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MAGIC – Multi-Agency Geographic Information for the Countryside

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Introduction

MAGIC is a unique partnership project bringing together seven government departments and agencies with a shared interest in rural policy. For the first time, information about key rural and countryside designations and schemes from the partners is available in one place. MAGIC uses web-based GIS technology to provide interactive maps and tools to explore the information, which is widely accessible to the partners and to other interested parties on the Internet at www.magic.gov.uk.

MAGIC has been developed using funds from the Invest to Save Budget¹ and from the Department for Environment, Food and Rural Affairs (DEFRA). The DEFRA Rural Development Service (RDS) Geographic Information Unit led the technical implementation of MAGIC and Phillipa Swanton of RDS managed the project.

Partners

- DEFRA
- Countryside Agency
- English Heritage
- English Nature
- Environment Agency
- Forestry Commission
- Office of the Deputy Prime Minister (ODPM)

The partners have a shared interest in the development and implementation of rural and countryside policies in England. This involves the collection and use of information on a wide range of countryside and environmental designations and land management schemes. Much of this information has a spatial or geographic dimension and GIS is increasingly used by the partners to manage and analyse this information to support and inform rural policy and decision making. MAGIC brings together information from all the partners into a shared information resource to enable the joined-up delivery of rural policies.

Rural and Countryside information – drivers for MAGIC

There is increased recognition that effective development and implementation of policies at all levels (from the national down to the site level) is significantly dependent on access to integrated information about existing and potential activity. Many government organisations use geographic information as a tool to inform the policy and decision making processes. These same organisations are working towards joined-up and modern ways of working. However, the approach to the development of geographic information and

implementation of geographic information systems has often been ad hoc and in reaction to a single circumstance or driver. Over time this has led to duplication of effort and inconsistencies in the information held by different government organisations. For example, commonly-used information such as maps of National Park boundaries have often been collected many times by different organisations and there is much variation in the way that data has been captured or is made available.

Prior to the development of MAGIC, information was being shared between departments but often on the basis of ad hoc arrangements that did not include any formal documentation of the data quality. Access to data was often restricted by concerns over data quality, currency or copyright. This served to highlight both the requirement to share core datasets and to agree protocols for sharing data.

Early development work carried out by DEFRA with web-based GIS technology had indicated the potential for effective and efficient delivery of information in support of the delivery of evidence-based policies and to provide the joined-up information needed for joined-up delivery of services. To further test this approach, and to demonstrate the potential benefits of sharing information, funding from the Invest to Save Budget (ISB) was pursued for the project. ISB was seen as an appropriate source of funds, as it is not tied to any one department and is supportive of more risky innovative projects.

Initial investigations of the business requirements indicated the need for an integrated and consistent overview of activities and resources, a common shared source of definitive information and the ability to use this information in conjunction with related information (for example, species and habitat data) available from other sources. Information requirements included designated areas, environmental interests (both opportunities and constraints), targeting priorities and information about existing schemes and managed land.

The benefits that MAGIC would provide were identified as being less tangible than simple savings in running costs; for example, a key benefit would be that the quality of decision making would be enhanced as decisions would be based on accurate, current and standardised information about designations and schemes. However, there was an expectation that there would be indirect cost savings by improving the efficiency of data collection, information exchange and provision and enabling the detection of double-funding issues (where more than one organisation might be making payments related to similar land management objectives). Furthermore, this approach would lead to an improvement in the delivery of the public services provided by the participating organisations and provide public access to information relating to significant public expenditure.

MAGIC would also provide enhanced opportunities for joint working in the targeting of public expenditure for the conservation of natural, cultural and landscape features with respect to both strategic policy development and local implementation. A shared centre of excellence for rural GIS would be developed by capacity building and sharing of expertise, as the intention from the beginning was to lead to a broader pool of expertise in the use of spatial data across a range of organisations rather than limiting experience and understanding to small specialist units working in isolation.

Implementation of MAGIC

The implementation plan identified that the partnership approach would be the key to success with a joint aim and objectives agreed at an early stage in the project. The aim of MAGIC was therefore confirmed as providing a one-stop-shop for rural information in England for the partners. The agreed objectives were to act as the definitive source of spatial information about rural designations and land-based schemes and to use web-based technology to create a single online GIS as the means of providing access to the information resource. Furthermore MAGIC would increase awareness of rural information and provide information for other applications including the Countryside Information Systemⁱⁱ or CIS.

The primary intention for MAGIC was to meet the needs of the partners but wider access to information was also identified at an early stage as an important element of the project. The use of the Government Secure Intranet (GSI) had initially been considered as the delivery mechanism for MAGIC. However, not all of the project partners were eligible to join GSI and an alternative Internet-based approach was selected, as this

met the initial objective of providing networked access for partners and offered a scaleable extension to other departments, agencies and the wider public. The ESRI ArcIMSⁱⁱⁱ software was selected to provide the GIS technology for the application and a dedicated Internet server established.

At this point in the project, progress was severely disrupted. Within a day of the first outbreak of Foot and Mouth in England the DEFRA project team been redeployed to develop interactive maps showing areas affected by disease control restrictions. Development of MAGIC was all but halted but the approach and vision envisaged for MAGIC were used instead to provide information to the farming community. The experiences in providing this service provided a benchmark for future developments, as the interactive maps for Foot and Mouth received up to 600,000 visits a day.

A dynamic approach was taken to identifying the user requirements for the Foot and Mouth interactive maps, The initial Foot and Mouth maps provided a full screen image and GIS tools designed for a specialist audience and performance and resilience were critical to the successful implementation. Feedback in the early stages confirmed that performance was simply not adequate and that the site was not resilient enough to cope with the level of interest. The site was quickly redeveloped to provide a new application with a much smaller map image, less detailed base mapping and simple interactive tools designed to help non-expert users find the information they needed quickly. An additional mirror service was established to provide extra capacity and resilience.

ArcIMS expertise was provided by English Nature, one of the partner organisations, to supplement the depleted MAGIC project team for the duration of the outbreak and allow some development work to continue. Users from the partner organisations (and other bodies) were actively involved at all stages of the development. The agreed approach was to develop a prototype for a proof of concept exercise and to fully establish user requirements, as many potential users had had little exposure to GIS or web-based GIS.

Despite the difficulties the first prototype of MAGIC was made available by May 2001 by drawing heavily on expertise from the partners and the experiences of delivering interactive maps over the previous three months. At this stage access was restricted to a small group of users and the prototype was designed to generate discussion about the user requirements of the first live system. The simpler approach taken for the Foot and Mouth interactive maps developed over time to a more specialist interface suited to the requirements of the partners. MAGIC users wanted the flexibility to choose the datasets shown on the map and to pick and mix within a session, they wanted the ability to save and reload maps and to see information overlaid onto a range of map scales from 1:625,000 to 1:10,000. Users requested an analytical capability to allow spatial searches and provide reporting facilities. They also asked for an area measurement tool and the ability to print and export high-resolution maps.

Development work for the live system was carried out from September 2001 to May 2002. During most of this period the prototype remained available, additional functionality was incorporated as it was completed and feedback requested from the users. In the meantime the core datasets for the system were identified and collated and a number of data capture exercises instigated, as some essential datasets were not available in digital format. The data model was created based on research into data standards and protocols established for documenting and updating the data. At this stage a decision was taken to store the data in SQL Server rather than in a proprietary data format and the ESRI Spatial Database Engine (SDE) is used in conjunction with ArcIMS to access the data.

The MAGIC web site (www.magic.gov.uk) now provides the interactive map tools supplemented by information about the project and links to information resources on the Internet. By September it should include around 65 rural datasets all of which should be documented to a common standard. The interactive map tools that allow the users to access the information spatially are supported by map tutorials and online help, and include all the functionality requested by the users. All access restrictions have now been removed from the system.

MAGIC has brought together a group of organisations with a common interest in joining-up aspects of their work. It is a key example of the innovative use of new technology that has improved efficiency and

motivated other organisations by sharing expertise through the project and demonstrating what can be achieved. It promotes sharing of information in a transparent and outward-facing manner.

MAGIC was made available on the Internet from May 2002, although the formal launch was not until the 25th July 2002. During the pre-launch phase there were almost 500,000 hits recorded on the web site (20,000 on one day) and 1,500 unique users. (All users accessing via the Government Secure Intranet count as a single user so the actual number is far higher). This serves to demonstrate the level of interest in rural and countryside information and provides a benchmark for the future.

Lessons learned

Working together in this manner requires commitment and dedication at many different levels. Once the commitment has been obtained at a high level it can take time for resources to filter down to enable participation at the working level. An early programme of awareness raising with each of the partners proved invaluable and allowed a joint aim and shared objectives for the project to be developed.

A key success factor was the creation of a number of different groups that included representation from each partner. The development was overseen by a steering group and a separate technical group formed by the GI and data specialists from each organisation supported the work of the project team. The sharing of expertise in this way was invaluable. One member of the project team has been seconded from ODPM for the duration of the project, which both ensured that the core project team had the range of skills needed and the knowledge of how other organisations worked. Finally, a user group was formed from potential users of the system. The users contributed ideas for the development of the system to support their own work and carried out user testing. Our thanks go out to everyone who contributed to these groups.

It did prove difficult at times for some of the participants to dedicate time and resources to aspects of the development. For example, working to develop and meet the data standard proved to be time consuming and often conflicted with other operational priorities. It is clear that if the adoption and implementation of common data standards is to become a reality, this activity must be acknowledged as a priority and funded as such.

Unforeseen internal and external factors also had a great impact on the project, as the involvement of seven partners increases the nature, scope and number of risks. However, to balance this working in partnership offers additional scope for capacity building as, for example, when DEFRA technical staff were diverted to other work, then there were significant advantages in being able to utilise expertise from English Nature.

It is also essential to manage the expectations of users. MAGIC users demanded far more flexibility than is normally provided in a web-based system, which could have had a detrimental impact on performance. The performance of MAGIC has been proved to be extremely dependent on the mechanism that the user connects to the Internet with. The user interface also needs to be designed to enable easy use by non-specialist users whilst providing the tools that more specialist users required.

Data issues were at least as challenging, if not more challenging than, technological issues. Very few of the partners (including ourselves) could provide metadata or documentation about their data and have had to invest time and effort in creating this. Issues of data quality, currency and accuracy caused many concerns for both the data suppliers and users. Some partners initially expressed reluctance to provide data for use in MAGIC because there were known weaknesses in the data. To some extent though these two issues go hand in hand, as adequate documentation of datasets that clearly states the limitations should go some way towards ensuring it is not used inappropriately.

The benefits of participating in the development of MAGIC are already being realised by the partners who have expressed their view that MAGIC has dramatically improved their ability to share information. MAGIC demonstrates the potential of the Internet for data sharing and is part of a wider culture of change that will support the e-Government objectives and greater joined-up working. Throughout the project, partners have worked to improve the quality of their own data and moved towards a common baseline of standards that allow other organisations to use their data.

Partners act as both users of MAGIC and suppliers of information to others. All the partners have recognised the benefits of MAGIC for their own organisations but also recognised the collective benefits and the value of providing information for the wider community. MAGIC provides a low cost (but widely accessible) GIS toolkit for each partner that allows their own information to be seen in context with a wide range of environmental data from other organisations.

MAGIC also provides the opportunity to improve access to other government and public users with an interest in land and land management. For example, the Forestry Commission expect that MAGIC will improve the quality of applications for woodland management schemes, as applicants have direct access to information about the environmental opportunities and constraints that relate to their own woodlands.

However, it must be acknowledged that the current version of MAGIC has been designed to meet the needs of the partner organisations. Further work will be needed to establish the requirements and expectations of public users, and to design a system that meets their own needs.

The next steps

DEFRA has made a commitment to continue to develop MAGIC as a platform for promoting sustainable development through joined-up policies. Key activities for the future include expanding MAGIC as more datasets become available, establishing and strengthening links with other organisations, exploring links with the devolved administrations, investigating interoperability and exploring the potential for wider access to MAGIC. We will also carry out fine-tuning and seek to enhance performance as well as exploring the scope and requirements for a data download facility and a CIS export facility to enable the wider use of data.

MAGIC currently contains (or will shortly contain) 65 different environmental datasets. Negotiations are ongoing with a number of other data providers to extend and develop the information resource to provide a wider base of rural data. This could include soils-based information, agricultural and rural statistics, habitat inventories and information about the socio-economic characteristics of rural areas. Users are actively encouraged to suggest additional datasets for inclusion in MAGIC.

MAGIC is now one of many information services on the Internet. We therefore wish to explore the potential for MAGIC to provide data to other applications and to use data from other services. For example, a pilot project has been set up with the National Biodiversity Network (NBN)^{iv} to establish a level of interoperability between MAGIC and NBN.

It has already been acknowledged that MAGIC was designed to meet the needs of the partner organisations. The user interface has been designed to be intuitive but users tend to be specialists with good understanding of the datasets. There is a far wider interest in rural data than simply within the partners - other departments, Local Authorities, non-government organisations and the wider public. Additional resources will be needed to fully establish and meet these wider requirements for MAGIC.

Conclusion

MAGIC provides access to a unique collection of rural information and desktop GIS tools to view, interrogate and analyse that information. Each partner benefits by having access to the information from the other project partners, and there is a collective benefit in working from a definitive and consistent information resource. As MAGIC is readily accessible on the Internet these benefits will also be more widely realised by other departments, agencies, non-government organisations and the wider public.

MAGIC is an excellent example of what can be achieved by working in partnership, using the opportunities provided by modern technology to improve the quality and efficiency of services. Open and shared access to integrated information about the countryside is seen as essential, particularly where the same information can be made available at all scales from local to national. The MAGIC partnership will continue to develop and to seek new innovative ways of working based on this approach.

ⁱ Invest to Save is a centralised government budget created to help government departments work together in innovative and more efficient ways [www.isb.gov.uk]

ⁱⁱ The Countryside Information System (CIS) is a Microsoft Windows-based program developed to give policy advisers, planners and researchers easy access to spatial information about the British countryside. CIS contains a wide range of environmental data - including landscape features, vegetation habitats and topography for each one kilometre square of Great Britain [www.cis-web.org.uk]

ⁱⁱⁱ ESRI Arc Internet Map Server software [www.esri.co.uk]

^{iv} The NBN is a national project that is building the UK's first network of Biodiversity information [www.nbn.org.uk]