FIELD SURVEY

CONTAMINATED LAND

GEOGRAPHIC INFORMATION SYSTEMS

GEOENVIRON
Managing the Environment

GEOKON

POLLUTION PREVENTION & CONTROL

RIVER MONITORING

WASTE MANAGEMENT

WATER SUPPLY

CASE MANAGEMENT

WASTE WATER

INTRODUCTORY OVERVIEW

Geokon is an independent software house specializing in environmental data management systems for local, regional, and government authorities as well as major private companies.

Established in 1971 Geokon is among the pioneers in software development in Denmark and from the very start working with geosciences and environmental subjects.

The company has its base in Copenhagen, Denmark, and system provider to environmental authorities in a series of countries

During the last 15 years Geokon has developed a very large environmental information and management system, GeoEnviron, dedicated for environmental authorities in industrialised countries.

From a solid base in Denmark with more than 2000 users GeoEnviron has expanded to cover environmental topics in a series of countries in Europe and the Far East. Today GeoEnviron is probably the most comprehensive environmental information and management systems in the world and continuously expanding.

THE GEOENVIRON HISTORY IN SHORT

During the late eighties and early nineties Geokon, as an environmental consultancy company and software vendor, was engaged by the counties in Denmark to map potentially contaminated sites.

Due to the vast amount of data collected, it was necessary to build up an automated system for handling and prioritizing these data. By the end of this task we stood with a local system and a technique we felt could be improved for use in other countries with similar problems.

In 1994, Geokon initiated the process of developing an international environmental management system for state, regional, and local environmental agencies. Through the European EUREKA Research & Development.

Programme Geokon formed a group of English, Russian, and Danish environment and IT companies for the development of GeoEnviron. In 1996 prototypes in English, Russian, and Danish were released and afterwards made commercially available.

Geokon did all system design and programming and the partners with all rights belonging to Geokon specified local adaptations.

Originally, GeoEnviron was designed for desk studies on potentially contaminated sites and prioritization of remedial actions, but it soon became quite clear that the market demand expanded beyond this. Users needed features for field surveys and remedial actions, which were implemented early 1998.

Requests for case management, inspection, and control of running industries added further to the system.

We decided to launch GeoEnviron as a general system for managing technical environmental data, i.e. soil, groundwater, surface waters, river monitoring, air, waste, and waste water together with administrative data for case handling, work planning and quality assurance with all data stored in a single all-encompassing database.

The goal was that all case officers in different departments across authorities could combine information and retrieve results for presentation via reports, GIS, graphs, and Web applications.

OVERALL FACILITIES

→ Efficient & reliable multi-user data storage and management - utilizes state of the art client/server SQL-based database technology

→ Enhanced strategic planning and workflow analysis - advanced reporting & analysis tools designed by environmental specialists

→ Fully GIS integrated - choice of integrations to MapInfo, ArcGIS, GeoMedia and others

→ Site Prioritization - transparent, defensible and easy to follow site prioritization system

→ Decision Support - contains a knowledge base with detailed information on industry profiles, contaminant properties and remediation technologies

→ Security - creates user accounts and gives each user appropriate access privileges to individual modules and tables

→ E-government - fully web enabled allowing for easy and reliable sharing of information

→ Quality support and continuous development - unlimited telephone support and active user group forum

THE IMPORTANCE OF TECHNOLOGY

As Geokon considered the creation of GeoEnviron, one of the first decisions we had to make was what development tool we would use.

We investigated a number of options for choosing the best development tool and we selected PowerBuilder because we found it to be a very powerful, efficient and cost-effective rapid application development (RAD) tool.

We were impressed with its object-oriented capabilities, its DataWindow data access, manipulation and presentation tool, and its open platform support.

We felt it would enable us to develop GeoEnviron in a way that would allow different groups of users in different countries and agencies to tailor it to their specific needs. In addition, this would make it easier for us to continuously update the application to meet the evolving needs of our users.

Geokon also employed PowerDesigner, Sybase's modelling and metadata management solution to model the back-end database and to generate its more than 1,000 tables. Geokon's developers used PowerDesigner's models to visually represent complex data structures and improve communication and efficiency between users and developers.

Architecturally, GeoEnviron is a client/server system that runs on standard Windows-based PCs. Users enter the complex data gathered by field investigators, along with any GIS or map-based data, into the application. The client portion of the application is connected to the application's back-end database (either Sybase SQL Anywhere or Microsoft SQL Server) via a local area network.

Once the data is in the GeoEnviron database, users have the ability to view them in a multitude of ways and to run reports quickly and easily.

The system is also Web-enabled to allow easy information sharing with colleagues and in some cases with the public.

Users consider GeoEnviron as a fast and very reliable application with low consumption of computer resources like disk storage and memory. Due to its link-and-sync design for integration with external systems, users can continue working in GeoEnviron although the external system may be down for extended periods.

Designing GeoEnviron we chose a modular concept where each module covers a defined environmental discipline, e.g. contaminated land, water supply, waste management, or river monitoring.

We wanted a fully scalable system from a single PC application to a client /server solution with hundreds of users where each installation could be tailor made by selecting the exact number of modules needed.

To give an impression on the range of possibilities the modules are listed as follows:

International modules:
→ Contaminated Land
→ Field Survey
→ Remediation
→ Boreholes
→ Samples and Analyses
→ Pollution, Prevention and Control
→ Air Monitoring
→ Waste Management
→ Waste Water
→ Oil and Chemical Tanks
→ Water Supply
→ Recipients and River Monitoring
→ Quality Assurance
→ Case Management
→ Document Management

GIS integrations:
→ MapInfo
→ ESRI
→ Intergraph

Local modules:
→ Nature Management
→ Open Pit Mining
→ Wind Mills
→ Livestock
→ Septic Tanks
→ Pest Control
→ Resource Planning
→ Time Management

VALUES AND BENEFITS USING GEOENVIRON

One of the main tasks for the authorities is to manage requests and complaints from the public and facilitate the disclosure of information by setting out administrative best practice that it is desirable for public authorities to follow when handling requests for information. Best practise is to follow the terms set out in the so-called Aarhus Convention, 1998, which most countries have signed, it states:

"Article 1: In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention.

The environmental information referred to above shall be made available as soon as possible and at the latest within one month after the request has been submitted, unless the volume and the complexity of the information justify an extension of this period up to two months after the request. The applicant shall be informed of any extension and of the reasons justifying it."
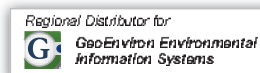
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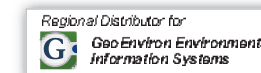
Prior to GeoEnviron environment health officers had to use a range of systems to cover their needs for collecting environmental data, handle requests and complaints from the public, which were laborious and time consuming with the risk of missing essential information or overrun the time limit for the request submitted.

As GeoEnviron is a modular and fully scalable system containing all environmental and administrative data in the same database all information is available on a fingertip. Together with the built-in GIS features, document handling, reporting, and quality assurance tools GeoEnviron forms a self-contained system dedicated for the case officers at environmental authorities to service both the public and to perform their in-house work in due time.

Consideration should be given to make web sites accessible to all and simple to use, such that information can be readily found and not be 'buried' on a site.

Using GeoEnviron data can easily be web enabled and plugged into the authorities' web site thus saving unnecessary requests.

In addition, environmental authorities should publish their procedures for dealing with requests for information. These procedures may include what the public authority's usual procedure will be where it does not hold the information requested. GeoEnviron can make these procedures available to the public as well as they can be used internally for quality assurance of cases and inspections.

One of the main benefits of GeoEnviron is the availability of both scientific and administrative data.

GeoEnviron is structured such that no matter how many modules are delivered with GeoEnviron in the first place, the full database is shipped with the system and thus be ready to be extended with new modules just by opening the modules with a code e-mailed by Geokon. No further installation is required.

As all data is in the same database serving different departments or agencies data can be shared among the different stakeholders. Regular access control provides the confidentially required for any data in the system. For example if one is investigating a dumpsite it is simple using the GIS integration to get an overview of adjacent receptors within a given radius. It could be rivers, water wells, residential areas etc. A click on one of these map objects conducts the user back to the database information of the object.

GEOENVIRON MAKES AGENCIES TO COOPERATE

The following describes a case from Sarawak (Borneo), the largest state in Malaysia, where GeoEnviron is utilized as a common system for all environmental State agencies and the municipalities in Kuching, the capital city of Sarawak.

BACKGROUND

In June 1999, the State Government of Sarawak initiated the process of developing an environmental management system for the City of Kuching. The focal point of the activities is the Sustainable Urban Development (SUD) Project, which is co-financed by the Danish Co-operation on Environment and Development (DANCED).

COWI A/S was requested, in close co-operation with the city administration, to assist in changing the environmental management processes of the city administration with particular emphasis on two selected and closely related areas of concern, river quality and solid waste management including illegal dumpsites.

The Sustainable Urban Development (SUD) project combines legal/regulatory expertise with environmental expertise in providing input to the administrative processes of establishing an urban environmental management system (UEMS) for the city of Kuching. It covers all aspects of the urban environment and enables the environmental authorities to manage the environment to reach desired goals for its future quality.

As the project proceeded, it became quite clear that the collection of extensive amount of data had to be stored in a comprehensive environmental database for later analysis, production of GIS maps, graphs, and reports.

The project selected GeoEnviron as the overall information tool and Geokon has since 2002 worked on tailoring the system to the specific needs of the agencies involved.

GeoEnviron is now running in Kuching as the main environmental management system (EMS) containing information on rivers, monitoring stations, pollution sources, e.g. industries, commercial premises, septic tanks and grease traps.

The main areas covered are river monitoring, registration of potentially contaminating industries and sites, e.g. illegal dumpsites and brown fields together with integrated waste management and wastewater management.

RESULTS

Data from the baseline study together with data collected by different agencies has been entered into GeoEnviron, which enables the authorities to retrieve annual reports on the overall river quality and detailed reports for specific areas. Sections of the rivers have been classified according to predefined goals and sampling stations has been registered for future monitoring.

The success of the project has lead to the decision that similar studies will be carried out for all river systems in Sarawak with collection of data for GeoEnviron.

Sharing data among governmental bodies is not a common issue but in case of Sarawak all state agencies within the environmental working field have overcome the normal resistance and under the lead of National Resources and Environmental Board (NREB), 12-14 agencies contributes to data collection and data sharing.

BENEFITS OF GEOENVIRON IN SARAWAK

Using a solid database and a single system covering all aspects of environmental issues where all agencies and municipalities share data the UEMS project for Kuching has survived long after the donor money has stopped. Local case officers perform the maintenance of data and a reasonably small maintenance fee for programme updates saves money in the administrative system.

As GeoEnviron is not developed for a single project, but as a widely used system with many customers throughout the world, the system is constantly moving towards better facilities for supporting the customers.

Being developed by a professional software house with the environment as its main target, the users can be confident when new facilities are introduced. GeoEnviron is a modular system where new modules can be developed easily by use of a toolbox equipped with already proof tested objects.

Statements produced by NREB and Eco-Ideal Consulting Sdn. Bhd. (Distributor of GeoEnviron in Malaysia).
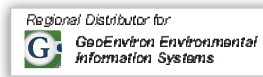
GeoEnviron, Background and Facilities

GeoEnviron, Background and Facilities
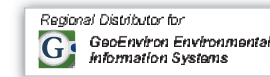
ORIGINALITY OF GEOENVIRON

The development of the GeoEnviron program has resulted in a number of requests from national, regional and local environmental authorities in many countries. To date, no similar system, devel-oped to the extent of GeoEnviron, has been located. In terms of the maturity of the system, GeoEnviron appears to be if not original, at least rare.

As far as we have had the opportunity to investi-gate the World market we have only found com-petitors dealing with data covered by a few of the GeoEnviron modules at the same time, but none covering the total environmental market.

Another aspect is that all modules of GeoEnviron are developed in close cooperation between end users and Geokon.

It is quite ordinary that such development occurs with software tools such as Excel spreadsheets, Access databases or other similar PC software ap-plications. For GeoEnviron, the development occurs within a sophisticated, relational database environ-ment upon which the user interfaces of the differ-ent modules are mapped.

Using PowerBuilder as the advanced development tool with its powerful facilities for inheritance of ancestor objects, enhanced use of datawindows, and reuse of programme code makes rapid applica-tion development possible.

On top of the client/server application, we have expanded the system with an umbrella of Web-ap-plications for Intranet and Internet use. Combining the better of two worlds, we imagine that we have created a unique tool for our customers.

RESISTANCE TO NEW TECHNOLOGY

Resistance to new technology has always existed and during the years, we of cause met a series of obstacles when we tried to convince people to use the new concept of GeoEnviron. Some are listed below:

- Creating standardized processes for decentralized individual departments.   Each business-operating unit, and even each department, had different busi-ness processes, and varying ideas for automation and standardization. The challenge was to make the data model and the programme so modular and flexible that it could be adapted to clients immedi-ate and to a certain extent future needs.

- Data sharing.   Since GeoEnviron was the first of its kind covering information for more than one department of an authority was the first challenge to the departments accept of data sharing, which was not common fifteen years ago. We had to make a security classification system for data privacy to convince the authorities that GeoEnviron could be used both for open and classified data. Even the Danish defence acknowledged the security and classification features of GeoEnviron as sufficient for use in national defence.

- Disparate IT systems that cannot talk to each other.   Even though a significant amount of effort had already been spent to consolidate IT systems, integration was and still is a significant challenge and gives many surprises along the way.

- Overcoming traditional ways of doing IT develop-ment and support.   The IT departments had evolved through a "functional" model, with specialists in each application and infrastructure area. With the introduction of GeoEnviron, the main applications were now integrated, forming an "integrated ap-plication environment", which were not common to the IT departments.

- Shared governance   between multiple business operating units meant that the main units had to form a "coalition" to fund and manage the system. IT served as a facilitator, but the business sponsors had to evaluate and prioritize new features, obtain sufficient budget for ongoing improvement, and manage the change internally.

- Internal resistance to the new technology and capabilities, discomfort with change, initial dis-comfort with technology, and reluctance to give up paper records.
One of the unanticipated challenges was the level of resistance by internal groups to the new technol-ogy and new systems. Many believed that the huge numbers of Excel sheets and small, specialized programmes were sufficient. "It is ok with a new system, but it must work exactly as the old one". We have heard this before. Campaigns to address these concerns had to be undertaken; change management and stakeholder management were critical success factors.
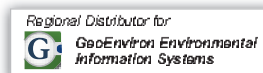
WE OWE THE SUCCESS OF GEOENVIRON TO OUR USERS

Summing up it has not been uphill all the way and at present, we have to admit that GeoEnviron has been a success not only in Denmark but also in a wide range of countries throughout the World.

The success of GeoEnviron is due to the coopera-tion with a long row of enthusiastic users who have been able to give in necessary information on legal issues, working standards and practical advice for user interfaces, needed reports and GIS operability. GeoEnviron has achieved its original goal of han-dling the widest range of environmental and admin-istrative data in one system so data may be shared among colleagues within one or more departments or authorities.
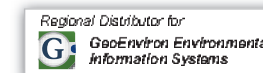
Furthermore, it has exceeded expectations by be-coming a de facto standard not only in Denmark but also in other EU countries and overseas.

Geokon Ltd   *Erik Kirsbo*
April 2010   *CEO*