Incorporating local nature-based cultural values into biodiversity No Net Loss strategies

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Abstract

Achieving “No Net Loss” (NNL) of nature from a development typically requires projects to follow a ‘mitigation hierarchy’, by which biodiversity losses are first avoided wherever possible, then minimised or remediated, and finally any residual impacts offset by conservation activities elsewhere. Biodiversity NNL can significantly affect people, including their cultural values. However, empirical research is lacking on how to incorporate impacts on cultural values of nature into NNL strategies. We use the Bujagali and Isimba Hydropower Projects and Kalagala Offset in Uganda as a case study to explore local people’s perceptions of the importance of cultural heritage to their wellbeing, how the developments affected their cultural heritage, and how these perceived impacts could be incorporated into NNL strategies. We sampled six villages experiencing different levels of hydropower development along the Victoria Nile River. Many river features, particularly rapids and waterfalls, are important cultural sites, associated with spirits and are worshipped by local communities. Spiritual beliefs, rituals and ceremonies, nature, and how cultural heritage is changing were frequently mentioned when respondents described cultural heritage. People perceived cultural heritage to be an important component of their wellbeing, but its importance differed between villages and socio-demographic groups. Men and the less poor found it to be very important, whilst people who had lived in the village for a short time and who had higher education levels found it less important. Respondents in villages where sacred sites are well-known or still intact described cultural heritage as being an important factor contributing to wellbeing. The study highlights the complex relationships between cultural heritage, nature and people’s wellbeing, and how essential it is to understand and account for cultural heritage when planning developments and associated offsets, if they are to be sustainable and fair to local people.

Keywords: cultural heritage, Uganda, hydropower, no net loss, biodiversity, sacred sites, compensation

Highlights

- Cultural heritage is central to people's wellbeing in areas altered by development
- It's importance to wellbeing revealed geographical and socio-demographic variation
- Compensation may be unfeasible as natural sites of high spiritual value are unique
- Not accounting for cultural heritage in NNL strategies can undermine wellbeing
- Considering cultural values assists with designing more equitable NNL strategies

Introduction

Achieving “No Net Loss” (NNL) of biodiversity is an increasingly influential policy priority being embraced by governments, businesses and lenders world-wide in the context of managing the environmental impacts of economic development activities (Maron et al. 2016; Bull & Strange 2018). NNL approaches require that negative impacts on biodiversity caused by development projects such as mining or road construction, be quantified and that commensurate gains be achieved through additional conservation actions in ways that are equal to, or greater than, the losses incurred from the project (Bull et al. 2013; Bull et al. 2017). Achieving a NNL objective typically requires projects to follow a ‘mitigation hierarchy’ (by which biodiversity losses are first avoided wherever possible, and then minimised or remediated, and finally any residual impacts are offset by conservation activities elsewhere). If designed and implemented within appropriate habitats and to good practice standards, biodiversity offsetting offers the potential to balance economic development with more responsible environmental stewardship (Virah-Sawmy et al. 2014).

The need to account for social aspects in biodiversity NNL policies and biodiversity offsets has increasingly been recognised (Maron et al. 2016; Bidaud et al. 2017), including that local people should be left ‘no worse off, or preferably better off’ in terms of their wellbeing as a result of NNL activities (Griffiths et al. 2019a). While NNL is framed around ‘biodiversity’, discussions about social impacts in environmental policy are often framed more broadly around ‘nature’, recognising that environmental elements valued by people are not limited to organisms and ecosystems, but also extend to the biophysical environment (e.g. landscapes, rocks, waterfalls). Losses and gains in nature under project-level NNL strategies can significantly impact people both positively and negatively, at both the development and offset sites, often affecting nature’s provision of cultural values (Koh et al. 2017). Guidance from The Business and Biodiversity Offsets Programme (BBOP) states that, during the design of NNL strategies, explicit attention should be given to the socio-economic and cultural values attributed to nature, thereby ensuring that the needs of local people are adequately considered (BBOP 2012). However, there is a lack of empirical research on how to incorporate people’s cultural values associated with nature into project-level NNL strategies, respecting their inherent complexity, context-specificity and place-based nature.

Culture is a broad term, defined as “shared knowledge, values and norms that are transmitted, usually with some modifications, from one generation to the next through processes of socialisation”, manifesting in language, stories, customs, value systems, ways of life, traditions and beliefs of society or a social group (Oviedo et al. 2005). Hence, the concept of cultural heritage not only refers to the built environment, physical objects, places and historical artefacts, but also incorporates these aspects of culture considered to be ‘intangible’ by Western cultures (Daniel et al. 2012; Tengberg et al. 2012).

People’s cultural values encompass a range of use and non-use values (e.g. aesthetic, inspirational, scientific, religious, social, heritage and spiritual values as well as sense of place; Daniel et al. 2012; Brown & Verschuuren 2018), some of which have little to do with nature (e.g. those associated with historic buildings), whilst others (e.g. associated with natural areas and use of wild products) are inextricably linked to it (Daniel et al. 2012; referred to from here on as nature-based cultural values). Human societies have been interacting with their environments for thousands of generations, resulting in human cultures shaping, and being shaped, by nature (Pretty 2011; MA 2005). Cultural values are therefore at the centre of the relationships between nature and people, governing individual and collective actions which, in turn, shapes the natural environment (Pretty et al. 2009). This inherent, mutualistic relationship between nature and culture has led people to protect (or degrade) spiritually important species, habitats and landscapes (Dudley et al. 2009; Anthwal et al. 2010; Smith & Andindilile 2017; Holmes et al. 2018), has shaped individual and collective identities (Stephenson 2008), and influenced knowledge, belief systems and traditional practices (Pretty et al. 2009).

Cultural values, sense of place, cultural identity, knowledge systems, religions, social interactions and other amenity services (e.g. aesthetic enjoyment, recreation, artistic and spiritual fulfilment, and intellectual development) all contribute to an individual’s quality of life and general wellbeing (MA 2005; Russel et al. 2013; Schneider 2018). Therefore, fulfilment of cultural values is seen as an essential component of multidimensional wellbeing (Boarini et al. 2014). The application of a wellbeing framework (McGregor 2007) provides a more holistic evaluation of the human condition, reflecting the importance of social, psychological and cultural needs required to thrive (Armitage et al. 2012). It not only considers the traditional material components of wellbeing (e.g. income and basic necessities) but also the relational and subjective components which emphasise the importance of social interactions, collective

identities, cultural values, norms and belief systems that people require to live a good life (Armitage et al. 2012).

Conservation and development activities need to depart from the traditional human-nature dichotomy notion and incorporate a worldview that is commonly held by indigenous people and traditional rural societies; that human communities are part of nature, and cannot be meaningfully separated from it, and have a role in contributing positively to its flourishing (Comberti et al. 2015). Considering relational values offers a way to transcend this dichotomy and reflects on aspects of cultural identity, social cohesion and social and moral responsibility towards nature (Ross et al. 2018). Understanding cultural values, appreciating different worldviews, and recognising the ways in which different cultures interact with and value nature, thereby forging different relationships with their natural environment, is essential if conservation initiatives are to be successful (Pretty et al. 2009; Infield & Mugisha 2013). Apart from an ethical standpoint, focusing on people's relationship with nature, and in particular their nature-based cultural, values can help justify and motivate conservation initiatives (including NNL strategies) that are not only meaningful to different groups of people but also align with communities' own conservation priorities, respecting the rights of local and indigenous communities (Infield 2001; Infield et al. 2018). This is a powerful means of building community support for conservation whilst also creating partnerships between conservation agencies and local communities (Infield 2001; Infield et al. 2018). Considering nature-based cultural values can therefore enhance the equity, efficacy and social acceptability of conservation efforts (Ormsby & Bhagwat 2010), including NNL strategies such as biodiversity offsets.

There are standards, guidelines and legislation to shape the assessment of economic development impacts on local people's cultural heritage. One such example is the International Finance Corporation (IFC) Performance Standard 8: Cultural Heritage, which recognises the importance of cultural heritage for current and future generations and aims to protect cultural heritage from the adverse impacts of development projects (IFC 2012). The Standard emphasises the use of the mitigation hierarchy, with avoidance of cultural impacts being prioritised as far as possible (IFC 2012). Cultural heritage impact assessments are undertaken as part of the Environmental and Social Impact Assessment (ESIA) process, or as a sub-component of the Social Impact Assessment (SIA), in order to understand how a development project could potentially affect local people's culture and way of life (Partal & Dunphy

2016). ESIAs are a legal requirement and standard practice for development projects in most countries (Niner et al. 2018), used to examine the environmental consequences of a planned development project with the aim of managing and mitigating its social, cultural and ecological impacts as far as possible, through applying the mitigation hierarchy (Kiesecker et al. 2010). However, ESIAs tend to focus in a reactive way on single projects (Heiner et al. 2019) and do not always also consider the impact of implementing NNL of biodiversity, especially offsets, on the people affected (Griffiths et al. 2019a). ESIAs applied in the earliest stages of the decision-making process will benefit from a more integrated approach (considering the intricate relationships between people, nature and culture), particularly for development projects (and NNL strategies) that impact communities for whom cultural values are of great importance (Heiner et al. 2019).

In this paper, we explore the challenges of incorporating people's nature-based cultural values into biodiversity NNL strategies for development projects, using the Bujagali and Isimba Hydropower Projects and Kalagala Offset in rural Uganda as a case study. We investigate whether, and how, NNL of biodiversity can be achieved whilst ensuring that local people are 'no worse off' in terms of their perceived wellbeing, particularly with regards to their nature-based cultural values. Our objectives are to: a) explore local people's perceptions of the importance of cultural heritage to their wellbeing, with a focus on understanding how perceptions vary geographically and between groups; b) evaluate how the development projects have affected their cultural heritage; and c) explore how these perceived impacts on nature-based cultural heritage could be incorporated into NNL strategies, to produce an equitable and socially just outcome from the development and its associated biodiversity offset.

Background

Study site

The study was undertaken along the Victoria Nile River in south-eastern Uganda. The area is densely populated and cultivated, with widespread poverty. Several Central Forest Reserves (CFRs) (protected forest or woodland areas) occur in close proximity to the river, as well as a large CFR about 20km to the west (Mabira). However, many of them are highly degraded, with local communities using their natural resources for fuelwood, medicinal herbs and agriculture.

Six villages were sampled, experiencing different levels of hydropower development (Table 1). Two study villages are adjacent to the 250MW Bujagali Hydropower Project (approximately 8km north of the town of Jinja), where construction was completed in 2012. Another two are located north of Bujagali within the Kalagala Offset catchment, where no development is occurring but where biodiversity offset activities associated with the Bujagali dam are located (Ministry of Water and Environment. 2009). The final two villages are located adjacent to the Isimba Hydropower Project, about 40km north of Bujagali, where construction was underway at the time of the study (September 2016 – February 2017).

Table 1: Characteristics of the study villages

Study site	Status of hydropower development	Village	Approx. no. of households *	River bank	District
Bujagali	Complete	Bujagali-East: Kyabirwa Village	404	East	Jinja
		Bujagali-West: Kikubamutwe Village	304	West	Buikwe
Kalagala	No development	Kalagala-East: Bubugo Bugobi Village	337	East	Jinja
		Kalagala-West: Kalagala Village	424	West	Kayunga
Isimba	Construction underway	Isimba-East: Bwase Buseta	211	East	Kamuli
		Isimba-West: Nampaanyi Village	374	West	Kayunga

**as of 2010, data received from the Wildlife Conservation Society- Uganda office*

The World Bank's financing for the construction of the Bujagali Hydropower Project was contingent on a biodiversity offset being developed to compensate for the project's residual environmental damage. In 2007, the World Bank and Ugandan Government signed an Indemnity Agreement to create the Kalagala Offset (Esmail 2017). Obligations for the Kalagala Offset, which aimed to offset expected

biodiversity loss from the ecological impacts by restoring and rehabilitating three of the seven CFRs in the offset catchment (Ministry of Water and Environment 2009), include:

- Setting aside the Kalagala Falls and Itanda Rapids downstream of the Bujagali dam to protect their natural habitat and ecological, social and spiritual values.
- Enabling tourism development activities at the Kalagala Falls site.
- Preventing the expected development of additional power generation in the future that could adversely impact the Kalagala Falls and Itanda Rapids.
- Conserving, through a sustainable management program, the ecosystems of three CFRs (Mabira, Kalagala and Nile Bank; Figure 1)

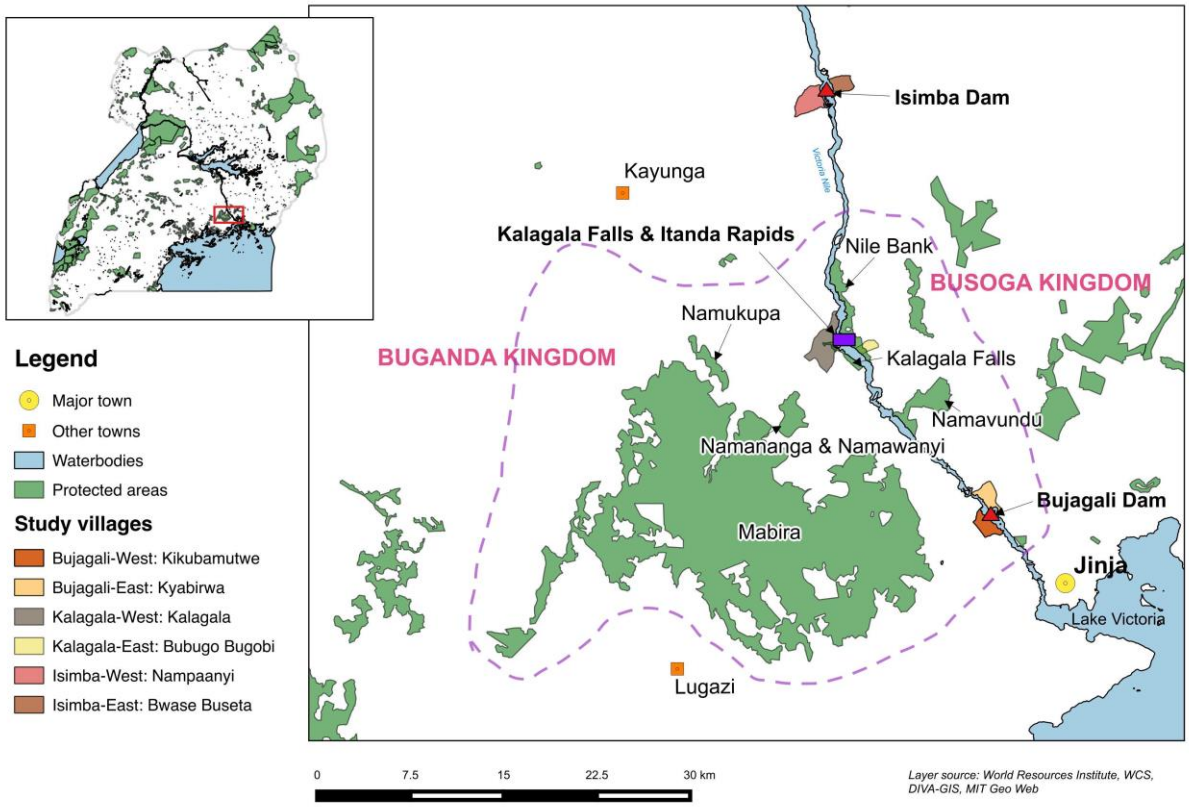

Figure 1: Study area, indicating the location of the six villages sampled. Purple dotted line delineates the Kalagala Offset catchment

Ethnicity and cultural heritage in the study area

The western side of the Victoria Nile River falls within the *Buganda* Kingdom whilst the eastern side of the river falls within the *Busoga* Kingdom. The dominant ethnicities/tribes in the study villages were

Basoga (46% of the population), *Baganda* (9%) and *Bagisu* (11%). Other, less common, ethnicities in the study area (making up 34% of the respondents) included, among others, *Alur*, *Banyole*, *Basamia*, *Jopadhola* and *Mugwere*. The most popular religions in the villages were Muslim (31%), Protestant (30%) and Catholic (27%). Few people self-identified as following a traditional religion, but nonetheless traditional religious beliefs remain important in the study area, particularly the belief that spirits control all aspects of people's lives. Spiritual practices occur at both the individual/household and the community levels. At the individual/household level, the spirits of family ancestors are often honoured at shrines, and these can be moved if the household moves (e.g. in Ghana, communities refused to relocate unless their ancestors and shrines were moved too; Apoh and Gavua 2016). At the community level, these practices are associated with an ecological feature (e.g. river rapids and waterfalls, caves, trees and stones), each of which has a resident spirit that is worshipped by a particular community.

A number of these sacred sites occur throughout the study area, with several found within or adjacent to the Victoria Nile River. Waterfalls and rapids (e.g. the Kalagala waterfall at Kalagala-West) shelter spirits that are worshipped by some members of the local communities, who visit them to ask for wealth, a good marriage, twins, a good harvest and rainfall, amongst other things. There are also shrines, sacred trees (e.g. a *Ficus* tree with a spirit called '*Nakibinge*' at Kalagala-West), stones (e.g. '*Nalongo*' or 'mother of twins' at Kalagala-West), caves (e.g. one that houses the spirit '*Musoke*' at Kalagala-West) and springs/swamps that never dry up along the riverbanks (e.g. *Kitaapo* spiritual site at Kalagala-East).

As documented in the Bujagali and Isimba projects' ESIAs (R.J. Burnside International 2006; Ministry of Energy and Mineral Development 2013), both hydropower projects resulted in significant cultural heritage impacts. In the case of Bujagali dam, impacts were felt at both the individual/household and community levels. At the individual/household level, significant cultural impacts arose from physical displacement of households, affecting family graves and small family shrines. Households were offered compensation which paid for the transfer ceremonies needed to relocate the graves and shrines to the new resettlement site. At the community level, the most significant cultural heritage impact was the flooding of the Bujagali Falls sacred sites. Village committees were set up to determine what sites needed to be relocated (and indeed if relocation was possible) and what ceremonies needed to be performed in order to complete the relocation and appease the spirits of Bujagali Falls. Transfer rituals were carried out, followed by settlement rituals at the new sacred site. The costs of the relocation and

appeasement ceremonies were paid by the developer. Ceremonies were carried out in September 2001 and documentation was signed acknowledging that the compensation had been adequate, and that construction of the dam could proceed. The ESIA did not provide details about where the spirits were eventually relocated. According to respondents in our study, the Bujagali spirits were relocated to a new sacred site at a village called Namezi. However, some respondents said that the spirits were not happy at this new site and one of the custodians now keeps them in shrines at his house in Bujagali-East. According to the Isimba SIA, people were amenable to relocation of the spirits and sacred sites at the Isimba Falls, but only after rituals and ceremonies were performed. However, the SIA documented that local people felt the spirits were associated with the river and could not be relocated further inland away from the riverbank. The relocation of the sacred sites was a specified requirement in the SIA. However, according to respondents in our study, the sacred sites have now been destroyed by the dam construction, and yet no relocation ceremonies were performed.

Materials and methods

Data collection

Eleven Key Informant Interviews (KIIs) were undertaken with representatives from the Ugandan Government's Ministry of Water and Environment and from leading non-governmental organisations (NGOs) in Uganda: Nature Uganda, the Jane Goodall Institute and the Wildlife Conservation Society, Uganda; with District Environmental Officers from the four Districts that the case study falls into; two Uganda-based cultural heritage consultants; and geography and social science professors at Uganda's Makerere University. All of these individuals were chosen because of their extensive experience working in conservation and environmental management, as well as with local communities in Uganda's rural areas. The KIIs helped gain a broad understanding of what cultural heritage consists of in Uganda, why it may be important to people in rural settings, how best to explain and define this concept to respondents and how best to approach the subject during Focus Group Discussions (FGDs) at the study site. This last question was particularly important as, during a scoping trip, we found that cultural heritage was a sensitive topic in the study area and several people (particularly women) were not willing to discuss it.

Four cultural heritage Focus Group Discussions (FGDs) were undertaken in each village, with participants aggregated according to their gender and livelihood strategy, to encourage participants to talk freely. Between eight and ten participants were selected for each FGD based on recommendations from the village Chairman, and the four FGDs represented the following groups: a) women relying on natural resources for their main livelihoods (such as farming and fishing); b) men relying on natural resources for their livelihoods; c) all other women in the village (including those that are retired, studying, unemployed, shopkeepers, businesswomen, labourers etc.); and d) all other men in the village. The aim of the FGDs was to learn about people's perceptions of cultural heritage in the study area, the role that nature plays in culture and traditions, what sacred sites and spirits reside in the area, local people's perceptions on whether (and how) the hydropower developments have affected cultural heritage, and whether (and how) lost cultural heritage can be compensated for. The FGDs were carried out early on in the data collection process as they also allowed the lead researcher to meet the community members and introduce herself. However, this approach meant that the lead researcher had to rely on the village chairman to help select appropriate participants as she was not yet familiar with the community and its dynamics. In order to overcome the biases that this 'gatekeeper' approach to participant selection could introduce into our data (particularly who is selected and invited to participate), the lead researcher spent a considerable amount of time with each village chairman, discussing the research and FGD aims and describing who the ideal participants would be. Furthermore, in an effort to make participants feel comfortable and to encourage their open participation, we requested that the chairman not attend any of the FGDs.

Individual questionnaires were also undertaken in all six villages (see Appendix A for the questionnaire). Households were randomly selected from a list compiled by the local Village Health Teams (VHTs); people selected by their own community to serve as the community's initial point of contact for healthcare. A total of 1305 respondents were interviewed (490 individuals from 317 households at Bujagali, 489 individuals from 289 households at Kalagala and 326 individuals from 178 households at Isimba). Villages at Bujagali and Kalagala were larger than those at Isimba. To maintain a consistent proportion of individuals sampled per village, more individuals were sampled in the four villages at Bujagali and Kalagala. Where possible, the household head and another family member were interviewed at the respondent's home to capture intra-household variation, particularly by gender and age. Four local enumerators (not from the villages, but from the study area) undertook the questionnaire

interviews in either Luganda or Lusoga (the local dialects) and assisted with FGDs. Comprehensive training was provided, and discussions carried out to agree on the most appropriate terms to use during the interviews (e.g. for nature and wellbeing). In addition, insight gained from the KIIs on how best to explain cultural heritage to respondents was used to help select the most appropriate terms to describe and introduce cultural heritage to participants.

The questionnaire comprised a structured interview, collecting pertinent socio-demographic data and information on household poverty/economic status (measured using a Basic Necessities Survey (BNS); Davies 2016). This was followed by questions exploring the perceived importance of cultural heritage to the respondent's wellbeing and how they felt the construction of the hydropower dams had affected cultural heritage in the area. The questionnaire ended with questions for the research assistants, to assess how forthcoming and honest they thought the respondent was during the interview based on their own judgement. Open Data Kit (ODK) was used to manage the data collection on Nexus Android tablets. The questionnaire was piloted in a separate village, Buloba Central (n = 74), located near the Bujagali dam.

The lead researcher spent over six months in the six study villages, observing the day to day activities in the villages, which served to triangulate the findings and interpretations from the FGDs and individual questionnaires. The lead researcher and enumerators also visited several sacred sites in the study area, accompanied by a spiritual or village leader who explained their significance, visited the main spiritual leader in the Busoga Kingdom, '*Bujagali'*, and observed several traditional ceremonies (e.g. the *Bagisu* circumcision ceremonies). All protocols and procedures used for the social data collection were approved by both Oxford University's ethics committee and the Uganda National Council for Science and Technology (UNCST). All participants were over 18 years old and none had diminished autonomy. Before each interview and FGD, the aims and potential implications of the research were explained, and participants' consent sought. Given that many participants were illiterate, verbal consent was recorded. Participants' privacy was respected and surveys stopped if a participant wished. No respondents withdrew from the interviews.

Data analysis

Thematic analysis

A thematic analysis was used to analyse data from the 24 FGDs, following the six-phase guide specified by Braun and Clarke (2006). It followed a theory-based deductive 'top down' approach, driven by the research question(s) and the analyst (Braun & Clarke 2006). Themes were identified at the semantic level, meaning that nothing other than what the participant said was looked at or assumed (Braun & Clarke 2006).

Information from the FGDs was first read and re-read with notes on initial ideas for themes and codes being made. FGD transcripts were then coded, with data being organised in a meaningful and systematic way. Each FGD discussion was read several times in order to check and confirm the coding. Some extracts were left un-coded, some were coded once and some were coded many times. Coding was performed manually in Microsoft Excel. The codes were analysed, relationships between them examined and similar codes grouped into potential overarching themes. The frequency of codes mentioned in each FGD question was measured to provide an indication of the importance of each code. Preliminary themes were reviewed and modified slightly to generate the final themes (see Appendix B for themes and codes).

Correlates of importance of cultural heritage

Non-parametric and parametric univariate statistics were first used to explore the data. Cumulative link mixed models (CLMMs) models, fitted with the Laplace approximation (Christensen & Christensen 2015), were used to assess which socio-demographic variables influenced people's perceptions about: i) the importance of nature-based cultural heritage to wellbeing; and ii) the relative importance of cultural heritage to wellbeing compared to other factors (e.g. food and shelter). Ordered Likert-scale indicators served as response variables, whilst socio-demographic variables (e.g. gender, age, education level, primary livelihood, economic status and time lived in the village) served as fixed effects explanatory variables. 'Village' was included in the models as a random effect to account for the hierarchical nature of the dataset. As more than one individual was often sampled per household, the variable 'household' was nested within 'village'. See Table 2 for a summary of all model variables. Statistical modelling was

carried out in R version 3.2.1 (R Core Team 2015), the package ‘ordinal’ used to fit the models (Christensen & Christensen 2015) and ‘ranef’ to extract the conditional modes of the random effect.

Table 2: Variables included in the cumulative link mixed models

Variable	Data type	Variable type	Description
Dependent variables			
Importance of heritage wellbeing	Ordinal	Response	Perception of importance of cultural heritage to wellbeing, using a Likert scale with -2 defined as not at all important, -1 not very important, 0 neutral, 1 important and 2 very important.
Relative importance of heritage to wellbeing	Ordinal	Response	Perception of the relative importance of cultural heritage to wellbeing compared to other factors, using a Likert scale with -2 defined as one of the least important, -1 not very important, 0 neutral, 1 important and 2 one of the most important factors.
Independent variables			
Village	Categorical	Random	Village in which the respondent lives (6 level factor)
Household	Categorical	Random	Household (in village) in which the respondent lives
Gender	Categorical	Explanatory	Gender of the respondent (2 level factor)
Education level	Categorical	Explanatory	Respondent's reported level of education (4 level factor: no education; primary; secondary; college/university)
Primary livelihood	Categorical	Explanatory	Respondent's reported main income generating activity (4 level factor: tourism, salaried employment; used natural resources; self-employed)

Variable	Data type	Variable type	Description
Time lived in village	Categorical (ordinal)	Explanatory	Number of years the respondent reported to have lived in the village (4 level factor: < 5 years; 5-9 years; >10 years; not sure)
Age	Categorical (ordinal)	Explanatory	Reported age of the respondent (4 level factor: 18-30; 31-45; 46-60; 61+)
Economic status	Continuous	Explanatory	Poverty score (BNS) of the respondent's household

Results

Characteristics of respondents

Of the total sample (1305 individuals), 39% were male (n = 511) and 61% were female (n = 794). The gender disparity is much higher than would be expected based on the female:male ratio in Uganda's latest National Population and Housing Census (51% to 49%; Ugandan Bureau of Statistics (UBOS) 2017). Men tend to engage more in paid work, while women spending twice the amount of time spent by men on unpaid domestic and care work (UBOS 2017). Therefore, one reason behind the gender disparity in our sampling could be that as the surveys were carried out in the villages during the day, most men would have been at work whilst more women would be at home. In addition, as is the case with many rural areas in other African countries, large numbers of spend time working in towns and cities, skewing the gender ratio in villages.

Most of the sample were below the age of 45 (65%, n = 848), the majority had a primary school level of education (54%, n = 701) and most had lived in their village for more than 10 years (86%, n = 1127) (Appendix C). Village economic status (based on the sampled households' average BNS score, on a scale of 0, poorest, to 1, least-poor) was similar across the six villages; Bujagali-West was the least poor (0.60) whilst Isimba-West was the poorest (0.45). Based on the enumerators' subjective ranking, almost all of the respondents were willing to answer the questionnaire (95%; n = 1233), most had a good understanding of the questions (moderate and above; 92%; n = 1197) and most appeared to be honest in answering (87%; n = 1132).

The most important aspects of cultural heritage

Three themes emerged from the FGD thematic analysis of people's perceptions of cultural heritage, ordered in terms of frequency mentioned.

Theme 1: Spiritual beliefs, rituals and ceremonies

This theme was mentioned the most. It encompasses many elements of cultural heritage, such as myths and stories, rituals, mainstream religion and spirits, that can be considered 'intangible' by

Western cultures (Figure 2). When focus groups were asked what first comes to mind when they think about cultural heritage, spirits were most frequently mentioned, brought up more during meetings with men. According to the FGD participants, rituals and traditional ceremonies are performed for numerous reasons, often to appease the spirits. Starting at birth, parents carry out rituals and ceremonies to thank the spirits for blessing them, particularly if they have twins. Later in life, there are introduction ceremonies: male circumcision (particularly amongst the *Bagisu,* who circumcise boys during even years); female circumcision (amongst the *Sabinys*) and clitoris elongation (amongst the Basoga and *Baganda*). Upon death, last funeral rights are carried out to send away the spirit of the deceased. Spirits are an integral part of myths and stories.

Theme 2: Nature

Nature and sacred sites were the next most frequently mentioned theme (Figure 2). Sacred sites are usually in the form of natural environmental features, ranging from forests, trees, caves, lakes, rivers, waterfalls and mountains to entire landscapes. One question specifically explored the role of nature in cultural heritage and the most frequent uses were: medicinal herbs, herbs used in ceremonies, sacred sites, spirits living in nature, accessing/harvesting natural resources, totems and bark cloth.

Several floral species in the CFRs (within the Kalagala Offset catchment) have medicinal properties, used to treat illnesses such as malaria, headaches, stomach problems, wounds and burns. Many herbs and other natural resources are also used during ceremonies and rituals (linked with Theme 1). Sacred sites (particularly the Itanda rapids near Kalagala-East and the Kalagala falls near Kalagala-East) were brought up by FGDs in all six villages. Waterfalls are associated with sacred water which, when mixed with herbs, is used during rituals to cure illnesses, wash away bad luck and bless people. Natural resources (e.g. grass, papyrus, stones, clay, sand etc.) are used to build shrines at sacred sites and are also used for traditional arts and crafts (e.g. baskets and mats). Some plant and animal species represent totems and are therefore protected. Bark cloth, a traditional fabric with ritual significance used by the *Baganda* and *Basoga* tribes, is made from the internal bark of a local *ficus* tree.

Theme 3: Changes in cultural heritage

Changes in cultural heritage was the third most frequently mentioned theme (Figure 2). The majority felt that cultural heritage and traditions have changed for the worse, becoming less important to their

communities over time. The most important reason for this change (based on frequency of mention) was the influence of mainstream religion, but other reasons recurrently raised were: western culture and modernity, diminishing belief in worshipping spirits and sacred sites, loss of medicinal herbs, lack of interest by youth, poverty, development projects, changes in access to natural resources, climate change and the commercialisation of cultural heritage.

Respondents said that the spread of mainstream religion was the main reason behind the loss of cultural heritage and traditions. For example, instead of carrying out twin and new born rituals, people prefer church baptisms. Also, many traditional practices (e.g. worshipping spirits) contradict mainstream religion and people who keep shrines are sometimes isolated by the village. Western cultures, modernity and education have also influenced cultural heritage and western medicine has diminished the use of traditional herbs. Culture and traditions are disappearing because the youth are no longer interested in the knowledge of older generations. Many respondents stated that poverty was negatively affecting cultural heritage. Rituals and ceremonies (e.g. circumcision) are expensive, as many require animal sacrifices, so are only undertaken when people can afford them, or not at all. Religious ceremonies, such as baptisms, are much cheaper. Groups acknowledged that, owing to unemployment, poverty and population growth, forests have been over-harvested, destroying medicinal herbs, sacred trees and natural resources used for shrines, musical instruments and traditional arts and crafts.

Also frequently raised was the impact of economic development on cultural heritage. During the FGDs, participants in all six villages mentioned that construction of the hydropower dams (Isimba and Bujagali) have destroyed sacred sites, disturbed spirits and cleared medicinal herbs. All six villages explained how riverbanks and islands with forests, medicinal herbs, natural resources, sacred sites and shrines were submerged.

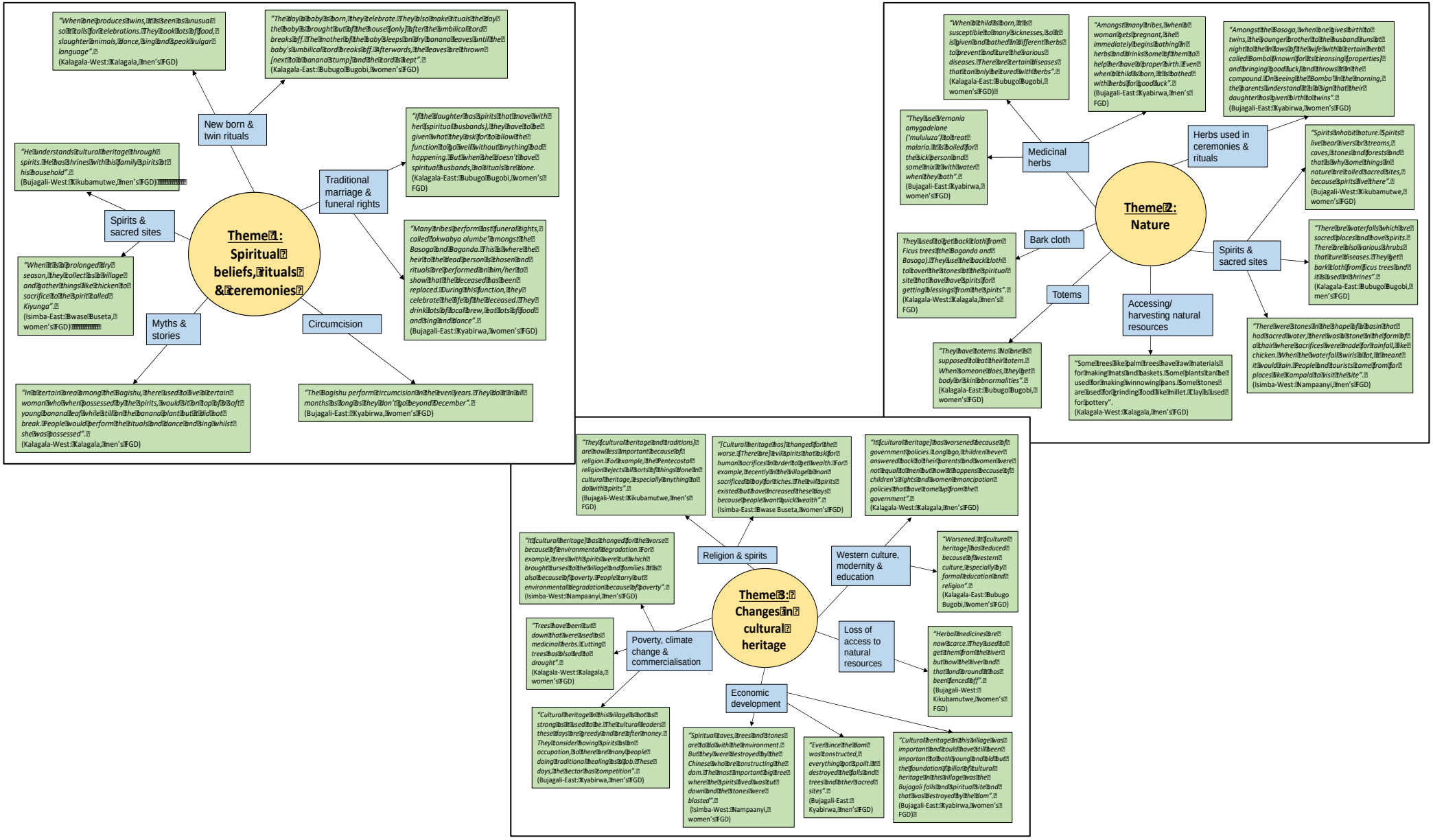

Figure 2: Most frequently mentioned codes (in blue), under the three themes (in yellow), and associated quotations from FGDs (in green)

Perceptions of the importance of cultural heritage to wellbeing

Most questionnaire and FGD respondents said that cultural heritage is important (46%; n = 596/1305) or very important (31%) to their wellbeing:

"Cultural heritage is a person's identity. You need a few other things to supplement one towards living a good life".

(Bujagali-East, men's FGD)

Only 4% said it was not at all important:

"One cannot survive without things like water, food, fuelwood but they can survive without cultural heritage".

(Kalagala-East, women's FGD)

Separate CLMMs were used to explore how important people think cultural heritage is to their wellbeing in absolute terms, and how important they think cultural heritage is to their wellbeing compared to other factors. As the results from the two models were consistent, we present only the results of the second model, which provided stronger associations (Table 3; see Appendix D for results of model 1).

Gender, education level, poverty, primary livelihood and the time lived in the village had significant effects on the importance of cultural heritage to wellbeing (Table 3). Compared to the baselines (female, no education, salaried employment and not sure how long they have lived in the village), men and the less poor found cultural heritage to be very important, whilst respondents with higher education levels found it less important (with people holding college/university degrees finding it to be the least important). People employed in the tourism sector and who had lived in the village the shortest (< 5 years) also found cultural heritage less important to wellbeing than other factors (e.g. food and shelter). Unexpectedly, age did not have a significant effect on responses and was hence removed from the model.

People living in the different villages had different feelings about how important cultural heritage is to wellbeing (indicated by the dissimilar intercept values for the six villages). Responses differed depending on which bank of the river villages were on, with those on the west bank finding cultural

heritage more important than those on the east bank for Kalagala and Bujagali, and the reverse for Isimba. There were also differences between geographical areas. In Kalagala-West, where the sacred sites are still intact (as no development is taking place), cultural heritage was seen as a comparatively important factor contributing to wellbeing. The Bujagali area (where the sacred sites were submerged by the dam in 2012) also found cultural heritage to be comparatively important, while the villages in the Isimba area and Kalagala-East did not.

Table 3: CLMM results with logit link function of perceptions of the importance of cultural heritage to wellbeing compared to other factors, with respect to predictor variables

Variable	Estimate	Std. Error	CI (2.5%)	CI (97.5%)	Significance
Gender – Male	0.35	0.14	0.07	0.62	*
Education – Primary	-0.41	0.21	-0.82	-0.01	*
Education – Secondary	-0.95	0.24	-1.41	-0.48	***
Education – College/university	-1.36	0.47	-2.29	-0.44	**
Economic status	2.76	0.64	1.50	4.02	***
Livelihood – Self-employed	-0.15	0.38	-0.91	0.60	
Livelihood – Tourism	-2.05	1.09	-4.19	0.08	.
Livelihood – Uses natural resources	-0.04	0.37	-0.75	0.68	
Lived in village < 5 years	-1.97	1.15	-4.24	0.29	.
Lived in village 5 – 9 years	-0.81	1.17	-3.10	1.48	
Lived in village > 10 years	-1.77	1.12	-3.97	0.43	
Threshold coefficients					
0/1	-4.23	1.25			
1/2	-2.79	1.24			
2/3	-2.36	1.23			

Variable	Estimate	Std. Error	CI (2.5%)	CI (97.5%)	Significance
3/4	-0.48	1.23			
Random effects (intercepts)					
Kalagala-West (Kalagala)	0.44				
Kalagala-East (Bubugo Bugobi)	-0.79				
Bujagali-West (Kikubamutwe)	0.16				
Bujagali-East (Kyabirwa)	0.09				
Isimba-West (Nampaanyi)	-0.37				
Isimba-East (Bwase-Buseta)	-0.19				

*Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Baselines: female, no education, salaried employment and not sure how long they have lived in the village.

Thresholds: 0 = One of the least important; 1 = Not very important; 2 = Neutral; 3 = Important; 4 = One of the most important

Local perceptions of the impact of hydropower development on nature-based cultural heritage

There was a significant association between village and whether respondents felt that the hydropower developments had impacted on their sacred sites (X^2 = 376.55, df = 10, $p < 0.05$; Figure 3). The highest proportion of people who reported an impact was in Bujagali-East and Isimba-West, the villages closest to the Bujagali and Isimba dams respectively. Conversely, the highest proportion of people who said there had been no impact was in the Kalagala region (Kalagala-West and Kalagala-East). Those respondents said they were too far away to have been impacted by the Bujagali dam, but raised concerns that the Isimba dam would submerge the Kalagala Falls and Itanda Rapids (sacred sites) near the villages.

"We only hear about Bujagali dam but it is very far away from this village to affect cultural heritage.

However, we are afraid that after the construction of Isimba dam, there will be back flow of water that will flood the spiritual site and destroy the sacred waterfalls".

(Kalagala-West: women's FGD)

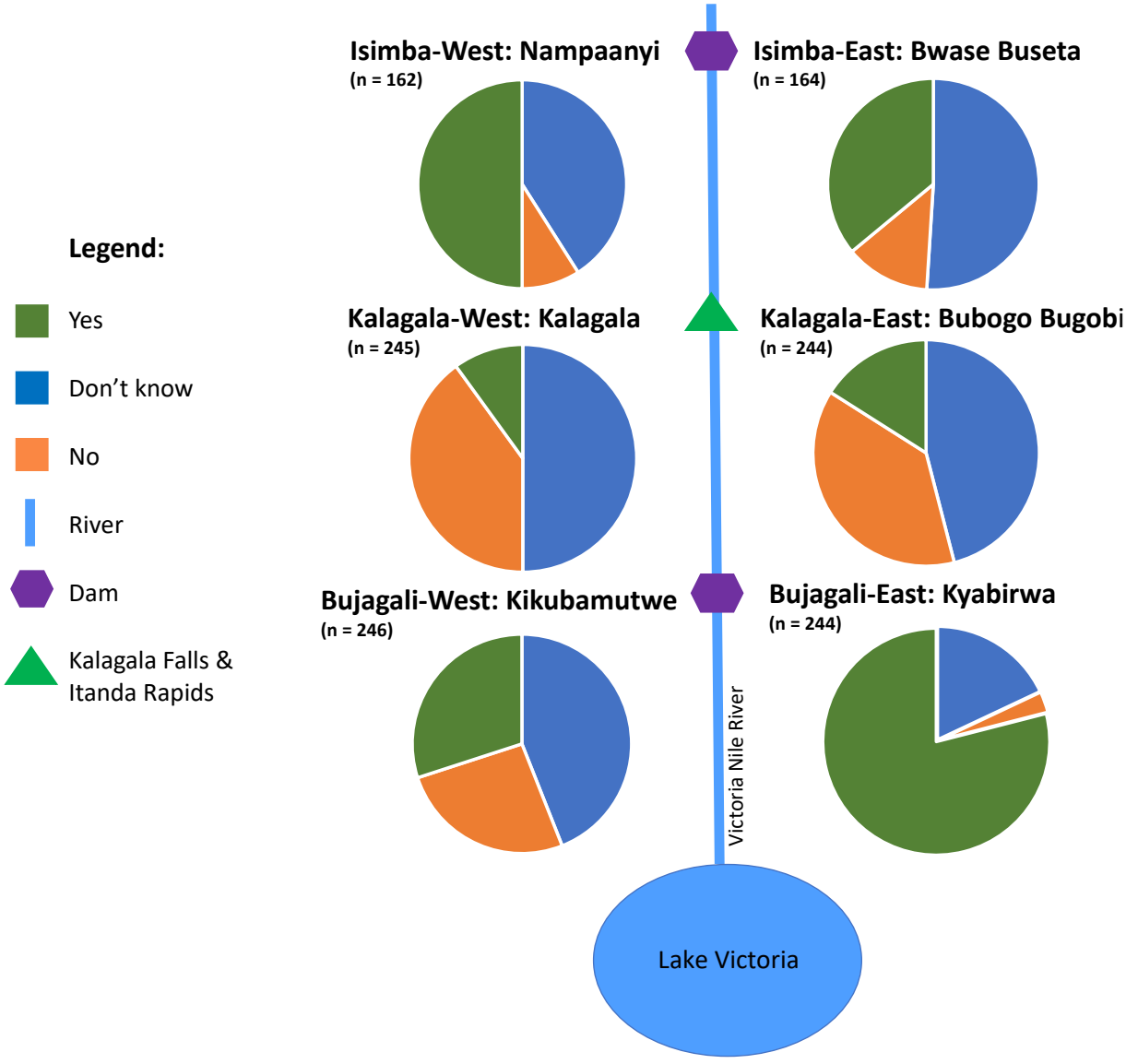

Figure 3: Schematic representation of the study area, depicting village locations along the Victoria Nile River and indicating the proportion of respondents in each village perceiving that the construction of either dam (Bujagali or Isimba) had affected any of the sacred sites near their village (n = 1305)

Responses about whether the hydropower developments had impacted sacred sites near a respondent's village differed between genders, level of education and time lived in the village (Table 4). There was no significant difference between age groups, primary livelihoods and poverty levels.

Table 4: Significant association between three socio-demographic variables and whether respondents felt that the hydropower developments had impacted on sacred sites near their village

Variable	Description	X^2	df	p-value
Gender	• More men acknowledged that sacred sites in their village had been impacted by the dams. • More women said that they did not know of an impact.	48.64	2	2.745e-11
Education level	• More educated people knew that sacred sites had been impacted by the dams. • Less educated people (with either no education or a primary school degree) tended not to know whether the sacred sites had been impacted by the dams.	31.18	6	2.346e-05
Time lived in village	• People who had lived in the village longer were more aware that sacred sites had been destroyed.	8.98	2	0.01125

Respondents complained that rock blasting activities (associated with both Bujagali and Isimba dams) disturbed the spirits at these sites, causing them to migrate or 'wander' around the village disturbing people. People at Isimba-West believed that the spirits are angry as they have not been relocated or compensated and that this is one of the reasons behind miscarriages and unexplained deaths in their village. Respondents also said that people now have to travel great distances to visit other sacred sites, but they are not the same as the ones lost.

"The dam has destroyed waterfalls which used to habit the spirits. The dam also destroyed all the

trees where spirits used to live and the rock blasting activity chased away the spirits".

(Isimba-East: women's FGD)

For those who reported that sacred sites had been affected by the dams (n = 465/1305), we explored how they felt about the dams' impact on these sacred sites. Overall 64% (n = 181/465) were either very sad (39%) or sad (25%) whilst 33% had no change in feelings; only 3% were happy. There was also a significant difference in feelings between the villages, gender and poverty level (Table 5).

Table 5: Variables that had a significant effect on a respondent's feelings towards the dam's impact on sacred sites

Variable	Description	Statistic
Village	Although no geographical pattern was apparent: • On average, respondents in Isimba-East and Kalagala-West felt very sad about the sacred sites' destruction, whilst the other villages, on average, stated that they felt sad. • Bujagali-West and Kalagala-East had the highest number of respondents who had no change in feelings about the dams' impacts on sacred sites.	Kruskal-Wallis X^2 = 33.34, df = 5, $p < 0.05$)
Gender	• Men on average stating that they felt sad about the sacred sites' destruction. • Conversely, women reported no change in feelings.	Mann-Whitney U test: W = 33186, $p < 0.05$
Poverty level	• The poorer people were, the sadder they were about the destruction of the sacred sites.	Spearman's rank correlation rho: S = 13400000, rho = 0.16, $p < 0.05$

Finally, of the people who reported that sacred sites had been destroyed (n = 465), there was a significant correlation between their feelings towards the dam construction and how the destruction of

the sacred sites made them feel (Spearman's rank correlation rho: S = 10813000, rho = 0.32, $p < 0.05$). The angrier people were about the dam, the sadder they felt about the destruction of sacred sites. People with no feelings towards the dam had no change in feelings about the destruction of the sites. There was also a significant correlation between how the destruction of the sacred sites made them feel and how they felt that their wellbeing had been impacted (n = 465, Spearman's rank correlation rho: S = 10195000, rho = 0.36, $p < 0.05$). Those who felt that their wellbeing had been negatively affected by the dams were sadder about the sacred sites being destroyed.

"[People are] very sad and angry because the spirits are not settled. They keep disturbing people in the village".

(Isimba-West: men's FGD)

Compensation for nature-based cultural heritage impacts

For those people who said sacred sites had been affected by the dams (n = 465/1305), we explored whether they were aware of any compensation, and if so, whether it had compensated for the loss of the sites. During FGDs in the Bujagali villages (the only site where compensation had occurred, as documented in the ESIA), respondents acknowledged compensation occurring, saying that the sacred site's caretaker/spiritual leader had been paid to relocate the spirits to a village called Namezi. Conversely, respondents in the Isimba villages averred that no compensation had been administered, saying that village meetings were held with developers, but that nothing had been forthcoming. These participants said they now had nowhere to worship spirits as other sites were far away and transport was expensive. Women were more likely than men to say no compensation had taken place ($X^2 = 4.80$, df = 1, $p < 0.05$). On average, respondents who said no compensation had taken place were slightly poorer (average BNS = 0.54), than those who said compensation had occurred (average BNS = 0.58, independent t-test t = -2.62, df = 139.38, $p < 0.05$).

"The spiritual site was destroyed that used to help them, yet no compensation was done. We have no other spiritual site to go to".

(Isimba-West: men's FGD)

"There were spiritual sites on the land that was taken by the dam. The dam compensated for the land but not the spirits".

(Bujagali-West: men's FGD)

During the FGDs, respondents in all six villages were asked how impacts to sacred sites and spirits could be compensated and for and whether it was possible to relocate impacted spirits. These questions were met with mixed responses. Some believed that compensation was impossible, feeling the sites were place-specific and that recreating the same environment as that being lost was not possible. Conversely, others felt spirits could be relocated, although it was a complicated and expensive process. Several FGDs described the difficulty in finding new sites; for example every existing waterfall is already home to a different spirit, which will not want to be relocated, or not take kindly to a new spirit. Further, spirits are 'site-specific', meaning that some need places with water and waterfalls whilst others need land with trees and stones. Thus, water spirits cannot be relocated to land. Spirits are also unique, so one cannot compensate for the loss of a sacred site and spirit in one area (e.g. Bujagali or Isimba) by protecting one at another site (e.g. Kalagala).

"Once the spiritual site is demolished, it will be the end and it cannot be gotten back".

(Kalagala-West: men's FGD)

"It is impossible for Kalagala spiritual site to compensate for Isimba spiritual site. It is like having a mother. If a person kills your mother, can that person compensate by giving you another mother? Will you be able to get another mother?"

(Isimba-West: men's FGD)

Of the respondents who acknowledged compensation (n = 92/1305), the majority said it had not made up for the loss of the sacred sites (47%; n = 43/92), whilst only a few said it did (13%). Respondents in Bujagali-East said they were unhappy as the compensation only benefitted a few people, whilst many people who used to visit and use the site had been negatively affected. Moreover, they said that the new sacred site at Namezi was artificial and not as valuable as the old sacred site at Bujagali. It is also about 2km away from the old site, so people had stopped worshipping at the site as it was too far away.

"The old spiritual site was much better because it had sacred falls where people got water to bath off bad luck. It had a sacred tree where people took their offerings and worshipped around it. The new site has no nature like herbs which people would bath in for good luck, no falls and no stones".

(Bujagali-East: men's FGD)

Discussion

Is cultural heritage important to people's perceived wellbeing?

The results indicate that cultural heritage is an important factor affecting local people's wellbeing, even compared to basic needs like food and shelter. However, its importance varied by village, being the highest in Kalagala-West. Of all of the villages sampled, the sacred sites at this location are intact, well maintained, well known in the region (second to the Bujagali sacred sites), act as a tourist attraction and are being protected as part of the Kalagala Offset. Conversely, the importance of cultural heritage was rated lowest in Kalagala-East. This was unexpected because the village is on the opposite bank to Kalagala-West, and their sacred sites are also being protected as part of the Kalagala Offset. The sacred sites on the east bank appeared to be less valued by local people, less well known, and less of a tourist attraction. Although the Nile River divides the historical Kingdoms of *Busoga* and *Buganda* and the two sacred sites fall in different Kingdoms (Kalagala-East falls in the *Busoga* Kingdom whilst Kalagala-West falls in the *Buganda* Kingdom), the tribal compositions of the study area and study villages on both sides of the River was mixed (the dominant tribes in the study villages were *Basoga* (46% of the population), *Baganda* (9%) and *Bagisu* (11%)). Thus, we felt that this difference could not be attributed to different tribal compositions on each bank of the River.

Individuals with higher education levels were more informed about sacred sites being impacted by the dams but found cultural heritage to be less important to wellbeing. In Africa, the spread of nationalised formal education, conversion to mainstream religion, modernisation of healthcare and increased immigration into villages has reduced traditional worldviews (Pretty et al. 2009; Holmes et al. 2018). This corresponds with results from the thematic analysis, where respondents attributed changes in the importance of cultural heritage to modernisation, westernisation and education, among other factors. It was surprising that age did not have a significant effect on responses to the importance of cultural heritage to wellbeing, as younger respondents tended to be more educated. In many countries, including sub-Saharan Africa, youth no longer respect traditional sacred places and knowledge transmission to the younger generations is declining (Bhagwat & Rutte 2006; Ekblom et al. 2019). This was mentioned during the FGDs. Another interesting finding was that less poor people found cultural heritage to be one of the most important factors to their wellbeing compared to other factors. This finding

was unexpected as the less poor people tend to be better educated, and our results indicate that individuals with higher education levels found cultural heritage to be less important to wellbeing. In addition, we found that the poorer people were, the sadder they were about the destruction of the sacred sites. Although wellbeing is a complex, multidimensional concept that is difficult to measure (Boarini et al. 2014), application of a wellbeing framework such as the WeD – Wellbeing in Developing Countries framework (Gough & McGregor 2007) could help when delving into reasons for such apparent contradictions.

In summary, people in the study area perceived cultural heritage to be an important component of their wellbeing despite notable geographical variation and socio-demographic differences. This indicates the importance of including people's nature-based cultural values when evaluating how losses and gains in nature from NNL affect people's wellbeing.

Gaining a deep understanding of cultural heritage is challenging

Studying cultural values is complex and requires time. For example, fieldwork for this research involved 24 FGDs, key informant interviews, direct observations and anonymous individual questionnaires over a six month period. This was, however, still insufficient time to gain a detailed understanding of the rich, complex and site-specific cultural values of people living in the study area. In particular, it is impossible to entirely eliminate cultural biases when undertaking cross-cultural research such as this, meaning that outsider ontological frames may have been inadvertently imposed onto data interpretations (Tayeb 2001). In our case, the lead researcher is a white 'Western' female with a different cultural background and reference points to the people in the study area. Furthermore, we recognised the 'researcher effect' (where the presence of the researcher may influence the participant's responses; Tayeb 2001), and minimised it by ensuring that the lead researcher was not present during the individual surveys.

Cultural values may be hard to articulate and community members may not always be willing to share cultural knowledge easily or openly, particularly with outsiders or uninitiated insiders (Infield et al. 2018). During our scoping trip, cultural heritage, in particular spirits and sacred sites, were evidently a sensitive topic and not everyone was willing to talk openly about them. For example, one women's FGD (in Bujagali-East) refused to talk about cultural heritage and worshipping the spirits. They insisted that they had no knowledge about sacred sites in their village and some participants were overheard discussing

how they could not publicly reveal that they believed in spirits, and that owing to the advent of mainstream religion, people who worship spirits were called pagan and stigmatised. A study by Byers et al. (2001) found that, similarly, local people in Zimbabwe were sometimes reluctant to reveal information about sacred sites. In all six villages, men tended to be more forthcoming than women about cultural heritage, sacred sites and spirits. This is interesting because several FGDs said that it was mostly women who visited the spirits to ask for children, twins and a good marriage, and who used medicinal herbs. Perhaps these sites were very personal and private to women, meaning that they were less inclined to divulge details about them. The influence of gender on cultural heritage beliefs varies widely between cultures and geographies. Studies have found that women often have a better knowledge about medicinal plant species than men, and in some regions in Africa, women dominate the traditional healing profession (Mathibela et al. 2015). Conversely, a study in Nepal found men had greater awareness and knowledge of place-based spiritual values than women (Spoon 2012).

In general, respondents were less likely to admit that they personally visited sacred sites and worshiped spirits, but were happier to generalise and speak about other people in the village. The individual questionnaire was confidential and this was explained at the star, with efforts being made to help the respondent feel comfortable (e.g. survey administered at their house, presence of a third party was discouraged where possible, two male and two female enumerators were employed, and sensitive questions pertaining to cultural heritage were asked towards the end of the questionnaire). Nonetheless, we directed our questions to the individual rather than generalising about the village as a whole because we wanted to understand people's own experiences. Bias's associated with employing direct questioning techniques to explore sensitive topics are well recognised, including participant opting out / refusing to answer a question or providing dishonest answers to conform with social norms (Warner 1965).

However, despite carrying out a scoping trip prior to data collection, we did not fully understand the sensitive nature of cultural heritage in the study area, and in particular around spirits and sacred sites. This only became apparent during the data collection trip and data analysis. In retrospect, applying methods specifically designed for researching sensitive topics (such as 'indirect questioning techniques; Nuno & St. John 2015), could have helped overcome the challenges associated with the sensitive nature of cultural heritage, thereby increasing data validity and potentially yielding stronger results.

These specialised questioning techniques make it impossible to directly link responses to an individual, thereby ensuring anonymity, increasing willingness to participate and encouraging honest responses (Warner 1965; Nuno & St. John 2015). An area for further research would be to explore the application of such techniques to cultural heritage research.

In summary, although gaining a deep understanding of cultural heritage is challenging, there are methods and techniques that can be used to help overcome at least some of the difficulties mentioned above. People in the study area perceived cultural heritage to be an important component of their wellbeing, therefore, despite these challenges, people's nature-based cultural values cannot be overlooked when designing biodiversity NNL strategies.

Incorporating nature-based cultural values into biodiversity NNL strategies

National economic benefits often out-compete local spiritual values within the decision-making process for development projects. This may be a combination of the wish to exploit new markets, the need for economic development and 'modernisation' making spiritual values less salient to decision-makers (Rutte 2011). This case study is an example of a trade-off between nationally significant economic development projects and local people's nature-based cultural values. The need to increase power generation within Uganda has been identified as a priority for the country (NDP 2015). However, to maximise hydropower potential, dams are built which inundate waterfalls and rapids, many of which have spiritual value to local people. Hydropower development, and hence impacts on spiritually important natural sites, is often deemed unavoidable, not only in Uganda but worldwide.

Although increasingly being included into government policies and ESIAs, cultural heritage is still a relatively new aspect of public policy, with cultural impact assessments having only been practiced for the last two decades (Partal & Dunphy 2016). Despite principles and guidance on how to incorporate cultural values into ESIAs (e.g. Vanclay et al. 2015), often the process often does not allow for the adequate evaluation of impacts to cultural values owing to timeframes, data availability, budget and the technical capacity required (Heiner et al. 2019). Hence, whether cultural impacts are addressed sufficiently in the ESIA process has also been questioned, with criticism that they are often included as a subsidiary part of the ESIA (Partal & Dunphy 2016). Moreover, as found in this study, cultural heritage is a sensitive topic, particularly spirits and sacred sites, meaning local people may not feel comfortable

voicing cultural values during the ESIA process (and to an outsider). There is often insufficient time in the ESIA process for practitioners to build trust with communities so that respondents openly talk about cultural values, which is especially important when communities experience anxiety associated with a pending major project development. Traditional ESIA methods could therefore fail to reveal the richness and diversity of cultural values in the area and the inherent, complex relationship between nature and people can be neglected in current environmental management systems, and particularly in approaches such as biodiversity offsetting that are perceived as 'commodifying nature' (Apostolopoulou & Adams 2015; Moreno-Mateos et al. 2015).

Accordingly, before managing and mitigating development impacts on people's nature-based cultural heritage, a thorough understanding of the ways that people value and use nature for their culture is needed, and why this is important to their wellbeing. A practical decision framework such as that presented by Heiner et al. (2019) could be applied as part of the ESIA process to assess impacts to environmental, social and cultural values in a proactive and integrative manner. With participation from the local community, spatial datasets can be constructed depicting where sites of high cultural, social and biological value are located. Once the cultural impacts (and who experiences these impacts) have been fully understood, coupled with the spatial information, the mitigation hierarchy can be applied to impacts on both nature and cultural heritage (as specified by IFC PS8; Appendix E), providing a platform for transparent discussion and negotiation of mitigation measures with the community. If the first two preventative steps (avoidance and minimisation) are unachievable fully or in-part, trade-offs could exist. At the last stage of the mitigation hierarchy (offset), a key decision needs to be made, in negotiation with the local community, on how to compensate people when a development project affects their nature-based cultural values, with the aim to ensure that they are 'no worse off'. Where impacts to cultural values are clearly unavoidable, transparent and participative decision-making processes are needed to help resolve these trade-offs (Moreno-Mateos et al. 2015), build community support for the selected compensation measures, as well as create partnerships with the local communities.

It may not always be possible to fully compensate people for negative nature-based cultural heritage impacts incurred from either a development or its associated offset, owing to the high irreplaceability of certain components for affected people (e.g. if spiritual sites are damaged, destroyed or rendered inaccessible (BBOP 2012)). In these instances, it must be recognised that the outcomes of a

development and its associated offset for people cannot be sustainable or equitable, even if biodiversity NNL is achieved (Bull et al. 2018). For example, the right to herd reindeer is an important tradition for the indigenous Sami people in Sweden but a mining project directly impacted reindeer grazing land and migratory routes (Koh et al. 2017). Consultations were held between the impacted Sami people and the developer to negotiate compensation for reindeer husbandry losses. An agreement was signed, influencing the location of mining operations and specifying monetary compensation for additional costs incurred by the Sami (e.g. feeding). Nevertheless, according to consultations with the affected Sami, the compensation could not substitute for the losses of land and hence the Sami still oppose the mining activities (Koh et al. 2017).

In our study area, responses about whether lost sacred sites could be compensated for were mixed. Some FGD participants (both men and women) felt that compensation is possible, provided the correct procedures are followed to consult with and relocate the spirits. Comprehensive engagement is necessary not only between developers and spiritual leaders, but also with the broader community in order to understand (as far as possible) the values attached to the impacted sacred site and why some people may feel that compensation (and relocation of spirits) is possible and why others do not. This can help to avoid elite capture (Brockington 2003), which FGD participants raised as a concern. Discussions and negotiations can then follow between all interested and affected parties to first decide on whether relocation is feasible, and if so, what the correct relocation procedure should be and to agree on a new location for the sacred sites that is mutually acceptable (e.g. minimising travel distance), whilst at the same time, respecting local people's beliefs and traditions.

All features of cultural and spiritual sites should be evaluated and compensated for if affected by the development. Although in our study area, spirits were the main cultural values attached to affected sites, values which may be particularly important in other settings include sense of place, identity and social interactions. 'Sense of place' is a concept used to describe those characteristics that make a place special or unique as well as those that foster a sense of authentic human attachment and belonging (Hernández-Morcillo et al. 2013). Natural features in the environment are often associated with the identity of individuals, a community or a society, providing intergenerational experiences, and can also be settings for community interactions which are important for cultures (Daniel et al. 2012). Development can change or negatively affect locally distinct characteristics in the landscape and their

cultural meanings, which can disconnect communities from their past (Stephenson 2008). FGDs raised the aesthetic value of sacred sites and how important nature and natural features are to this value. If the new location for a sacred site is not aesthetically pleasing (e.g. too artificial, or a sacred site around water being moved to land), people may not value it as much as the original site and, consequently, may avoid the site altogether. It has been suggested that 'sense of place' is one of the most neglected cultural aspects and that more information is needed on how to include it into conservation decision-making (Millennium Ecosystem Assessment 2005; Hausmann et al. 2016).

Achieving the 'no worse off' principle for people, alongside biodiversity NNL

Griffiths et al. (2019a) propose that fulfilling the 'no-worse-off' principle means ensuring that local people's wellbeing is not negatively impacted by losses and gains in nature resulting from a development project and its NNL activities (e.g. an offset). This requires a decision on the scale (i.e. regional, village, interest group, household or individual) used to evaluate impacts on people's nature-based cultural heritage, and how these impacts and the associated compensation affect their perceived wellbeing.

The results from this study demonstrate geographical variation, with differences in how important cultural heritage is to people's wellbeing existing between the six villages. Therefore, it may not be appropriate to use a regional scale (aggregating villages) when measuring impacts on cultural heritage and wellbeing and evaluating whether the 'no worse off' principle has been achieved. However, it may not be appropriate to use the village scale (aggregating households and interest groups) either, as these results demonstrate variations in the importance of cultural heritage to wellbeing between different socio-demographic groups. Individuals within socio-demographic groups, including within the same household, were also found to value cultural heritage differently. Measuring impacts on cultural heritage at the individual level provides the greatest level of detail, but determining whether every individual is 'no worse off' as a result of the development's NNL activities (at both the development and offset sites) is not practically feasible. Changes in wellbeing (in part owing to impacts on cultural heritage) should consider people at the scale at which potential impacts are predicted to be significant (which can be defined in accordance with best practice for ESIAs; Bull et al. 2018). In this case, people may need to self-define as potentially impacted by loss of cultural heritage in order to participate in discussions about avoiding, mitigate and only then compensating for these losses. Even this can be

challenging if certain groups (e.g. women) are both highly affected by lost cultural heritage and not comfortable discussing it in public or with external consultants and researchers.

Demonstrating the 'no-worse-off' principle also requires measuring impacts from NNL on people's wellbeing, including on cultural values. This is challenging because the value of cultural heritage is not calculable (Hernández-Morcillo et al. 2013). In some instances, economic valuation techniques (e.g. choice experiments) can be used to measure the value of certain cultural aspects such as ecotourism (Daniel et al. 2012; Hernández-Morcillo et al. 2013; Griffiths et al. 2019b). However, many cultural values (e.g. religious and spiritual values) cannot be mapped spatially nor do they conform well to economic assumptions and are often resistant to monetary valuation owing to their incommensurability (Hernández-Morcillo et al. 2013). In addition, people's cultural values associated with nature may change over time (Heiner et al. 2019). As a result, economic valuation methods can downplay cultural values (Infield et al. 2018). The most frequently studied cultural aspects are often the easiest to measure (e.g. recreation and tourism), which can lead to a significant gap between what matters to local people and what is easy to measure (Milcu et al. 2013).

"Projects like Isimba dam take people's land unwillingly and when they are compensating, they pay for the economic value of the trees and other plants but don't compensate for the spirits that live in those trees so the spirits punish the care takers, not knowing that the land has been taken forcefully"

(Isimba-West: men's FGD)

A mixed methods approach can address this challenge, where quantitative techniques (e.g. formal surveys) are coupled with qualitative techniques (e.g. FGDs, participant observation, participatory scenario planning etc.). Although the methods used here are similar to those employed during the ESIA process, a deeper understanding of the development-related cultural impacts on local people was gained by spending longer with communities than ESIA consultants typically are able to, by focusing on impacts on wellbeing, and by conducting FGDs on cultural heritage alone. A focus on wellbeing was beneficial as many wellbeing components (e.g. life satisfaction, social cohesion and sense of purpose) are in part derived from the fulfilment of spiritual and cultural values (Schneider 2018).

Conclusion

This research demonstrates: a) the importance of nature-based cultural values to people's wellbeing within a geographical region affected by large development projects; b) how these values differ between villages and groups of people; c) why cultural values need to be accounted for within NNL strategies; and d) how an understanding of the importance of cultural values can help operationalise the 'no worse off' principle. The study also illustrates how complex understanding cultural heritage can be, but that ignoring cultural values or failing to account for them adequately (e.g. in a rapid ESIA), can lead to NNL negatively affecting people's wellbeing. Taking time to understand people's cultural values and beliefs through a mixed methods approach, including comprehensive engagement, is vital when designing and implementing development projects and NNL strategies that are equitable, socially acceptable and therefore potentially sustainable.

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Conflict of interest statement

The authors of this manuscript do not have any conflicts of interest.

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Supplementary material

Appendix A: Individual questionnaire

Section A: Individual socio-demographic information (about the respondent only)

We would first like to ask you some questions about yourself:

1. Name: _____

2. Gender: Male / Female

3. Age:

   ☐ 18 - 30 ☐ 31 - 45 ☐ 46 – 60 ☐ 60+

4. Marital status (tick one):

   ☐ Married ☐ Single (never married) ☐ Co-habiting ☐ Widower ☐ Divorced / Separated

5. Nationality: Ugandan / other (please specify): _____

6. Ethnicity (tick one):

   ☐ Baganda ☐ Basoga ☐ Mugishu ☐ Gishu ☐ Mukonjo ☐ Mugwere

   ☐ Toro ☐ Banyole ☐ Bagisu ☐ Bakiga ☐ Muteso ☐ Mululi

   ☐ Other (please specify): _____ ☐ Chooses not to answer

7. Religion (tick one):

   ☐ Protestant ☐ Catholic ☐ Muslim ☐ Seventh Day Adventist

   ☐ Traditional Religion ☐ Pentecostal

   ☐ Chooses not to answer ☐ Other (please specify): _____

8. Level of education (tick one):

☐ Primary ☐ Secondary ☐ College or university ☐ No formal education

Section B: Household socio-demographic information (about the household)

We would now like to ask you some questions about your household. This means that we would like to know about people in your house who regularly share meals and live together, including people who might be away for education but come home for holidays.

1. How many years has your household lived in this village?

☐ < 5 years ☐ 6 – 9 years ☐ > 10 years ☐ Not sure

a) If <10 years (after 2006), where did you live before? _____

b) Why did you move here?

---

2. What is your status in relation to land ownership (tick one)?

☐Owner ☐ Tenant ☐ Licensee ☐ Unsure

3. Are you the household head? Yes / No

a) If no, define status: _____

4. Including the interviewee, please tell me how many people live in the household:

Age (years)	**Number of males in this household**	**Number of females in this household**
Below 18		
19 – 59		
60 +		

Section C: Education

5. How many people in the household are currently at primary school? _____

6. How many people in the household are currently at secondary school? _____

7. How many people in the household are currently at college or university? _____

Section D: Livelihood activities

1. Which activity generates the most money for the household over a year? What is the next most important? And the next? (mark 1, 2 and 3 in the boxes)

☐ Farming
☐ Livestock rearing
☐ Fishing
☐ Boda boda driver
☐ Renting property
☐ Pensioner
☐ Private institution employee
☐ Other (please specify): _____
☐ Tourism related activities
☐ Village market sales
☐ Running small businesses
☐ Government employee
☐ Manual labor
☐ Carpentry
☐ Working for someone who runs a small business

2. How many adults (> 18 years) in the household contribute money to the total household income? _____

3. How many children (< 18 years) in the household contribute money to the total household income? _____

Section E: Use of natural resources

1. What things does your household currently collect and use from nature in the area?

☐ None
☐ Sand

☐ Fish

☐ Fruits

☐ Medicinal herbs

☐ Clay

☐ Palm leaves

☐ Fuel wood

☐ Other (please specify): _____

☐ Fodder for livestock

2. Where do you collect them (tick all that apply)?

☐ Forests and vegetation along the Nile River

☐ In the Nile River

☐ Other forests in the area that I can walk to

☐ Islands on Lake Victoria and in the Nile River

☐ My farmland

☐ Other people's farmland

☐ Other (please specify): _____

3. What do you use them for (tick all that apply)?

☐ Food for the household

☐ Building materials

☐ Arts and crafts

☐ Traditional medicine

☐ Household materials

☐ Fuel for the household

☐ Cultural or traditional events and practices

☐ To sell at markets

☐ Other (please specify): _____

☐ Fodder for livestock

Section F: Water

1. Where do you obtain water (tick all that apply)?

☐ Protected spring

☐ River

☐ Borehole

☐ Unprotected spring

☐ Piped water

☐ Lake

☐ Roof catchments ☐ Ponds

☐ Other (please specify): _____

Section H: Basic Necessities Survey

This section is divided into two stages. First go through the list and ask:

1. Which of these items do you think are basic necessities, things that everyone in the village should have and no one should go without (tick boxes below)?

   Then once the list is complete, ask:

2. Which of these items does your household currently have (tick boxes below)?

Item	Are these items a basic necessity? (√)	Do you currently own / have them? (√)
A water source within 1km (or within half an hours walking distance) of the household		
A gas cooker		
Two sets of clothes for every member of the household		
Two goats		
Able to have at least two meals a day		
A paraffin lamp		
All children able to attend primary school		
A pit latrine or other form of toilet		
A solar power lamp		
A kettle		
A mattress for every adult in the household		
At least 3 acres of land		
Access to medical facilities within 5km (or within 2 hours walking		

distance)		
A television		
Brick walls for your house		
A motorbike		
Two saucepans		
A blanket for every child in the household		
A bank account		
A bicycle		
A water tank/drum		
Property insurance		
A pair of shoes for every member of the household		
A metal roof for your house		
Two cows		
An FM radio		
A mobile telephone		
Access to electricity (from public or generator)		
At least one child able to attend higher education		
A set of chairs (at least two)		
A car		
A fridge		
A concrete floor for your house		
A mosquito net for every member of the household		

Section I: Wellbeing

1. For yourself, what does it mean to lead a good life?

   _____

   _____

   _____

   _____

2. How has life been for you over the past year (tick one)?

   ☐ Good ☐ So-so ☐ Hard ☐ Don't know / would rather not say

3. Can you explain why?

   _____

   _____

4. How has life been compared to last year? (tick one)?

☐ Better ☐ No change ☐ Worse ☐ Don't know / would rather not say

5. Can you explain why?

_____

_____

6. Compared to other households in the area, how well-off in terms of income is your household (tick one):

☐ Worse ☐ About average ☐ Better ☐ Don't know / would rather not say

7. Compared to 10 years ago, do you consider your household to be (tick one):

☐ Poorer ☐ The same ☐ Wealthier

☐ Don't know / would rather not say

8. What are the reasons for this change?

_____

_____

9. What has improved in the village over the last 10 years?

_____

_____

_____

10. What has become worse in the village over the last 10 years?

_____

_____

_____

11. How often do you go to Jinja?

☐ Never ☐ Every week ☐ Every two weeks ☐ Once a month ☐ Every 3 months

☐ Every 6 months ☐ < Every six months ☐ Don't know / would rather not say

12. Why?

_____

_____

_____

13. Do you feel that accessing Jinja influences your ability to live a good life?

☐ Yes ☐ Maybe ☐ No ☐ Don't know / would rather not say

14. Why?

_____

_____

_____

Section J: Cultural heritage

I am now going to read out some statements and several possible answers. I would like you to pick the answer that you think best represents your feelings. There is no right or wrong answer to these statements and sometimes there will be statements that you disagree with and sometimes statements that you will agree with. We are expecting people to agree with some things and disagree with other things so please note that it is okay to disagree at times. There are also quite a few questions that I will ask you so you do not need to spend a lot of time thinking about the answer.

A: Attitudes towards cultural heritage

1. I enjoy experiencing the beauty of the natural environment

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

2. There are **no** myths, legends and stories associated with nature in my culture

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

3. I have a strong attachment to particular plant and animal species because of their importance in my culture and traditions

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

4. I believe that myths, traditions and beliefs **do not** need to be taught and passed down to future generations

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

5. Taking part in traditional activities in nature makes me feel happy and comforted

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

6. It would be a boring experience to help relocate spirits

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

7. I think that time spent in nature can teach people things outside of the school classroom

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

8. My religion encourages me to protect nature

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

9. Cultural traditions, beliefs and ceremonies **do not** help me to bond with other people in the village

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

10. I would avoid visiting sites with angry spirits

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

11. Because of my religion, traditional and cultural beliefs and practices are no longer important in my life

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

12. Sacred sites and traditions such as weaving could be a tourist attraction and bring money to my village

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

13. Being in charge of cultural events means that you are well respected in the village

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

14. I will do everything that I can to keep the spirits which live in nature happy

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

15. Places, plants and animals in the environment are **not** important for my culture and traditions and so do not need to be protected

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

16. Things that I can find in nature (for example herbs or trees) are useful for my culture and traditions

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

17. I fear going near certain places in nature as they may bring me bad luck

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

18. I would not mind if cultural traditions and beliefs changed in the future, meaning that nature becomes less important

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

19. My favourite cultural tradition is visiting sacred sites in nature

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

20. Being in nature makes me want to learn more about other people's traditions and cultures

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

21. There are some parts of the environment of that remind me of important past events

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

22. I sometimes carry out animal sacrifices when worshipping at a sacred site

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

23. There is a need to protect and preserve the different cultural beliefs and traditions in my village

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

24. I look forward to the next time that I will take part in a traditional activity in nature

☐ Strong agreement ☐ Agreement ☐ Neutral ☐ Disagreement ☐ Strong disagreement

☐ Don't know / would rather not say

B: Spiritual sites

1. This is a personal question so please only answer if you feel comfortable, can you tell me what spiritual sites are (or used to be) in the area and why they are important to you?

_____
_____
_____
_____
_____

2. When last did you visit a spiritual site?

☐ A few days ago ☐ A week ago ☐ A month ago ☐ 6 months ago

☐ > 6 months ago ☐ Never ☐ Don't know / would rather not say

C: Wellbeing

3. How important is cultural heritage (all these things mentioned above) to leading a good life, for you?

☐ Not at all important ☐ Not very important ☐ Neutral ☐ Important

☐ Very important ☐ Don't know / would rather not say

4. Thinking about all the other things that help you to lead a good life, such as food, shelter, health, how important is cultural heritage to you, relative to those things?

☐ One of the least important ☐ Not very important ☐ Neutral ☐ Important

☐ One of the most important ☐ Don't know / would rather not say

Section J: Dams, wellbeing and cultural heritage

1. What are your feelings towards the construction of the dam?

☐ Happy ☐ No feelings ☐ Sad ☐ Angry ☐ Don't know / would rather not say

2. Why?

_____

_____

3. Has the dam affected your ability to live a good life?

☐ Very negatively ☐ Negatively ☐ Neutral ☐ Positively

☐ Very positively ☐ Don't know / would rather not say

4. Why?

_____

_____

5. How much has the dam (Bujagali or Isimba) affected your household's ability to access the natural resources that you mentioned before (tick one)? (for example: fuel wood, fish, medicinal herbs, palm leaves, papyrus, sand, clay and fruits)

☐ Greatly improved ☐ Improved ☐ Remained the same ☐ Worsened

☐ Greatly worsened ☐ Don't know / would rather not say

6. Why and which resources?

_____

_____

7. Has the dam had an impact on the size of your household's land (circle one)? Yes / No

8. Have you lost or gained land (circle one)? Lost land / gained land

9. If lost land, has this impact been (tick one):

☐ Small (lost less than ¼ of my land)

☐ Medium (Lost between ¼ - ½ my land)

☐ Large (Lost > ½ of my land)

10. If gained land, has this impact been (tick one):

☐ Small (gained less than a quarter as much land as I already had)

☐ Medium (gained about quarter to a half as much land as I already had)

☐ Large (gained more than half as much land as I already had)

11. Has the dam had an effect on your household's income (tick one)? Yes / No

12. If lost income, has this impact been (tick one):

☐ Small (lost less than ¼ of my income)

☐ Medium (Lost between ¼ - ½ my income)

☐ Large (Lost > ½ of my income)

13. If gained income, has this impact been (tick one):

☐ Small (gained less than a quarter as much income as I already had)

☐ Medium (gained about quarter to a half as much income as I already had)

☐ Large (gained more than half as much income as I already had)

14. Has the dam affected your households' food production (tick one)? Yes / No

15. If food production has reduced, has this impact been (tick one):

☐ Small (lost less than ¼ of my food production)

☐ Medium (Lost between ¼ - ½ my food production)

☐ Large (Lost > ½ of my food production)

16. If food production has increased, has this impact been (tick one):

☐ Small (gained less than a quarter as much food production as I already had)

☐ Medium (gained about quarter to a half as much food production as I already had)

☐ Large (gained more than half as much food production as I already had)

5. Has the construction of the dam (Bujagali or Isimba) affected any of the spiritual sites near your village?

Yes / No / Do not know

(if yes, answer the following questions)

6. If yes, in what way?

_____

_____

7. How does this make you feel?

☐ Very sad ☐ Sad ☐ no change in feelings ☐ Happy ☐ Very happy

☐ Don't know / would rather not say

8. Has anything been done because the spiritual sites were affected by the dam (circle one)?

Yes / No

9. What has been done?

_____

_____

10. Does this make up for the loss of the site?

☐ Yes ☐ Slightly ☐ No ☐ Don't know / would rather not say

11. Why?

_____

_____

Appendix B: Themes and codes emerging from the thematic analysis

Theme 1: Spiritual beliefs, rituals and ceremonies	Theme 2: Nature	Theme 3: Changes in cultural heritage
• Religion • Myths and stories • Ancestors and burial grounds • Spirits • Animal and human sacrifices • New born rituals • Twin rituals • First harvest tradition • Circumcision traditions (male and female) • Clitoris elongation • Last funeral rights and burial traditions • Christmas, birthdays, graduation, get together's • Traditional marriage: preparation, dowry, introduction • Traditional songs and dances • Traditional food and alcohol • Culture differing between tribes • Clans	• Bark cloth • Traditional music and instruments • Totems • Sacred sites • Insects and naming months • Accessing / harvesting natural resources • Medicinal herbs and traditional healers • Traditional arts and crafts • Specific harvesting / planting times • Wearing / using animal skins	• Climate change • People are afraid of cultural heritage • Religion's influence • Culture changing / disappearing • People trying to make money out of cultural heritage • Modernity • Dam's impact • Impact of other projects • Sacred sites destroyed • Traditional dress • Men and women's roles • Manner and behaviour • Teaching younger generations

Misc. code = language

Appendix C: Characteristics of respondents

Characteristic	Number
No. individuals sampled	1305
No. HHs	784
Gender	
Males	511
Females	794
Age	
18-30 years	429
31-45 years	419
46-60 years	292
60+	165
Education level	
Primary school	701
Secondary school	341
College / university	38
No formal education	225
Time respondent has lived in the village	
<5 years	99
5-9 years	73
>10 years	1127
Not sure	6
Primary livelihood	
Tourism	5
Salaried employment	63
Uses natural resources	961
Self-employed	276
Average household poverty score (based on the Basic Necessities Survey) in each village	
Bujagali-West: Kikubamutwe	0.60
Bujagali-East: Kyabirwa	0.55
Kalagala-West: Kalagala	0.55
Kalagala-East: Bubugo Bugobi	0.54
Isimba-West: Nampaanyi	0.45
Isimba-East: Bwase Buseta	0.48
Respondent willing to answer questions? (answered by research assistants)	
Yes	1233
Moderately	31

Characteristic	Number
A little	39
Not at all	1
Not answered	1
Did the respondent understand the questions? (answered by research assistants)	
Yes	780
Moderately	417
A little	98
Not at all	9
Not answered	1
Was the respondent honest when answering the questions? (answered by research assistants	
Yes	1132
Moderately	107
A little	64
Not at all	1
Not answered	1

Appendix D: Cumulative link mixed model exploring how important cultural heritage is to wellbeing

Two socio-demographic variables have a significant effect on responses to how important cultural heritage is to wellbeing, namely gender and education (CLMM; Table 1). When compared to the model's baseline conditions (female and no education), gender has a positive parameter estimate whilst education has a negative estimate, implying that males and those with less education are more likely to say that cultural heritage is important to them. Gender has a parameter estimate of 0.66 (above all of the thresholds), indicating a high probability that men find cultural heritage more important to wellbeing than women do (the baseline condition). Age did not have a significant effect on response and was hence removed from the model. Although non-significant, poverty and time lived in the village were left in the model as this led to the lowest AIC value. The coefficients suggest that those who were less poor were more likely to find cultural heritage important, and those who worked in tourism and had lived for longer in the village were less likely to find it important.

Responses also differed between the six villages. Respondents in Kalagala-West found cultural heritage to be the most important to wellbeing, whilst respondents on the opposite side of the river, Kalagala-East, found cultural heritage to be the least important to wellbeing. The next village where respondents found cultural heritage to be important to wellbeing was Isimba-East, and the next village where they thought it was less important was on the opposite bank, Isimba-West. Lastly, respondents in Bujagali-West found it important to wellbeing whilst those on the opposite bank, Bujagali-East, found it less important to wellbeing. This suggests that there was no clear geographical structure to the results.

Table 1: CLMM results with logit link function of perceptions of importance of cultural heritage to wellbeing to predictor variables

Variable	Estimate	Std. Error	CI (2.5%)	CI (97.5%)	
Gender – Male	0.66	0.14	0.38	0.93	***
Education – Primary	-0.29	0.20	-0.68	0.10	
Education – Secondary	-0.64	0.23	-1.09	-0.19	**
Education – College / university	-1.39	0.47	-2.31	-0.48	**
Economic status	0.97	0.62	-0.24	2.19	
Livelihood – Self-employed	-0.39	0.39	-1.15	0.37	
Livelihood – Tourism	-2.05	1.18	-4.36	0.27	·
Livelihood – Uses natural resources	-0.33	0.37	-1.05	0.39	
Lived in village < 5 years	-1.14	1.06	-3.22	0.94	

Variable	Estimate	Std. Error	CI (2.5%)	CI (97.5%)
Lived in village 5 – 9 years	-0.55	1.07	-2.65	1.56
Lived in village > 10 years	-1.29	1.03	-3.31	0.73
Threshold coefficients				
0/1	-5.26	1.16		
1/2	-3.94	1.15		
2/3	-3.10	1.15		
3/4	-0.01	1.14		
Random effects (intercepts)				
Bujagali-West (Kikubamutwe)	0.06			
Bujagali-East (Kyabirwa)	-0.10			
Kalagala-West (Kalagala)	0.33			
Kalagala-East (Bubugo Bugobi)	-0.41			
Isimba-West (Nampaanyi)	-0.28			
Isimba-East (Bwase-Buseta)	0.15			

*Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Baselines: female, no education, salaried employment and not sure how long they have lived in the village.

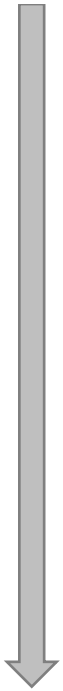
Thresholds: 0 = Not at all important; 1 = Not very important; 2 = Neutral; 3 = Important; 4 = Very important.

Appendix E: Applying the mitigation hierarchy to manage impacts to local people's nature-based cultural values

Table 1: Applying the mitigation hierarchy to manage impacts to people's nature-based cultural values, using the Bujagali Hydropower Project and Kalagala Offset case study and a hypothetical model case study in which different considerations for incorporating cultural heritage fully are explored

	Mitigation hierarchy	Bujagali Hydropower Project & Kalagala Offset	Considerations for incorporating cultural heritage
More preferred 	Avoid (Preventative measure)	A hydropower dam is generally constructed in a valley or at a place where the river narrows, and where the natural riverbed level drops rapidly and dramatically. This is because hydropower generation uses the "head difference" (the difference between the water level stored in the dam and the water level downstream of the dam) to drive water through the turbines that generate electricity. There is a natural head difference between the upstream and downstream of waterfalls and rapids in a river, making these locations ideal sites for hydropower dams. Alternative power generation technologies were not considered. Alternative hydropower sites were considered as part of the ESIA. However, of all the alternative locations, the Bujagali site was considered	Avoid hydropower development altogether by investing in other renewable energy sources that have less impact on the waterfalls and rapids (e.g. solar power, wind, geothermal). However, the many large rivers in Uganda, and particularly the Victoria Nile, offer huge hydropower potential. Thus, if hydropower is selected, find an optimal location for the dam taking all environmental and social aspects, including cultural heritage, into account. This may not be possible as most waterfalls and rapids in Uganda house spirits and sacred sites. However, some sites may be culturally more valuable than others, and moving the location will result in damaging less valuable sites. Therefore, if a hydropower dam is deemed necessary and unavoidable for economic growth and

	to have the lowest environmental impact whilst still generating substantial amounts of power. Development of Bujagali dam unable to avoid impact on sacred sites: rapids, waterfalls, sacred stones, sacred trees and shrines were inundated.	national development, move on to next step in the mitigation hierarchy, minimising the impacts to nature-based cultural heritage.
Minimise (Preventative measure)	The Bujagali dam was unable to minimise the impact on sacred sites and spirits as they were submerged by the reservoir.	The impact of a dam on waterfalls could be reduced by using a 'run of river' power station. This scheme diverts part of the river water going over the waterfalls into a pipeline or tunnel, allowing it to by-pass the waterfall, and flow through the turbine to generate power. At the same time, the remaining water still flows over the waterfall. However, run of river power stations require a fairly large river with lots of water, and are usually only suitable for smaller capacity power stations. Another alternative could be to construct a dam as far upstream as possible to maximise the 'head difference' and divert water around the waterfall to the turbines, but at the same time, make provision within the dam outlets that will allow enough water to still flow through the waterfall. Both cases create a trade-off, however. The more water that is let through to flow over the waterfall, the less that is being used to generate power.



Less preferred

		Other measures to minimise impact could be to ensure that construction activities do not take place at culturally significant times. If none or only some of these minimisation measures are feasible, move on to next step in the mitigation hierarchy.
Remediate (Compensatory measure)	Flooded sacred sites (and disturbed spirits) cannot be restored or rehabilitated.	If impacts of the hydropower project are permanent, sacred sites cannot be restored, as the aesthetics of the area have been altered, waterfalls inundated and spirits disturbed. However, remediation may be possible for temporary impacts.
Offset (Compensatory measure)	Comprehensive engagement was carried out with affected groups, notably the spiritual leaders. Compensation was agreed upon and included agreeing on a new sacred site and paying for ceremonies to relocate the spirits at Bujagali to a village called Namezi. Sacred sites (and associated cultural values) downstream at the Kalagala site are being protected as part of the Kalagala offset.	Comprehensive stakeholder engagement must be carried out between the developer, local communities and spiritual leaders to agree on acceptable compensation activities. In terms of what is acceptable, this is to be decided on in negotiation with spiritual leaders and all affected communities / groups of PAPs. Some of the shrines, sacred stones and sacred trees on land could potentially be relocated to new areas away from the dam and/or its reservoir. Compensation to take the form of paying for spirit relocation ceremonies and construction of new

sacred sites that are as similar as possible to the sites being lost. Thus, based on this compensation, people may be ‘no worse off’ even if the exact nature and location of their sacred site has changed. However, achieving biodiversity NNL and the ‘no worse off’ principle in terms of nature-based cultural heritage may not be possible, despite compensation efforts. This is owing to high irreplaceability of certain biodiversity components. Thus, it may not be possible to achieve NNL with respect to areas of high cultural or spiritual significance (BBOP 2012).