WORKING DOCUMENT

Social Science Methods for Investigation of Spiritual and Emblematic Cultural Ecosystem Services

RESAS RD1.4.1bvi Cultural Ecosystem Services indicators and mapping

Deliverable D2: Social science methods Internal Report

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1. Summary

This report is a deliverable for RD 1.4.1 Objective B (Assessing ecosystem service delivery and interactions), which is part of the 2016-2021 RESAS Strategic Research Programme's WP1.4 on Sustainable and Integrated Management of Natural Assets. Its aim is to describe research methods, drawn primarily from the social sciences, which have been identified as being potentially useful as means of gathering data to inform the development of Cultural Ecosystem Services (CES) indicators. These CES indicators will be used to make maps for inclusion in the Natural Asset Register (NAR), with a particular focus on spiritual and emblematic CES. The five methods described in this report have either already been or are likely to be used in this research project. They have been identified for their usefulness to complement and enrich existing data sources identified in Deliverable 1 (Aalders and Stanik, 2016) through the identification of potential new indicators and 'groundtruthing' existing indicators.

This deliverable is considered a working document. Given the speed with which the field of ecosystem services – and in particular that of CES – is developing, the report is one that may be added to and revised. Similarly, as we seek to make connections across different research deliverables (especially RDs 1.3.2, 1.4.3 and 3.4.3), additional methods may be applicable to the work being done through this RD.

2. Background and Objectives

There is an increasing interest on the part of governments in spatially mapping the extent and quality of ecosystem services. Such maps are considered a valuable resource for use in, for example, decision making about land management where there may be a trade-off between 'services' as well as for understanding the impact of change (e.g. climate) on ecosystem services over time. The provisioning, supporting and regulating services have been, for the most part, relatively straightforward to map, as these services can more readily be objectively measured and monitored. Cultural ecosystem services (CES) have, however, proved more difficult to quantify and spatially locate. This is due firstly to the conflation that has occurred between 'benefits' and 'services' and secondly due to the continuing debate over the definition of CES.

The Millennium Ecosystem Assessment (MA, 2005) defined CES as "*non-material benefits people obtain from ecosystems through spiritual enrichments, cognitive development, reflection, recreation and aesthetic experiences*" (p40). These benefits are considered in terms of cultural diversity, spiritual/religious values, recreation/tourism, social relations, educational values as well as aesthetic values, sense of place and cultural heritage. Recent work in the UK on CES within the UK National Ecosystem Assessment (NEA; Church et al 2011) and UKNEA Follow-on (Church et al 2014) has conceptualised CES as an interaction between the behaviours of people and the environmental setting in which those behaviours take place (Fish et al 2016). As such, CES becomes a place-based concept. The idea of CES as an interaction between person and place is also developed by Fischer and Eastwood's (2016) framework which argues that ecosystem services are co-produced, resulting from human-nature interactions. The continuously evolving understanding of CES has implications for not only understanding this component of our natural capital but also the development of indicators to map CES onto the landscape.

TheCommon International Classification of Ecosystem Services CICES (Maes et al 2013; https://cices.eu/) provides a classification system for the mapping of ecosystem services. The classification for CES is shown in Table 1. CES have been broadly divided into 'physical and intellectual interactions' and 'spiritual, symbolic and other interactions'; these divisions are further partitioned into groups and classes which provide greater specificity as to the potential meaning of – and how one might operationalise – these divisions. As argued by Aalders and Stanik (2016) in their CES data gap analysis, existing data for the mapping of CES predominantly represent the physical and intellectual interactions with ecosystems and landscapes,focusing on the supply of CES

infrastructure (e.g. location of places to dive) rather than actual experience (e.g. sense of place). The mapping of the spiritual, symbolic and other intangible interactions CES remains problematic although the field is rapidly developing (e.g. Tratalos et al., 2016). Indeed, the CES portion of CICES is undergoing revision based on new and emerging work on CES (Roy Haines-Young, personal comm. 6 July 2016). [Since publication of this report v5.1 has been released]

Table 1: Cultural Ecosystem Services Classification from CICES V4.3 (from Maes et al, 2013)

	Division	Group	Class
Cultural [environmental settings]	1 Physical and intellectual interactions with biota, ecosystems, and land-/seascapes	1.1 Physical and experiential interactions	1.1.1 Experiential use of plants, animals and land-/ seascapes in different environmental settings
			1.1.2 Physical use of land-/seascapes in different environmental settings
		1.2 Intellectual and representative interactions	1.2.1 Scientific
			1.2.2 Educational
			1.2.3 Heritage, cultural
			1.2.4 Entertainment
			1.2.5 Aesthetic
	2 Spiritual, symbolic and other interactions with biota, ecosystems, and land-/seascapes	2.1 Spiritual and/or emblematic	2.1.1 Symbolic
			2.1.2 Sacred and/or religious
		2.2 Other cultural outputs	2.2.1 Existence
			2.2.2 Bequest

This report discusses five research methods drawn primarily from the social sciences that we have identified as potentially useful for understanding – conceptually and spatially – the CES that are considered 'spiritual, symbolic and other interactions' with biota, ecosystems, and land-/seascapes. The integration of these alongside landscape research methods (e.g. landscape character units, GIS) will seek to inform development of indicators that can be used in mapping CES at a Scotland-wide scale.

3. Social science research methods

Social science research methods are typically defined as either quantitative or qualitative approaches. Quantitative methods emphasise numerical data, typically gathered via self-report questionnaires and controlled laboratory experiments. The latter approach can facilitate collection of objective non-self-report data through for example eye-trackers or electroencephalogram (EEG) equipment. With the availability of increasingly sophisticated technology, some of the laboratory-based equipment is beginning to be used for field-based research thereby allowing the collection of objective data within a 'real world' setting. For example, EEG has been used to understand brain activity during a walk in a predominantly urban versus a more natural setting (Aspinall et al 2013). Quantitative methods can be useful when one wants to gain insight from a large sample. Qualitative methods allow social scientists to delve deeper into reasons for certain human behaviours and include techniques such as interviews, focus groups, observation and ethnography. Many social scientists engage in mixed methods research, applying both quantitative and qualitative methods to address the issue at hand.

This report examines five main research methods in light of how they might help address the issue of identifying less tangible CES and moving towards meaningful indicators for these services that can be used for mapping of these ES in the Scottish context.

The methods covered in this report include:

- Secondary/content analysis of geotagged photographs
- Card sorting
- Touch table activities
- Collecting data via online surveys
- Participatory mapping exercises or PPGIS

3.1 Secondary/content analysis of geotagged photographs

Geotagging is a method of storing location data with digital photographs. It uses latitude and longitude information stored in the image file's EXIF (Exchangeable Image File Format) data. EXIF metadata can also include make and model of the camera, timestamp of the photo and camera settings. The location data can be used by social media websites like Flickr, Panoramio, Facebook and Instagram to pin photos to a map. Most smartphones geotag photographs automatically using the GPS capabilities unless the setting is turned off. Newer point-and-shoot and DSLR cameras also have GPS capabilities built in to them.

For cameras without GPS capabilities it is still possible to geographically locate photographs by adding the location manually when uploading photos to social media websites such as Flickr. Other information can also be added manually, such as title, tags and descriptions for the image. These additional data are searchable and as such can be a source that could be content analysed to gain insights about the CES provided by the environments captured in the photographs.

The use of social media as a means of extracting information for the mapping of CES is emerging from the simple counting of number of photos to more advanced interpretation of the photos based on content related to CES (see Oteros-Rozas et al., 2017). For example, Wood et al. (2013) found that Flickr photographs can be used as a proxy to estimate visitor numbers to particular visitor attractions and recreational sites. Information from the profiles of the photographers can additionally be used to derive the origin of the visitors. Others (e.g. Casalegno et al., 2013; Tenerelli et al., 2015) have used phots uploaded to social media to derive insights about the aesthetic value of ecosystems.

Within RD1.4.1 some research using Flickr has recently been completed (contributing to the EU OpenNESS project). A key observation from this piece of work is that exploring the tags associated with photos on Flickr as a data source is unlikely to be fruitful. People are not consistent in the way in which they tag images, with some choosing to provide information relating to the location or topic while others provide more practical information such as the camera name and setting. From the point of view of gathering CES data, there is likely to be greater value in looking at the textual description provided with the photos, as these descriptions may tell us about the *actual experiences* people were having when they took the photograph. The assessment/interpretation of each photo can then be linked to a specific location due to geotags, which will support their use in spatial context. Content analysis of these descriptions is therefore an approach that will be investigated subsequently within 1.4.1.

We can also consider whether other social media platforms such as Twitter with its hashtags could also be useful as a source of data. Palomino et al (2016) in their analysis of social media and the idea of 'nature-deficit disorder[1]' provide an example of how such an investigation might be undertaken.

Geotagged photographs from crowdsourced platforms such as Flickr and Instagram are also valuable as an ecologically valid source of material with which to conduct card sorting as a method of categorising the less tangible elements of CES. Card sorting is discussed in the next section (3.2).

[1] 'Nature-deficit disorder' is a phrase introduced by Richard Louv in his 2005 book "Last Child in the Woods". It describes the negative moods and attentional and behavioural problems that can arise through spending more time indoors and away from the natural world.

3.2 Card sorting

Card sorting is a method used to generate information about the associations and groupings of specific items. Card sorting usually involves identifying key concepts and writing them on index cards or post-it notes, or presenting pictures or photographs. Participants, individually or sometimes as a group, then arrange the cards to represent how they see the structure and relationships of the information. Participants can be organised as collaborative groups (focus groups) or as repeated individual sorts. The goal of card sorting is to generate a user-centred taxonomy. The result of a card sorting exercise is normally a dendrogram or tree diagram, used to illustrate arrangement of clusters produced using cluster analysis. Interpreting the groups in dendrograms is notoriously subjective, especially when there isn't high agreement between users. Using Factor Analysis may lead to better discrimination.

There are two types of card sorting, open and closed. In open card sorting, participants create their own names for the categories. Open sorting is generative – it is typically used to discover patterns in how participants classify, which in turn helps generate ideas for organising information. Closed card sorting provides participants with a predetermined set of category names to which they assign the index cards. This helps reveal the degree to which the participants agree on which cards belong under each category. Closed sorting is evaluative – it is typically used to judge whether a given set of category names provides an effective way to organise a given collection of content.

Card sorting can be done in person or online. Online (remote) card sorting uses web-based tools such as OptimalSort, Websort and Userzoom. Its major advantage is that it can reach a large number of participants at lower cost, and the software can help analyse the results. The main disadvantage is the lack of personal interaction between card sort participants and the researcher, an interaction which may produce valuable additional insights.

As a rule of thumb, card sorting activities can take up to 20 minutes for 30 items, 30 minutes for 50 items and 60 minutes for 100 items. There is surprisingly little guidance on finding the right sample size for a card sorting study. Tullis and Wood (2004) performed a resampling study with one large card sort involving 168 users and found the cluster results would have been very similar (correlations above .93) at sample sizes between 20-30 participants.

A variety of different photograph-based card sorting exercises could be conducted to identify common 'representations'/interpretations of symbolic/emblematic CES, and to fill some of the data gaps identified in D1. For example:

1. Using the pre-defined CICES classifications (spiritual, emblematic etc.), ask people to sort the photos into each classification. This would allow us to look at similarities across individuals. Our Open House and RBGE experience (see later) suggests that the distinctions between classes may be difficult for people to distinguish since participants ticked many of the categories when thinking about their favourite woodlands. However, behaviour may be different when looking at only one picture rather than being asked to recall a meaningful place.
2. Allow people to sort photos into as many CICES classes as they feel apply to that photo – this may help us establish places that have a higher delivery of CES than other places.
3. Present photos along with a list of descriptors and ask people to select terms that they associate with the images. This would require some *a priori* selection of photographs that we think are indicative of certain CES. Careful selection of the words would also be required.

3.3 Using the touch table

Touch tables are becoming a more frequently encountered display device, found in museums, airports and showrooms. In museums and galleries they can be a means of enhancing and enriching interaction with collections (Ciocca et al., 2012; Patsoule, 2014), wherever they are found they tend to attract attention, particularly with younger generations (Ch'ng, 2012; Zaharias et al., 2013). Within

educational settings there is evidence that touch tables facilitate effective collaborative learning, compared to traditional pen and paper methods (Higgins et al., 2012), and in planning settings, touch tables can be particularly valuable as decision support tools involving different stakeholder groups. For example, Bhandari et al. (2010) employed a touch table with geographic information systems (GIS) software enabling freehand drawing over maps to allow stakeholders to collaboratively design forest biolink areas. Arciniegas and Janssen (2012) used a touch table in a similar way in peat-meadow polder planning workshops in the Netherlands. Areas of conflict for a potential site for tidal renewable energy in Scotland were captured on a touch table by Alexander et al. (2012), and urban development conflicts have also been facilitated through meeting around digital maps on a touch table (e.g. Pelzer et al., 2013; Lay, 2013).

During the first year of the research project we trialled gathering map related data using the touch table at two public engagement events - Doors Open Day event at The James Hutton Institute Aberdeen site in September 2016, and a public engagement event on woodlands at the Royal Botanic Gardens Edinburgh at the end of the same month. At both of these events participants were asked to identify their favourite woodlands and answer a few closed questions about these. Using QGIS, ordnance survey map layers covering the whole of Scotland were presented on the touch table. Participants were shown how to scroll and zoom on the table, and as such were able to identify the region of their favourite woods. Once they had located the woods, they told the researcher, who selected the menu to enable a point feature to be added. When the participant then touched the map, a text box appeared on which a series of questions appeared. Once the participant had completed the questions, a coloured star appeared on the map to represent the location of their favourite woodland.

One key observation from the Doors Open event was that participants found it difficult to locate their woods due to the fact that they could only zoom into 1:250 000. Given that the majority of participants at the Doors Open event were local to Aberdeen and many wanted to tell us about local woodlands they would have liked the ability to zoom in closer to this part of the country. Therefore for the RBGE event a larger scale layer (1:50 000) was added for the local area (Edinburgh and surrounding area) meaning that people were able to pinpoint their local woodlands with greater accuracy. This worked well, although it meant that the researchers had to manually turn on and off different map layers.

Our main observations after the two events were:

- Participants were immediately attracted to and impressed by the scale of the touch table, and wanted to engage with it.
- The statements we chose to present were representative of the different CICES classifications and as such we hoped to be able to distinguish between different types of CES delivered by the woodlands. However, we observed that many participants selected many of the options, meaning that distinguishing between the woodlands on this basis was difficult (however, this may be indicative of the fact that these woodlands were favourites precisely because they delivered so many CES).
- Zooming in and out on the map was not a smooth process from the user's perspective. Zooming from one scale level to another was problematic because when pinch to zoom is used it zooms on the centre of the screen regardless of where the pinch takes place, and when zooming it blanks the screen taking the user briefly out of the immersion of the interface. Many users were familiar with using Google Maps and Bing Maps on desktop computers, tablets and phones where no such issues occur, so this was unfortunate. A possible future solution is to develop a web server that is stored on the touch table itself, meaning that data gathering using web-based software such as Leaflet (www.leafletjs.com) is not vulnerable to loss of network connection, and opening up options of using different software.

Using the touch table to gather map-based data was a useful approach and allowed us to begin building a map of valued Scottish woodlands. Based on this experience we are considering a 'ticking over' of this particular activity, using it in several different environmental settings to glean differences / similarities as well as to continue to advance development of closed-ended statements that might be able to capture CES qualities that people associate with those woodlands.

The touch table is well suited to group activities and discussions, as people can comfortably congregate around the large table. The effectiveness of communicating around the touch table has been demonstrated in previous research at JHI, for example in in-depth discussions of locally contested land use areas (TRANSGRASS, www.hutton.ac.uk/research/projects/TRANSGRASS) and in sharing and conveying what a landscape is like (Route Aware[2]). Using map-based and geotagged photo activities on the touch table with members of local communities could be a particularly fruitful way of gaining understanding of the less tangible CES of an area and in investigating what it is about a (local) landscape that helps provide a sense of place. Conducting focus groups/workshops around the touch table can be used to supplement and enhance the CES data from existing projects (such as those collated by SNH) and help in the identification of CES in cross-work package research.

In summary, the touch table can be useful in a number of ways e.g.:

- As a tool to bring people from a community together to discuss the CES of their local environment in a group situation, as in Route Aware – helps fill the D1 gap of missing data on *actual experience* of CES
- As a method of capturing spatial data in an immediate fashion e.g. people dropping pins onto map as at the Open House and RBGE events
- As a tool with which to try out different techniques e.g. card-sorting

Based on our experience with the touch table we will be investing in a smaller-scale touch screen laptop that can perform the same functions as the touch table but could be used in one-on-one interview situations as may be appropriate for exploring the less tangible spiritual and emblematic dimensions of CES.

3.4 Collecting data via online surveys

Online surveys can be used as a method to gather data about the places that are important to people. There are various interactive map-based mapping applications that can be used for gathering spatially located information. For example, map-me (http://map-me.org/index.html) is a freely available piece of software that allows you to set up your own mapping exercise using Google Maps. Participants are able to use a 'spray can' to indicate broad areas on map without being spatially explicit. This method has been used to identify culturally valuable places to see and enjoy nature in Edinburgh (project GREEN SURGE www.forestry.gov.uk/fr/greensurge). Other web-based software (e.g. Harava, which uses Open StreetMap www.eharava.fi/en/) use point data rather than the spray can method, which allows a greater degree of precision.

It is not just spatial information that can be captured in these surveys – it would be possible to allow people to upload photographs of their favourite places and include descriptions of what these places mean to them and why. In this manner we would be able to reach a greater number of people across a broader swathe of the country.

The disadvantage to web-based spatial surveys is that the captured data are often not available as GIS information and would need to be translated for use in GIS map layers.

[2] Route Aware was funded by the Macaulay Development Trust to investigate the utility of the touch table to explore issues around GPS recording and sharing of favourite walking routes. The final report of the project is available on request.

3.5 Public Participation Geographic Information Systems (PPGIS)

The involvement of the public in generating spatial data and knowledge is a method originally developed for use in areas particularly poor in local spatial data, for example Africa, as a means to capture local knowledge in a spatial context. The format of PPGIS can range from the identification of important location/features in relation to each other in the sand or on paper, to the application of paper maps or aerial photographs, to the creation of 3-D scaled models (e.g. Gaillard et al., 2013; Texier-Teixeria et al., 2014; Muchemi et al., 2016). Generally these methods are used to engage the local community in dialogue regarding environmental issues, to understand change and to explore ways to adapt land use practices (e.g. Khalif et al., 2015). This generally leads to a qualitative assessment although the inclusion of quantitative social science methods can be included.

More recently technological developments have allowed a range of different electronic opportunities to engage the public in the mapping of features and experiences, via the internet (Brown, 2012), tablets or touch tables (see section 3.3). This has led to PPGIS emerging as a popular tool for eliciting information that can be used for mapping of ecosystem services in particular CES. Although increasingly being used, recent reviews (Brown et al., 2015; Darvill and Lindo, 2015) conclude that although the methods successfully elicit public responses on CES, they require the development of standards for best practice for them to be successfully used in mapping CES.

Within 1.4.1 we will continue to engage in PPGIS activities such as those described in section 3.3 using the touch table whilst keeping a close eye on the literature and emerging techniques in this field, to best address the issue of how to capture spatial CES information.

4. Conclusion

As Daniel et al (2012) argue, there is considerable insight that can be gained from existing literature in the social sciences on the cultural dimension of the natural environment. Similarly, there are a range of methods from the social sciences (and other non-ecological sciences) that can bring a depth of understanding to the CES domain of the ecosystem services framework. We have identified five such methods that we think could usefully inform development of such depth as well as bring innovative methodological advancement to the identification and development of indicators to map such CES. These will be particularly relevant for understanding the CICES class 'spiritual, emblematic and other interactions'.

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