

WORKING DOCUMENT

Touch table mapping and photo activities: Methods for capturing Cultural Ecosystem Services

RESAS1.4.1bvi Cultural Ecosystem Services indicators and mapping

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1. Introduction

One of the aims within this research deliverable (RD 1.4.1 bvi) is to identify, develop and test research methods that can help quantify less tangible cultural ecosystem services (CES), such as symbolic and spiritual, for incorporation into a national asset register. Much of the insight about these CES has been gathered via the traditional qualitative social science methods of interviews and focus groups. These methods allow an in-depth analysis and understanding of the CES afforded by particular (usually local) landscapes. They are, however, time-consuming and resource intensive thus often only feasible for use with a relative small proportion of a population, frequently in a particular location. A challenge thus is what methods could be used to generate reliable national scale data that retains this often localised experiential insight

This working paper builds on Conniff, Irvine and Aalders's (2017) overview of five social science methods that were considered potentially relevant for use in mapping CES at the national scale. Here we provide an in-depth description of two studies that we have conducted using two of these methods:

- Public Participation GIS (PPGIS) using touch table with closed-ended questions
- Picture-word matching task (a pre-cursor to card-sorting activities)

2. Study 1 – Touch Table PPGIS Favourite Woodlands

2.1 Background

A touch table, essentially a large touch-based surface that can be mounted to legs, was one of the five approaches identified as a potential method for mapping CES (see Conniff et al., 2017). Drawing on previous research in which a touch table was effectively used to facilitate conversation and engagement with landscape-related issues (Conniff, Colley & Irvine, 2017; TRANSGRASS, www.hutton.ac.uk/research/projects/TRANSGRASS;), we considered it useful for three reasons:

1. As a method of capturing spatial data in an immediate fashion;
2. As a tool to bring people from a community together to discuss the CES of their local environment in a group situation; and,
3. As a platform through which to try out different techniques e.g. card-sorting

In this study we sought to examine its usefulness for capturing spatial data. We were particularly interested in whether national scale spatial data could be collected and how one might operationalise CES for quantitative data capture. We focused the study on woodlands as places that can incorporate several different CES.

2.2 Method

We took advantage of two public engagement events at which to trial the use of a touch table format. The events occurred at the James Hutton Institute's Doors Open Day at the Institute's Aberdeen, Scotland research site and at the Royal Botanic Gardens in Edinburgh, Scotland. At both events the touch table was one of several activities in which members of the public could take part. At the former, activities were focused on sharing information about all aspects of the Institute's

scientific research conducted in Aberdeen; the event at the Botanical gardens was specifically focused around woodlands. Both events occurred in September 2016.

2.2.1 Data Collection Instruments

2.2.1.1 Touch Table & Maps

The model of touch table used in the events was a Zero Bezel 1920 x1080 @ 60Hz 58-inch display, with an Intel® Core i7-4790 CPU 3.60 GHz with 256 touch points, using the Windows 10 operating system. Ordnance survey map layers covering the whole of Scotland at a scale of 1:250,000 were presented on the touch table using QGIS, an open-source desktop GIS application. Following the Aberdeen event it was decided to additionally provide a 1:50,000 map layer for the local (Edinburgh) layer, to enable participants to more easily use the touch table capability to zoom into local urban and peri-urban areas to locate their favourite woodlands.

2.2.1.2 Questionnaire

A short questionnaire consisting of closed-ended statements only was developed and integrated into the map layers. Using CICES 4.3 (<https://cices.eu/resources/>) as a guide, we selected 5 classes of CES for inclusion that were reflective of both divisions and all four CES groups; see Table 1.

Table 1. Cultural Ecosystem Services (CES) classification from CICES v4.3 (Maes et al., 2013) with classes of CES (bolded) used in understanding why a particular woodland is considered a favourite.

| | 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 |
| | 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 |

Seven closed-ended statements were developed: two each for symbolic and existence; one each for physical use, heritage/cultural and sacred/religious (Table 2). Wording for statements was informed by examples provided in the CICES framework in relation to a woodland ecosystem. In response to the stem question 'These woods are my favourite because...', participants selected any statement(s) that they felt applied to their selected woodland.

Table 2. Statements to measure five CES classes that might be associated with favourite woodlands

| Class | Statement |
|----------------------------------|---|
| <i>Symbolic</i> | I can hear or see Scottish wildlife I can hear or see Scottish trees or plants |
| <i>Existence</i> | I feel connected to nature when I'm here I feel the presence of wildlife here |
| <i>Physical use (recreation)</i> | There are fun things to do here |
| <i>Heritage, cultural</i> | They are historically important |
| <i>Sacred and/or religious</i> | They are good for my soul |

Figure 3 illustrates the questionnaire as displayed on the touch table. Age (over 16 / 16 or under) was the only sociodemographic information collected. This was deemed appropriate to both keep the questionnaire short due to the nature of the event and to reduce ethical issues associated with collecting information from individuals who are 16 years of age or younger.

James Hutton Open House

All answers to the questions below are anonymous.

I agree to answer the following questions

I am 16 or under

I am over 16

These woods are my favourite because ...

I can see or hear Scottish wildlife when I'm here

I can see Scottish trees or plants when I'm here

they are good for my soul

there are fun things to do here

I feel connected to nature when I'm here

they are historically important

I feel the presence of wildlife here

OK Cancel

Figure 3. Pop-up questionnaire integrated onto touch table to understand why a selected woodland was considered a favourite. Statements represent five different classes of CES (see Figure 2).

2.2.3 Procedure

At both events, participants were recruited from individuals who were attending the event. Individuals were asked if they would like to take part in a study about favourite woods in Scotland. Following a brief description of the process, participants were shown how to scroll and zoom on the table and invited to identify their favourite woods. Once located, the researchers selected the appropriate menu tab on the touch table which enabled participants to add a point feature to the map layer to indicate the location of their wood(s). When the participant touched the map, a text box appeared on which the questionnaire appeared. Following completion of the questions, a coloured star appeared on the map to represent the location of their favourite woodland (Figure 4).

The study was conducted in accordance with the Declaration of Helsinki; ethics approval was provided by the James Hutton Institute Research Ethics Committee. Participation was voluntary and responses anonymous. Written consent was obtained in the form of a single question (*I agree to answer the following questions*) at the beginning of the questionnaire (see Figure 3). In instances where someone under the age of 16 approached the table and wanted to participate, the researchers confirmed verbally with their parent or guardian in addition to obtaining a response to the single consent question in the questionnaire.

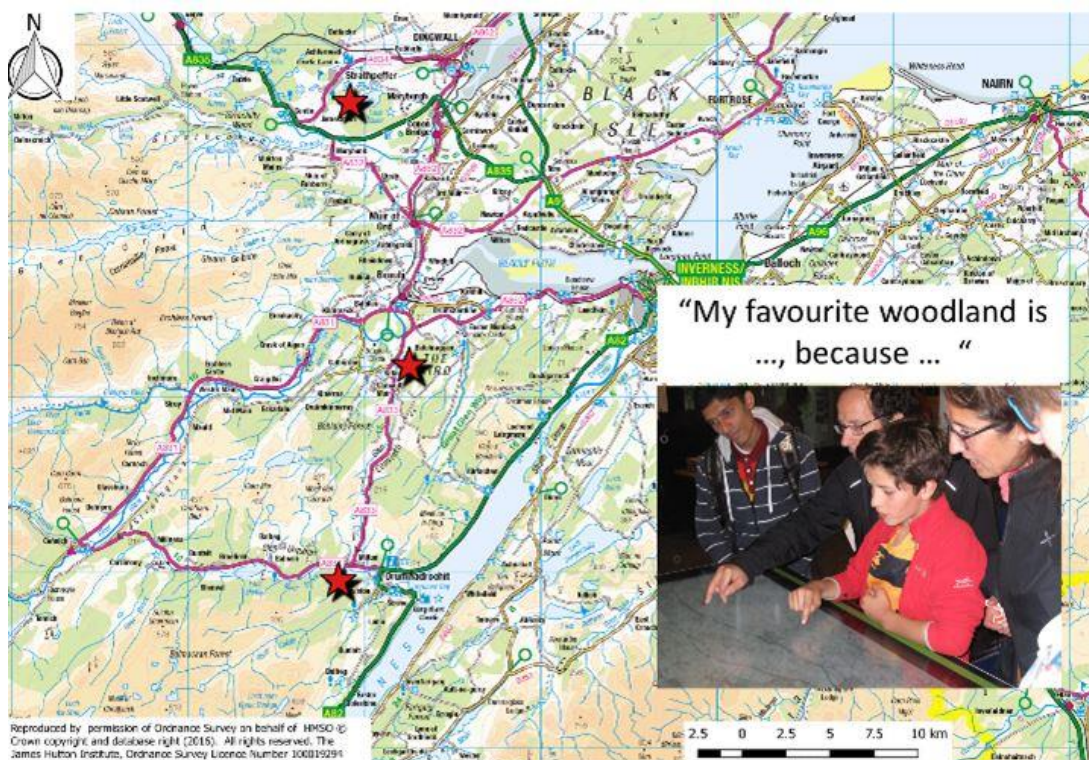


Figure 4. Illustration of process for (inset) and results from (stars) use of touch table to capture spatial location of a favourite woodland in Scotland linked with information about why it is considered favourite

2.2.4 Analysis

Data for the two events were combined for analysis given the study focused on piloting a process rather than comparisons between groups. Spatial data were compiled to generate maps based on identified location of favourite woodlands for each CES statement.

Due to the exploratory nature of this study, data associated with CES that had two statements (i.e. symbolic, existence) were kept separate. This was done in order to facilitate understanding of how well the statements performed (e.g. participant understanding of statement; differentiation between statements).

2.3 Results

2.3.1 Participants

A total of 115 individuals agreed to take part in the study. Thirty-three of these were 16 years old or younger (32% of sample).

2.3.2 Maps

Figure 5 depicts the spatial location of woodlands that were associated with each of the seven CES statements. Perhaps unsurprisingly, there are clusters of favourite woodlands around the city hubs within which data were collected. However, and importantly, the maps do illustrate a national distribution of favourite woodlands indicating that participants were able to use the touch table process to identify woodlands at a national scale.

There is clearly overlap in the location of favourite woodlands. All maps include a cluster around the data collection cities. There are also similarities in spatial location nationally for the different CES. For example, the spatial location of woodlands that are symbolic (e.g. where one can see Scottish trees/plants; Fig. 5b) is similar to those where one can feel the presence of wildlife, considered in this study as an assessment of an existence CES (Fig. 5g). These spatial similarities are suggestive of the multiple classes of CES associated with urban and peri-urban woodlands and woodlands more broadly.

Despite similarities, distinctions can be seen between the CES classes. The most clear example of this is the difference between woodlands that are considered sacred or religious (Fig. 5c) and those that are more associated with physical use (Fig. 5d).

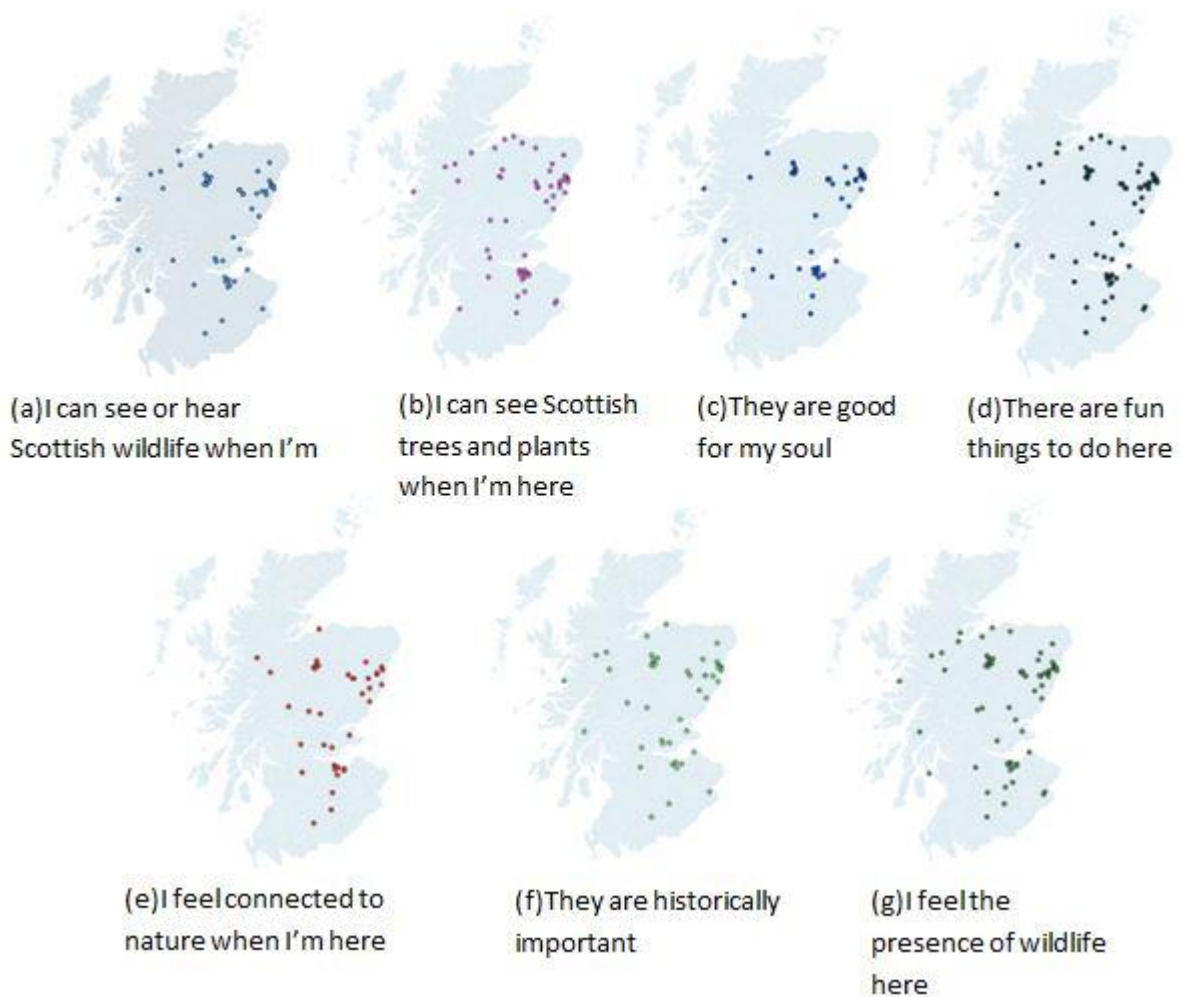


Figure 5. Spatial distribution of favourite woodlands by type of CES associated with them. (a) symbolic; (b) symbolic; (c) sacred/religious; (d) physical use; (e) existence; (f) heritage/culture; (g) existence

2.3.3 CES measurement

Most participants selected more than one option from the questionnaire. This can be seen through the similarity in location of woodland between the different CES classes and within class (e.g. symbolic; Figure 5 a,b). It was however possible for participants to distinguish between the classes, as evident by the fact that the maps are not all exactly the same. This is promising from the perspective of developing measures that can be used to quantify CES in relation with spatially located landscapes.

2.3.4 Touch table format for data collection

At both events the touch table drew curious onlookers, who were then often easy to recruit to the study. The touch table is particularly appealing to children, who naturally gravitated to it and started to interact with the surface. Parents and adults were impressed by the size of the touch table, and intrigued by the idea of interacting with such a large touch screen. As such, the touch table is a valuable piece of equipment to bring to public engagement events such as these.

As touch screen technology is now ubiquitous, and applications such as Google Maps widely used, most participants were comfortable with the concepts of panning, zooming and working with a map at national scale. However, presenting the maps in QGIS layers meant that the interaction was not as smooth as a Google Maps experience tends to be. For example, when pinch to zoom is used the map 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. However, we were encouraged to find that these interactivity issues did discourage participants from engaging in the activity, and they persevered until they had achieved their mapping goal.

In future studies of this type we suggest development of a web server that is stored on the touch table itself. This approach would provide the option of using web-based software such as Leaflet (www.leafletjs.com) that is not vulnerable to loss of network connection as well as different software options to QGIS.

2.4 Discussion

We conducted two public engagement events in Aberdeen and Edinburgh Scotland at which members of the public were invited to take part in a study about favourite woodlands in Scotland as a way through which to spatially map CES at national scale. The study utilised touch table technology as a research tool for spatial mapping and tested the use of closed-ended statements to quantitatively assess five classes of CES that might be associated with Scottish woodlands. The CES classes included physical use, heritage/cultural, symbolic, sacred/religious and existence.

The touch table proved useful as an approach through which to gather map-based data. Identified woodlands were not just locally-based which allowed us to begin to develop a map of valued Scottish woodlands. This is encouraging in terms of identification of methods for use in generating insight for national scale maps. The ability of individuals to be able to manipulate the maps suggests that this approach, i.e. the identification of particular landscapes associated with different CES could be done through other mechanisms, e.g. as part of an online survey.

The quantification of CES proved challenging. While, in general, the phrasing used in our closed-ended statements was largely understood by adults, it was less interpretable by those 16 years and under. This may be problematic for rollout in situations where discussion to clarify is not possible (e.g. online survey) and suggests either a need to simplify language, provide a further description or target specific segments of the population, i.e. those only over 16 years of age. Participants also often checked multiple statements. This is suggestive of the multiple CES that are often associated with woodlands and is an important issue to consider with respect to mapping of CES. Although there was overlap, there were clearly distinctions between how woodlands were perceived as the maps for the different CES did differ which is promising for being able to quantify CES through these types of closed-ended statements.

3 Study 2 – Picture-Word Matching of Historical Elements

3.1 Background

Card sorting was one of the five methods identified as potentially relevant for identifying non-tangible CES for national scale mapping (Conniff et al., 2017). Picture-word matching can be considered as a pre-cursor to a card-sorting activity. It is a basic form of gathering data that can provide insight into the associations people make between words and images. In this study we investigated connections made between CES-related terms used in the CICES classification and historical elements found in the Scottish landscape.

3.2 Method

We took advantage of the fact that the James Hutton Institute has an annual presence at the Royal Highland Show, and developed a quick and intuitive task that could be undertaken by visitors to the Royal Highland Show in 2017. The year 2017 was Scotland's year of History, Heritage and Archaeology, and we chose this as the theme for our task. The task also complemented the project's poster (Aalders et al., 2017) that was being displayed and discussed at the RHS. In light of the finding from Study 1 that participants often selected more than one response option in relation to CES, in this study we incorporated a forced choice approach which restricted people's response options to choose only one word to go with each picture.

3.2.1 Data collection instruments¹

3.2.1.1 Words

We wanted to investigate how well members of the public are able to distinguish between terminology used to describe the different CES in CICES classification which has been developed largely through consultation with experts (e.g. Haines-Young and Potschin, 2013). We were particularly interested in those that refer to the less tangible CES. The words we chose to investigate included: *educational*, *recreational*, *symbolic*, *spiritual*, *sacred* and *inspiring*.

Symbolic, *sacred*, *spiritual* and *educational* are all descriptors of group and class in the CICES definition (see Table 1). *Recreational* was chosen as a word that would capture an experience that people can have at a physical location, and *inspiring* was selected as an alternative to *aesthetic*, as it was felt that using the term *aesthetic* might lead participants to judge the quality of the photo rather than assess the historic element in its surrounding landscape.

3.2.1.2 Photos

We decided that it was important to use photos that had been taken by members of the public, rather than professionally taken and produced images that might make the photographed object appear different to the way in which most people would experience it. To that end, photos were selected from Flickr (<https://www.flickr.com/>) and Wikimedia Commons

¹ An online version of this task was also piloted during the Royal Highland Show, publicised via the James Hutton Institute's Twitter account, and hosted on SmartSurvey (www.smartsurvey.co.uk). Ten respondents completed the survey; these results are not included in this working paper.

(https://commons.wikimedia.org/wiki/Main_Page), the online repository of free-use images, sound, and other media files. We sourced images that did not contain people or animals, where the weather/sky was similar, and the historical element was clearly the focal point of the photograph.

Photographs were selected from three different categories of historical element: castles, churches and standing stones. The castles and churches were of different styles and time periods (see Figure 6). We also considered the landscape character within which the historic element was situated.



Figure 6. Photographs of the (a) castles, (b) churches and (c) standing stones presented in the study.

3.3 Procedure

Participants were recruited in two ways. Our main method was via visitors to the James Hutton Institute marquee at the RHS. The historic land use poster signposted participants to the activity

which was set up to one side of the poster (see Figure 7), and the researchers standing at the poster asked people who stopped to look at the poster if they would like to take part in the activity.



Figure 7. Study set-up at Royal Highland Show 2017, Edinburgh, Scotland.

The words were arranged on an A3 poster on a metal stand, and the photographs with author attributions² were printed out at 10x15cm size and mounted in magnetic photo frames which could be easily placed on and removed from the poster.

The activity was explained as a word-photo matching activity. Participants would be given three sets of three photographs representing different historic elements (castles, churches, standing stones). Each photo in a set was to be placed below the word that the participant most associated with the

² Castle Stalker: CC by-nc-nd 2.0 Castle Stalker by John Francis O'Brien Photography, Flickr
Caerlaverock: CC by-sa 4.0 Caerlaverock Castle from the South West by Roland Hanbury, Wikimedia Commons
Crathes: CC by-nc-nd 2.0 Crathes Castle by Zoë, Flickr
Glenfinnan: CC by-sa 2.0 Church, Tree, Loch, Mountain by Adam Ward, geograph.org.uk/p/4985399
Fortrose: CC by 2.0 Fortrose Cathedral by Bert Kaufmann, Flickr
Edderton: CC by-sa 2.0 Old East Parish Church Edderton by John Ferguson, geography.org.uk/p/2468761
Callanish: CC by-nc-nd 3.0 Callanish by Rhonda Surman, Flickr
Aikey Brae: CC by-nc 2.0 Aikey Brae Stone Circle by Les Hamilton, Flickr
Nether Largie: CC by 2.0 Nether Largie by Erik Fitzpatrick, Flickr

place depicted in the photograph. They were told that they could only use each word once for the three photographs in a set.

The order in which the sets of photos were presented to the participants was randomised. Prior to removing the photos from the magnetic board and presenting the next set, the researchers recorded on a scoring sheet under which word each picture was placed. After the activity participants were asked if there were any words they would have liked to have been available, and for any other feedback.

Our second method was more pro-active, where two researchers visited other stands and marquees at the RHS and asked workers at those stands if they would take part in the study. In this case we took the photographs along with the words cut out on strips of paper. Using whatever surface available, participants laid out the set of images in each set of photographs and placed the words with the photographs.

Additional information noted on the scoring sheet included age category (over 16 years of age; 16 years old or younger) and whether the participant undertook the activity on their own or in collaboration with another member of their party. As feasible we noted any reasons that participants gave for placing the photo against a selected word.

The study was conducted in accordance with the Declaration of Helsinki; ethics approval was provided by the James Hutton Institute Research Ethics Committee. Participants were informed that their participation was voluntary and their responses would be anonymous. Verbal consent was obtained. In instances where someone under the age of 16 wanted to participate, the researchers confirmed verbally with their parent or guardian.

3.3 Results

3.3.1 Participants

Over 130 participants were recruited to the study. Of these, 7 individuals under the age of 16 took part and 10 responses were the result of collaboration between two or more participants. There were 121 completed responses in total.

3.3.2 Picture-word matching

Results from the picture-word matching activity are presented in Figures 8, 9 and 10. In general, participants associated different words for the castles and churches while for standing stones the findings are less clear cut.

With respect to the castles (Figure 8), the term *recreational* was most frequently associated with Crathes Castle followed by *educational*. Castle Stalker was most likely to be associated with the terms *inspiring* and *symbolic*, whilst Caerlaverock was evenly split between *educational*, *inspiring* and *symbolic*. Very few participants associated the castles with the terms *spiritual* or *sacred*.

For the churches (Figure 9), there was also a clear distinction between the words that were most frequently associated with each. Glenfinnan was most frequently associated with the words *spiritual* and *inspiring* while Edderton was clearly seen as *sacred* and, to a lesser extent, *spiritual*. For

Fortrose, the most associated word was *symbolic*. Few participants related the churches as a recreational service.

There was little difference among the three different standing stones. For all three, the words *spiritual*, *sacred* and *symbolic* were relatively equally associated with each most frequently (Figure 10). Aikey Brae was marginally seen as more *educational*, Nether Largie was more often associated with *recreational* and Callinish somewhat more *inspiring*.

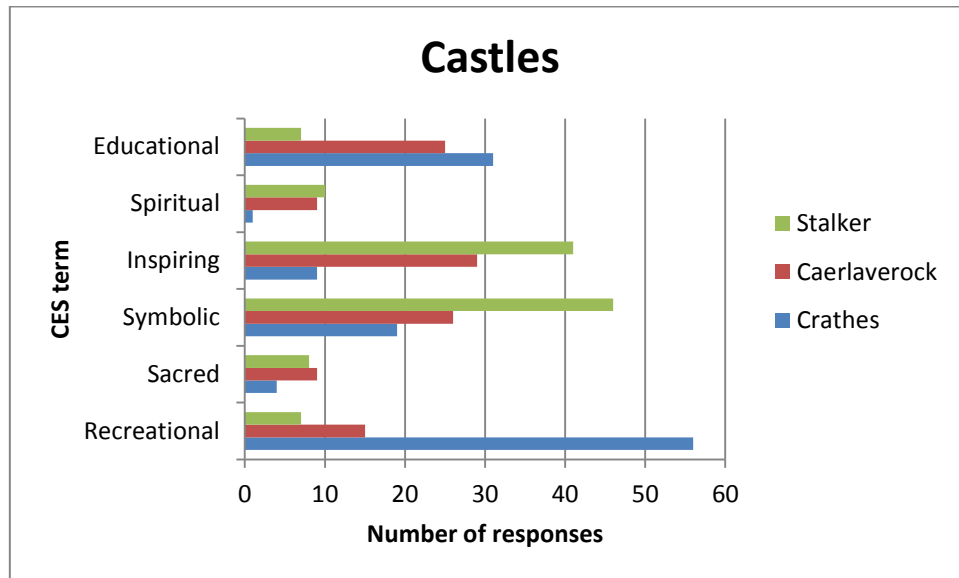


Figure 8. Words associated with castles (n=121)

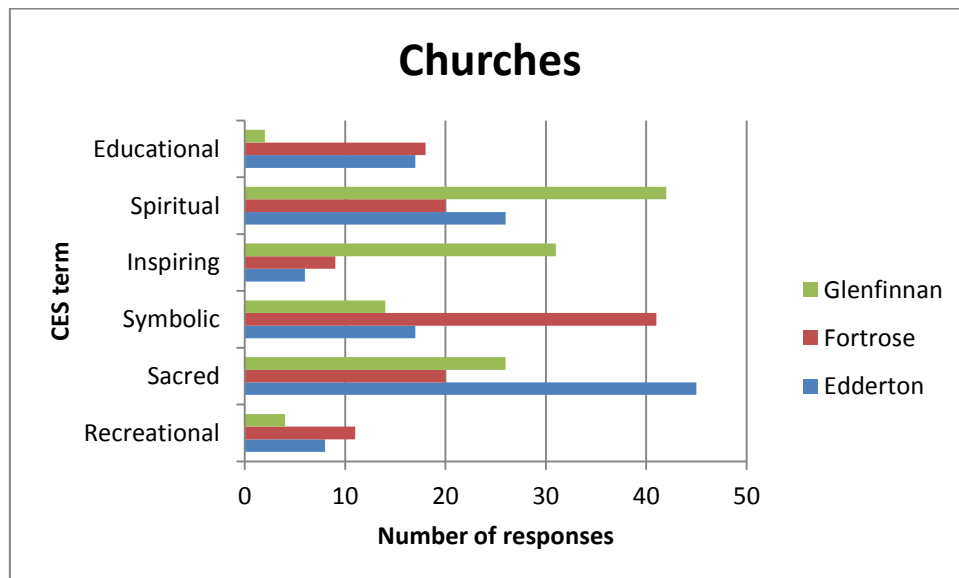


Figure 9. Words associated with churches (n=121)

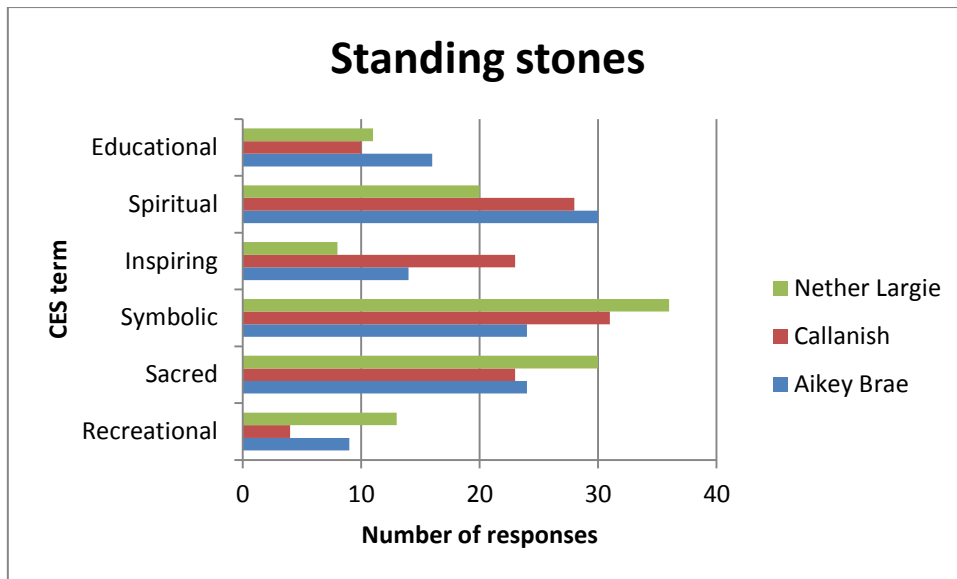


Figure 10. Words associated with standing stones (n=121)

At the end of the activity participants were asked if there were any words they would have liked to have been included, to help us in trying to identify words for CES that might resonate more with members of the public. Additional words identified were: historic(al), iconic, traditional, beauty, ancient, familiar, ruined, significant, ancient, peaceful, tranquil, memorable, religious, holy, architectural, scenic, majestic, authentic, mysterious.

3.4 Discussion

We observed that participants appeared to find it easier to categorise buildings (castles and churches) than standing stones. This is likely explained by the fact that castles and churches have distinctive styles and can be ruined or restored, unlike standing stones. For example, Crathes Castle was most associated with the word *recreational*. Participants commented on how they could see that this was a managed castle, probably by the National Trust for Scotland, and that they could imagine there were lots of walks and gardens in the grounds. Some participants told us Castle Stalker was associated with *symbolic* and *inspiring* because of its ancient appearance and the landscape in which it sits. With the churches, Edderton Church was more associated with *sacred* than the other churches – could this be because of the prevalence of gravestones in the foreground? These comments suggested that the landscape in which the historical element sits has an effect on the perception of the CES that would be derived from that location, an observation that will be the focus of further analysis and research within this RD (see Section 4).

With respect to the words we offered participants, it was notable that children found it difficult to distinguish between some of the vocabulary used, particularly *spiritual*, *symbolic* and *sacred*. Many of the additional words that participants told us they would have liked to use were in fact synonyms for the words that had been provided in the activity.

A limitation with our study was the fact that we did not control for familiarity with the locations depicted in the photographs. Some participants talked about how they had previously visited places in the study (particularly the castles) and this appears to have influenced the words they associated

with the location. Any future study of this nature should specifically collect data on whether people have visited a particular site before or not.

Our choice of experimental material (heritage objects in the landscape) was due to the theme of the event at the RHS, but clearly there is a need to repeat this kind of study with landscapes on their own. There is a wealth of data available on landscape perception studies that could provide either insight to research of this nature, or provide a model for future studies.

4. Conclusion

The activities described in Studies 1 and 2 are promising ones for rolling out at a larger scale through online surveys. The mapping activity of Study 1 was conducted on a touch table but this type of activity could be done equally well on a desktop or laptop computer. Whilst it might be slightly frustrating to complete the task on a screen as small as a smartphone, there is no technical reason why this could not be achieved. Study 2 did pilot an online version of the picture-word matching study (see footnote 1) which worked well, but due to low numbers of participants has not been discussed in this document. As noted in Section 1, it is necessary to identify methods that will enable us to capture CES data at the national scale, and to link experience of space and place, and we feel that both of the methods described here are promising in this regard.

In both studies we observed a degree of collaboration between participants. This was partly to do with the nature of both events – people often attend public engagement events with friends and family rather than on an individual basis – but may also have do with the fact that less tangible CES are more difficult to express, meaning that collaboration with another can help with the process of clarification/articulation. It will be important in future research of this nature to keep a record of whether participants are on their own or working in collaboration.

In Study 2 we sought to use photographs of historical elements in different landscape character types, and observed that participants did make word association judgements by taking the landscape into account, at least in some instances. Our next steps will include investigating the landscape character dimension of the images to see if there is a way to generalise from the types of landscapes in which the elements sit and the CES associated with that element. There is also a need to replicate this type of research using landscapes only, to separate the effects of historic elements and the background landscape.

Finally, it is important to note that since conducting these two studies the CICES classification has undergone a revision (CICES Classification version 5.1) and future work will need to take this into consideration.

4. Acknowledgements

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