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Location Data Scotland
Geospatial Skills Roadmap

Report
Scottish Enterprise
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Table of Contents

Prepared By: Ashley Stewart (in collaboration with Bruce Gittings and Tom Janes (University of Edinburgh and AGI Scotland))	**Date:** 23/01/2024
Approved By: Iain Weir	**Date:** 24/01/2024

1 Introduction

1.1 Background and Context

Geospatial is flourishing with growing interest across a range of sectors and government. But can we meet the future demand for skilled professionals?

Location Data Scotland (LDS), the University of Edinburgh and the Association for Geographic Information in Scotland have been working in partnership to explore the Scottish geospatial skills landscape to assess whether there is a geospatial skills shortage and if so, how it could be addressed.

Jointly supported by Scottish Government, Scottish Enterprise and the Geospatial Commission, Location Data Scotland (LDS) was established to connect, inform and facilitate collaboration between industry, academia, public and third sector, across multiple sectors, to drive innovation, unlock skills and enable economic growth through the better use of location data.

For some years it has been suggested that employers in the geospatial sector have both struggled to grow their workforce and retain existing staff given the large number of positions available and the limited supply of graduates. However, this was very much anecdotal information and given the remit of LDS to support growth and Scottish Government's ambition to ensure Scotland is recognised as an international hub for the geospatial industry, a skilled workforce is necessary to support this aspiration. Therefore, through our collaboration we sought to validate the skills challenges and consider how these could be addressed to future proof the industry.

2 Geospatial Skills Challenges

A widely-distributed survey revealed concerns around the current and future recruitment and retention of suitably skilled staff within the sector, as illustrated:

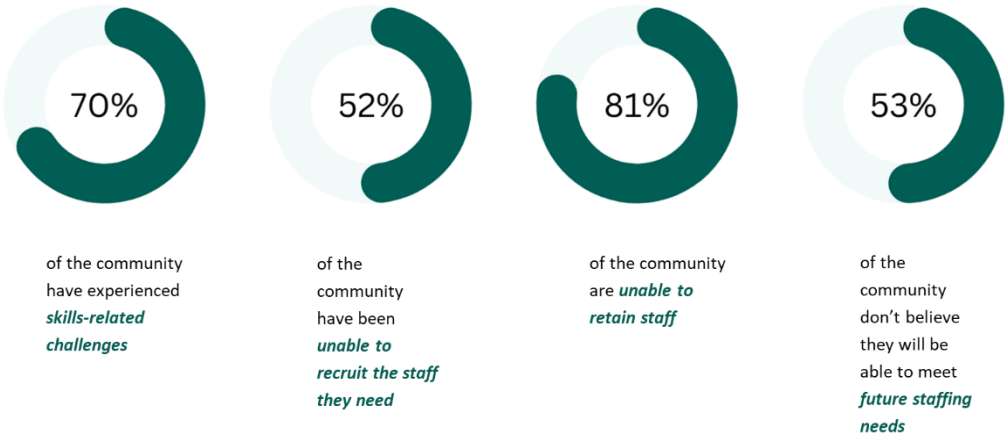

Figure 1: Geospatial Skills Survey

This demonstrates a developing geospatial skills gap in Scotland. The concentration of skills development in higher education, particularly Masters-level, is at risk; narrowing the pool of available applicants and excluding sections of society the profession would wish to welcome. Higher education is not for everyone, and there are significant barriers to access, not least cost. Many students attending universities do not see their future in the UK; for example more than 70% of those taking the GIS Masters at Edinburgh are from overseas and can't or won't remain in the UK. Equally many geospatial roles do not need the level of educational attainment that four or five years at university provides. We would propose the broadening of educational provision to colleges (where there is currently no provision in Scotland) and schools (where provision is at best patchy). We would also argue the need for work-based apprenticeships which, while developing, are very limited and rarely focused on geospatial. The goal being to increase awareness of geospatial and ultimately the skills base for the geospatial industry in Scotland. We have undertaken research specifically on the current provision, needs and aspirations within schools. The research examined the curriculum content, teachers' attitudes towards geospatial skills, and opportunities to improve current teaching. Documented experience reveals the benefits of using geospatial skills in the classroom are well established and embedding these into schools are consistent with aspirations of Scottish Government's Digital Strategy and school curriculum. However, the development of geospatial skills in Scottish schools is falling behind other countries, with a survey revealing their teaching is largely informal and piecemeal. Some course content encourages teachers to consider it as a teaching tool, but a lack of curricular guidance, assessed work and resources present barriers. However, geography teachers are generally positive towards the use and teaching of geospatial skills. This leads to three main conclusions:

- Scotland is falling behind in teaching geospatial skills in schools, and this is inconsistent with the curriculum and the Government's digital strategy.
- Teachers are willing to teach geospatial skills but reluctant to devote time and resources to them at the expense of teaching assessed work.
- Proposed education reforms present an opportunity to improve geospatial skills development in schools, hopefully narrowing the skills gap.

However, the ubiquitous nature of geospatial and the parlous position of geography in Scottish schools (geography is often the forsaken for history or modern studies, and is unfortunately not seen as a STEM subject) suggest success is founded on geospatial being embraced well beyond the geography curriculum. Surely geospatial should be central to data science skills within the curriculum? Geospatial thinking could also inform history, cartography could be introduced in Art & Design, GIS used for ecological surveys in biology and routing, location, altitude, and simple spatial analysis be used within Physical Education. This requires geography teachers to serve as geospatial evangelists and careers teachers to be aware of the number of lucrative roles available in the profession. Given that geospatial and geography are inexplicably linked, the profession can undoubtedly enhance the position of school geography and give geography teachers a reinvigorated raison d'etre.

3 Industry & Stakeholder Engagement

3.1 Roundtable Discussions

A series of roundtables[1] were hosted which were an opportunity for the geospatial community to come together to get to know each other, share mutual interests and potential contributions, and to commit to the shared skills vision, specific aims and to agree a workplan for future proofing the geospatial sector in Scotland.

Details of the participants can be found in Appendix A.

The roundtables saw a meeting of minds between industry, Government, academia, and research, to consider these findings and explore the geospatial skills gap in Scotland. A number of key themes emerged from these discussions:

- Awareness - there is a need in the geospatial sector to develop an online resource that provides information for anyone looking for a career in the field of geospatial. This will significantly increase the awareness of geospatial and ultimately the skills base for geospatial in Scotland. The importance of language and terminology cannot be underestimated when developing resources and communicating with target audiences.
- Consistency – we need a clear and consistent message for pupils, teachers, and careers advisors. Current approaches are piecemeal and confused; we struggle even to agree on what we call ourselves - is it GIS, geospatial, spatial analysis, digital mapping…?
- Collaboration - there is a need for greater collaboration between geospatial/GIS professionals and wider departments; thus, improving awareness and understanding of the applications of geospatial. For example, improved links between geography and ICT departments with education.
- Participation - expose children to maps and geospatial thinking; whet their appetite and showcase the fun side of it - let them play with data. There is also a need to improve the routes to participation e.g. introduce it via school, college or university courses, apprenticeships and jobs.

These roundtable discussions and identified themes informed the development of the Geospatial Skills Roadmap, as described in the following section.

[1] Held in September (virtually) and November (in-person) 2022

3.2 Agreed Vision & Aims

Geospatial Skills Vision

To create a skilled and diverse pool of geospatial professionals in Scotland capable of meeting the current and future needs of our industry

Geospatial Skills Aims

- Extending the skills base in our industry
- Meet the future demand for skilled professionals
- Develop home-grown talent
- Ensuring diversity
- Create and signpost a pathway from schools into the geospatial industry
- Crystallise the importance of geo within data science
- Create opportunities to upskill existing staff through Continuous Professional Development
- Influence the school curriculum to explain, demonstrate and the value of geospatial technology within and beyond geography
- Building community – utilise the network of network approach
- Bring together industry and schools – forge links
- Educate employers – "driving value from geospatial"
- Increase engagement and awareness of the potential of geospatial – the art of the possible
- Create and use consistent and simple language

4 Development & Delivery of Skills

4.1 Development of Resources & Practical Materials

With support from an MSc student at the University of Edinburgh, this work has also created awareness-raising resources and practical materials which can be used in schools/colleges. These recognise and signpost the significant amount of existing material which can contribute to the study of GIS and geospatial skills development in Scotland. This includes:

- A survey of geospatial education in Scottish Schools
- A research paper "Mapping the Present, Plotting the Future: Geospatial Education in Scottish Secondary Schools"
- A consultancy report "An Appraisal of Geospatial Skills Development in Scottish Secondary Education"
- An appraisal of the GeospatialUK.org web site
- A draft slide deck "GIS and Geospatial: An introduction" with eight varied case studies from very different fields, and ideas for more
- A catalogue of resources

All of which has informed and/or is represented in the Geospatial Skills Roadmap.

These can be made available upon request as separate documents.

4.2 Delivery of Skills – Fife College Pilot

The work completed to date on geospatial skills has captured the attention of the sector and has resulted in coverage across social media and industry publications. Consequently, Fife College approached Location Data Scotland to discuss the potential of working together to develop a geospatial skills pilot programme. These discussions have been ongoing, between Location Data Scotland, Fife College, Scottish Government, the University of Edinburgh, and AGI Scotland, since September 2023 and have led to the development of a draft outline for a progressive path to entry level roles using Geospatial skills, as illustrated below:

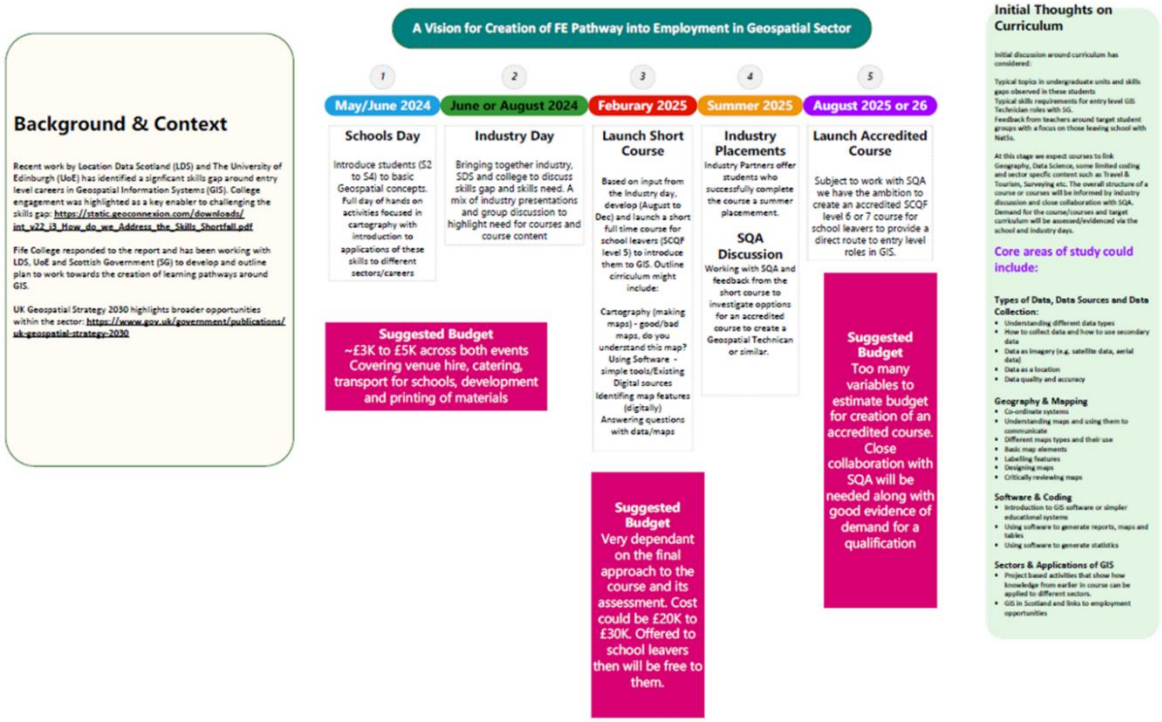

Figure 2: Draft Outline of Geospatial Skills Pilot

It should be noted, however, that this remains in the early stages, and a memorandum of understanding would be recommended to formalise and progress this further. Similarly, delivery of the course would be dependent on support from key partners and stakeholders as well as industry to provide, for example, work placements, internships and site visit opportunities.

5 Geospatial Skills Roadmap

5.1 Overview

The aforementioned themes (section 3.1) alongside the survey and research findings have informed the development of a Geospatial Skills Roadmap which sets out a work plan of Engagement, Communication

and Substantive Development short, medium and long-term actions that are believed to address the identified challenges and ensure a pipeline of talent coming into the geospatial industry in the future.

5.2 Roadmap Structure

The Geospatial Skills Roadmap consists of 30 actions organised into three thematic areas: engagement, communications and substantive development. The engagement actions focus on further liaison and dialogue with industry, education and stakeholders to build on work to date. The communications activities focus on enhancing messaging, materials and connections. Finally, substantive development is the development of materials and resources necessary to successfully realise the ambitions of the plan.

These work packages are sorted into short, medium and long-term actions, as illustrated:

Figure 3: Geospatial Skills Roadmap

5.3 Roadmap Actions

The following section describes the actions set out in the roadmap in more detail.

5.3.1 Engagement

Short-term Actions

1. **Engage with the Scottish Qualifications Authority (SQA)**

Engaging with the Scottish Qualifications Authority (SQA) via the Geography National Qualification Team to discuss the inclusion of geospatial skills development in the school curriculum and assessment of geospatial skills is a strategic action that involves collaboration between the geospatial sector and educational authorities.

The primary goal is to advocate for the integration of geospatial skills within the school curriculum. This ensures that students are exposed to and equipped with essential geospatial knowledge and abilities. Likewise, discussing the assessment of geospatial skills indicates a commitment to not only teach these skills but also to evaluate and recognise students' proficiency in this area.

In summary, engaging with the SQA for the inclusion of geospatial skills in the school curriculum involves a strategic, collaborative, and iterative process aimed at enhancing the educational landscape and aligning it with the evolving needs of the geospatial sector.

2. **Continuous professional development (CPD) and teacher training**

Inspiring teachers with easily digestible and accessible in-service training and/or CPD is a crucial step to support the integration of geospatial skills in the school curriculum. This activity complements the curriculum discussions with the SQA by ensuring that educators are equipped and motivated to effectively teach geospatial skills.

Before designing any training, it will be essential to conduct a needs assessment. This involves understanding the current knowledge and skills of teachers regarding geospatial technology and identifying areas where they might need support. Thus, ensuring that content is specifically tailored to the needs of teachers and is aligned with the proposed changes to the curriculum. Ensuring that it covers the basics of geospatial technology, practical applications, and teaching strategies and incorporates real-world examples and case studies that highlight the relevance of geospatial skills in various subjects. This will help teachers to contextualise the information and make it more engaging.

This action ensures that educators are not only aware of the changes in the curriculum but also equipped with the knowledge and skills necessary to effectively incorporate geospatial education into their teaching practices. This holistic approach aims to create a supportive and empowered teaching community.

3. **Engage with the school and college network**

Engaging with schools and colleges to raise awareness of geospatial and showcase career opportunities is a proactive step towards fostering interest and understanding of geospatial technologies and opportunities amongst students. This initiative not only serves to promote the importance of geospatial but also aims to highlight the various career pathways available in this field.

The overall intention through this engagement is to raise awareness among students about geospatial, its applications, and its significance in various industries. Thus, showcasing the diverse career

opportunities associated with geospatial, encouraging students to consider pathways into the sector for their future careers.

By engaging with schools and colleges there is an opportunity to plant the seeds of interest early on, encouraging students to explore geospatial as a potential career path which will contribute to the growth of the geospatial workforce. This type of outreach is crucial for building a talent pipeline and promoting the long-term sustainability of the sector.

4. **Engage with the STEM Ambassador Programme**

Establishing connections between schools and STEM Ambassadors to explore opportunities for integrating geospatial content into their educational materials. This collaboration seeks to enhance the exposure of geospatial concepts among students through the existing STEM ambassador program.

The aim is to gain a thorough understanding of the STEM ambassador program's objectives, target audience, and existing educational materials. This provides insight into how geospatial content can align with their goals.

The fact that initial contact has already been established is a positive step, but it is essential to continue building relationships with key stakeholders within the STEM ambassador program.

This is a strategic action to broaden the exposure of geospatial concepts among students interested in STEM. Through effective collaboration and continuous engagement, this activity can contribute to the enrichment of STEM education and inspire the next generation of geospatial professionals

5. **Facilitate connections between schools and STEM ambassadors**

Facilitating connections between schools and STEM ambassadors involves creating a structured and supportive framework to connect schools with professionals working in the fields of Science, Technology, Engineering, and Mathematics (STEM). STEM ambassadors are individuals from diverse STEM backgrounds who volunteer to engage with schools, inspiring and supporting students in their STEM-related education and career journeys.

This is a valuable action to inspire students, provide them with real-world insights, and foster a passion for STEM subjects. This action aims to bridge the gap between academic learning and practical applications while promoting diversity and long-term engagement in STEM education and careers including geospatial.

6. **Engage further with professional bodies**

Engaging with professional bodies, such as the Royal Geographical Society (RGS), Hydrographic Society, British Cartographic Society, British Computer Society, Royal Town Planning Institute and the Royal Institution of Chartered Surveyors (RICS), is a strategic action aimed at fostering collaboration, sharing knowledge, and aligning efforts to enhance the geospatial sector.

Understanding the objectives and missions of each professional body and identifying common goals and areas of mutual interest related to geospatial sciences, technology, and applications will be central to this activity. This can be followed by reaching out to representatives from each professional body, introducing the shared interest in geospatial technologies and expressing the desire to collaborate.

Engaging with these professional bodies is not only about knowledge sharing but also about creating a collaborative effort to address challenges, promote advancements, and ensure the sustained growth

and recognition of the geospatial sector. This collaborative approach contributes to a more cohesive and impactful geospatial community.

7. **Engage Developing Young Workforce (DYW)**

Engaging with Developing the Young Workforce (DYW) to showcase the potential of geospatial technology and exploring collaborative opportunities is a strategic action that aims to bridge the gap between education and employment.

This includes gaining a comprehensive understanding of DYW's mission and objectives in connecting young people with the world of work. Identifying how geospatial technology aligns with DYW's goals and initiating contact with DYW representatives, clearly articulating the intent to collaborate in showcasing geospatial technology and career opportunities within the sector.

Engaging with DYW in this manner not only benefits young people by providing valuable insights and experiences but also contributes to the growth of the geospatial sector by fostering a skilled and motivated workforce.

Medium-term Actions

1. **Engage with careers advisors**

Engaging with the Careers Advisory Service to connect with careers advisors is a strategic action aimed at raising awareness of geospatial technology and showcasing its career potential to students.

This includes gaining a thorough understanding of the services provided by the Careers Advisory Service, including their target audience, methods of engagement, and goals for career guidance. This can be achieved by building on preliminary discussions with Skills Development Scotland to initiate potential collaboration.

This action serves to empower careers advisors with the knowledge and resources needed to guide students toward geospatial careers, contributing to the development of a skilled workforce in the geospatial sector.

2. **Forge connections with data science**

The action aims to build stronger connections with organisations like The Data Lab to ensure data science education incorporates spatial data science, GIS and such like. This is a strategic action that leverages Scotland's expertise in data science and such a collaboration aims to enhance educational offerings by integrating spatial data science and recognising the importance of spatial information within the broader field of data science.

This includes gaining a comprehensive understanding of The Data Lab's mission, ongoing initiatives, and focus areas in data science and exploring any existing partnerships or collaborations The Data Lab may have with educational institutions or industry stakeholders related to spatial data science.

This action ensures that data science education in Scotland is aligned with the growing geospatial demand and industry trends; thus, equipping students with the skills needed in the evolving geospatial sector. This collaboration not only benefits educational institutions but also contributes to the advancement of both the data science ecosystem in Scotland and the geospatial sector.

Long-term Actions

1. **Sustainable engagement and dialogue**

Continued engagement and dialogue with stakeholders are critical components of successful project implementation and realising the actions outlined in the roadmap. This action focuses on maintaining commitment, motivation, and effective communication throughout the entire process.

By consistently engaging with stakeholders, maintaining open communication, and addressing challenges collaboratively, this action helps ensure a dynamic and adaptive approach to implementing the roadmap. It promotes a shared commitment among stakeholders, fostering a collaborative environment that is essential for the success of the actions proposed in the roadmap.

2. **Continue to grow the partner base**

Continuing to grow the partner base and community of engaged stakeholders aims to harness diverse expertise, perspectives, and support to fully realise the potential of the roadmap and ensure its ongoing relevance for the industry.

This involves landscape analysis to identify potential partners and stakeholders who can contribute meaningfully to the roadmap's objectives and developing a strategic outreach campaign to introduce the roadmap to potential partners; thus, clearly communicating the goals, benefits, and opportunities for collaboration.

By actively growing the partner base and community of engaged stakeholders, this action aims to create a robust ecosystem of support and expertise. The diversity of perspectives and collaborative efforts will strengthen the roadmap, ensuring it remains relevant, adaptive, and well-positioned to address the evolving needs of the industry.

3. **Explore further pilot opportunities**

Building on the skills pilot programme with Fife College to identify additional opportunities for delivering geospatial skills across the further education landscape. The goal is to identify new and enhanced ways of delivering geospatial skills education across Scotland.

This action aims to optimise and expand geospatial skills education, ensuring that it remains effective, relevant, and accessible to a broader audience. The collaboration with Fife College serves as a foundation for identifying and exploring additional opportunities in geospatial skills development.

5.3.2 Communications

Short-term Actions

1. **Develop a Branding and Marketing Plan**

Developing a branding and marketing plan for geospatial skills aims to create a strong identity for geospatial education and promote effective outreach and engagement across various stakeholders in the ecosystem.

This includes articulating the value proposition of geospatial skills and identifying and segmenting the target audiences for geospatial skills. This may include, for example, students, educators, industry professionals, policymakers, and potential industry partners.

Developing a comprehensive branding and marketing plan for geospatial skills is crucial for raising awareness, attracting diverse participants, and creating a positive message within the ecosystem. The plan should be dynamic, responsive, and aligned with the goals of promoting geospatial education and its benefits.

2. **Create a teacher information pack**

Building on the work completed already by Tom Janes (MSc Student, The University of Edinburgh) to refine the draft pack with suitable teaching resources in consultation with teachers as well as practitioners and trainers.

This includes identifying any gaps or areas for improvement in the draft materials and exploring opportunities to enhance the materials for example to align them more closely with the evolving needs and expectations of teachers, practitioners, and trainers.

By refining the draft pack with suitable teaching resources in consultation with teachers, practitioners, and trainers, this action aims to create a comprehensive and effective set of educational materials for geospatial skills development. The iterative and collaborative approach ensures that the materials are well-received, meet the needs of the target audience, and contribute meaningfully to the enhancement of geospatial education.

3. **Create a pupil information pack**

Creating a comprehensive information pack targeted at students to generate awareness and interest in studying geospatial subjects is essential for attracting young talent to the geospatial field.

This will involve collaborating with stakeholders to 'pitch' the content appropriately and curating content that includes details about, for example, the significance of geospatial studies, potential career paths, success stories, and the impact of geospatial technology across various industries.

This action aims to effectively communicate the benefits of studying geospatial related-subjects to young people and adopting a collaborative approach ensures that the content is engaging, relatable, and aligned with the aspirations and interests of the target audience.

Medium-term Actions

1. **Develop a 'Geo-Mentors' programme**

Developing a Geo-Mentors programme involves creating a structured and organised mentoring initiative that connects geospatial professionals (Geo-Mentors) with schools. The primary goal is to provide students with valuable insights into the geospatial field and its applications, fostering interest and understanding.

This will involve developing a formal programme structure with clear guidelines for both Geo-Mentors and schools. This includes defining the objectives, expectations, and duration of mentorship engagements as well as recruiting geo-professionals who are willing to volunteer their time to the programme. These mentors could come from diverse backgrounds within the geospatial sector, such as GIS analysts, cartographers, remote sensing specialists, or geographers.

This action aims to bridge the gap between the geospatial industry and schools, providing students with valuable insights, mentorship, and exposure to the exciting opportunities within the sector. The

structured approach ensures that mentorship is consistent, effective, and contributes to the overall educational experience of students.

2. **Create a careers advisor information pack**

Developing a pack to present pathways into the industry and promote geospatial as a viable career path involves developing a comprehensive resource that educates and informs careers advisors about the geospatial industry, career pathways, and opportunities. This information pack is designed to equip careers advisors with the knowledge and tools needed to guide students towards geospatial careers.

This will also be an opportunity to encourage careers advisors to build connections with educational institutions offering geospatial programmes and facilitate collaborations between schools, colleges, and universities to strengthen the pipeline of students entering the geospatial field and promote opportunities for schools to engage with geospatial industry professionals through events, site visits, and guest lectures.

3. **Gather case studies/stories**

Gather and share powerful stories and case studies and disseminate via Location Data Scotland, AGI Scotland and/or a dedicated Resource Hub.

This will involve identifying impactful case examples that showcase the application of geospatial technologies in various contexts. Location Data Scotland already has a range of case studies available on its website, but these can be increased. This could include examples from industries such as urban planning, environmental conservation, emergency response, and more. It will be essential to ensure a diverse range of case studies are included to highlight the versatility of geospatial technologies across different sectors and domains; thus, collaboration with industry and stakeholders will be essential to illustrate the breadth of possible applications.

This action aims to inspire, educate, and create awareness about the value and potential of geospatial technologies. Disseminating these narratives through established platforms and potentially a dedicated Resource Hub ensures that the positive impact of geospatial solutions is effectively communicated to diverse audiences, including professionals, students, and the wider community.

4. **Enhance marketing and comms activities**

Continuously enhancing marketing and comms activities including developing materials, and revisiting key messages to promote work in progress and outcomes involves an ongoing effort to refine and strengthen the marketing and communication strategies associated with the roadmap.

The goal is to effectively communicate progress, outcomes, and the broader impact of geospatial efforts to various stakeholders.

This action aims to create a dynamic and impactful narrative around geospatial initiatives. Regular review, content development, and adaptation to stakeholder needs contribute to a vibrant communication strategy that effectively conveys the significance and progress of geospatial efforts.

Long-term Actions

1. **Ensure stakeholder commitment**

Ensuring stakeholder commitment to sharing communications and driving forward the roadmap actions via a network of network approach involves creating a collaborative network where stakeholders

actively participate in actions. This approach aims to foster a sense of shared responsibility, engagement, and amplification of key messages within a broader network of stakeholders.

This action aims to create a dynamic, interconnected, and collaborative ecosystem that actively contributes to the promotion and success of geospatial initiatives. The strength of this approach lies in the collective efforts of diverse stakeholders working together to advance common goals within the geospatial sector.

5.3.3 Substantive Development

Short-term Actions

1. **Develop a roadmap implementation plan**

Developing an implementation plan for the roadmap involves creating a comprehensive and strategic document that outlines the details of how the roadmap for the geospatial initiatives will be executed. This implementation plan serves as a guide for stakeholders, detailing the scope, objectives, purpose, and resource requirements necessary to successfully achieve the outlined actions in the roadmap.

The plan will provide stakeholders with a clear understanding of the roadmap's execution strategy, ensuring alignment, accountability, and efficient resource utilisation. The plan serves as a dynamic guide that evolves with the progress of the geospatial initiatives, contributing to their successful implementation and overall impact. It does, however, require support, collaboration and commitment from industry and stakeholders.

2. **Continuously assess demand**

Continuously assessing demand, including the size of the job market, involves an ongoing process of evaluating the demand for geospatial skills and expertise within the job market. This activity is essential for ensuring that the geospatial initiatives outlined in the roadmap remain relevant, aligned with industry needs, and responsive to changes in the job market.

This involves regularly evaluating the demand for geospatial skills and professionals and monitoring industry trends, job postings, and workforce requirements to stay informed about evolving needs.

This action will ensure that the roadmap can remain dynamic, responsive, and well-aligned with the evolving needs of the industry. This ensures that educational programs, training initiatives, and workforce development efforts are tailored to address the specific demands of employers, ultimately contributing to the growth and sustainability of the geospatial sector.

3. **Landscape Mapping**

This activity involves a landscape mapping exercise aims to understand and document the existing skills-related activities within the geospatial community. The goal is to create a detailed and organised map of ongoing initiatives, educational programs, training efforts, and other skill development activities.

This includes identifying key stakeholders involved in geospatial skills development including educational institutions, industry associations, government bodies, non-profit organisations, businesses, and other entities contributing to skill-building efforts. Then reaching out to identified stakeholders to gather information about the skills-related activities they are currently undertaking and establishing open communication channels to facilitate collaboration and information sharing.

The landscape mapping exercise is a crucial step in creating a holistic understanding of the existing geospatial skills ecosystem. By understanding existing stakeholders can gain insights into the strengths, gaps, and collaborative opportunities within the geospatial community's skills development efforts.

4. **Develop a Resource Hub**

The development of a dedicated Resource Hub aims to create a centralised and easily accessible repository for information related to geospatial skills development. This hub serves as a comprehensive platform where stakeholders can access valuable resources, tools, and information to support their efforts in advancing geospatial knowledge and expertise.

This should involve exploring collaborative opportunities with an existing hub - geospatialuk.org – which is an extremely useful resource. Initial conversations have been held and these should be continued going forward.

The development of a dedicated Resource Hub serves as a strategic action to centralise and streamline resources for geospatial skills development. Through collaboration with established organisations and thoughtful curation of content, the hub could become a valuable asset in supporting the growth and proficiency of the geospatial community.

5. **Develop the geospatial skills pilot with Fife College**

Initial conversations with Fife College should be formalised via a Memorandum of Understanding to progress the pilot and a structured agreement should be defined to outline the terms, objectives, and responsibilities of each party involved.

Formalising the initial conversations with Fife College will enable collaborators to create a structured foundation for a successful geospatial skills development pilot. This formal agreement ensures clarity, commitment, and a shared understanding of the roles and responsibilities, ultimately contributing to the effectiveness of the initiative.

Medium-term Actions

1. **Develop a GIS fundamentals education programme**

Developing a Geographic Information Systems (GIS) fundamentals education programme such as a further education course (Level 8-10) involves the creation of a structured educational programme specifically focused on GIS fundamentals. This program is designed to operate at further education levels providing individuals with a pathway into the geospatial industry.

This will involve clearly defining the scope and content of the programme program and identifying the essential concepts, skills, and tools within GIS that participants will learn and apply. And shaping that into meeting the needs of the target audience that may, for example, be seeking an alternative, non-higher education path into the geospatial industry, such as professionals looking to upskill or individuals transitioning from other fields.

This activity is a strategic effort to provide accessible pathways for individuals seeking entry into the geospatial industry. By carefully designing the curriculum, fostering industry collaboration, and maintaining a commitment to continuous improvement, this programme has the potential to contribute significantly to building a skilled and diverse workforce in the geospatial sector.

2. **Develop a directory of work experience opportunities**

Developing a directory of work experience opportunities involves creating a comprehensive and organised list of organisations that are willing to offer work experience opportunities. This directory serves as a valuable resource for individuals, especially students and job seekers, seeking practical exposure and hands-on learning in a specific industry or field.

This will involve research and outreach to identify organisations within the community that are open to providing work experience opportunities including, for example, companies, government agencies, research institutions, and non-profit organisations.

This is a proactive step toward bridging the gap between education and industry by facilitating practical learning experiences. The directory serves as a valuable resource for individuals looking to gain hands-on experience in the geospatial sector, fostering a stronger connection between aspiring professionals and organisations willing to support their development.

3. **Develop evaluation and monitoring protocols**

Developing evaluation and monitoring protocols for the geospatial roadmap involves creating systematic processes and frameworks to assess and track the ongoing success, impact, and effectiveness of the roadmap's implementation. This ensures that the objectives are met, and adjustments can be made as needed.

The results of the evaluation and monitoring can be used to implement changes based on lessons learned, ensuring that the geospatial roadmap remains dynamic and responsive to the evolving needs of the industry.

4. **Extend pilot with Fife College**

This involves expanding upon the pilot with Fife College which will require an evaluation of the outcomes and effectiveness of the initial pilot programme; understanding the successes, challenges and lessons learned and using these to inform future developments and programmes.

This will also include discussing next steps with Fife College in terms of extending the programme and identifying opportunities to integrate internships and placement experiences into the extended pilot program. This would also require an understanding of the needs of students, the curriculum, and the requirements of potential employers in the geospatial sector.

This action aims to deepen the integration of academic learning with practical industry experience. The focus on skill development, mentorship, and networking enhances the overall educational experience and contributes to the goal of producing a workforce that is well-prepared for the geospatial industry.

Long-term Actions

1. **Develop apprenticeship route**

This involves exploring the potential to develop an apprenticeship for geospatial by conducting research and analysis to determine the feasibility and design of an apprenticeship program specifically tailored for the geospatial industry.

This would require engagement with representatives from the geospatial industry, including employers, professionals, and relevant association to seek their insights and feedback on the need for apprenticeships and the specific skills required in the field.

This requires a strategic and collaborative approach involving industry and stakeholders to understand the evolving skills gaps, and designing a program that aligns with industry needs, this action aims to contribute to the development of a skilled and well-prepared geospatial workforce.

6 Conclusions

This work has shown there is a skills shortage and this will most-likely get worse. The last university undergraduate geospatial programme in the UK has recently closed, leaving only Masters courses. Social diversification will benefit not just employers but will provide future entrants into higher education. As the industry continues to grow (DataCity suggests geospatial in the UK's 5th fastest growing sector and predicts 10.5% annual growth to reach £9 billion by 2027 †) so the problem will become magnified, damaging the prospects for new innovative start-ups and the ability to attract inward investment. The problem is significant, requiring better awareness of the career possibilities within our industry, professional ambassadors, curricular buy-in at schools and colleges, and the goodwill and support of private industry and government. But working together, with a coordinated approach, solutions are possible. There is no choice if the sector is to be future-proofed and achieve growth.

6.1 Next Steps

The industry and stakeholder engagement, and the collaboration between LDS, the University of Edinburgh and AGI Scotland and the development of the Geospatial Skills Roadmap represents a significant step forward. However, to ensure continued sector growth and to realise Scottish Government's ambition of Scotland being recognised as an international hub for the geospatial industry, a skilled workforce is necessary to support this aspiration. Thus, there are opportunities for next steps to ensure continued progress, including:

- Continued engagement with AGI Scotland Training & Skills Group: cementing the collaboration and partnership to advance the roadmap towards implementation stage.
- Continued discussions with The Data Lab: The Data Lab, Scotland's innovation centre for data science and AI, has shown particular interest in engaging more with geospatial as a key data source. Thus, there is an opportunity to work in collaboration to deliver training and skills.
- Fife college pilot – a partnership with Fife College represents an opportunity to develop and launch a substantive training programme. This involves a short geospatial appreciation event for young people at school, a day for school leavers at the College leading into Higher National qualifications.
- Discussions with Scottish Qualifications Authority (SQA): build on initial discussions with SQA regarding the role of geospatial (and possibly geography) as a STEM subject.
- Implementation of the roadmap – finally, to be truly impactful the actions need to be realised this, however, requires resources, commitment from key stakeholders (including Scottish Government) and funding.

Appendix A: Industry & Stakeholder Engagement – participants

Organisation
Aberdeen University
AGI Scotland
British Geological Society
CodeClan
Dundee University
Edina
Education Scotland
ESRI UK
Forestry and Land Scotland
Forth Valley
Geographical Association
Geospatial Commission
Improvement Service
Location Data Scotland
Nature Scot
Optimat Ltd
Ordnance Survey
Royal Geographical Society with the Institute of British Geographers
Royal Institution of Chartered Surveyors
Royal Scottish Geographical Society
ScotlandIS
Scottish Association of Geography Teachers
Scottish Enterprise
Scottish Government
Skills Development Scotland
University of Edinburgh
University of Glasgow

optimat

Business Growth | Economic Development | Technology Commercialisation

Head Office:

Optimat Limited

100 West George Street,

Glasgow,

G2 1PP, United Kingdom

Tel: +44 (0)141 260 6260

Email: resource@optimat.co.uk

Web: www.optimat.co.uk