

REMOTE SENSING EDUCATION FOR LIFE LONG LEARNING ACROSS THE EAST MIDLANDS REGION

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ABSTRACT

Over the last decade, Remote Sensing technologies have provided useful tools for a diverse range of sectors. G-STEP (part funded by the ERDF) is the University of Leicester's flagship project for innovation, training and education in GMES and GIS based technologies. G-STEP (GMES - Space Technology Exchange Partnership) is the first GMES accelerator initiative in the UK and is breaking new ground in the application of GMES and GIS.

The core G-STEP team initiates and develops Knowledge Exchange Practices between the University and Life Long Learning partners in the East Midlands Region, through training packages and collaborative research projects. The programme integrates novel research, to direct downstream applied training packages, supported by analytical processing of attendee assessment data. The collation of this information presents a unique opportunity to incorporate a statistically viable feedback cycle, making G-STEP the interface between pure and applied research, thus initiating downstream dissemination to groups and small business.

In this paper we outline the GMES and GIS training packages, and the route to market to increase uptake of underused data streams via university and regional entrepreneurs (start-ups) and established small business with a core interest in utilisation and dissemination of novel technologies in sustainable lifelong learning.

INTRODUCTION

The anticipated growth in the UK's space sector, is, in part, linked to the uptake of Earth Observation (EO) data in the development of downstream data services. The European Earth Observation Programme Copernicus (1), previously known as GMES (Global Monitoring for Environment and Security), provides the means to collect and process multi-source EO and environmental data that supports policy developments at the European level.

Whilst there is excellent research in all aspects of Earth Observation science, the link to potential downstream applications is underutilised at best. By necessity EO data manipulation training is aimed at high level competency – undergraduate degree, MSc, PhD and beyond – with some developments in GIS used for compulsory school age students. Access to appropriate software is also dependant on the end user, with the cost of business licensing for established data manipulation software often prohibitive. The necessary instruments to involve new end users are in their infancy and for applications of EO the whole chain from provider to end-user should be examined (2,3).

The University of Leicester's pioneering G-STEP project was initiated in 2009 to exploit the research base of the Earth Observation Science research group to increase the downstream use and application of EO data from all sources, enabling UK business and the public sector to develop new products and services. It is still the only academic/business interface addressing both the issues encountered by entry level users as well as manipulators of EO data streams simultaneously. A key issue addressed within this end user cohort was and is the time necessary to develop enabling skills to efficiently access and manipulate the often complex data sets and processing software.

G-STEP pioneered an all-encompassing approach to engagement, in the first instance to determine the business interest for novel data and technologies. From this, the development of G-

STEP's procedure of collaboration and engagement highlighted the need to have a tiered system of training. This structure enabled G-STEP to build awareness and skills prior to investigating bespoke innovative solutions and applications. Refined modules and workshops (both educational and professional training) were developed in response to input from collaborators and the wider community.

The results from these workshops and other awareness building campaigns demonstrated end-user 'pull' in the uptake of Remote Sensing and Earth Observation data, with some unexpected applications particularly in the area of software manipulation for mobile devices.

METHODS

The project funding criteria (part financed by ERDF) restricted the potential collaboration cohort and impact area to Small and Medium sized Enterprises (SMEs) located in the UK East Midlands region. From this pool of potential users, G-STEP piloted a series of information events to test the existing knowledge range and to ascertain interest in EO data sets. A process termed 'the G-STEP funnel' was applied to concentrate EO interest from initial nonspecific interactions.

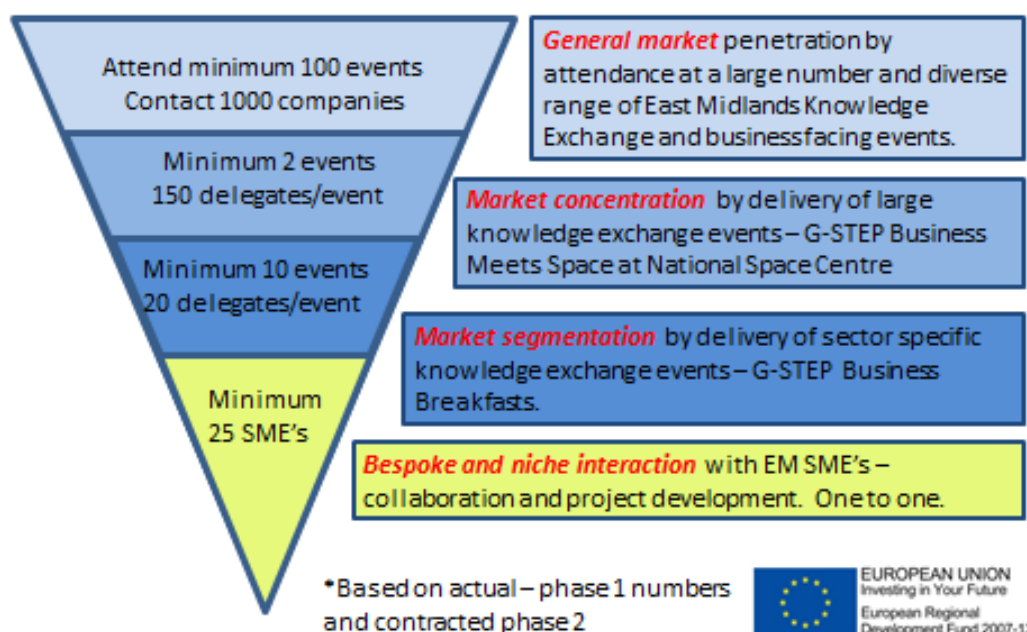


Figure 1: The G-STEP funnel – G-STEP engagement.

Full day events were held for over 100 delegates from a range of policy, EO applications (research and industry) and data manipulation sectors. During these unique events, delegates offered insight into industries collective background interest in EO data, training and the collaboration processes. Business interest at this stage was encouraged by free access to expertise.

Market research of active business in the region was carried out via exploitation of G-STEP's extensive existing contacts, web based search engines and by direct or e-based mailing and marketing processes. In addition to this, further contacts in indirect markets were established by G-STEP attendance at non EO specific local business events to test interest in and the perception of the use of EO data and technologies. The G-STEP 'message' was refined throughout the project development period to reflect input from users and collaborators.

Feedback on content and areas of interest informed market segmentation and analysis to refine content for sector specific workshops. Short two to three hour workshops, with specific themes, were then tailored to suit the needs and skill levels of the regional business community.

To provide additional services, over and above the sector wide generalised interactions, bespoke training was undertaken to solve specific issues and problems, enabling users to continue to access software and EO resources outside of the G-STEP environment.

In parallel, G-STEP, with its complement of EO specialists, collaborated to develop and deliver specific, tailored GMES and GIS based products and services. This is particularly apparent in cases where the business was time constrained and unable to devote the necessary hours to the education process.

RESULTS

To enable a justified and efficient work programme, G-STEP carried out an analysis of the regional interest in GMES/GIS related products and services by participating in a broad range of business facing events and conferences (Table 1). These engagements also delivered our overarching message of the benefits of the use of GIS and GMES technologies. Using the high quality response from participants (collected using highly structured and concise feedback opportunities), G-STEP refined its message and approach to significantly expand its programme to include regional conferences and workshops. From this, cohorts of interested potential downstream users were invited to future GMES and GIS G-STEP hosted events (Table 1).

Table 1: G-STEP funnel – 2009 – 2013.

| Event type | No of Events | Audience number | G-STEP Activity |
|---|-----------------------------|--|---|
| Non-specific – general business events generating EO data interest from networking and presenting | Over 150 attended by G-STEP | Over 2000 – provide core business database | Generate feedback Inform G-STEP events |
| EO and Space Technology events and conferences | Over 50 attended by G-STEP | Over 1000 | Generate feedback and corporate interest |
| G-STEP Full day events | 1-2 per year | 100 per event | Delivery of wide scope message to target audience |
| G-STEP sector specific events | 14 | 10 -20 per event | Targeted group – sector specific EO delivery |
| G-STEP engagement with EM SME's | 40 | One to one | Bespoke |

From very early in this process, G-STEP organised 'Business Breakfasts' for local businesses (SMEs) and public sector organisations, to introduce application areas of GMES, GIS and satellite data to the regional community. Events were targeted to offer a coherent introduction to these themes, including the underlying scientific principles, guidance upon open source data tools and the applications of most use to SMEs in the region. Breakfast events were tailored to the specific SMEs invited, facilitating effective communication and uptake of information on GMES data uses and manipulation techniques for specific market sectors. The direct involvement of the SMEs allowed face-to-face interactions with downstream users and gave an opportunity for them to visualise GMES data in their traditional working environments (Table 2).

Once an initial engagement had been achieved, more detailed workshops were available to elaborate more thoroughly upon theories and techniques already presented. The engaged entities then had access to freely available open source tools in order to better understand the processes employed and specifically how it might benefit their company. It was the aim of the programme to provide clients with the necessary skills to not just communicate with G-STEP or other EO specific companies, but also to allow them to understand the key mechanisms that could help drive them into a new business sector.

Maximum intervention by G-STEP occurred (Table 2), following consultation, to provide one to one packages utilising high-end object-oriented GIS and GMES tools available through the academic departments at the University. This process developed solutions which were built in collaboration with the clients. Further advanced level training sessions were organised to ensure GIS and GMES related development could be continued post G-STEP intervention.

Table 2: G-STEP 1-1 collaboration by market sector and event activity.

| Number of SME's | Sector | G-STEP Activity |
|-----------------|-----------------------|--------------------|
| 8 | Environment | EO GIS and mapping |
| 6 | Marketing | EO GIS and mapping |
| 6 | Built Environment | EO GIS and mapping |
| 4 | Land Management | EO GIS and Mapping |
| 3 | GIS/Data Manipulation | EO GIS and mapping |
| 3 | Education | EO GIS and mapping |
| 2 | Transport | EO GIS and mapping |
| 1 | IT services | EO GIS and mapping |
| 1 | Space Technologies | EO GIS and mapping |
| 4 | IT services | Software and apps |
| 1 | GIS/Data Manipulation | Software and apps |
| 1 | Transport | Software and apps |

Numerous successful client driven projects have provided ample evidence for the efficacy of the G-STEP knowledge exchange and collaboration process. For example, the development of a process for isolating levels of subsidence within a specific region identified via postcodes. Specialised GMES tools were used by Earth Observation experts (within both G-STEP and the University), in conjunction with advanced geological background knowledge, to utilise the clients existing data sets and produce a detailed, but user friendly solution. This development isolated the levelled risk of subsidence in a particular region of interest and applied weighted logic using the user database of subsidence insurance claims. The combination of these data sets meant that a unique tool was created (Figure 2).

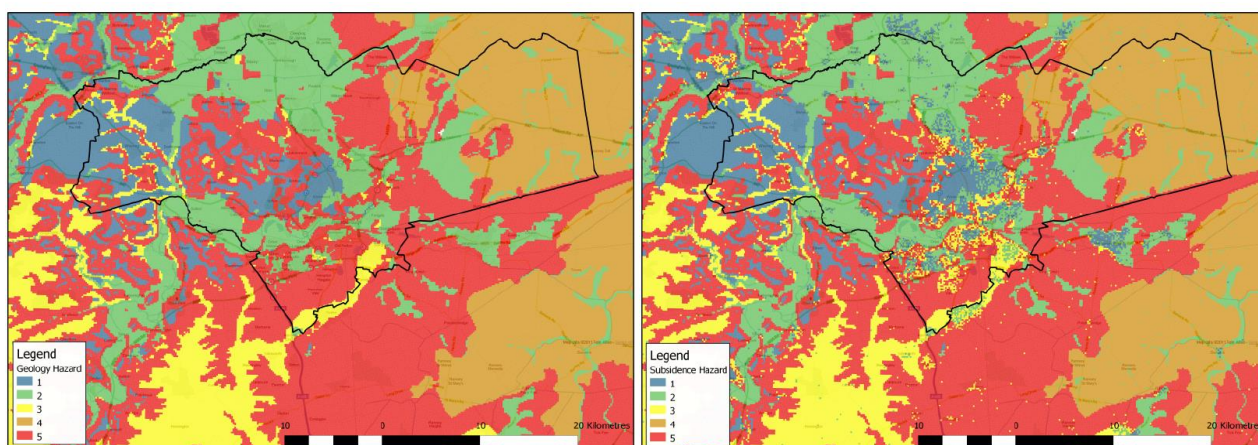


Figure 2. Geological Subsidence Risk in Peterborough. Left: Map of geological subsidence risk. Right: Map of adjusted risk overlaid with historical subsidence claims data.

CONCLUSIONS

The purpose of the 'G-STEP funnel' was to introduce and inform the regional business community of the possibilities offered by GMES and GIS related data processing technologies; to develop new services and new market opportunities from space technologies, and to involve regional SMEs as potential providers or developers of GMES and GIS related downstream services. G-STEP has initiated dialogues resulting in over 40 direct interventions with local SME's. This represent a much larger engagement profile including a diversity of sectors, business, local and regional authorities Through a combination of engagements at numerous technical levels, the fundamental aims have been met and continue to be achieved through G-STEP's innovative programme.

The training sessions presented as a part of G-STEP activities have allowed downstream users to gain a good understanding of GMES and GIS related tools and applications, establish a substantial footing within cross sector markets, as well as their own, and to appreciate the importance of these in their environment.

Business interactions often start from the basis of a sector specific information event with business response around 'that looks great, but can you do....?'. By assessing the data already held by the business, and applying GMES and GIS technologies, unique products and services have been piloted. Examples of the range of outputs include:

- a short investigation of solar data by a small group of business involved with clean energy provision – thermal data investigated as part of this process provided additional information for a local company particularly interested in insulation.
- analysis of water flow and land accessibility for a novel application involving siting of micro water turbines for domestic level of energy production – this was an investigation of proof of concept for potential export to developing nations
- urban green spaces and tree mapping
- uses of GMES data and GIS technologies to develop applications for mobile devices – this area in particular has often developed in response to "but can you do...?"

The overriding aim achieved by this project, has been to make users aware of GMES and GIS facilities and to provide a basis for manipulating novel data sets to commercial and societal advantage. Consequently, positive impacts are being achieved throughout the region by establishing new and innovative applications that assist in improving the competitiveness of SMEs. The continued progress in interactions and engagements rests on the accessibility and availability of both data sets and processing at an economically viable level both in terms of actual physical cost and the time required to learn techniques to exploit the technologies (4).

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