GIS IN NOISE MAPPING

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1. INTRODUCTION

Geographical Information Systems are becoming an increasingly common site in the public and private sectors. Their use for managing, analysing and exchanging information has lead in recent years for calls to develop common data standards and structures, so that organisations are able to share data and undertake more understandable and consistent decision making. In addition, new complex geodatabases are being taken up requiring increasingly sophisticated management techniques, whilst providing new levels of compatibility with other professional disciplines.

This paper explores how a modern GIS can be a powerful dynamic information management tool capable of joining people together through their common interest in data. It considers data initiatives and the impact these may have on future noise mapping.

2. WHAT ARE GEOGRAPHICAL INFORMATION SYSTEMS?

GIS maybe thought of as a project tool for managing, querying and visualising spatial data. This of course is correct, however from an organisation point of view a GIS can be much more.

There are 5 recognised components to a GIS – Software, Hardware, Data, People and Protocols.

When an organisation implements GIS corporately, many considerations need to be taken on board; to ensure the hardware can support the software, software can read the data and that staff are trained to use the software and follow protocols when using the data in their work.

Analysis[1] of the GI sector has identified 3 levels of GIS user:

Expert users who build and maintain systems which hold the organisations information infrastructure together

Domain users who use data for specific business purposes, such as noise mapping, and

End users who want to see the results for decision making

The interactions between these 3 levels of user are essential to ensure the 'expert' users provide sufficiently robust systems for 'domain' users to undertake work from which information can be provided to the 'end' users. Nowhere is this relationship clearer than in a corporate GIS implementation.

3. ORGANISATIONAL USE OF GIS

As hardware standards improve and the quality and quantity of data improves, organisations are increasingly viewing data held by individual teams as a corporate asset to be used across the organisation, rather than being confined to the one team who maintain the information.

Of course, most information held within an organisation such as a local authority or a government agency needs to be maintained and kept up to date. Depending on the subject matter and the

[1] ESRI UK Ltd, 2002

means of capture, the updating of the data can take place at different frequencies, from real time to long time intervals such as the population census, which is completed at 10 year intervals.

To aid decision making however, it is important not only to have data of sufficient currency, but also consistency. The world in which we live, and seek to model with geographic data, is dynamic but also relatively consistent in spatial terms. Therefore it is important, where possible, to use data of a consistent geographic standard. The most obvious example of this would be the scale of the data – a feature modelled at 1:1,250 scale would look considerably different to the same feature modelled at say 1:500,000.

Other issues of consistency include differences in geographic referencing. There are different ways of defining a location – postcode, address, grid reference, global positioning reference, political constituency etc… In addition, when considering a street name such as St. James' Street it is possible to see how different spellings of a geographic reference such as a street name can be 'interpreted' by a human to mean one place but how a computer will return an error.

A number of inconsistencies between key datasets have been known about for many years. To resolve this issue a number of data initiatives and products have or are in the process of being developed.

4. DATA INITIATIVES

Difficulties in managing and sharing data have long been acknowledged. Perhaps the greatest recognition of this problem has come from local authorities.

In order to dispense their duties, local authorities require access to various types of information about features within their area. Most of this information will have a geographic component.

Often the uniting geographic element will be an address. Therefore local authorities are often primarily concerned with address geography. It is with this in mind that a series of national datasets are being created to provide a consistent platform for information management. These national projects are summarised below.

National Projects[2]

National Land and Property Gazeteer (NLPG) - The National Land and Property Gazetteer is a means by which local authority data can be consistently referenced to enable it to be identified, retrieved and integrated with other data. It is the foundation of the data infrastructure for joined up government.

National Land Information System (NLIS) - NLIS is an initiative being proposed to provide national information on land and property. Its potential is far-reaching and likely to involve many different data sources, both public and private.

National Land Use Database (NLUD) - A partnership has been established to develop a definitive map of land use within the UK.

Local authorities Secure Electoral Register (LASER) – Builds on the NLPG to provide electoral registers that are joined up, maintained and managed locally, and can then be accessible on a national level to authorised users.

National Street Gazeteer (NSG) - A national index of streets, brought together from individual local authorities under a national concession.

[2] www.idea.gov.uk

OS MasterMap

OS MasterMap is a digital dataset released by Ordnance Survey in 2001. It is seen as a consistent topologically structured digital map base in the UK.

OS MasterMap is an intelligent product designed to reflect the real world structures and changes in a way that previous OS products such as Landline could not. However it is complex in its design with Great Britain being represented by over 400 million features structured into Themes. Due to the file volumes many users manage the data in databases, rather than 'flat' files.

Every feature has a unique topographic identifier called a TOID®. TOIDs® remain constant, however the geometric feature that the TOID® relates to can change. In time the key to modelling with OS MasterMap is developing a mapping infrastructure using the TOID® to link together datasets.

Updates to OS MasterMap take place on a daily basis. When changes occur, rather than receiving a new tile of data requiring a previous layer to be removed, new or modified TOIDs® can be added to the database. These new updated features are then shown the next time a user requests to view the data.

Positional Accuracy Improvements (PAI)

The Ordnance survey are currently in the process of remapping various rural areas mapped at 1:2,500 scale.

The positional accuracy programme will result in an improved and more consistent accuracy standard of mapping data for rural areas. Furthermore, it will future proof the data for the addition of new building development and other change, as well as providing a better relationship between Ordnance Survey map data and customers' own GPS-positioned resources[3].

Acacia Programme

The 6 main users of address geography and related property information in the UK (Ordnance Survey, Local Government Information House, Her Majesty's Land Registry, Registers of Scotland, Royal Mail and the Valuation Office Agency) are working together to develop a single national infrastructure for Great Britain of definitive addresses and related property information to support key government functions.[4]

Pilot Pan Government Service Level Agreement

This innovative pilot will for 1 year enable government departments and agencies to gain access to the consistent digital datasets from Ordnance Survey. The benefit of the PGSLA for those departments and agencies covered by the SLA is that data linked to OS data can be exchanged and used without the traditional licensing barriers being encountered. Crucially, the PGSLA covers the use of OS MasterMap, the product being used in the current England mapping project.

INSPIRE

The Infrastructure for Spatial InfoRmation in Europe is an initiative currently being prepared by the Commission to support the availability of spatial information for the formulation, implementation and evaluation of Union policies. It intends to set the framework for the gradual creation of a harmonised spatial information infrastructure.

The INSPIRE initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from

[3] www.ordsvy.gov.uk
[4] www.idea.gov.uk

the local level to the global level, in an inter-operable way for a variety of uses. The target users of INSPIRE include policy-makers at European, national and local level and the citizens and their organisations[5].

6 THE IMPACT ON NOISE MAPPING

Noise mapping although, made to look simple by the very clever software products now available, is in terms of data management, very complex.

When constructing a noise model, costly manual intervention is often required by the modeller to clean data supplied by 3rd parties so that it is fit for purpose. In short, this cleaning is often the result of different geometry specifications, inconsistent or missing identifiers or inconsistent geographic referencing. There is often little or no metadata available to confirm the integrity of the data being used. The approach to modelling often being dictated by the datasets held by the organisation.

It is therefore essential for the acoustic community to work in partnership with the GI community and those communities who hold input data in order to share knowledge and requirements and work towards developing common data standards, supported by appropriate metadata.

7 CONCLUSIONS

To conclude it can therefore be seen how the GI community, from 'Experts' to 'End' users are working in partnership to develop definitive geographic datasets across Great Britain.

Some initiatives are driven by a particular 'Domain' such as the planning community, other technological advances developed by the GI community are driven by an increased will to share data and maximise use. In particular the digital framework provided by OS MasterMap combined with an ongoing PGSLA will assist this, although the technical issues OS MasterMap poses with modelling based around TOIDs®, should not be underestimated if the full benefits of the product are to be maximised.

In time these advances amongst the GI community may provide a platform from which noise mapping specifications emerge. This will be achievable as the acoustic and wider GI community work closely to understand their respective requirements.

[5] http://gi-gis.jrc.it/esdi.html