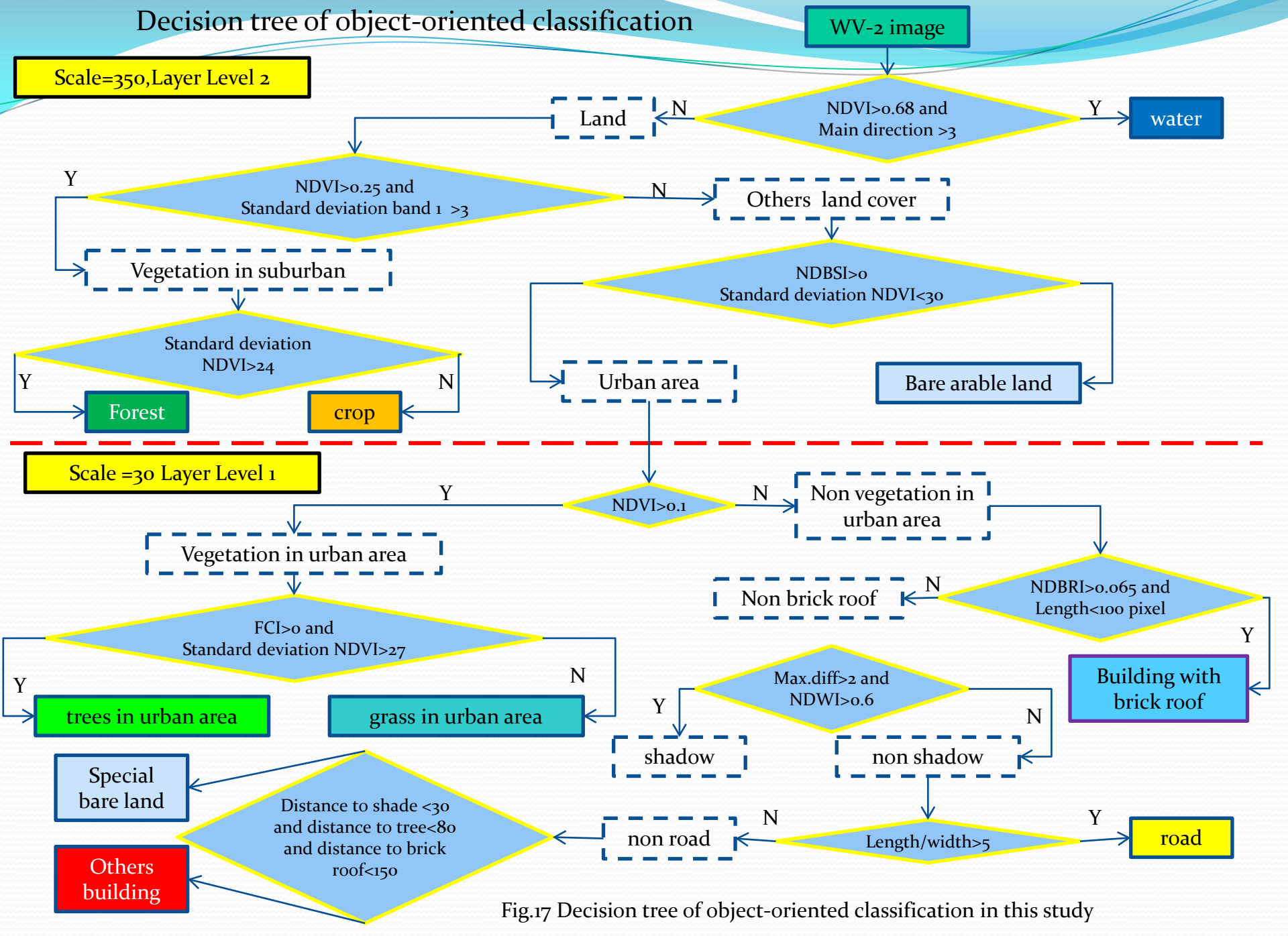
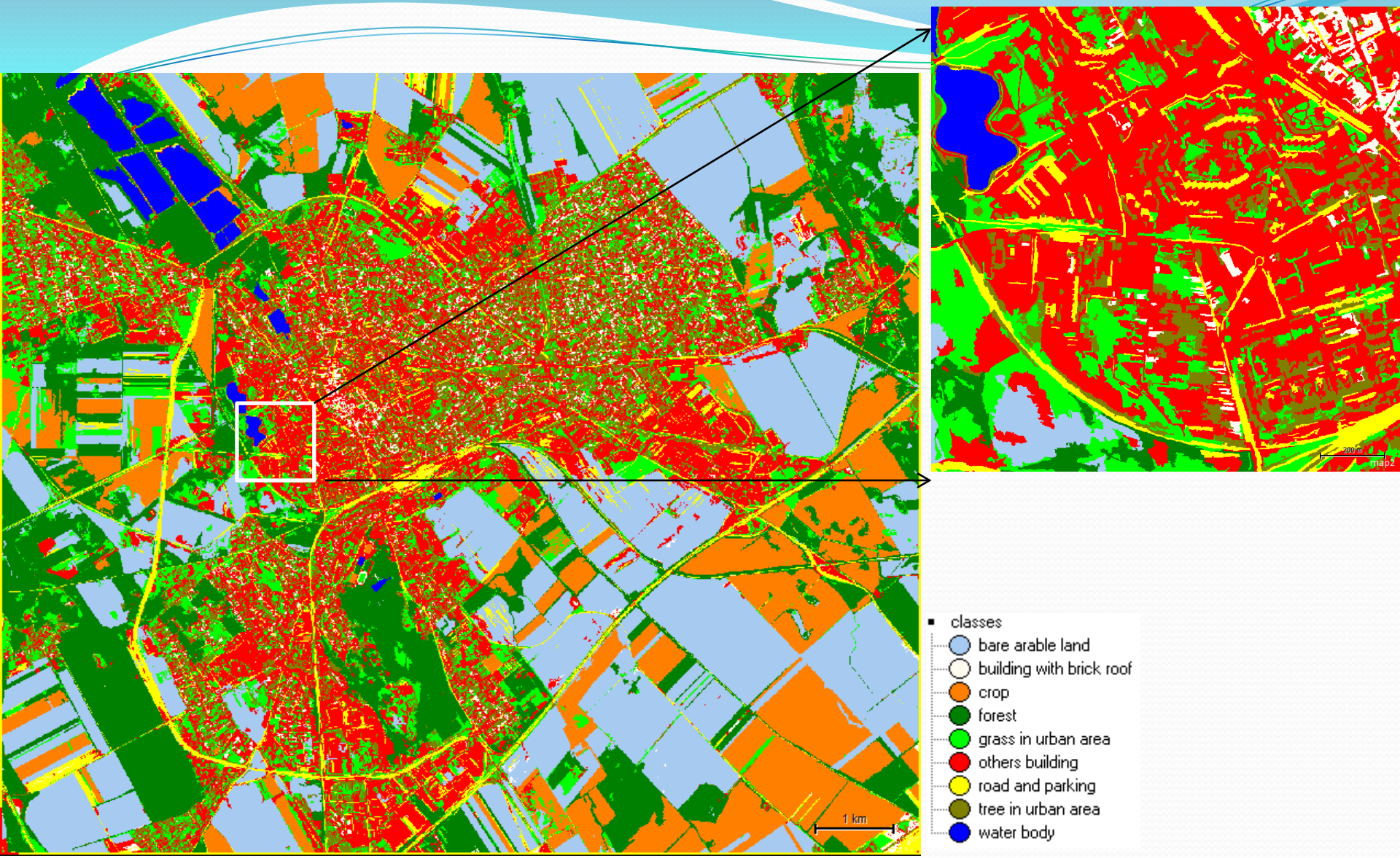
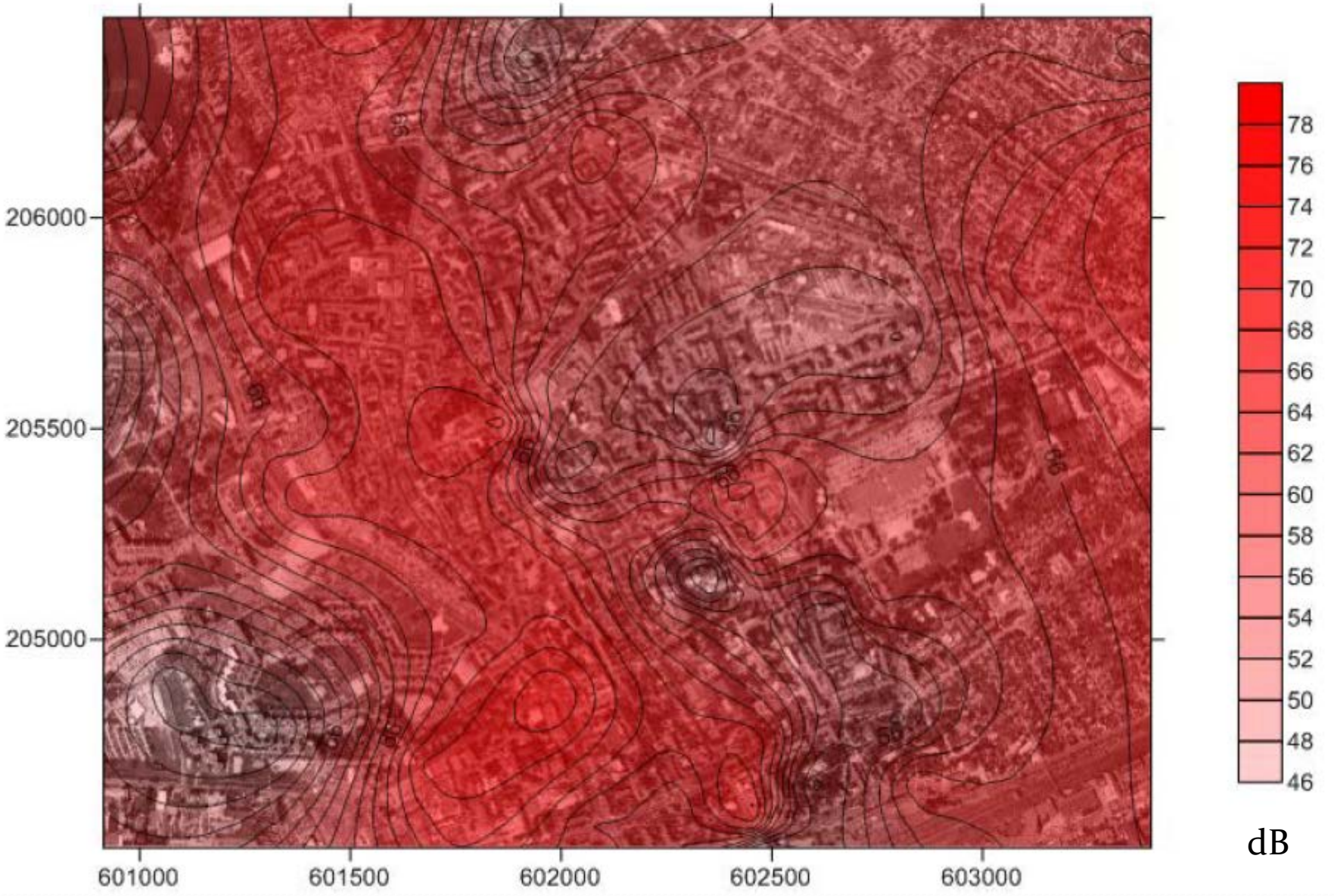


Fig.17 Decision tree of object-oriented classification in this study



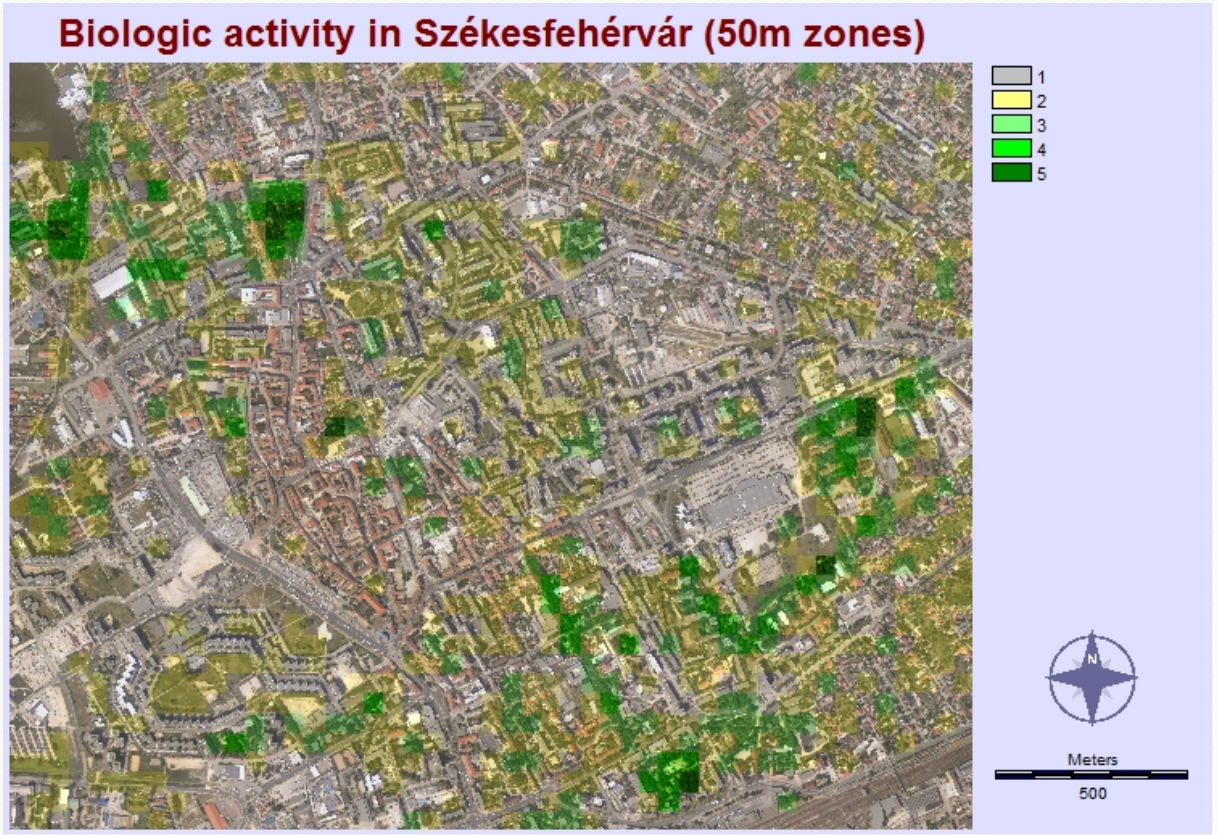
Classification result (nine land cover classes)
Szekesfehervar, Hungary



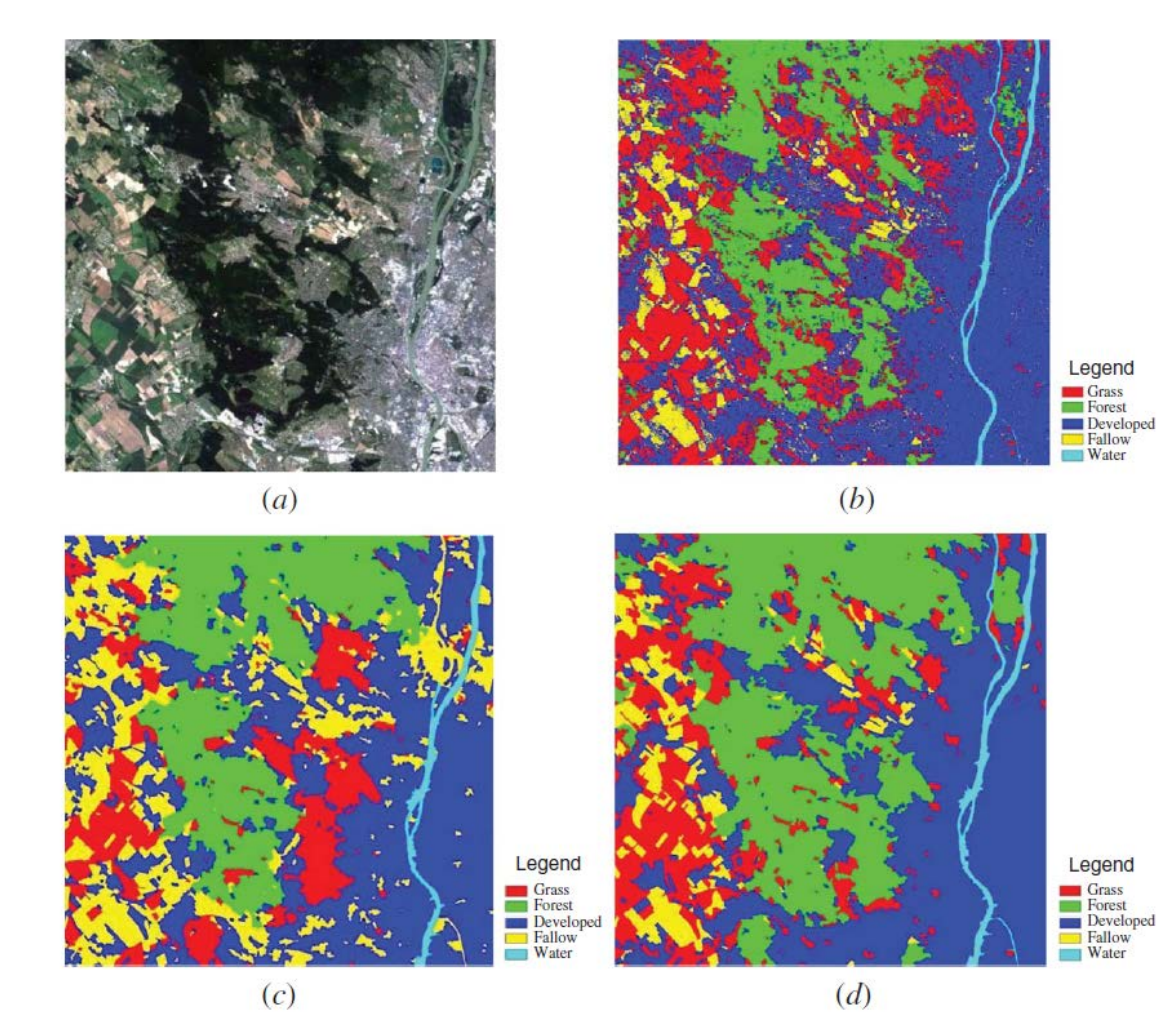
Noise Map of Szekesfehervar, Hungary

Biologic Activity Map

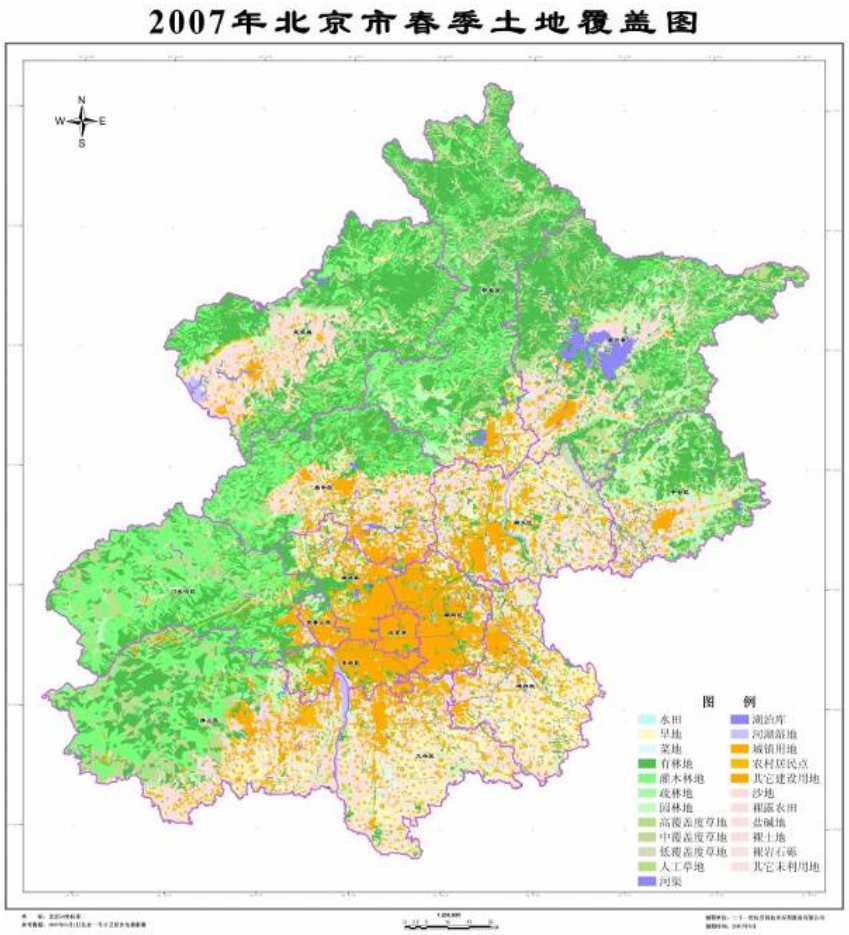
Grade	Number of cells	Score
1	1168	1168
2	544	1088
3	146	438
4	44	176
5	9	45
Total	1911	2915
Average biologic activity:		1.53

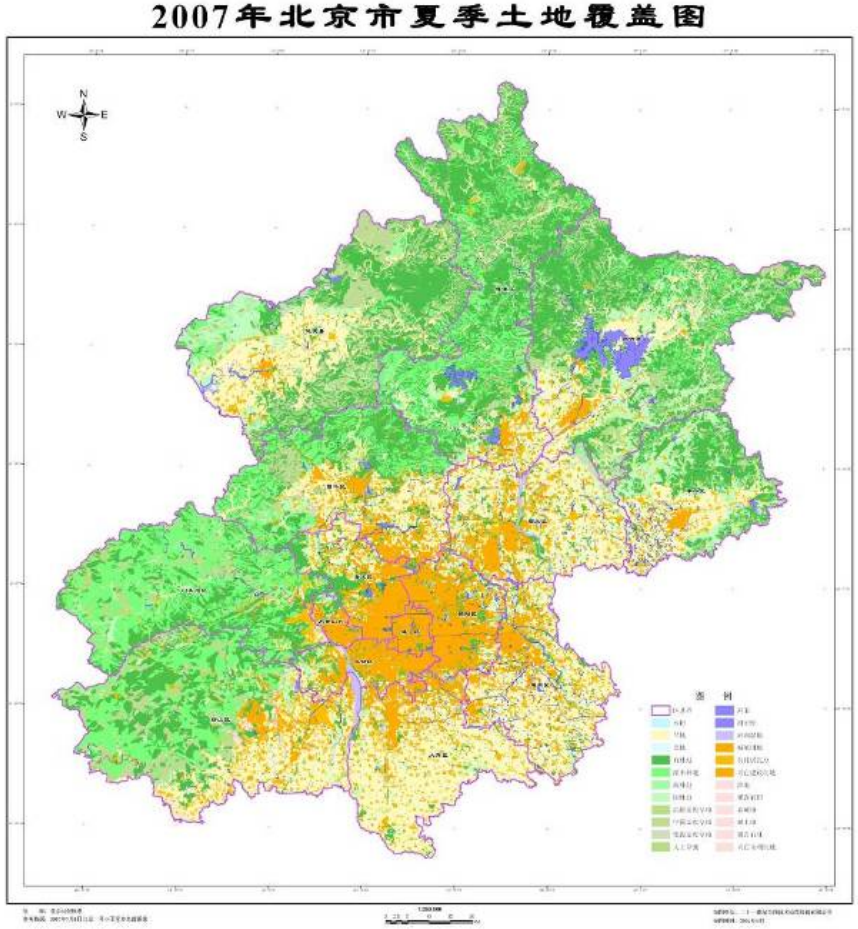


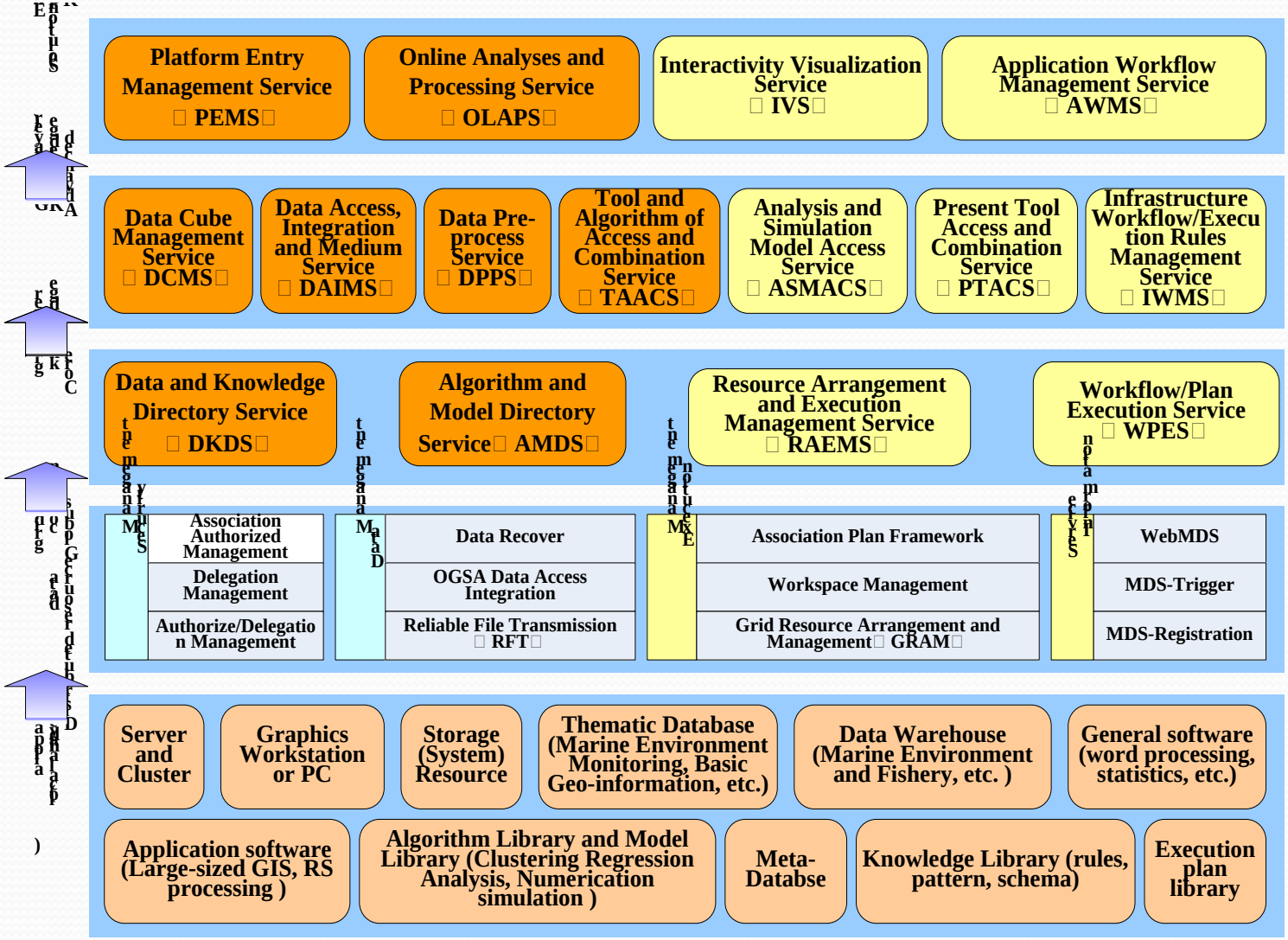
A hybrid method combining pixel-based and object-oriented methods and its application in Hungary using Chinese HJ-1 satellite images



Land Cover Map of Beijing in Spring and Summer of 2007

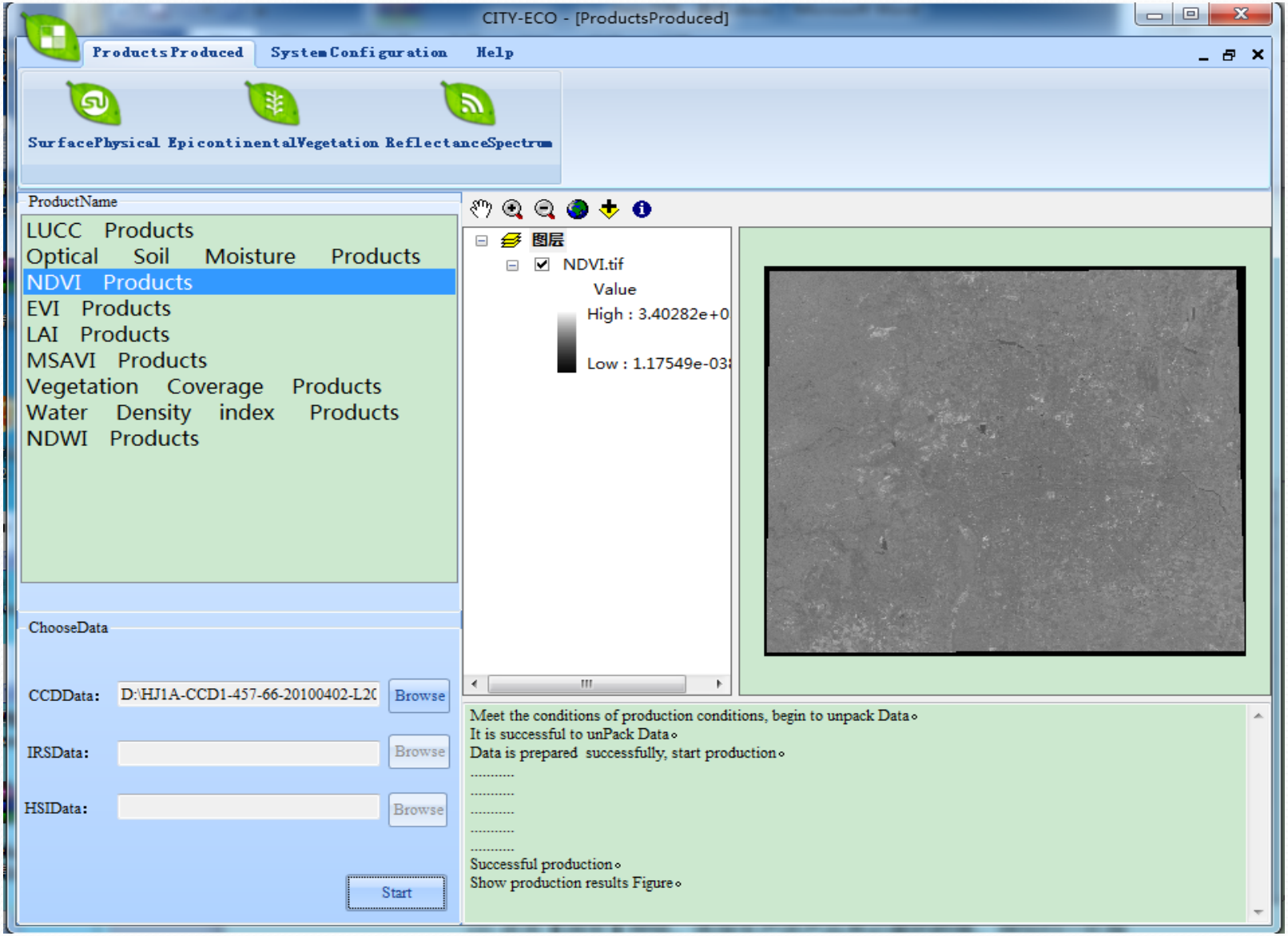






The overall system architecture of the GeoKSGrid

City-Eco Products


CITY-ECO - [ProductsProduced]
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HSIData:
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Data is prepared successfully, start production。
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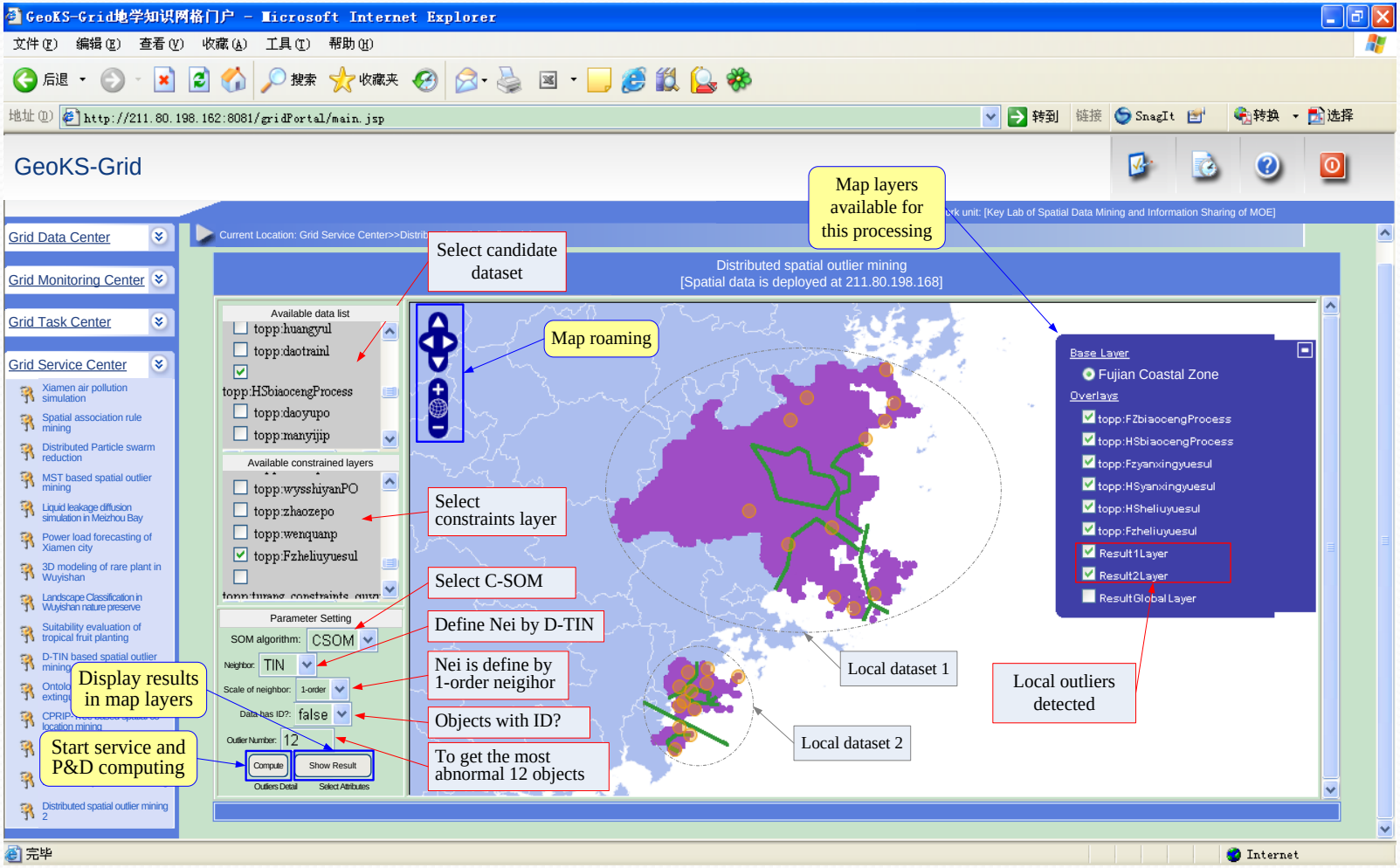
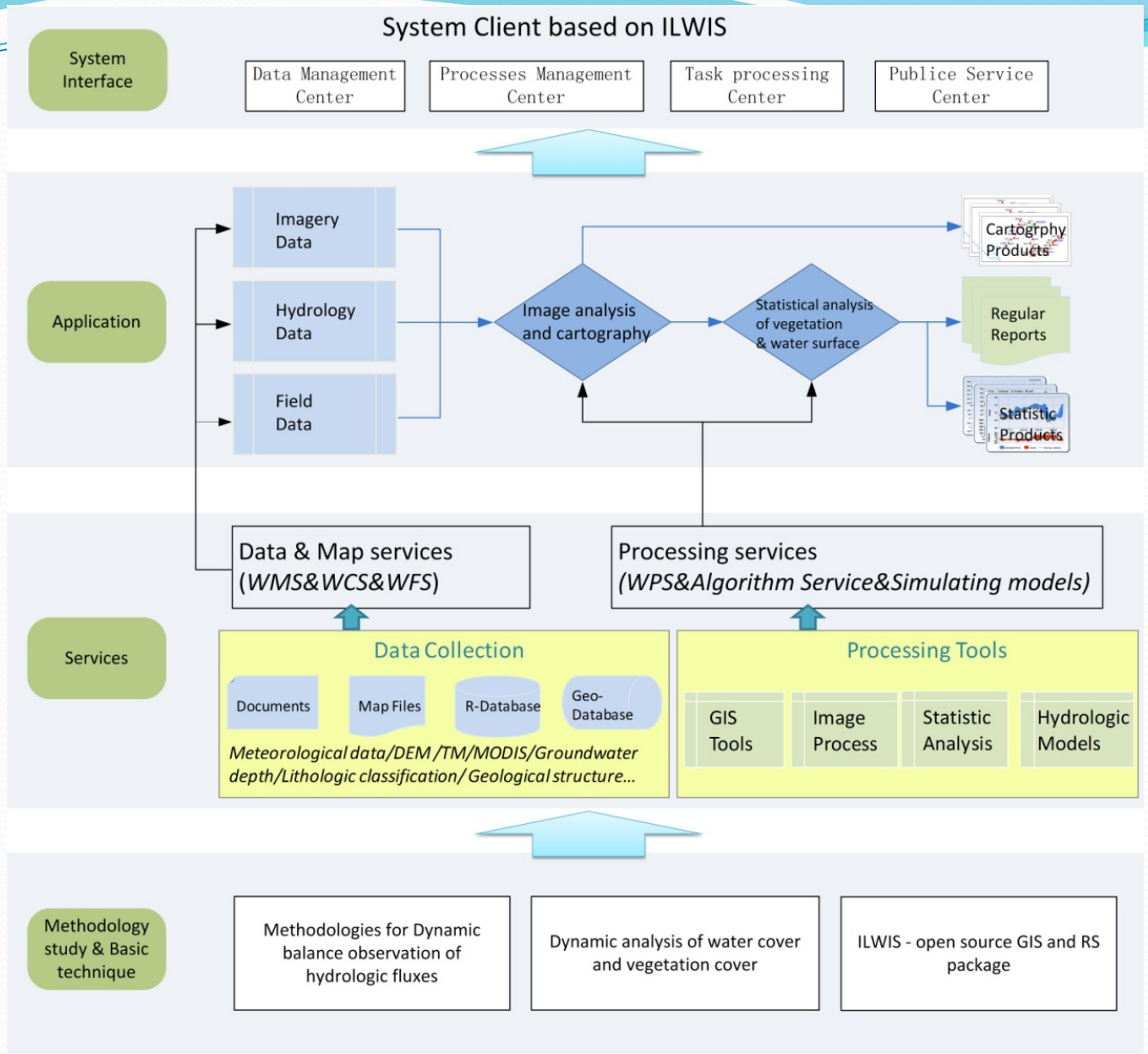
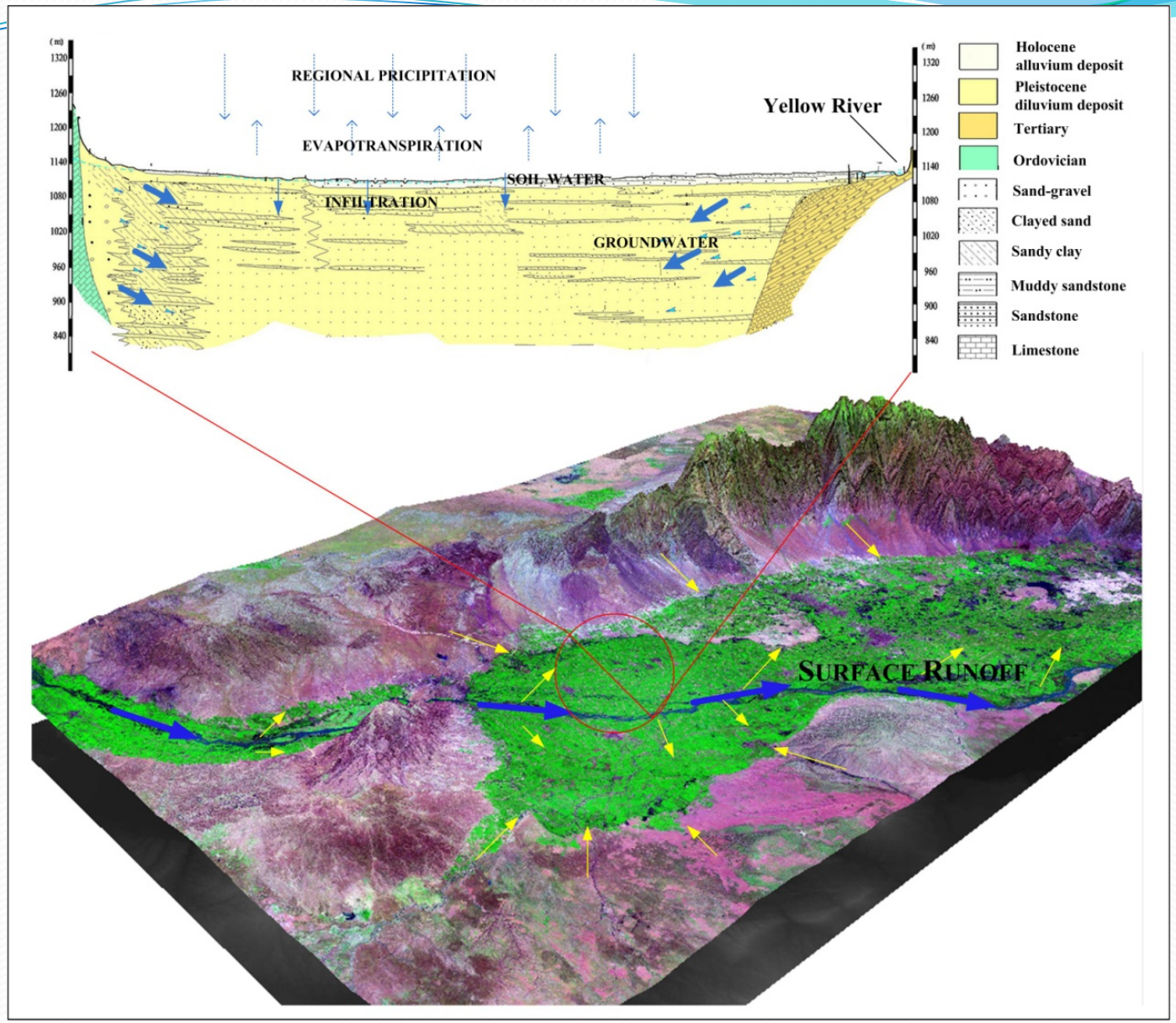


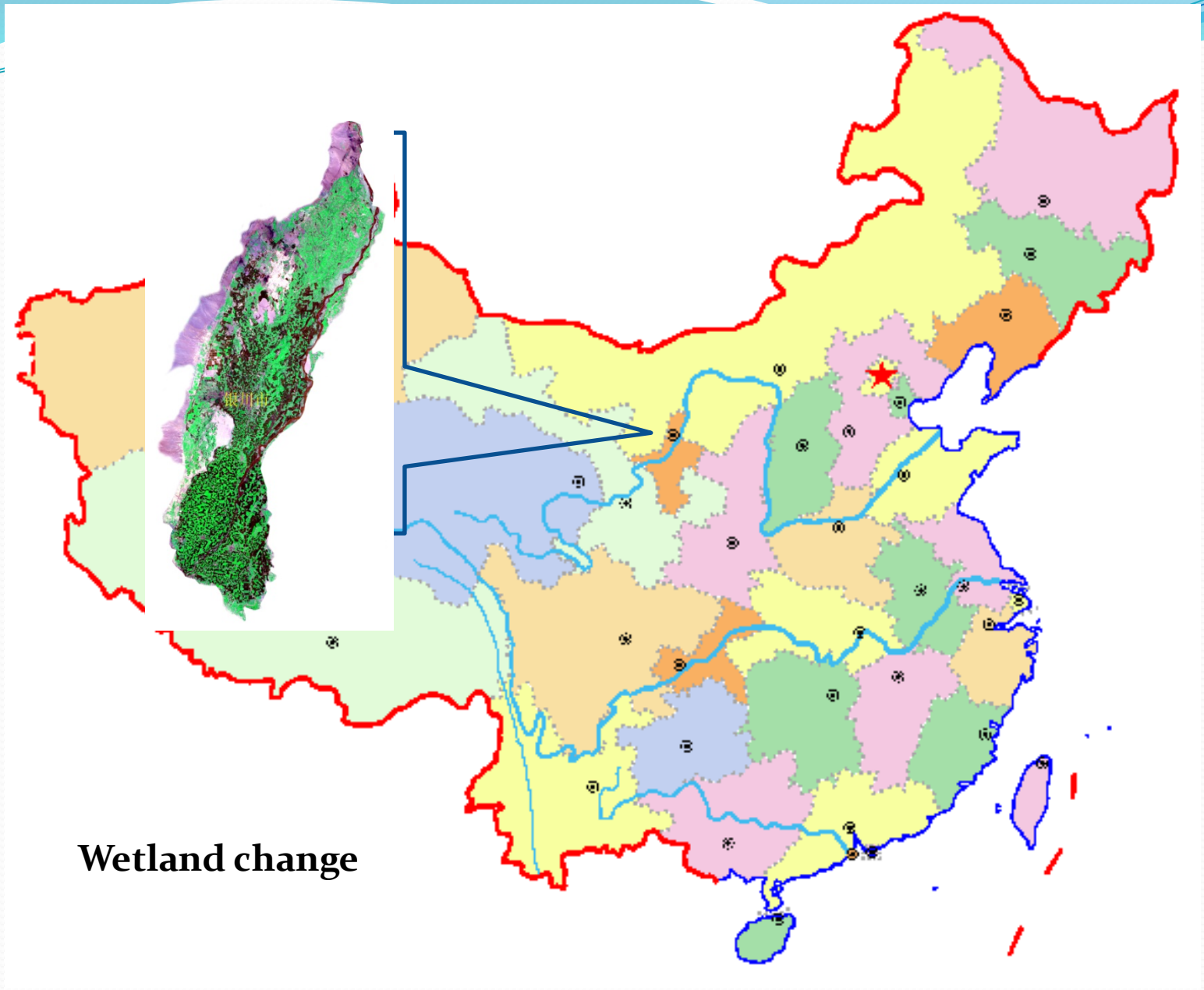
Parallel & distributed spatial outlier mining on soil geochemistry data



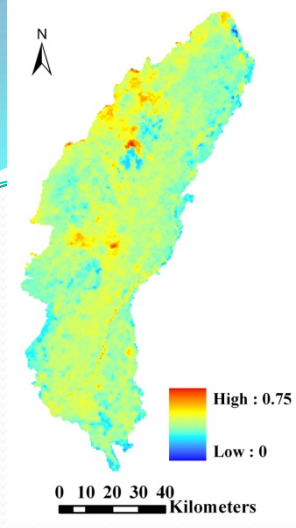
A framework of web service based WELMA



Hydrology situation of Yinchuan plain



Wetland change



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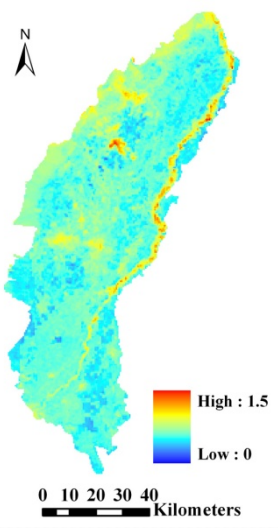

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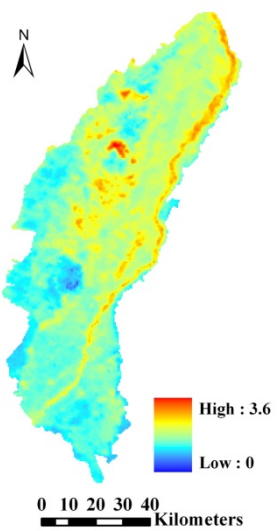

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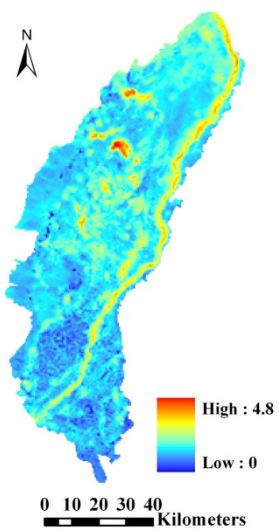

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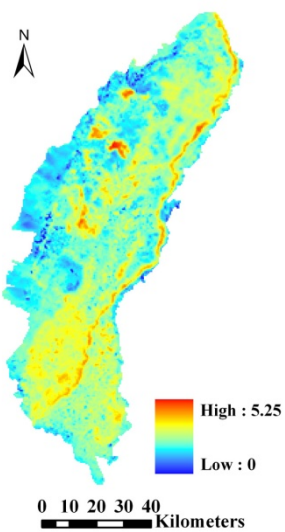

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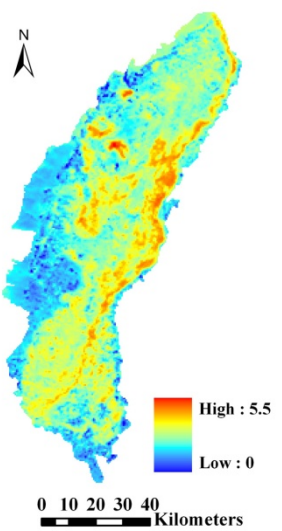

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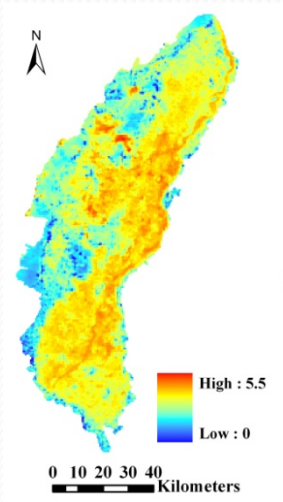

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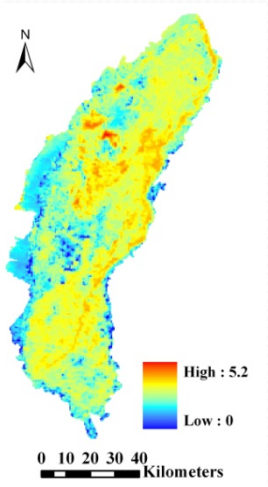

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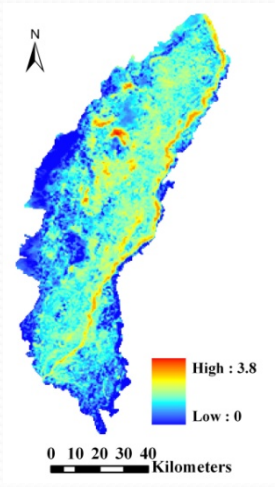

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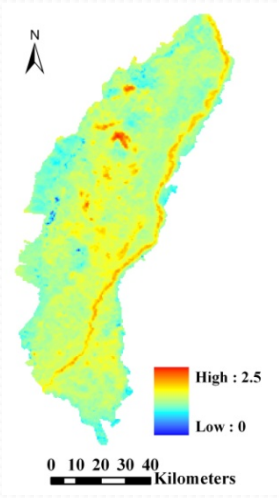

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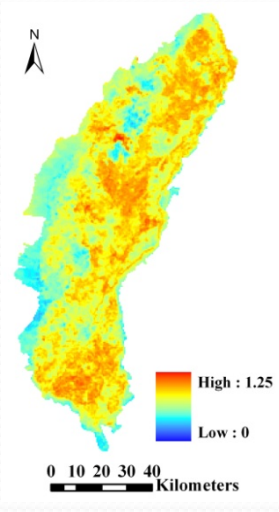

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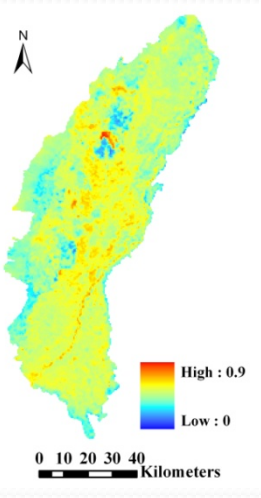

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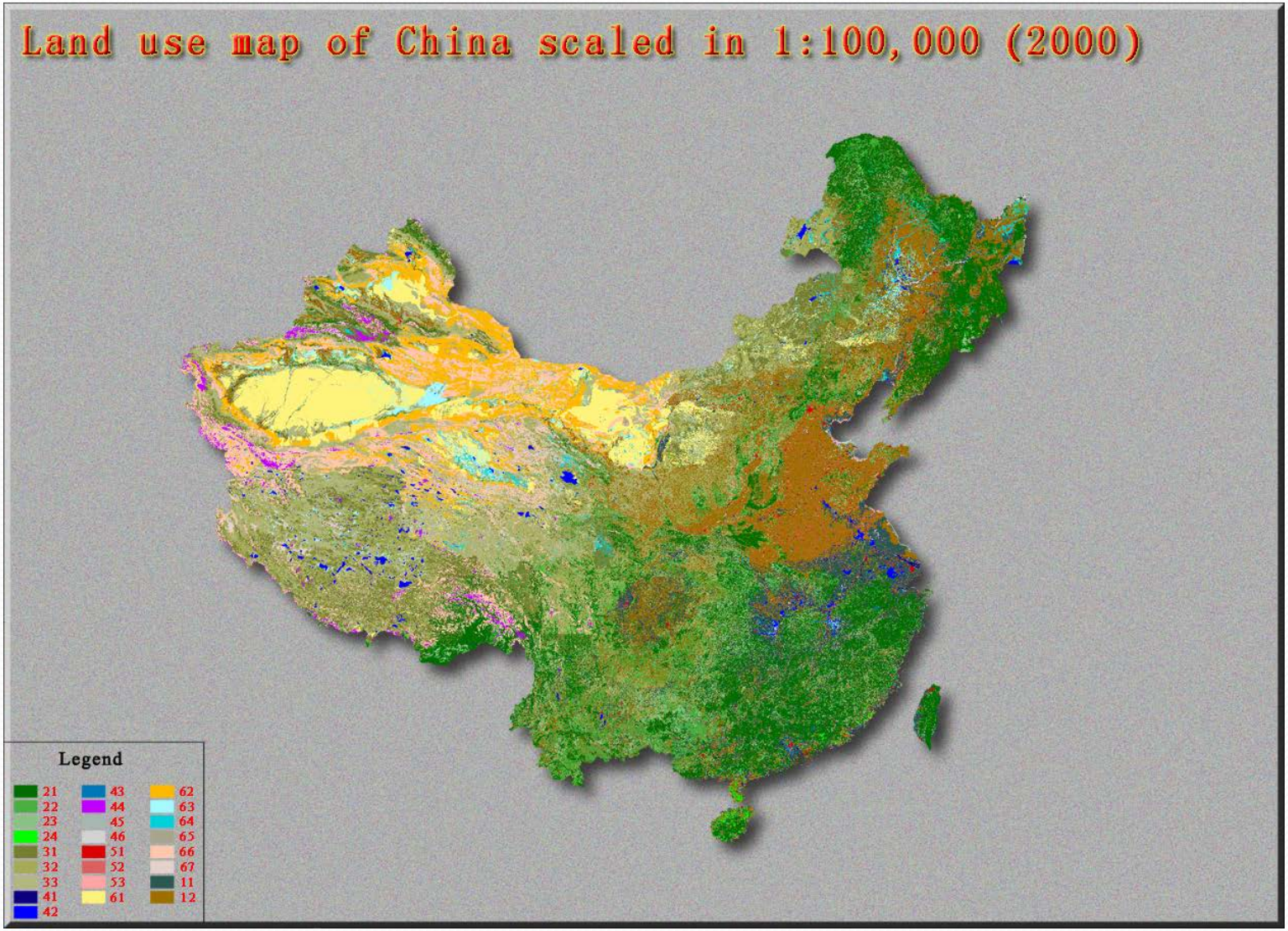
Land use map of China scaled in 1:100,000 (2000)
Legend
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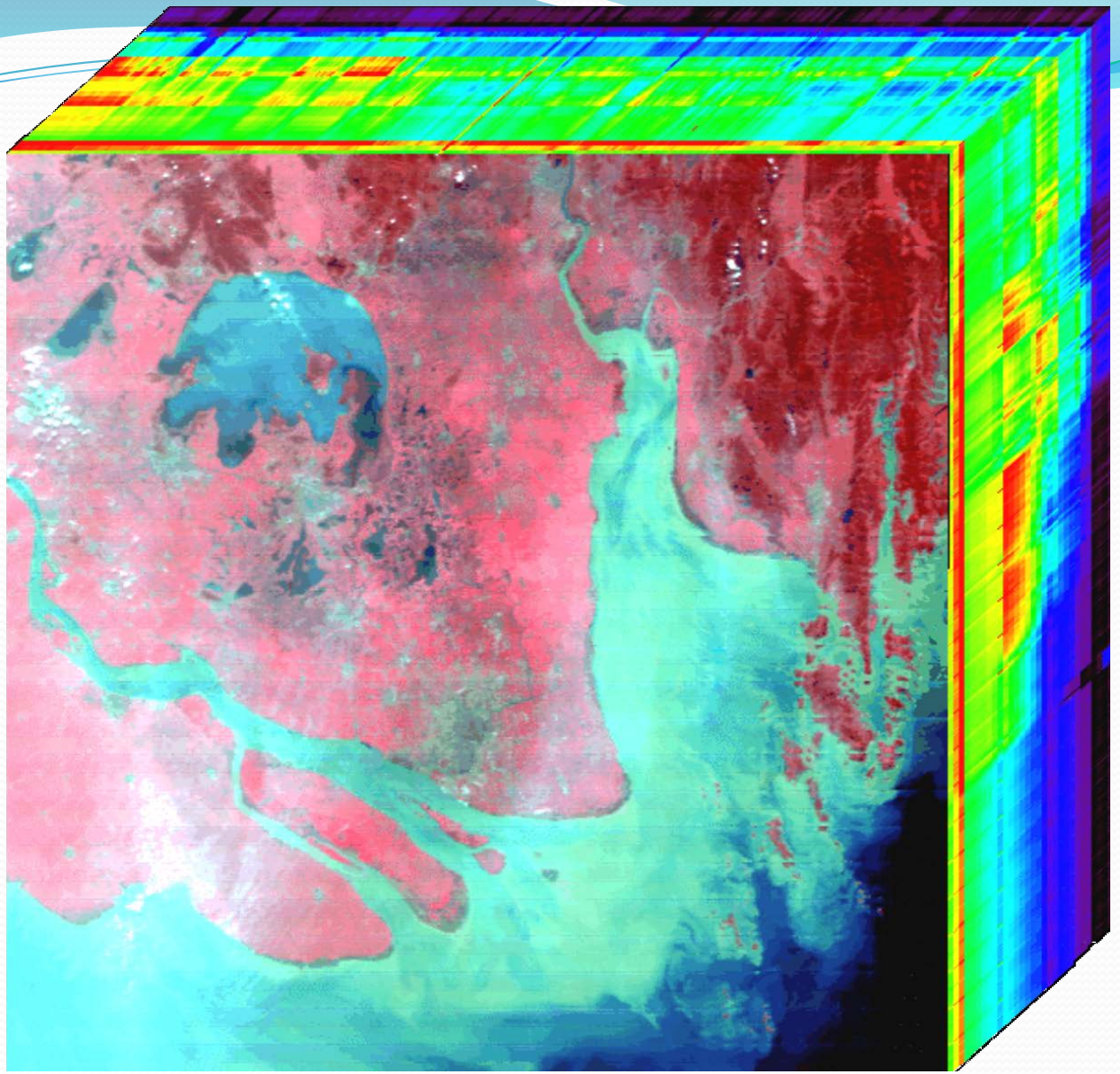
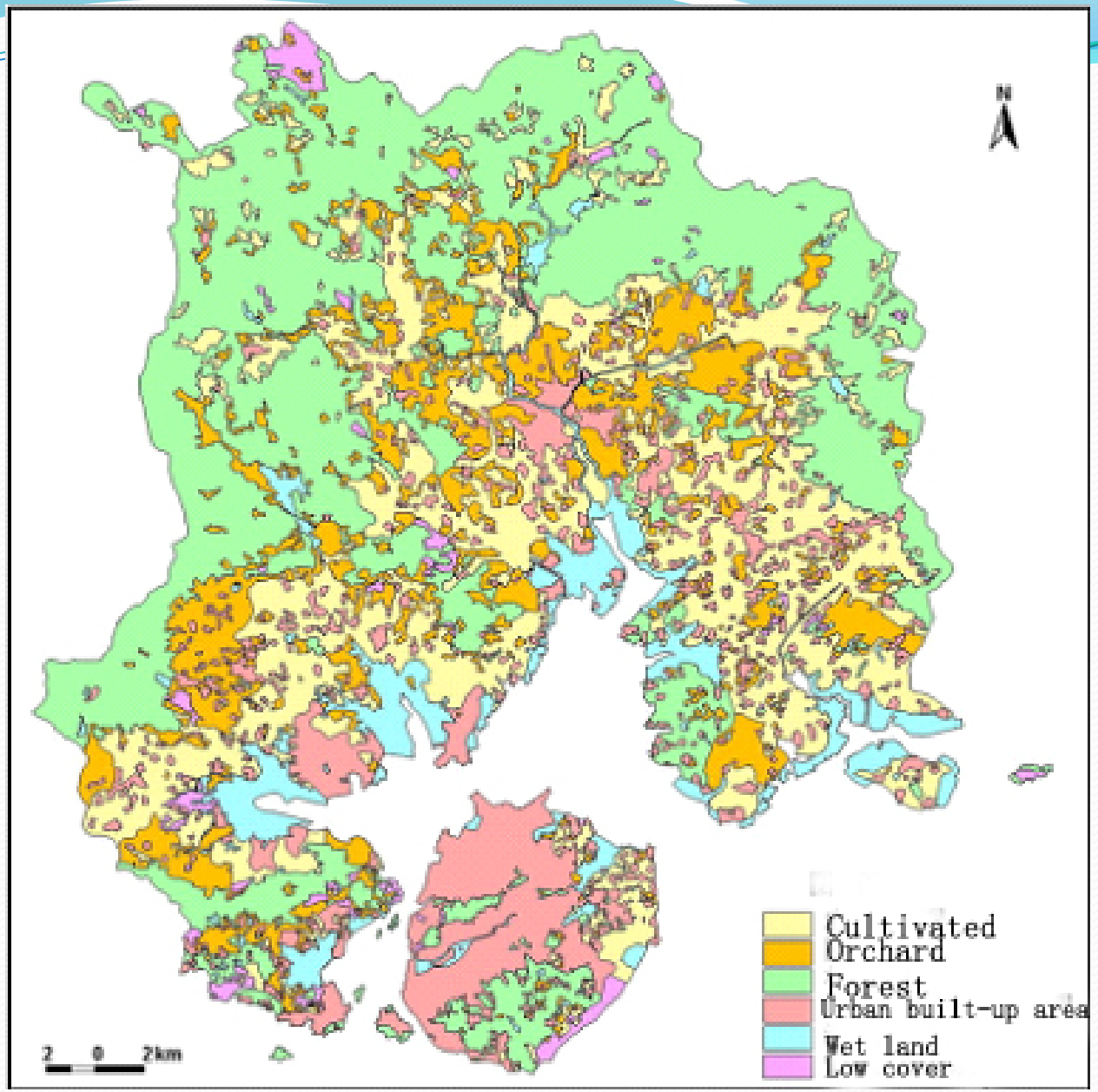
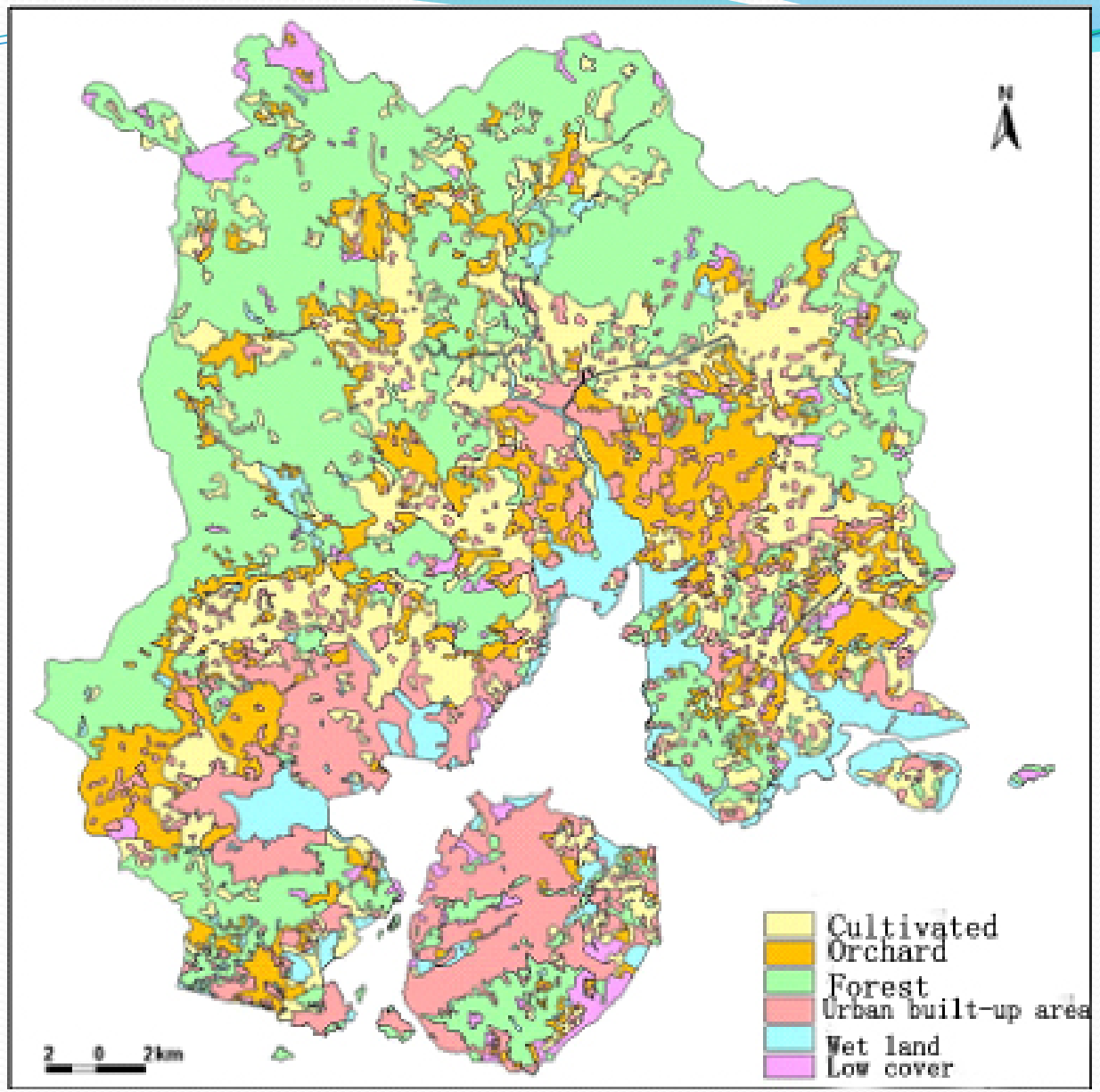


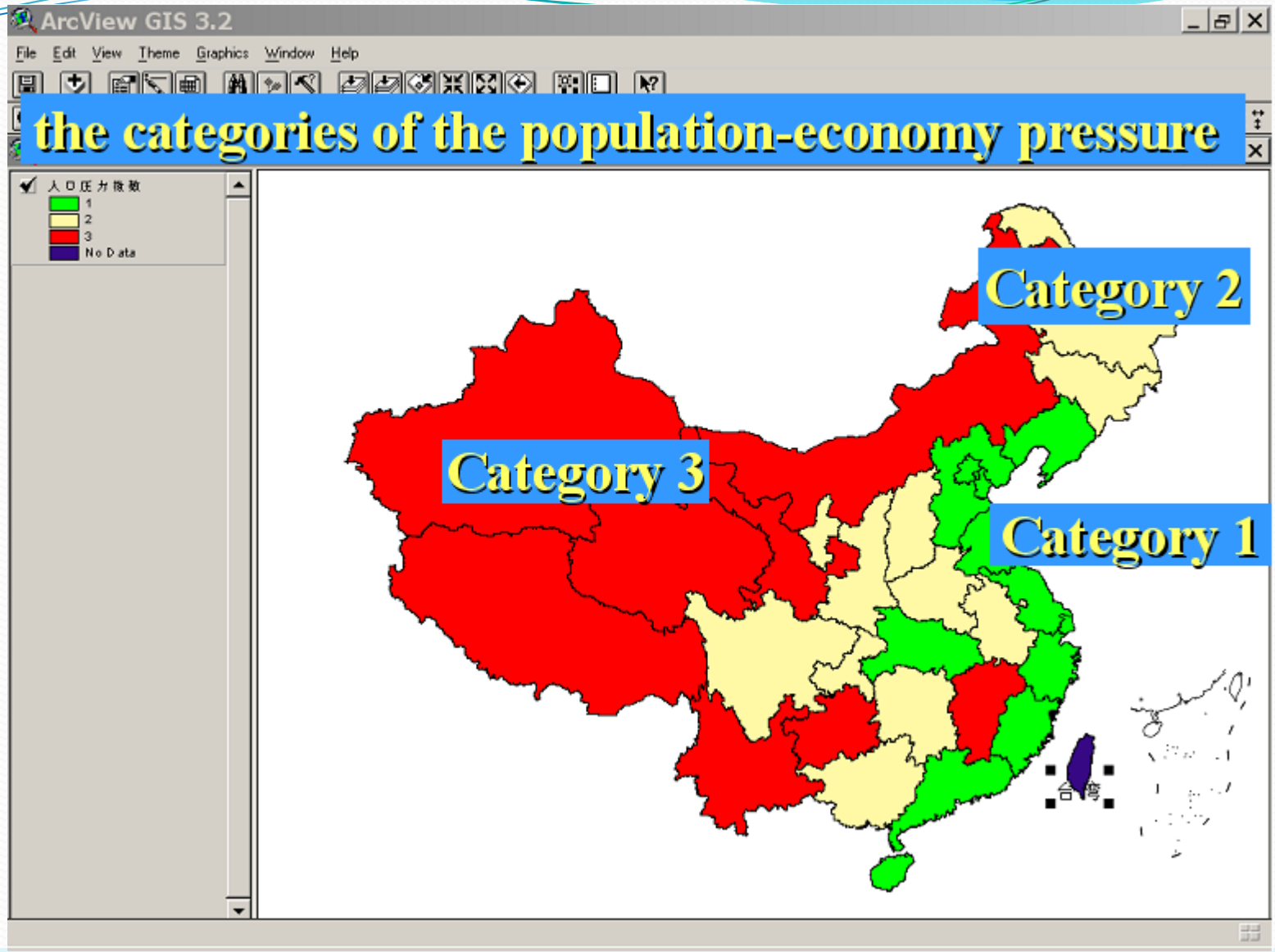
C-MODIS image of Tai Lake



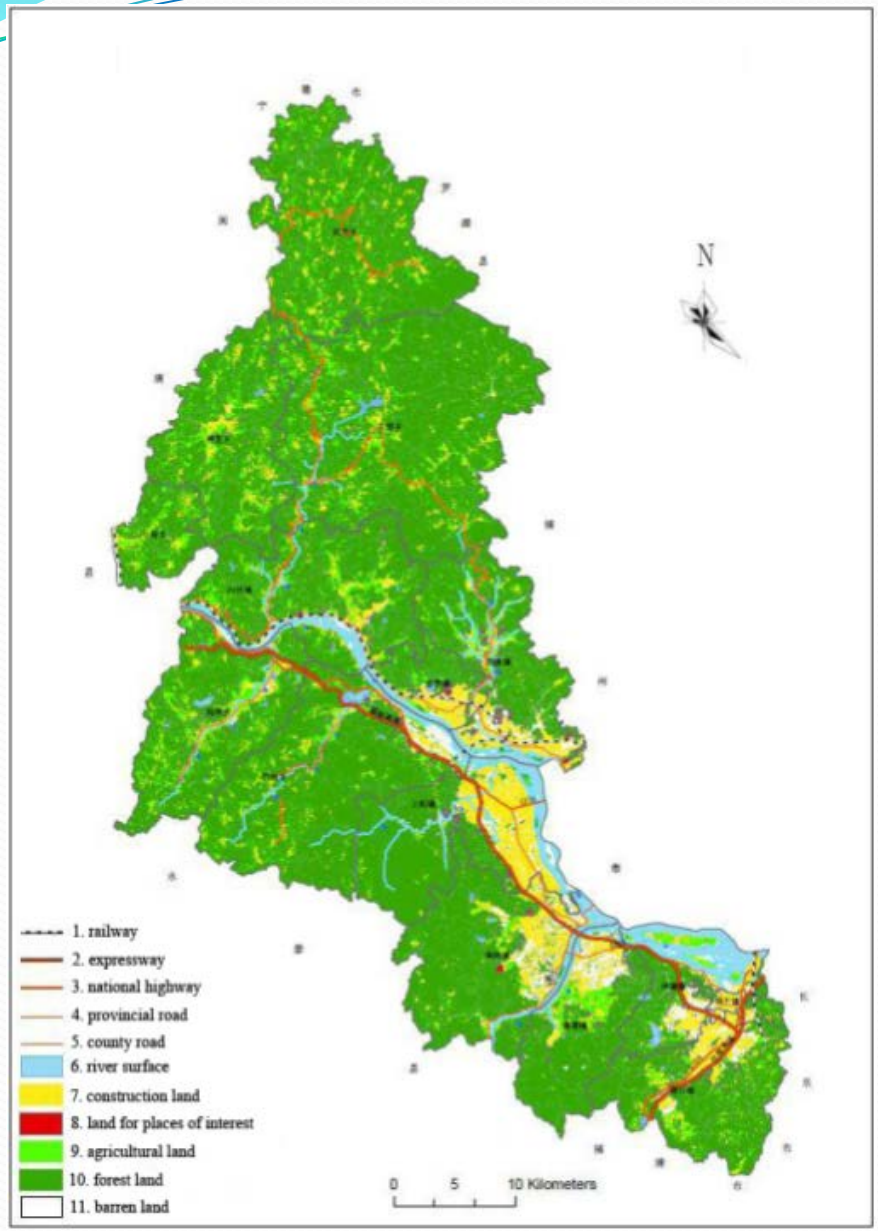
Landscape type map of Xiamen in 1998

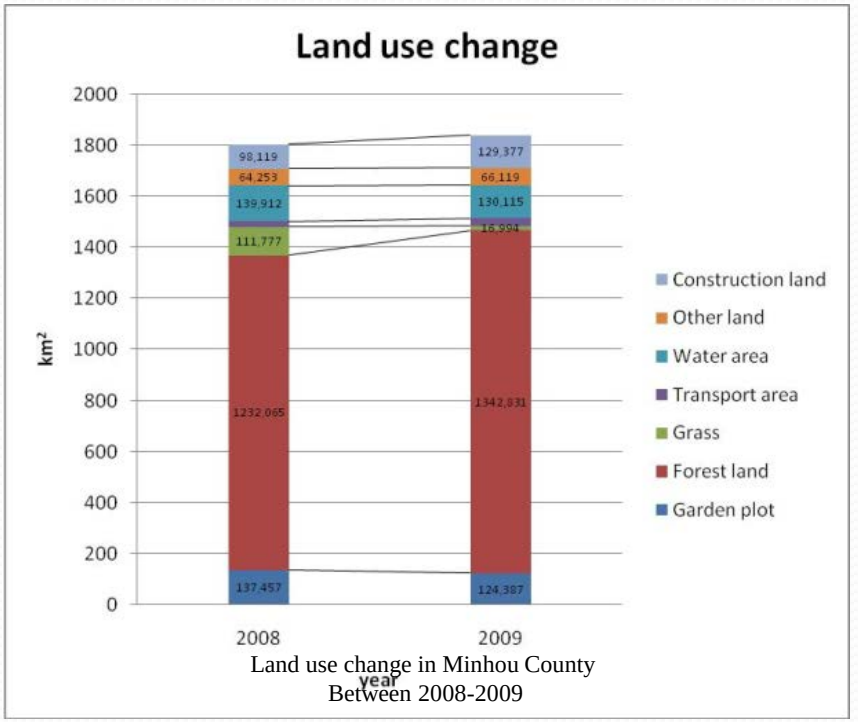


Landscape type map of Xiamen in 2008



data source: the statistical almanac of China of 2003

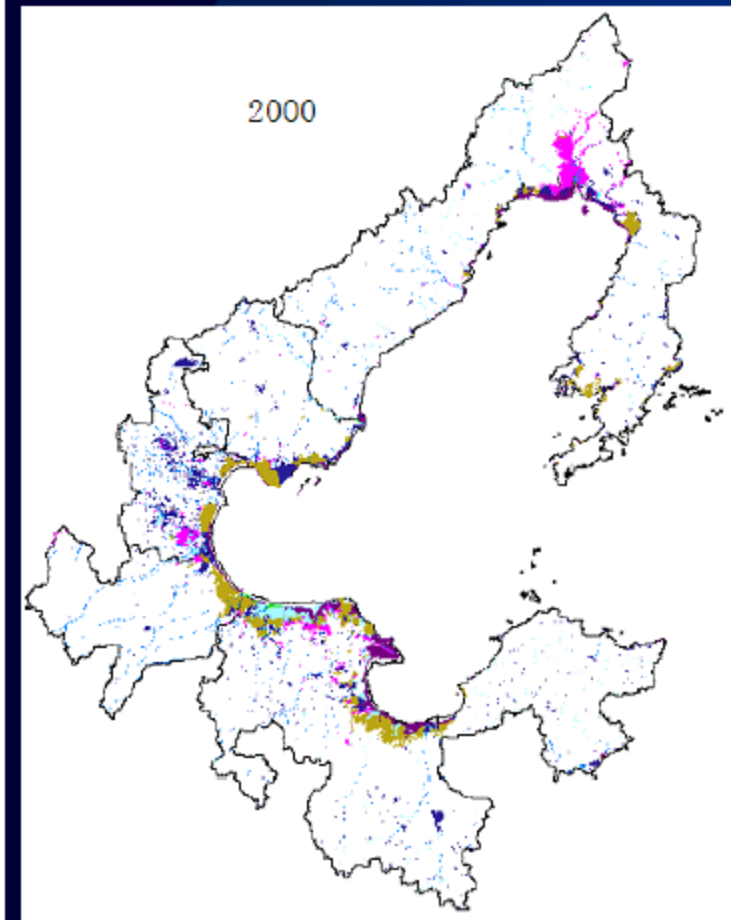


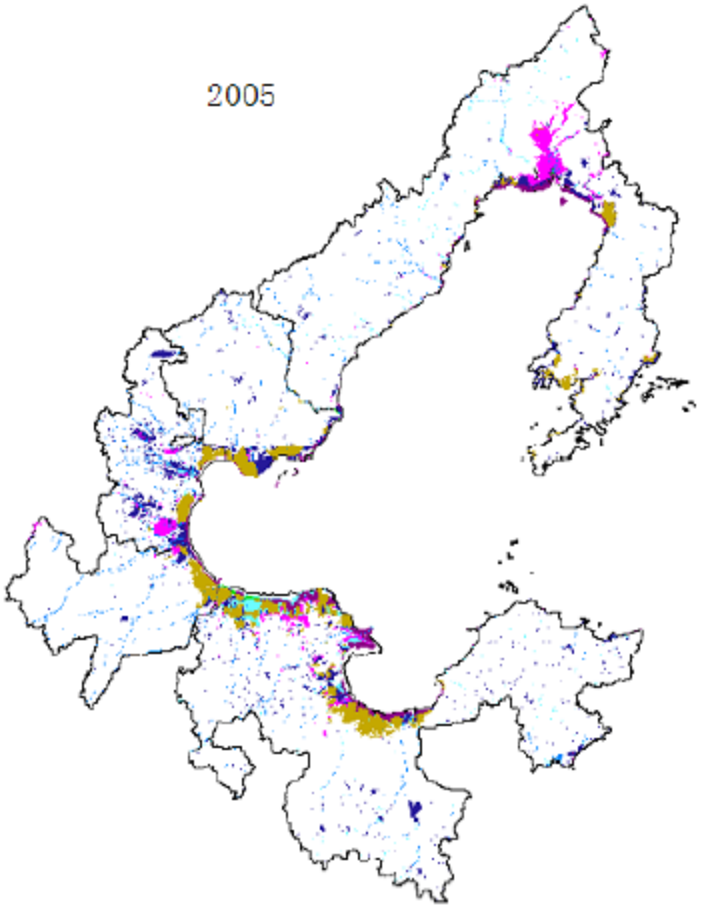


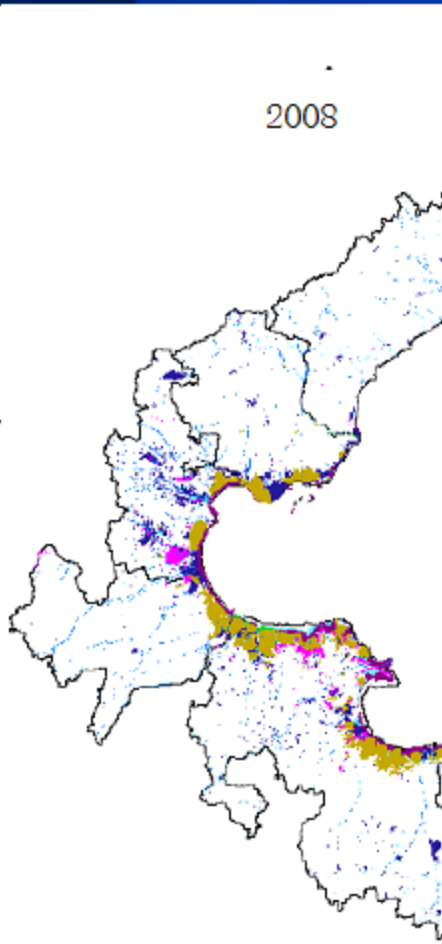
Land use change in Minhou County
Between 2008-2009

Land use of Minhou County

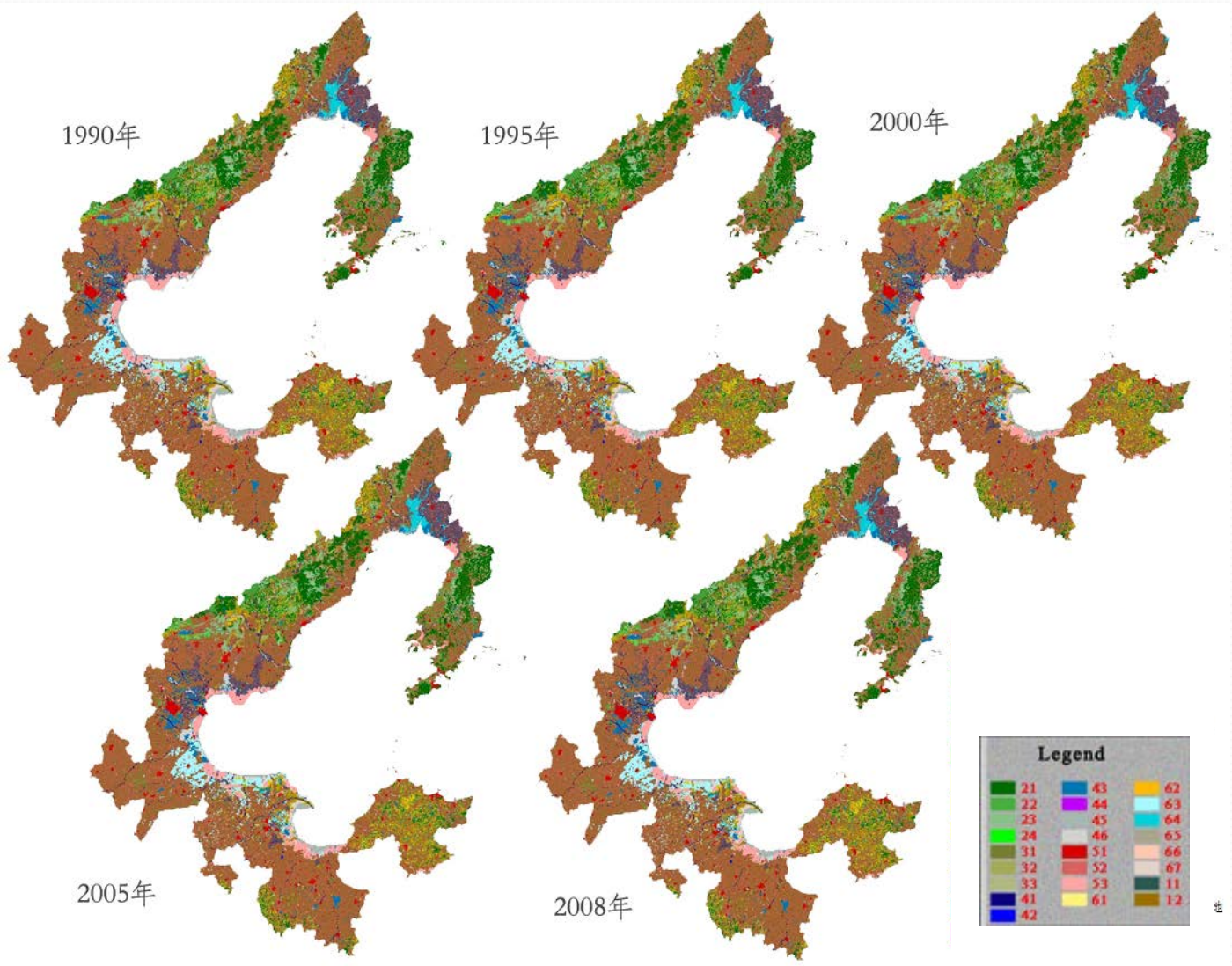
Coastal wetlands from 2000-2008







Land use and cover from 1990-2008



Problems encountered

- The Chinese partners tried to follow all the instructions regarding the organization of the research work and the associated mobility actions. For them the EU regulations were new and strange.
- From socio-economic perspective we experienced from the Chinese side that the most difficult task for them was to fulfill the Mobility Plan, in some cases their institutional requirements and interests coming from the Chinese leadership overwrote all requests from our side.
- There is no budget for the management costs and management meetings in Europe. It would be desirable to allow short travels(1 week) between the European partners aiding more effective co-operation and planning of research tasks.

THANK YOU FOR THE ATTENTION!

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