Project SSGP 009: 61463-454198

Using Earth Observation for efficient and effective peatland assessment
Project Overview

• User need / reason for project/ problem statement:

The User required a more efficient and effective method of sustainably managing its extensive peatland resource; a challenge that could be met through incorporating satellite-enabled services into their daily operations.
Project Overview

- What the project achieved - solution identified:
  
  An online **Landscape Intelligence Portal** that depicts key components of peatland integrity across water catchments in Scotland, for end users in the Water Utilities industry.

Log-in page of the Portal.

Main page, displaying map, data products and other Portal functionality.
Project Overview

- **Key features of the Landscape Intelligence Portal:**

  (i) **Data products**, e.g. Relative Soil Moisture, Water Quality Risk, Combined Vegetation Indicator, Peatland Integrity Index, created from Sentinel satellite images, other earth observation (EO) data sources (e.g. Shuttle Radar Topography Mission, Landsat 8) and ground surveys;

  (ii) The ability to perform synoptic, landscape-level assessments (through integrating these products), identifying **hotspots of peatland degradation and disturbance**;

  (iii) The ability to **reduce the time and cost** required to manage large, relatively remote and disparate areas of land from which companies extract water for use by consumers; and

  (iv) The ability to **estimate water quality risk** remotely over large areas, assess what factors may be contributing to that risk and based on this information, **prioritise restoration work** across the identified degradation hotspots that is most cost-effective for the water treatment process.

Water Quality Risk product displayed, overlaid by the Drains layer (at 55% opacity), illustrating the potential relationship between one of the mapped anthropogenic disturbance factors and water quality.
Satellite enabled solution

- Description of the satellite application or study developed:

Rezatec’s online Portal offers novel landscape intelligence, developed from Sentinel satellite images and other data sources. Maps covering peatlands in water catchments are provided to End Users in the Water Utilities industry, enabling them to reduce the time and cost required to manage their often large, relatively remote and disparate areas of land from which they extract water for use by consumers.

- How the application is being used (if at all) and by whom:

Scottish Water is using the Portal to monitor peatland integrity and water quality risk across their catchments, and prioritise areas for restoration. In particular, they are currently looking at selected drinking water catchments to determine how the condition of the land, with an emphasis on peat, is having an impact on source water quality and what restoration work is possible. Many of these catchments are large and/or difficult to access, and to collect data using traditional survey techniques represents a significant challenge.

The requirement for extensive ground data is reduced through the use of satellite imagery, to enable landscape planning using the Portal.
Satellite enabled solution

The Portal provides layers mapping the following:

- *Catchment Features* for use in contextualising the landscape, e.g. contours and woodlands;
- The location of anthropogenic landscape disturbances, i.e. Drains, Peat Cuttings and Upland Vegetation Management;
- Aspects of peatland soils, i.e. the distribution and depth of organic soil and *Relative Soil Moisture*;
- The distribution of positive and negative floristic indicators of typical peatland hydrology, i.e. the *Combined Vegetation Indicator*; and,
- Layers to aid management decisions, i.e. *Water Quality Risk* and *Peatland Integrity Index*.

Data Layers panel displayed on the main page of the Portal.
Satellite enabled solution

Rezatec’s Landscape Intelligence Portal:

The main page of the Portal, showing one AoI, with various Catchment Features overlying the Peatland Integrity layer.
Engagement with end users

• User communities involved during the project:
  We worked closely with Scottish Water, our key user community, throughout this project.

• Any feedback received by end users:
  “This tool can be used to assess the current condition of peat within drinking water catchments, which can have a large impact on source water quality. Using the tool, we should be able to identify specific areas to focus ground based activities; this may include more detailed surveys as well as potential peat restoration. This will save on unnecessary surveys, which can often involve considerable man power due to the location and nature of the terrain. The tool will also provide a baseline from which we can evaluate any change.

Scottish Water is committed to providing wholesome water to our customers. To help achieve this it is important that our source water quality is protected both now and for the future. Using this tool will help us towards this goal.”

Dr Zoë Frogbrook
Technical Lead: Catchment Management, Sustainable Land Management
Benefits for end user - economic social or financial

• Impact on the user(s) organisation (i.e. capabilities needed):

With such large and disparate landscapes to manage, Scottish Water requires a method to more quickly, regularly, accurately and at lower cost, map and monitor them. This tool has enabled Scottish Water to do this, identifying specific areas to focus ground based activities such as detailed surveys or peat restoration; saving on unnecessary surveys, which can involve considerable man power, time and expenditure due to the location and nature of the terrain.

• Savings made/expected benefits for the end user:
  - Reducing fieldwork requirements, resulting in *lower costs* incurred by Scottish Water to monitor their estate;
  - **Increasing the regularity** with which landscape integrity can be monitored, thus improving effectiveness of restoration and other management interventions for achieving sustainable upstream catchment management;
  - **Extending the area** over which Scottish Water can regularly monitor catchment condition, to improve detection of degradation hotspots; and,
  - Early detection and restoration of degraded peatland will reduce the amount of organic matter entering the water supply, therefore **reducing the cost of water treatment**.

• If not realised yet, describe the potential benefit and saving achievable with the satellite application:

The satellite-enabled Portal will provide Scottish Water with a means of practicing more efficient, effective and sustainable upstream catchment management, notably in peatland areas, thus reducing downstream water processing costs and generating significant financial savings.
Business models considered

- Delivery of outputs through a subscription-based online data delivery portal
- Subscription allows routine updates through annual period
- Users access Rezatec platform with secure access to specific portals
- Option to deliver to both private and public sector users

Secure user access to the Portal through the log-in page.
Next Steps

- Lessons learned - What has been learnt that others can benefit from:

Methods for integrating Sentinel-1 EO imagery and ground-based data layers to create a map of Relative Soil Moisture, as part of a landscape intelligence tool that focuses on depicting peatland integrity across water catchments.

- What has been gained by SSGP involvement:

The ability to work with the End User, Scottish Water, and thus assist the Scottish Government in more sustainably managing their natural/semi-natural landscape, and notably their extensive and globally important peatland assets.

- Next steps (i.e. new functionality, engagement with different communities, nationwide roll-out, export potential,…):
  
  o Extension of peat depth, vegetation and associated maps across Scotland, in order to map peatland integrity and water quality risk across the nation;
  
  o Addition of enhanced predictive modelling capabilities to enable more proactive peatland management; and,

  o Engagement with new stakeholders including public sector institutions, e.g. SNH, and other water utilities, to assess their interest in the Portal in the UK and overseas.
Conclusions

- We have developed a **Landscape Intelligence Tool** that can be used by **Water Utilities companies** to **reduce the cost and improve the effectiveness** of managing their upstream catchments and downstream water quality.

- Through the development of an **online Portal**, this project has enabled the key end user, Scottish Water, to:
  - Access a high density of landscape-based information in a cost-effective manner;
  - Improve spatial and temporal monitoring capabilities within their drinking water catchments;
  - Increase their understanding of the dynamics and inter-relationships within their catchments to improve source water quality; and,
  - Identify potential areas for peatland restoration, whilst ensuring that these are cost-effective in terms of the impact they will have on the water treatment works.

- With the increase in EO data becoming available, further data products can be added to this tool and its capability extended.
- Involvement of additional Water Utilities companies in the development of this Landscape Intelligence tool may also extend its scope in the near future.