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# E-GIS

## EUROPEAN LEVEL DEVELOPMENTS OF FLEXIBLE LEARNING MODELS WITHIN GEOGRAPHICAL INFORMATION SCIENCE (GIS) FOR VOCATIONAL TRAINING

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### Abstract

E-GIS is a Leonardo pilot project, within Geographical Information Science (GIS), to be implemented over a three year period, 2002-05. The main objectives of the project is to establish co-operation between European Universities and GIS user organisations and to develop modularised courses intended for Internet based learning, establish links of communications between the partners in the project in order to disseminate and share “best practises” in different teaching situations and for different types of students. The course modules to be developed, all together, will constitute a one-year programme within GIS. This project mainly targets full time students, private and civil service employees within the EU but also similar categories in non-EU countries. The course modules are supposed to be flexible both in time and in “tempo”. However, synchronous group models will also be considered.

The outcomes of the project will be high level content, new net-based pedagogic method suited for accessing target groups of great diversity as regards pedagogic traditions, access to computers and bandwidth. Cooperation between the institutions will, certainly, give higher level courses than the individual institutions could possibly themselves.

### Objectives/ aims for the E-GIS project

#### *GIS as a tool for society*

Within Geographical Information Science (GIS) are handling geographical data, both in the form of “digital maps” and as “attribute data”. Attributes are e.g. tabular data connected to geometric features, like points, lines and surfaces, on a map, describing what type of feature an object represents and the characteristics of the object. A point could be a well, a line could be a road, a surface could be a cultivated field, etc. In most sectors of society, the use of GIS is currently increasing rapidly. The utility of being able to manage, analyse and visualise data using the graphic interface provided by the map has been recognised to improve efficiency for many organisations.

Informative data, linked on to geographical data, give society a unique tool for visualizing numerous situations in the geography, such as: a) *Physical planning*, b) *Tourist information (road information – choice of route for travel from one point to another and tourist site and hotel information)*, c) *Environmental issues and finally* d) *Natural resources*.

Data is found in GIS databases and may be picked up by accredited persons or by public in general. It all depends on type of information – and the level of security and necessary protection. In the following we will give some examples on information available for public.

Depending on the purpose of the GIS analysis, the data needed are either available or have to be captured. If we want to use GIS as a simple “map making system”, digital maps are often available and the user is able to create a layout that suits her/his demands. However, even if there are a lot of free

data available over the Internet, it should be realised that one of the main obstacles connected to extended use of GIS is high costs. More specialised analysis, like modelling of environment effects in time and space relating to different sources of emission, require detailed, user-specific, data that have to be collected and entered by the individual user.

## Partners

The project partners are 10 institutions from 6 European (BU, LT, NE, NO, PT and SE) countries, several are HEI, two partners one from Sweden and one from Norway are from the users side. For partner allocation, please see fig 1. Gjøvik University College is contractor and project coordinator.



**Bulgaria:** FRI (Forest Research Institute, Sofia)

**Lithuania:** VGTU (Vilnius Gedimino Technikos Universitetas)

**Netherlands:** ITC (International Institute for Geo-Information Science and Earth Observation)

**Norway:** GUC (Gjøvik University College), NAS (Nettskolen AS), Geolok

**Portugal:** ICIST (Instituto Engenharia de Estradas, Territorio e Construção)

**Sweden:** LU (Lund University), ULI (Swedish Development Council for Land Information), LUVIT AB

*Fig. 1 Geography of project partners.*

## Course content

The following eight course modules will be developed, all together constituting a one-year programme, 60 ECTS. **1. Basic GIS I** (Basics for understanding GIS and be able to identify operations for solving GIS concepts). **2. Basic GIS II** (Treats advanced GIS theory and discuss methods for advanced analysis). **3. Specification of GIS in an Organisation** (Learn to identify a user/organisation's needs for geographical information and the implementation of it). **4. Physical Planning** (Focus on the use of GIS in the process of establishing physical plans, and the public authorities' use of GIS as a decision support system) **5. Resource Planning** (Introduce to the student to GIS as a planning tool for resource management) **6. Environmental Planning** (The student will be used to handle environmental data in a GIS environment and discuss environmental data sources and data quality). **7. Geographical Data Modelling and Management** (The students will be able to use conceptual schema languages to describe (simple) information models and how to convert the models into databases suitable for geographical data, how to manage the database, including the user access to databases). **8. Internet GIS** (On completing the module the students have knowledge on how to visualise geographical data, both as traditional maps and as perspective views. The students will also have experience on how to distribute and use geographical data over Internet).

## **Why Internet-based?**

The main advantages of Internet-based learning, is increased accessibility, also for disadvantaged groups in society. Advantages are the possibility for attending courses at distant education institutions that may provide specific education not available at local institutions. Another obvious advantage by an intra-European co-operation is the sharing of best practise among the teaching institutions that will provide better quality for the students and constitute a basis for creative development of new course modules within special fields of competence not available everywhere.

The outcome of this project will be a network of co-operation between some of the most prominent GIS HEI in Europe. This network would be used to develop a set of modular courses adding up to a one year full time studies in the field of GIS. The concept of using short modules will have several advantages to traditional one term university courses. Those advantages are mainly: flexibility to choose only appropriate parts for students already professionally active, spreading the modules over longer time span for full time employees, full time student from different fields could top their exams with selected GIS competence and modules could easily be adapted to fit specific training environments, e.g. third world countries, district civil service, etc.

## **Practical use of GIS**

As indicated above, GIS can be used for many different purposes and by many different types of users. At a basic level, GIS is normally used for map making and data retrieval. Since the digital map data in the system are divided into different “layers”, it is possible for the user to construct maps at an appropriate scale and with desired data content. The data retrieval is twofold: either we can identify objects on the map and retrieve corresponding attribute data, or we can select specific attribute data (e.g. properties belonging to a specific user) and visualise where the corresponding map objects are situated by the use of the digital map. To make this data retrieval possible, the attribute data have to be linked to the map data. As a matter of fact, this link is the fundament of GIS, and a prerequisite for most analysis.

More advanced use of GIS, such as transport optimisation, environmental modelling and GIS-based marketing, can be very complex and complicated. Depending on application, the GIS analyst needs deep knowledge in e.g. mathematics, economy or archaeology. Only a few of the possible analyses have yet been performed. It can be stated that GIS is a multi-disciplinary tool with an enormous potential.

In appendix 1 a number of GIS applications are presented available through Internet. Most of the examples include data from eastern Norway, and all presented information is open for public.

## **Why E-GIS?**

Unfortunately the current level of understanding and skill is not very high in most European countries regarding implementation of GIS. A system for promoting education and training within the field for undergraduate students as well as for people already active in a professional career is considered high priority in many countries. In Sweden, as an example, the government has implemented a project over the past three years in order to pilot implementation of GIS in the public domain - promoting networking, sharing of experiences and education of civil service staff.

## **Pedagogic and technological challenges in the project**

The implementation of the E-GIS modules are planned to be as flexible as possible for the user groups concerning pedagogic and technological solutions. Some of the users starts and finish when they want (*Individual learning path*). Others will be working in synchronous groups starting and finishing simultaneously (*Joint learning path*). These two different approaches require different pedagogic and technological planning. Both has advantages and disadvantages regarding necessary resources and communication models. At the moment, we are in the project process of finding pedagogic solutions for the implementation of 'full freedom' - and synchronous group solutions.

Individual learning paths give possibilities for greater flexibility. This will, possibly be an advantage with target groups spread over the continent. Individualization will require numerous resources for implementation, in case each student should be supported individually. Most possibly, a kind of 'self-correction' type of tasks could be basis for evaluation.

Joint learning path gives possibilities for the students to interact and exchange experiences through the course. One may establish student groups, net-discussions and student-to-student evaluation.

The 'transport' of GIS information requires Internet connection with high capacity (broad-band). Besides unequal access to broadband and even computers in some of the partner countries, there are technical challenges among the partners and target groups, how to access all these with the same information and the same goal for competence development. The modules developed in the E-GIS project, will be designed for many different user-groups implying that the demand on flexibility is extremely high. The partners will contribute with target groups comprising campus students and civil service employees. Some groups will be spread over Europe and some being concentrated in closer regions.

Students with a higher level of technical facilities will be able to use sophisticated e-learning tools, video streaming and on-line chatting while other students have to rely on written material and audio streaming. However, it has to be stressed that, independently of technical facilities, all students should be given learning material that are equal in terms of theoretical and practical contents.

Luvit is choosed as the tool for developing the course modules in the E-GIS project.

## **Experiences so far in the project**

Even if the E-GIS project has just started, the value of the project is obvious. Different partners have brought in different aspects of e-learning and GIS methodology into the project, which already have given effect. The idea to intensify the cooperation between experienced GIS teachers interested in pedagogic development and skilled pedagogues has proved to be successful. Different experiences from different parts of the world have been integrated in this new learning concept, with focus on high theoretical and practical standard as well as on flexibility, both in terms of student groups, transfer of knowledge, starting data and tempo.

## **Expectations**

The specific results of the project can be divided into three parts; 1) Development of GIS course material adapted to flexible learning methods based on ICT, 2) New methods of building up course modules for the adaptation to specific target groups, and 3) A strengthened international network concerning GIS, resulting in future close cooperation. The main target groups for the courses will be ordinary students in higher education as well as professionals. The course material will be adjustable according to educational level, technical support and area of interest of the target group. Continuous evaluation of theoretical as well as pedagogic content of the courses will assure broad applicability. All course material will be developed in printed form, on CD ROM and available in interactive form on Internet connected to e-learning systems. The cooperation between the universities will also provide possibilities to “share” experts and strengthen multidisciplinary international research and education within the European society.

## **References**

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[www.lu.se](http://www.lu.se)

<http://www.giscentrum.lu.se/>

<http://www.geographynetwork.com/>

<http://www.ringsaker.kommune.no/internett/default.asp>

(For Scandinavian speaking people. The GIS examples are picket up from here)

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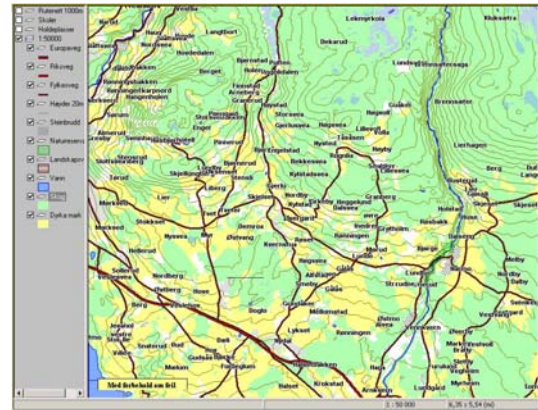
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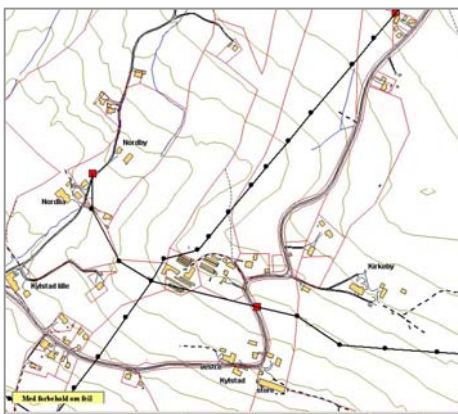
# Appendix



**Fig. 1 Map information.** A regional map. Little information



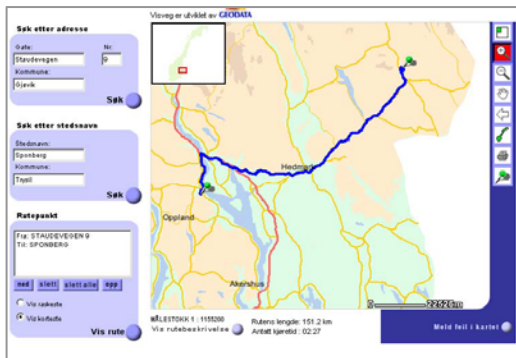
**Fig. 2 Map information.** A certain area of the municipality have been marked for enlargement. We can now view roads and names of places.



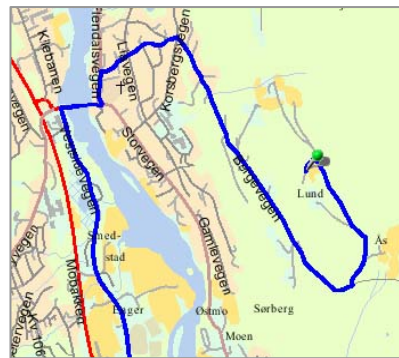
**Fig. 3 Map information.** Further enlargement and we can view houses and other geographical details.



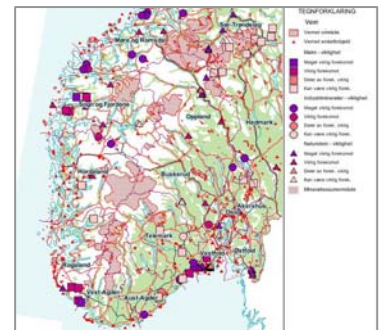
**Fig. 4, 5 and 6 Map information.** Displaying a municipality map. From the map, we may access the area by vertical aerial photographs. This may further be enlarged to give extreme details, down to individual houses in the area.



**Fig.7 Tourist information.** A start and destination address has been given to the GIS system. The shortest route has been calculated and marked on the map.



**Fig. 8 Tourist information.** Further enlargement – and you can't miss your destination.....



**Fig. 9 Recourse management.** Protected areas in South of Norway- also displaying places with mineral resources