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Purpose of the Series

The aim of this publication is to provide an opportunity for students to publish the findings of their undergraduate or postgraduate work. Guidance on publication will be given by staff who will act as second authors. It is hoped that by providing a guided transition into the production of papers that students will be encouraged throughout their future careers to publish further papers. Guest papers are welcomed in any field relating to the Built Environment. Please contact E.A.Laycock@shu.ac.uk. A template will be provided on request.

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THE EFFECT OF CANINE DISTURBANCE ON WATER VOLES *ARVICOLA AMPHIBIUS*: A CASE STUDY

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The water vole (*Arvicola amphibius*) is a declining species and a current focus of conservation management efforts. Extensive research has documented the effects of predation, habitat fragmentation, and habitat quality on the status and long-term viability of important populations. Research suggests that strong core populations of voles can aid the recovery of populations in adjacent suboptimal habitat, and are important for recolonisation at a landscape-scale. However, whilst countryside recreation is increasing, and is largely welcomed, there remain issues of potential adverse impacts on protected species such as water voles. Furthermore, there is currently little evidence regarding the effects of recreational disturbance on wildlife and especially on endangered mammals. Indeed, the subject is complex and controversial due to competing recreational and ecological interests, and worryingly there is a lack of robust research. This is especially true for impacts relating to recreational dog-walking. The present study utilised the implementation of purpose-built fencing at a site on the edge of the Peak District National Park to conduct a

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structured exploration of the effects of canine disturbance on water vole activity in a stretch of homogeneous riparian habitat. Latrine counts served as a relative marker of water vole activity. These were analysed within a 600 m stretch of watercourse (1.2 km of transects on both bank sides) consisting of fenced and non-fenced sections. Potentially confounding habitat variables were also considered. The results of this study suggest that water vole activity is significantly lower in areas of high canine disturbance. Whilst it is far from being a primary factor in the survival of water vole populations, disturbance may influence the effectiveness of on-going conservation efforts.

Keywords: Water vole conservation, Disturbance, Recreation, Dog-walking, Access

CONTEXT

The water vole (*Arvicola amphibius*) is an endangered riparian rodent. Though it is common in many parts of continental Europe, populations in the UK have declined drastically in the last century (Jefferies, 2003), primarily due to habitat loss and predation by the introduced American mink (*Neovison vison*) (Lawton & Woodroffe, 1991; Barreto *et al*., 1998). The resulting fragmentation of populations decreases long-term viability of water vole colonies, as it reduces genetic transfer and increases vulnerability to stochastic factors and environmental change (Rushton *et al*., 2000). The continuing decline represents a serious local or regional extinction threat in many areas. Large, stable colonies can provide high numbers of dispersing voles which may enable smaller colonies to persist, and may provide the basis for gradual repopulation of the surrounding area (Capreolus Wildlife Consultancy, 2005). Conservation work in order to increase connectivity and bolster core source populations is therefore essential (McGuire & Whitfield, 2017), and prominent authors in the field of water vole science have recommended that site-specific habitat enhancement in areas where key populations survive is crucial for recovery (Strachan, 2004).

In addition to threats of habitat loss and predation, declining species may also be influenced by the effects of anthropogenic disturbances relating to recreation. For many species, subtle forms of individual disturbance can affect activity at a population-level and prevent natural processes such as dispersal without altering physical landscape characteristics, and therefore have significant negative effects

on persistence of key populations. This mechanism of disturbance effects leading to decreased habitat quality and suitability has been coined 'landscape resistance' (Stronen *et al.*, 2012). Perhaps due to the controversy inherent in considering contrasting social and ecological factors, for many species including the water vole there has been relatively little definitive research on this topic (Hill *et al.*, 1997). Whether water voles are broadly tolerant of human activity is still unclear. Broad studies of the relationship between habitat factors and water vole presence by Lawton and Woodroffe (1991) and Stewart *et al*. (2017) found no negative association between simple measures of anthropogenic site-use and water vole presence. Indeed, Stewart *et al*. (2017) found that water voles in the Glasgow region were more concentrated in areas of higher human activity, though they stated that this may have been due to the abundance of suitable grassland sites in these areas. However, much anecdotal evidence suggests that water vole populations can be negatively influenced by human-related activity, and that disturbance is perceived to be a problem at many sites holding key populations. A chief concern is the effect of domestic dogs, which are a common accompaniment to recreationists who use nature reserves that are water vole strongholds (Weston & Stankowich, 2014).

Dog-walking is now one of the most common recreational activities in natural spaces all over the world (Miller, Ritchie, & Weston, 2014). In 2005, the 'Dogs, Access & Nature Conservation' report by English Nature (2005) highlighted the augmented disturbance effects that dogs (especially off-lead) which accompany countryside walkers can have on some species of wildlife. The harassment, displacement and disturbance that domestic dog presence can cause for many species is well-documented in the literature (Sime, 1999). A recent review of the worldwide impacts attributed eleven vertebrate extinctions and the decline of 188 threatened vertebrate species to domestic dogs (Doherty *et al.*, 2017). The reviewers suggested that this is a conservative estimate due to the difficulty in quantifying many types of canine disturbance, and that impacts are often extremely underestimated. Though many effects are sub-lethal and indirect, for many species the repetitive disruption and subsequent increased vigilance commonly result in a diminishing of activities including foraging, resting, display and caring for young (Weston & Stankowich, 2014). In combination with increased energy use in avoidance, this may cause long-term negative effects on growth and reproduction, and increased susceptibility to predation and disease (Hennings, 2016). Although disturbance of wildlife by domestic dogs mostly occurs at an individual level, it is clear that for certain species these impacts may have negative implications at a population level (Sime, 1999).

It is worth noting that there is a clear distinction between active forms of wildlife persecution using dogs, and accidental disturbance that may accompany recreational dog-walking. The present literature review identified a distinct lack

of evidence relating to the effects of accidental disturbance on many species, yet trends for some groups are clear. Most research pertains to bird populations, though evidence regarding negative effects on mammals is also strong (Doherty *et al.*, 2017). Lenth, Knight and Brennan (2008) found that small mammal activity was significantly reduced, and that the density of prairie dog (*Cynomys* spp.) burrows was significantly lower, within 50m and 25m respectively of trails where dog-walking was permitted in comparison to where it was not. Mainini *et al.* (1993) found that the act of domestic dogs walking over marmot (*Marmota marmota*) burrows created significant disturbance both physiologically and physically, which was greater than that of human impact alone. Riverine mammals such as otters (*Lutra lutra*) have also been studied in their adverse reactions to domestic dogs, which can be as extreme as holt abandonment (Green, Green, & Jefferies, 1984). However, for many mammalian species including water voles, there is still a lack of evidence regarding canine disturbance effects. Open, empirically driven management planning and spatial prioritisation is crucial in designing effective conservation strategies for threatened species which may be sensitive to these effects as dog populations increase (Doherty *et al.*, 2017). More thorough examination at a species-specific level is required to guide the complex process of impact alleviation.

Site-specific mitigation measures are increasingly implemented by conservation managers to protect wildlife from the effects of disturbance, particularly in areas where there is an interface between high levels of recreation and ecological importance, such as National Parks (Williams *et al.*, 2009). Strategies such as informative signage programmes are often used to encourage compliance to leash laws (Sime, 1999). However, many authors have suggested that a large proportion of dog owners ignore this signage, ignore byelaws (which state that dogs must be under close control on access land), and fail to control the behaviour of their dogs (Yalden & Pearce-Higgins, 1997). Indeed, high levels of non-compliance are regularly documented in research (White, 1997). Studies have shown that dog walkers value the opportunity to walk their dog without a lead highly, and this may contribute to widespread non-compliance with lead regulations (Miller, *et al.*, 2014). This has led some reviews to suggest that fencing sensitive areas can be an acceptable solution in some circumstances (English Nature, 2005; Weston & Stankowich, 2014). However, solutions involving reducing access for dogs raise controversial issues regarding the importance of ecological, economic, social and political values (Hughes & Macdonald, 2013). Some authors have suggested that dogs' experience is compromised by unnecessary reduction of freedom, and that this is rarely acknowledged in the literature (Bekoff & Meaney, 1997). Management interventions must therefore be empirically driven to increase site-specific effectiveness, and considerate of the social dimensions involved

(Weston & Stankowich, 2014). Clear data are necessary to address this complex interface.

The present study took place at a site on the edge of the Peak District National Park, centred on Grid Reference SK 26096 86475, along a man-made conduit which supplies Redmires Upper reservoir from the north. This watercourse is owned by Yorkshire Water (Figure 1).

Figure 1. Survey Site Context Map:

The conduit is approximately 2km long, and water voles are present for this entire length. In February 2018, a section of watercourse was fenced by the landowner Yorkshire Water, with the explicit intention to protect water voles from canine disturbance. This action was prompted by growing concerns voiced by the general public and local conservation charities such as Sheffield and Rotherham Wildlife Trust regarding the negative impacts of domestic dogs at the site (pers. comm. Tomkins, 2018). Such concerns have long been a feature of Peak District conservation practice. Previous research into the effects of canine disturbance on

threatened bird species prompted the creation of the ‘Take the Lead’ campaign in 1989, to encourage compliance to lead laws with the aim of reducing this disturbance, which continues to this day. Around 600m of post-and-wire mesh-fencing was installed along the top of the conduit bank, between the well-used path and the watercourse, leaving a width of approximately 5m of protected bankside habitat for this length. The construction of this fence provided an opportunity for analysis of disturbance effects. The homogeneity of habitat within this stretch of the conduit, in addition to the absence of mink and brown rat, enabled valid and reliable study of canine disturbance without the influence of common confounding factors.

METHOD

Field research took place between May and August 2018. Ten site visits, each approximately three hours in duration, were carried out with consecutive visits at least three days apart. The survey area consisted of two distinct areas: 1) 300m of fenced and 2) 300m of non-fenced watercourse. Each of these was divided into six 100-m transect lengths on both bank sides (see Figure 2). Latrine counts, as a proxy for water vole activity, were carried out for all twelve 100m transects on each of these survey visits, according to best practice guidelines (Dean et al., 2016; PTES, 2018; Strachan & Moorhouse, 2006). Latrine counts provide the most commonly used method for calculating relative measures of activity and population size (Strachan & Moorhouse, 2006). Literature on water vole habitat quality has regularly used latrine counts as an indicator of vole abundance and habitat suitability (Bonesi et al., 2002).

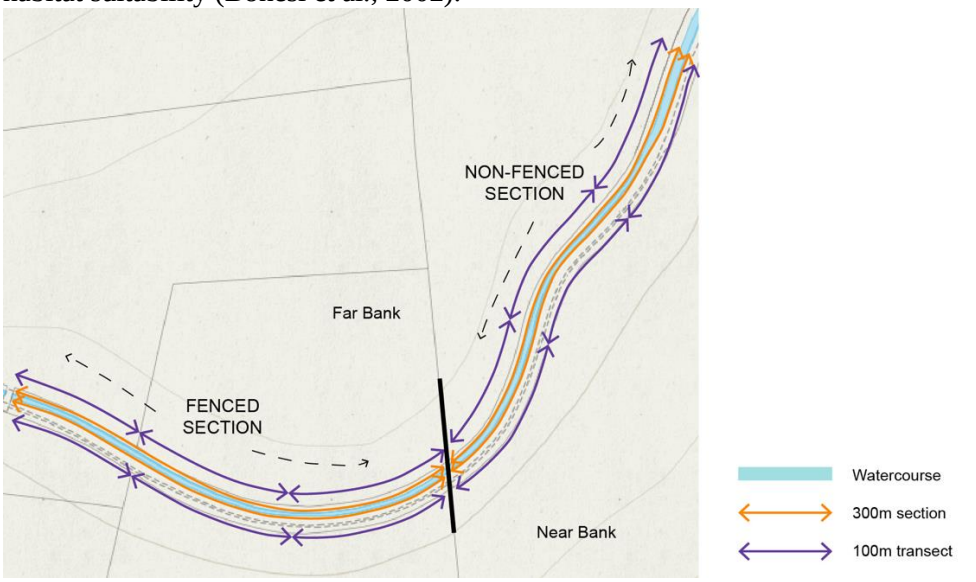

Figure 2. Transect Sections Diagram

Though the survey area was perceived to consist of homogeneous riparian habitat, homogeneity was assessed empirically. For each section, three quadrats were placed at randomly generated points adjacent to the bank of the watercourse. DOMIN measurements of percentage cover using a $50cm^2$ quadrat were taken at these points. By means of classifications similar to those used by Bonesi *et al*. (2001), species recorded were grouped into commonly observed vegetation types, in order to produce quantitative measures of vegetative habitat structure within each 100m watercourse transect. Measurements of bank angle were also taken.

During visits, the number of domestic dogs observed per hour and the proportion of these dogs off-lead were recorded, as quantitative measures of canine disturbance potential. Instances of dogs without a lead entering the watercourse were also recorded, as were observational notes on dog behaviour and unprompted comments by the general public.

RESULTS

Water Vole Activity

Latrine data collected through 100m transect counts (n = 120) in fenced and non-fenced watercourse sections were analysed. Descriptive statistics for latrine numbers in these two sections are shown in Table 1. Histograms illustrating these statistics are shown in Figure 3. Abundance of latrines in the fenced section of the watercourse was compared to abundance in the non-fenced section using a one-way ANOVA. The results of this test showed that there was indeed a significant difference ($p < 0.001$) in latrine numbers between the two survey sections (see Table 2). This analysis confirmed that latrine abundance, and therefore water vole activity, was significantly higher in the fenced than the non-fenced watercourse section.

To provide a quantitative measure of the effect of canine disturbance on water vole activity, a linear regression was carried out, using presence of fencing as the predictor in the model. Dummy coding was used to enable analysis of the ordinal variable, presence of fencing. The model produced an adjusted R^2 value of 0.123, suggesting that this variable predicted around 12% of the variance in latrine density (see Table 3). This analysis confirmed that a significant proportion of the variance in water vole activity was described by variation in disturbance effects.

Table 1. Fenced vs Non-fenced Descriptive Statistics

	Section			*Statistic*
Number of Latrines	Fenced	Mean		29.93
		95% Confidence Interval for Mean	Lower Bound	27.85
			Upper Bound	32.02
		Std. Deviation		8.076
		Minimum		16
		Maximum		48
	Non-fenced	Mean		24.60
		95% Confidence Interval for Mean	Lower Bound	23.15
			Upper Bound	26.05
		Std. Deviation		5.597
		Minimum		13
		Maximum		41

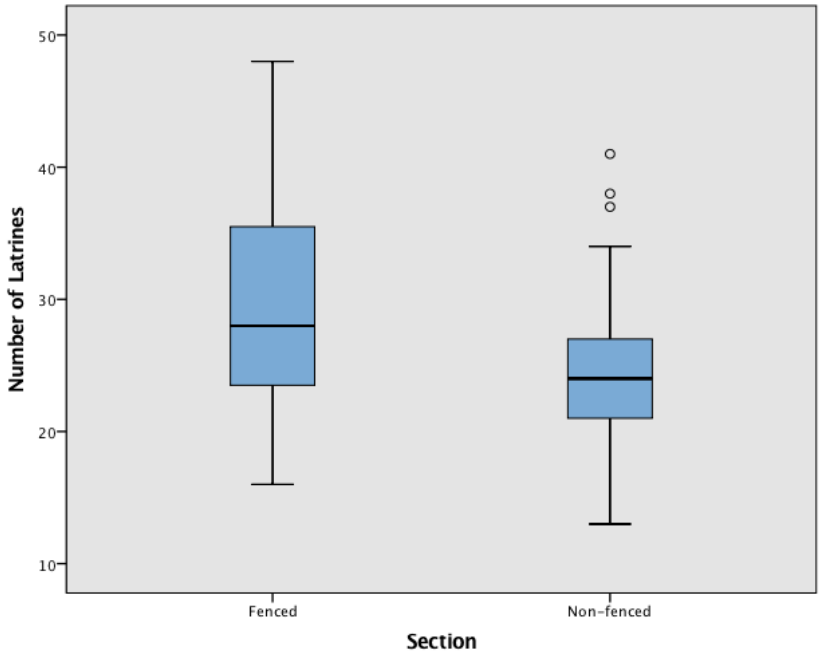

Figure 3. Fenced vs Non-fenced Histograms

Table 2. One-way ANOVA Comparison of Fenced and Non-fenced Sections

	Mean Square	*F*	*Sig.*
Between Groups Comparison	853.333	17.677	.000

Table 3. Linear Regression of Disturbance Effect

Model	R	R Square	Adjusted R Square	Std. Error	F	Sig. F
	.361[a]	.130	.123	6.948	17.677	.000

Habitat Data

Figure 4. Mean % Cover of Vegetation Types by Section

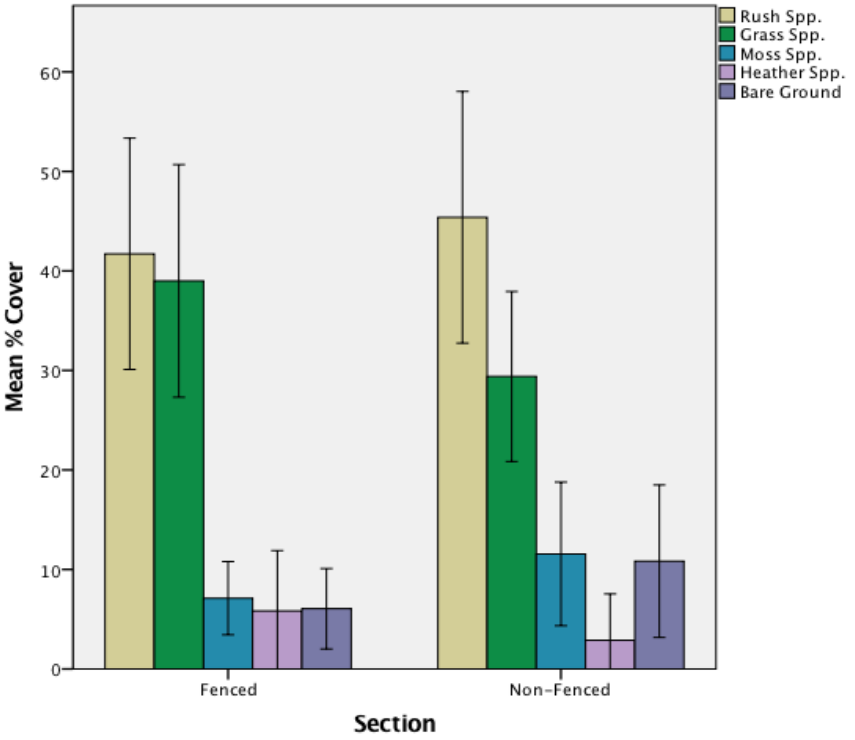

Table 4. Between Groups Analysis of Section (Fenced vs Non-Fenced) by Vegetation Cover

Vegetation Type (% Cover)	Mean Square	F	Sig.
Rush Spp.	121.000	0.203	.655
Grass Spp.	831.361	1.962	.170
Moss Spp.	177.778	1.341	.255
Heather Spp.	78.028	.661	.422
Bare Ground	205.444	1.355	.253

Table 5. Number of Latrines by Vegetation Type Pearson's Correlations

		Mean Rush Cover	*Mean Grass Cover*	*Mean Moss Cover*
Number of Latrines	Pearson Correlation	.028	-.147	-0.74
	Sig. (2-tailed)	.764	0.108	0.421

Average percentage cover for commonly occurring species groups in fenced and non-fenced sections is shown in Figure 4. ANOVA tests confirmed that there was no significant difference in cover of dominant vegetation types between watercourse sections (see Table 4). In further analysis, Pearson's tests showed that there was no significant correlation between abundance of the three dominant vegetation types and number of latrines present in a given transect (see Table 5). Bank angle was consistently >35º, a figure used by Lawton & Woodroffe (1991) in classification of the 'steep' banks associated with core sites. It was determined that within the survey area, differences in vegetation structure did not significantly influence vole activity, and that the effect of habitat was sufficiently controlled for in analysis comparing watercourse sections with differing disturbance characteristics.

Domestic Dog Site Use

The number of dogs using the path alongside the watercourse during survey visits was 1.44/h (SD = 0.71). This figure represents daytime, week-day use and is therefore a conservative estimate of dog-walking use of the site (Sastre *et al.*, 2009). The proportion of dogs observed off-lead was 72%, similar to previous research in the Peak District National Park (Yalden & Pearce-Higgins, 1997; Yalden & Yalden, 1990). The frequency of dogs observed entering the watercourse (in the non-fenced section) was 0.40/hr. A number of these dogs

were observed sniffing at water vole burrows during this time. Many users of the site expressed unprompted concerns regarding this behaviour, and one site user gave an unprompted account of a Jack Russell terrier regularly catching water voles before the construction of the fence, despite this site-user's plea encouraging the use of a lead. Another unprompted account of professional dog-walkers with up to eight dogs, all off-lead, using the site on a regular basis suggests that average dog-walking use of the site may be significantly higher than observed within the timeframe of the present study. The reliability of this anecdotal evidence is questionable. However, the quantitative measurements of domestic dog activity were deemed sufficient to evidence the presence of regular canine disturbance at this site.

Figure 5. Fencing at Redmires Conduit

Figure 6. Poaching of the Watercourse Bank by Dogs

Figure 7. Water Voles Swimming in the Watercourse

Figure 8. Water Vole Burrow and Latrine

DISCUSSION

The drifting nature of female water vole territories, which are marked by latrines and can move substantially on a weekly basis, has been illustrated in previous research (Moorhouse & Macdonald, 2005), and here provided information regarding what was considered optimal habitat, as in other research into water vole habitat quality (e.g. Bonesi *et al.* (2001)). Identification of areas of increased activity in the form of latrine deposition enabled clear evaluation of differences between sections experiencing differing levels of disturbance. In comparison to previous research, latrine counts were found to be extremely high at this site. The observed mean of 27.27 latrines per 100m sits outside the range used in previous literature to examine the relationship between vole abundance from latrine density (Morris *et al.* 1998; Capreolus Wildlife Consultancy 2005). Though this meant that previous regression equations were unreliable for estimation of vole abundance, it clearly demonstrates that the site hosts an extremely dense population in comparison to sites studied in previous research. This

density presented a clear opportunity to investigate disturbance effects on an otherwise healthy and stable population, where high levels of activity rendered differences more easily detected and the effects of stochastic factors on patch occupancy were reduced. Activity in the form of latrine abundance was found to be significantly higher in the fenced section (mean = 29.9/100m, 95% CI = 27.85 - 32.02) than the non-fenced section (mean = 24.6/100m, 95% CI = 23.15 - 26.05). This suggests that a reduction in disturbance in the fenced section was associated with relatively higher levels of water vole activity. A fully experimental test-retest methodology is required to conclusively prove the causality of this association. However, the elimination of confounding factors in the present study through rigorous control for variation in habitat suggests that canine disturbance can indeed have a significant negative effect on water vole activity.

This result has significant implications for conservation management practice. Research relating to water vole ecology and metapopulation survival suggests that increasing core habitat quality through such interventions may promote the formation of large and active populations, where strong colonies are resilient to environmental change and stochastic factors (Telfer *et al.*, 2001), and where a reproductive surplus means that many voles will disperse into adjacent suitable habitat (Capreolus Wildlife Consultancy, 2005). As populations continue to decline despite efforts to increase recording and positive management of suitable watercourses, future recolonisation will depend on the veracity of remaining core populations in safe habitat (McGuire & Whitfield, 2017). Increasing activity and abundance through reducing canine disturbance to existing populations at sites where there are high levels of dog-walking is therefore a clear pathway to increasing the likelihood of future conservation success. Fully experimental research regarding disturbance effects at sites with varying habitat characteristics is necessary to enable full assessment of suitability and cost-effectiveness of mitigation measures (Sawyer *et al.*, 2011). Assessment of public response to restricted access is also crucial. High levels of support will only be possible if ecological benefits can be clearly demonstrated on a species and site-specific basis.

The main influencing factor in future conservation efforts, not discussed in full here, is the continuing presence of mink in many historically occupied sites, and the continuing increase in mink range into areas were water vole currently still survive (Jefferies, 2003). Mink presence remains the main

influencing factor on water vole distribution, and it is still unclear whether a group of dense populations in high-quality sites with protected habitat can prevent further loss as mink populations continue to grow (Lawton & Woodroffe, 1991). However, striving to protect and strengthen core populations may be an incredibly important step for conservation, especially in remote upland areas where mink are currently absent and may remain so (Fraser *et al.*, 2015). The results of the present study suggest that site-specific habitat enhancement through reducing canine disturbance may be an important pathway for protection of key water vole populations. Evidence illustrating the significant disturbance effects that recreational dog-walking can have on threatened species continues to grow. Clear education strategies are necessary to increase public awareness of these effects, and the ways in which they may be reduced, in order to promote sustainable recreation.

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THE INFLUENCE VALUED ECOSYSTEMS CAN HAVE IN THE UK

William E. Jones & K. Spence[2]

William Jones studied Quantity Surveying at Sheffield Hallam University and graduated in 2016. K. Spence is a member of staff at Sheffield Hallam University who supervised the dissertation.

The possibility of the government protecting wildlife from construction is evaluated. The value transfer function was used to work out the value of wetlands. The hypotheses that ecosystems have a higher long term value than development were proven to be valid. It was found that population density makes a large impact on the value of ecosystems. Value transfer function was found to prevent development on greenfield taking place. Sustainable urbanization could be the answer to protecting UK ecosystems. Ecosystems near densely populated cities contained higher benefits. The comparison of ecosystems and development could make the government implement policy to protect wildlife.

Keywords: Value transfer function, Wetland, Ecosystem ,Valuation

INTRODUCTION

The problem with the decline of nature in the UK has been of great concern over the past 40 years; 1 in 10 species in the UK face extinction (Briggs, 2015). There has been a decrease of 60% of wildlife in the UK over the past 30 years (Davies, 2013). Construction still takes precedence over nature and approximately 240,000 houses are required to be built each year (de Castella, 2015). Therefore, the

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economic value of ecosystems should be compared against construction so as to determine which takes precedence. If the government were to make economic valuation policy, using methods such as the value transfer function then this would be carried out before developers can have planning permission approved. This will prevent inappropriate construction from taking place. Currently before development, surveys are carried out and the loss of wildlife is mitigated, but it is believed wildlife should not have to receive any loss, if the value is significantly higher for ecosystems. This research used the value transfer function as a tool to identify the benefits that an ecosystem provides and to make suitable recommendations, where appropriate, for improving the function. The responses of organisations at the centre of the aim will determine whether it is feasible. Because of dramatic increases in the housing market the construction industry in the UK has been rapidly growing since 1999. The figures in the UK for housing demand are above the EU average (World Atlas, 2016) which could result in UK based developers increasing occupancy of green belt land once used for farming, with the latter then potentially replaced by use of previous wild areas. The added risks could further speed up the decline of wildlife at a much higher rate. Henry Gregg director of the National Housing Federation commented "identifying and freeing up brownfield land is a good move in the short term. However in the long term, there simply will not be enough of this kind of land to keep pace with the need for homes" (Sembhy, 2015). From Mr Gregg's comments long term can be considered 9 years from now when the boom is expected to end. Does this mean no land will be left in 9 years' time to support demand? In the past 30 years 59,000 species of wildlife have been lost. Beetles and wildflowers are the most vulnerable species and the most important. The V-moth has decreased to 1% of its original population and hedgehogs have declined by a third. An animal such as the hedgehog can be considered enjoyable to watch as recreation. If hedgehogs were to go extinct, what benefit would that bring? (Davies, 2013). In the UK, wetlands are considered prime targets for development. This is because they are low lying and are easy to access. The result is they are declining in the UK resulting in loss of biodiversity. Biodiversity is not just affected, so is water quality as pollution increases. The types of pollution generated by construction are air, water and noise. Fortunately wetlands can be recreated as easily as they are destroyed (Moss, 2008).

The deterioration of wetlands by housing development and the increase of people living in urban areas is called urbanization. The rural population of Europe is greater than that of America, yet, it also has a high urban population. Europe has an area of 10.18 million km² compared to North America (25.71 million km²) and South America (17.84 million km²) but Europe's population growth is considerably more (World Atlas, 2016).

Homebuyers are attracted by developments made close to main roadways for commuting to cities resulting in an increase in developments on greenfield sites close to existing infrastructure. Growth in greenfield sites for development is higher than for urban development in most areas which is a worrying sign for UK wildlife. Ecosystem services applied in the UK are in early stages recogising the benefits an ecosystem provides to peopleand to wildlife (Alcamo, 2003). Research studies such as Catchment Futures are investigating the approach (Hansen, 2011). In the past 10 years the discussion of ecosystem services has rapidly increased. In terms of policy decision making, value transfer is considered as advice. A policy question needs to be answered through economic valuation after the impact of such a policy is determined. Value transfer function allows for greater control over the site and the context of the study as the value of costs and benefits of the environment are estimated and tested. The services of wetlands in the UK are similar but the site variables are different. A value transfer function is considered more appropriate for this scenario.

Defra state they are currently enforcing laws that protect areas of land in the UK, the 2015 policy paper states actions that they have taken. This is contradicted by the agreement that greenfield sites be made available for housing by the government under the starter homes scheme. Under this, home buyers receive 20% off the price on homes built on greenfield sites. Valuing the benefits of nature is still being worked on and currently the value transfer function is used as evidence for policy decision making. The question regards quantification of the level of benefits that valuing ecosystem services in documentation will produce (Bull, 2015). There is need to quantify wetland value because there is current debate of how much public resources should be used for their protection (Woodward & Wui, 2000) as meta-analysis assesses the change of an attributable value. The value of each benefit can be found using the function; thus far Brouwer et al. are believed to be the only people to carry out meta-analysis of wetland. The comparison against development has yet to be considered (Woodward & Wui, 2000). Using the function the challenges of valuation can be determined and certainty of benefits will be achieved as components can be examined.

METHODS

Interviews were chosen as one of the methods of data collection. The analysis coded the information and applied descriptive statistics to quantitative data. This is important as the sample is small with limited interviews.

Quantitative data.

The normal distribution will distinguish probability of an ecosystem being higher in value than construction development

Cap rate

A cap rate relationship can be determined for each site.

$$Capitalization\ rate = \frac{net\ cost\ benefit\ ratio}{cost\ per\ m^2}$$

T-test analysis

Cost per m² obtained from natural value and housing value over 200 years

Ecosystem value

The cost per m² of natural value is higher than housing development of the same area over 200 years. H1 states that X1>X2 (Naoum, Parametric (t-test), 2013).

Null hypothesis

There is no significant difference in the cost per m² between the two samples. H0 states that X1=X2

More data is required to support policy making (Economics for the Environment Consultancy, 2010). This type of study could provide data that can be used for policy making opposing development appraisals. When using value function this habitat type gives the most reliable results. It is considered an inland marsh. They are found throughout the UK and contain ecosystem services. The biodiversity cost benefit will identify how important wildlife is to protect.

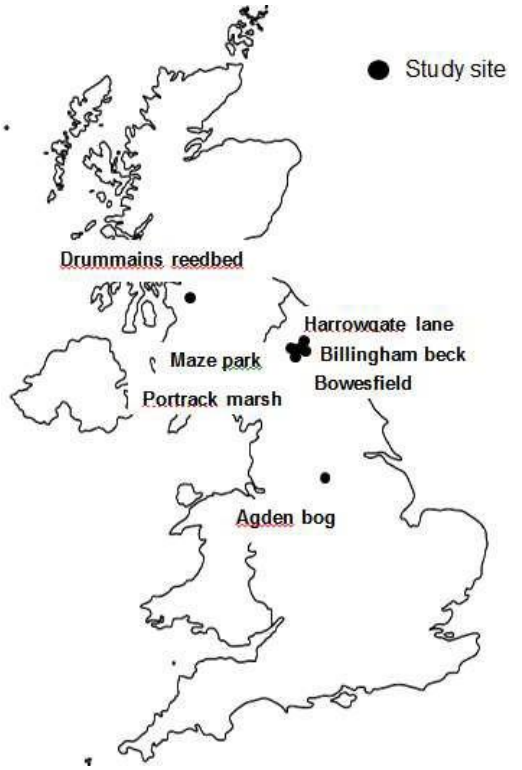

Figure 1. Location of wetland sites considered in this study. Circles filled demonstrate wetland sites. Details of all sites are provided in Table 1.

Site	Wetland size (ha)	GDP per capita(US $)	Population density (km²)
Harrowgate lane	120	21,385	190
Agden bog reserve	15.7	26,645	1532
Billingham beck reserve	150	21,385	190
Bowesfield	50	21,385	190
Drummains reedbed	6	22,025	23
Maze park reserve	16.9	21,385	190
Portrack marsh reserve	20	21,385	190

Table 1 *The parameters for all site studies that were surveyed.*

Long term wetland analysis

Agden bog nature reserve had an annual benefit 3.34 times higher than the mean. The hypothesis of a larger site creating more cost benefits is null when the value per hectare is considered. It was clear that population density signifies the cost

benefit of a site. This explanatory variable is significant in the level of benefits for a site. As the population density increases the annual benefit will also increase.

Billingham beck nature park is the largest site and illustrates that area size in the long term does increase the value. If the area is assessed over a year the increase is minimal. It can be said when assessing the annual benefit/hectare of a site, population density influences the total value. When comparing the explanatory variables over the long term, area size has the largest influencing factor. This is because the annual benefit is per hectare. When expenses were excluded the mean value was £7,272,799 (Figure 2) when expenses are included the mean net long term value is £4,842,344; a reduction of 67%. Large ecosystems will be affected by expenses more than small ecosystems. Billingham beck decreased in value by 48% mainly due to running costs whereas Agden bog decreased by 7% where this reserve is16 hectares compared to Billingham's 150 hectares. If staff costs were higher for Agden bog in Sheffield then a further investigation would be required.

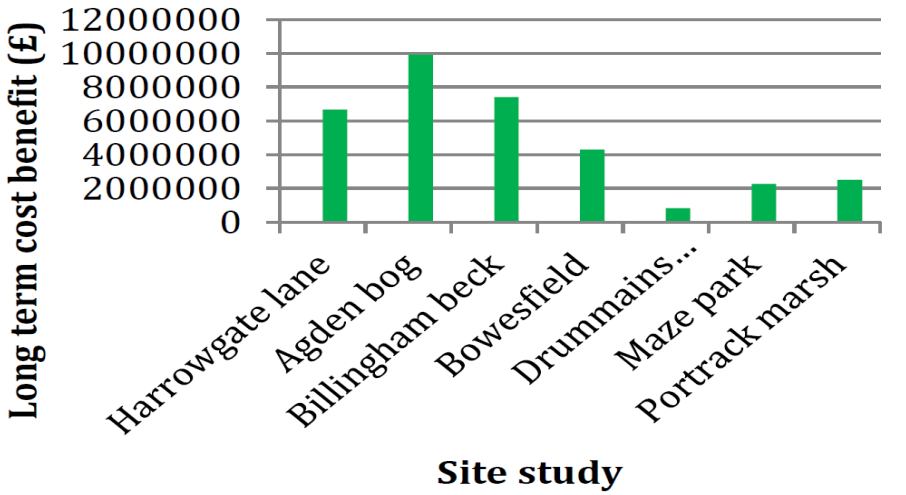

Figure 2 Net long term cost benefit

Construction development appraisal

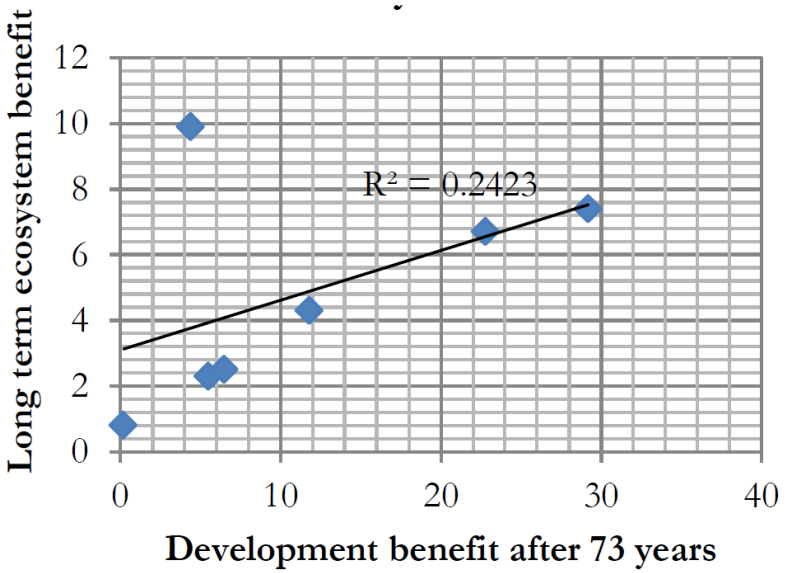

Figure 3 Development benefit after 73 years against Long term benefit of ecosystems

The hypothesis that the value of site will decrease if replacement is included is valid. The significance is P<0.001 as r equals 0.956. The hypothesis suggested is therefore that original value can be considered higher than ecosystems. Agden bog does not follow the relationship. It is important not to consider development only in the shorter term as expenses are yet to be fully considered and the values of these costs are similar to the average running costs for ecosystems as they are set over a 200 year plan.

The mean for long term value is now £3,200,000 compared to the shorter term value of £11,485,000. This is a 73% decrease in value after expenses are considered for 200 years. The value of ecosystems decreased by a similar amount, (a fall by 67%). The decline is because building and demolition costs occurred more than once over the 200 year period. When population density is not considered Agden bog has one of the lowest values. This is because site area becomes the significant variable. Billingham beck nature park and Harrowgate lane are the largest sites which is why they contain the highest value.

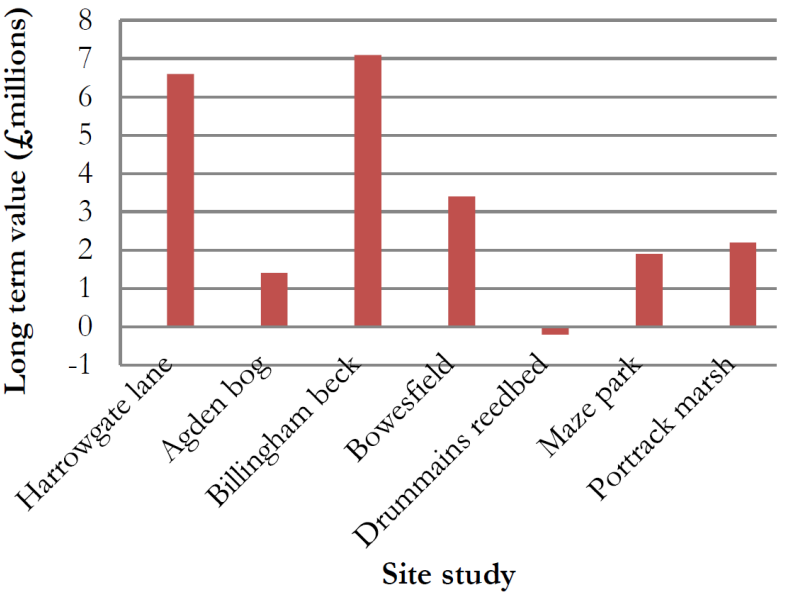

Figure 4 Long term development value over 200 years

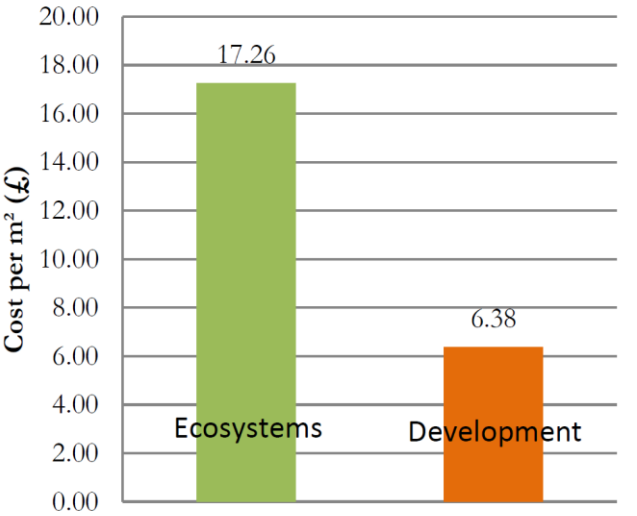

Figure 5 Mean cost per m² compared

The mean difference for long term benefits between ecosystems and development is £1,642,344.16. The mean difference signifies the long term value of ecosystems is higher than development. There is a significant difference between the cost per m² of natural value and housing development. It can be said land as

part of an ecosystem is more valuable than land as housing development because of the services provided. The cost benefit ratio is higher for ecosystems than it is for development. Agden bog had the highest amount for cost benefit ratio. For every pound invested it would generate £12.96; due to the large population density the value was extremely high as more people will benefit from the ecosystem at Agden bog. It was found that the acceleration slows as a site gets larger. If this is the case then the other development sites may have a lower cost benefit if the value is considered after 200 years, for example for 400 years wereas an ecosystem can increase in value the longer the period is. Over the long term, development causes a loss on investment. Whereas, ecosystems induce £4.35 from a £1 investment. This means it is not advisable for development to take place on land where ecosystems exist. The results signify flood control provided the highest benefit with a mean of 6.35 £/m². Biodiversity was second highest with 5.41 £/m². Therefore biodiversity can be considered a significant benefit as it makes up 32% of the overall benefit.

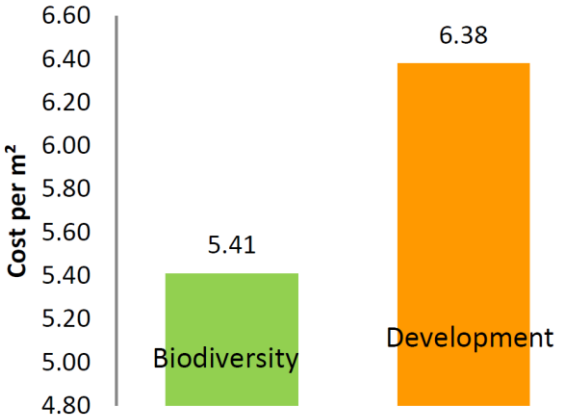

Figure 6 Mean cost per m² biodiversity against development

The mean for development is 17% larger than biodiversity. It is likely the difference of 0.97 £/m² will decrease over a longer period. An assessment of more than 200 years would be required in a further investigation

Wildlife experience and its services

Most interview respondents were not aware of wildlife decline and a common theme was that respondents were unaware of ecosystem services; unaware of the benefits they provide to people. There was also a common theme to response of valuation. Environmental surveys were considered a way of protecting ecosystems. Although this is not a valuation, it is a way of mitigating habitat loss - similar to biodiversity offsetting.

Ecosystems and construction in government policy

Local authority member A stated that planning rejected by local authority was overruled. They made the comment if there are natural services the planning is accepted by inspectorates. Quantity surveyor A believed that protection of ecosystems would be followed up nationally if benefits were found.

There was a common theme between the other three responses where the interviewees stated there is a shortage of housing. They believed this was the priority. They stated because it is green it doesn't mean it should be kept. They also believed nature provides a barrier to people having jobs and houses.

However there was a common theme with the final question. Do you think the valuation tool would be useful in a policy. The responses were all positive. Quantity surveyor A believed it would benefit everyone.

DISCUSSION

The results signified the value for ecosystems was higher in the long term. The cost per m² allows the sites to be compared together. However if an ecosystem is located where the population density is high the short term value could be higher than the development. The investment in the long term benefited ecosystems substantially. A difference of £4.47 for investing one pound was discovered. The mean difference was £1,642,344.16. The millennium ecosystem assessment found that ecosystems should be recognized more, however, their investigation did not consider construction comparison. The purpose of the policy would be to prevent construction from ignoring the consideration for nature when development is proposed. This is why the findings of this work are different to the Millennium ecosystem assessment. Biodiversity was the service focused upon in the value function used, and was proven to have substantial benefits towards humans. Approximately 34% of the mean cost per m² was biodiversity.

Figure 7 shows the mean for development value at year one, and then the mean after replacement, the value of development decreases. The mean annual benefit for biodiversity was £17,309 and after 200 years the benefit was £1,800,902. Ecosystems were found to increase in value over a time frame whereas development land fell in value. Biodiversity is a service with an ecosystem; therefore it will increase in value until at a certain point past 200 years it will outweigh the development value. Biodiversity provides cultural services to people. The coefficient value of flood control was the highest from the value function table with a value of 1.102. Compared to biodiversity which is 0.917 the value is 20 percent higher than biodiversity. Whereas the cost per m² was 17% higher. Therefore the value of flood control is considered more beneficial in the value function.

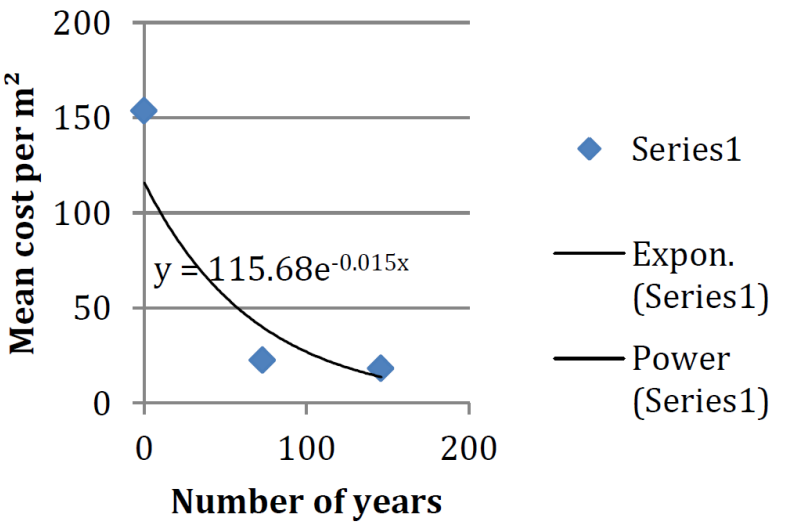

Figure 7The value of development over time

A further investigation could be used to see why flood control has a higher coefficient than biodiversity. Local authority A commented saying flooding had occurred because of development. If an ecosystem existed, natural flood control would be provided and the value of this protection would increase over time. Instead the value of land is much less than if it were an ecosystem. The relationship between net cost benefit and cost per m² determined the cap rate. The mean difference between the two variables gave a cap rate of £0.0647 larger for ecosystems; a better rate of return. Local Authority A believed the benefits of ecosystems would outweigh development and that a higher rate of return and more income achieved. The rate of return for development may be quicker in the short term but will receive less income in the longer term. Now a cap rate has been compared to construction, more areas could be assigned to be economically valued. The value transfer function provided a comparison for ecosystems of the same type. The sites will have differing values for each service. Therefore using a coefficient value for every site may not be accurate, for example if on one site biodiversity is very limited. Explanatory variables make use of important factors that greatly affects the total value, such as population density. Ecosystems located near cities will induce larger benefits, as the population of cities increases in the UK, ecosystems nearby will attract people. The houses built in urban areas need to be built at an affordable price to deter people from buying houses in rural areas, driving increased greenfield development. The value transfer found ecosystems to have more value than rural housing developments.

The response by the majority of interviewees was that wildlife is of low importance. If a policy of valuation were to be in place, this could would make people realise the value of what was already there. The conclusion to the value transfer function can be made. The true value is hard to determine because of differing service levels at different sites. The function estimates a higher value for ecosystems than development providing a mechanism to balance of construction and ecosystems. The hypotheses that ecosystems have more value than development have been proven. For some sites it was substantial, specifically the sites located near to cities. The value function was specifically designed for the habitat under investigation. This should persuade the government to endorse the value transfer function as policy, preventing the construction on ecosystems.

It is apparent that more investigations need to be carried out. Firstly, the value transfer should be applied to other habitats (for example, for woodland) therefore the model function will have to be adapted so that the benefit can be investigated. The government at the present stage is only considering wetlands, one of the most common habitats in the UK. An investigation into the coefficient values of the value transfer function should be carried out with respect to comparisons of different wetlands for their flood control potential. If the value transfer function can be adapted then it should improve the accuracy of the function and the benefit may be larger than estimated. More regions should be assessed using the value function because of the significant relationship between population density and economic value, around London there are potential large and long term benefits. The ability to demonstrate these increases the likelihood of improved policy and ecosystems not being put at risk. The third report by the Natural capital committee was acknowledged by the government, a response which took 8 months and with the strategy, a 25 year plan with new legislation (Spencer, 2015). At the time of writing the government has not acknowledged how ecosystems will be monitored in order to challenge the erroneous perception of some developers that wildlife is increasing in the UK.

It is possible that coefficient value of biodiversity could have been greater for some sites, and incorporation of a survey of the different types of species would make the function more accurate. For example Maze park may have had more species than Portrack marsh, therefore its value in the function could have been higher resulting in a lower development value

If the benefits from ecosystems can be demonstrated to outweigh development in habitats then it is possible the government will need to take action and put in place a policy which would be effective in protecting nature from poor development decisions.

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AN INVESTIGATION INTO THE PERCEPTIONS OF TOURISM AT GROUND ZERO

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This research aims to determine motivation for visiting Ground Zero, to identify the behaviour of people at the site and to explore whether the site is being commodified. Undertaking primary research has added to the existing literature by filling gaps where there was little knowledge reported since the Memorial opened. The analysis discusses the main reasons people visit the Ground Zero site. This includes seeing it first-hand and that it is perceived as a tourist attraction. Behaviour at the site is deemed by some, mainly people who have a connection to the site, as disrespectful. Evidence of commodification at the site was also discovered in both the literature and primary research. These findings provide an insight into perceptions of tourism at the site of Ground Zero and can be used to inspire further research on this topic.

Keywords: Ground Zero, tourism, commodification.

INTRODUCTION

Ground Zero is the area in Lower Manhattan, NYC, that encompasses the September 11 Memorial. The memorial commemorates the victims killed in the 9/11 attacks. For the purposes of this research, given the popular understanding and repeated reference, the site is referred to as 'Ground Zero'. The meaning of Ground Zero is examined by Neal (2008), and described as a neighbourhood, a commercial district, a tourist attraction, a sacred place and a site for memory and mourning.

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This research investigates perceptions of tourism at Ground Zero and the motivation for visiting. Undertaking this study on the site of Ground Zero is timely because, although it is widely referenced in the current literature, there is little research that has been done since the Memorial itself has opened. Additionally, there has been limited attention paid to exploring why tourists may be drawn towards memorials and their opinions of these sites. The primary research gathers people's opinions on the subject, ranging from tourists themselves to people who were directly affected by the events of 9/11.

Figure 1: Aerial view of the Ground Zero Site (Source: Melcher, 2014)

Figure 1 displays the Ground Zero site. Number 1 identifies the Memorial itself with two large pools, where the World Trade Center towers once stood, surrounded by gardens. The official September 11 Memorial Museum is number 2 on the image. Number 3 is the One World Trade Center building which was built in replacement of the old World Trade Center towers.

As a US citizen with friends and family in the USA who live near to NYC, the site is significant on a personal level. Since some friends and family members know people who were directly affected by the events, their recollections and experiences have helped shape my perspective. Having visited Ground Zero numerous times and experiencing it first-hand makes this research even more intriguing and fascinating.

This paper focuses on perceptions and questions the commodification of the memorial site. Four objectives were created to address these aims.

- Determine why people visit Ground Zero
- Identify the behaviour of people at the site
- Explore whether people believe the site is being commodified
- Analyse the difference in perceptions between US and UK visitors

A mixed methodological approach is used in this research to achieve the objectives. This includes undertaking research motivated visits to Ground Zero, questionnaires and interviews. Participants involved are from both the US and the UK enabling comparison of the two.

LITERATURE REVIEW

This literature review begins by researching dark tourism, followed by a focus on tourism at Ground Zero. The aim of the review is to examine the already existing literature on the topic and identify the gaps where this research can contribute to knowledge.

"Tourism has become a tremendously important phenomenon in the contemporary world" according to Yamashita (2015 p465). Many countries, both the developed and the developing, are now pouring resources into the tourism industry, which they see as an important option for economic development. The US Department of Commerce (2008) has identified that New York City is the primary destination for foreign tourists in the USA with nearly a third of all international visitors arriving and/or planning to spend time there.

Dark Tourism

Dark tourism is a niche within the topic of tourism. Biran and Hyde (2013 p191) use the term dark tourism to describe the phenomenon of "travels to sites associated with death, suffering and the seemingly macabre". Dark tourism has a longer history, however, Hooper and Lennon (2017) believe the event that each dark tourism site has evolved from should be post 1900 and preferably in living memory. Although dark tourism is not a new phenomenon, White and Frew (2013) highlight that there has been a recent emerging scholarly interest in researching and analysing dark tourism. Several dark tourism sites are referenced throughout this literature review, including Auschwitz, the Chernobyl site, death sites of the famous and the focus of this research, Ground Zero.

Sharpley and Stone (2009) question whether it is ethical to develop, promote or offer dark sites for touristic consumption. Stone (2013) feels that death and dying is now used as a commodity within the visitor economy. Medina (2003) defines commodification as the offering of products and practices for money. It is also

described by Robinson (1999) as the process by which ways of life, traditions and their complex symbolism are imaged and transformed into saleable products. As described by Lennon and Foley (2000), it is possible that death sites have become the locations for service industries to intervene in the journeys made by visitors through commodification. This is shown in Hooper and Lennon's (2017) research undertaken at the Holocaust Memorial. They discovered that tourists to the site have consequently led to the creation of restaurants and shops in the area.

Despite common references to commodification when researching dark tourism sites, it must be understood that some sites, including Auschwitz and the 9/11 Memorial, are run by non-profit organisations (Muzeum Auschwitz-Birkenau, 2018 & 9/11 Memorial and Museum, 2018). Additionally, dark tourism sites are sometimes created to recoup the money lost by a disaster or used as an opportunity to rebrand an area. Martini and Buda (2018) explain that the dark tourism phenomenon often produces new economic ventures and opportunities to rebrand places following events of great loss and turmoil. This is evident in the Chernobyl site where it is believed that commodifying the area can be justified because tourism is seen by locals as a boom to its stunted economy (Travel Wire News Editor, 2017). Others remark the political and social role of visits to such sites as a means to raise awareness, international sympathy and support for the recovery process. Martini & Buda (2018) believe this was the case in the aftermath of Hurricane Katrina which attracted private enterprises to the area.

Sharpley (2005) discusses whether the phenomenon dark tourism is attraction-supply driven or consumer-demand driven. He recognises that it is important to consider both supply and demand. Figure 2 defines the four shades of dark tourism in this consideration.

Figure 2: The understanding of demand and supply (Source: Hull, 2017)

	Demand	**Supply**
Black tourism	An interest in death	Visiting places intended.
Pale tourism	Minimal interest in death	Visiting places non-intended
Grey tourism	Defined interest in death	Visiting places intended
Grey tourism	Defined interest in death	Visiting places non-intended

Hull (2017) describes the table in more detail explaining that 'Black tourism' is the fascination with death, which is satisfied by a supply in which the places are

intended. ‘Pale tourism’ has a minimum fascination with death where places do not intend to supply in dark tourism attractions. Grey tourism has a defined fascination with death and here the supply is either intended or non-intended. According to Sharpley (2005) it is possible to locate specific sites within these four shades. He states that the 9/11 Memorial would be defined as ‘Black tourism’ and visits to famous people’s gravesites would be ‘Pale tourism’. In addition to demand and supply, dark tourism sites can also be assessed on the ‘spectrum of intensity’. Figure 3 shows the seven different elements in the spectrum.

Figure 3: The spectrum of intensity (Source: Stone, 2006)

Stone (2006) gives examples to demonstrate the spectrum. He places the Auschwitz Museum in the ‘darkest’ category, battlefield sites in ‘darker’, John F. Kennedy’s grave site is categorised as ‘dark’ and in the lightest there are ‘dungeons’ attractions where the purpose is to share history using actors for entertainment. Sharpley and Stone (2009) believe in the existence of a ‘continuum of purpose’ of supply, varying from accidental supply (places that have become tourist attractions by accident) to supply that is directly intended to exploit, for profit or otherwise. Tourists are attracted to the sites and memorials of atrocity, which have thus become tourist attractions whether this was the intention of those establishing and managing such memorials or not (Ashworth et al., 2005).

Sharpley and Stone (2009) express that limited attention has been paid to exploring why tourists may be drawn towards sites or experiences associated with death and suffering. The few motivational reasons they found vary from morbid curiosity, to a collective sense of identity or survival. It is possible that fascination with or interest in death may often not be the principle factor driving the consumption of such experiences (Sharpley & Stone, 2009). In the case of global news media, deaths across the planet can be consumed in the living rooms of the western world (Lennon & Foley, 2000). This suggests that the modern-day interest in celebrity, famous places and the development of communication that produces images of violence, war and tragedy, may support an individual’s desire to visit such sites. This is reflected by White and Frew (2013). Motivation is likely to vary between different dark tourism sites. Martini and Buda (2018) analysed studies concerning visitors’ motivation at concentration camps in the Netherlands. They discovered that curiosity, the need to see with their own eyes is a strong motivator. On the other hand, Allman (2017) believes that people visit gravesites due to an emotional connection to the person, for example the

Graceland home of Elvis Presley. She also states that this offers visitors an experience that is different to that of everyday life.

Ashworth et al. (2005) believe that few dark tourist attractions operate policies that discriminate between acceptable visitors on the grounds of their motivation. A respectful visitor engagement at these sites cannot always be guaranteed. There are questions asked whether visitors should in fact be 'required' to acknowledge the historic pain and suffering that took place there before attendance to a memorial (Hooper and Lennon, 2017).

There is little knowledge concerning how visiting sites of death configures a tourist's emotions, what tourists contemplate, why they feel the way they do about particular sites or how they respond to death tourism experiences post-visit. Such questions remain largely unstudied as Mandelartz and Johnston (2016) believe. There is also little research available on the significance that such visits have on those who make them (Lennon & Foley, 2000). There is a gap in the literature where there has been limited attention paid to exploring why tourists may be drawn to towards these sites. This research adds to the knowledge of the already existing literature by undertaking primary research investigating why tourists visit dark tourist sites and their opinions of them.

CASE STUDY: GROUND ZERO, NYC

This section analyses the literature focusing on Ground Zero, including detail of each site, motivation to visit, the controversy of tourism to the area and research into commodification at Ground Zero.

Wagstaff (2011 p67) discovered that "1.8 million people visited the World Trade Center Complex in 2000… – 3.6 million – visited the space where the towers once stood in 2002". Sharpley and Stone (2009) use this as evidence of a greater willingness or desire on the part of tourists to visit dark attractions. The memorial opened on 11 September 2011, the tenth anniversary of 9/11. By the end of 2011 it had welcomed a staggering one million visitors. This is supported in Blais and Rasic's (2011) work. Lisle (2004 p9) suggests that "despite the 'unique' status of Ground Zero as an urban site of mass death and destruction, it slotted quite easily into a normalised circuit of tourist consumption. With seven out of ten visitors to New York lining up to see Ground Zero, there was no doubt that it became another New York attraction to be listed on the guide books". There were stakeholders who wanted the place to be an aesthetically architectural wonder, a commercialised tourist attraction that would help recoup the $100million spent developing the site (Paliewicz & Hasian, 2017). This suggests that it is sometimes a commercial decision to attract tourists to the area in order to rebuild or get back the money lost, not just exploiting the dark site as suggested previously in the literature.

Dalton (2015) describes the memorial as featuring reflecting pools in the footprints of each tower, each with cascading water falling 30 feet down all four sides. The pools are surrounded by a plantation of deciduous trees. As recounted by Paliewicz and Hasian (2016), the names of those who perished on 9/11 are etched on bronze paraphets that surround the reflecting pools. The museum tells the story of 9/11 through displays of 23,000 images, 10,300 artifacts, nearly 2,000 oral histories of those who died, and 500 hours of videos. Paliewicz (2017) acknowledges the existence of many significant objects in the September 11 Memorial Museum: impact steel from where Flight 11 exactly struck the North Tower, and digital projections of missing posters that once painted the streets of Lower Manhattan.

The affordance of digital technology, and the hour of the attacks meant that 9/11 was witnessed by nearly one third of the world's population on live television. This is supported by both Paliewicz (2017) and Ferres (2013) and gives motivational reasons for people to visit Ground Zero. Travel to the sites of trauma gives the events a kind of authenticity that is not available through just hearing about it or seeing it on TV (Ferres, 2013).

Authors have discussed the controversy over how visitors behave at the site of Ground Zero. Smith (2012) quoted a retired fire fighter, who was a first responder on the day, who feels that the site is not being treated like a memorial. He recalls crowded lines, laughter, smiling people and on lookers leaning and sitting on the tablets inscribed with victim's names. In the interview with ABC News, the fire fighter recalls feeling as if he was lined up not for a sombre memorial but a tourist attraction. He also mentions that a group of teenagers were evicted from the memorial after throwing trash in the reflecting pools (Smith, 2012). Ferres (2013) remembers the site being a buzz with the chatter of thousands of visitors that competed with the unexpectedly loud volume of the cascading water. She mentions that people stood at times four or five people deep around the pools. Gutman (2009 p66) understands the most popular activity among visitors is taking photos "and as many of them as possible". The behaviour at Ground Zero is similar to that at other dark tourism sites. At both the 9/11 Memorial and Auschwitz, crowds are controlled with carefully timed tours. However, at Chernobyl sometimes there are so many buses that all of a sudden the ghost town feels like Disneyland, according to Travel Wire News Editor (2017).

Although the 9/11 Memorial and Museum are non-profit sites, many scholars feel there is the presence of a commodity culture around the site in the form of tourist souvenirs, leading to ideas of kitschification of memory. Potts (2012) describes kitsch as a dramatic failure of taste which accompanies the commercial exploitation of a disaster. Numerous street vendors selling souvenirs range from framed photographs of the burning towers to Osama Bin Laden toilet paper (Sharpley & Stone, 2009). Paliewicz and Hasian (2016) mention that this is part

of a growing controversy where accusers said the memorial was cashing-in on the nation's pain. Lisle (2004 p9) quotes Ellen Shea who lost her husband on September 11th. She expressed disapproval at the way Ground Zero was being commodified, saying "It is so sad for me that people do not call it for what it is – a ghoulish attraction, a money-maker".

Potts (2002) believes that the souvenir economy serves to place Ground Zero as a paradigmatic example of the extreme commodification of death and tragedy. According to Sharpley and Stone (2009), there is an increasing number of people keen to promote or profit from 'dark events' as tourist attractions, such as the Pennsylvania farmer who offered a $65 per person 'Flight 93 Tour' to the crash site of the United Airlines Flight 93. Tours to dark tourism sites is common. At Fukushima, the site of a nuclear power plant severely damaged in a tsunami which killed nearly 19,000, local guidesl take over 2,000 tourists each year to the villages near the stricken reactors. A Hollywood-based tour company, titled 'deathly departed tours' takes tourists to celebrity grave sites (Travel Wire News Editor, 2017).

Overall, there are a few factors identified in the literature that motivate visitors to the site, including wanting to view the site after seeing the TV coverage of the events and images on the internet. This research adds depth to people's reasons for visiting dark sites. Tourists at Ground Zero have been controversial and there are differing opinions of their presence at the site. A commodification culture is also a common discussion in the literature with the promotion of 9/11 souvenirs. The literature about the Ground Zero site after the 9/11 Memorial opened in 2011 is sparse and the existing literature pays little attention to opinions of tourists at the site. This research focuses on the site after 2011 which will contribute to filling this gap along with investigating and analysing the perceptions of different people, including tourists and local people, of Ground Zero.

METHODOLOGY

This research uses both primary and secondary research methods. The secondary research is in the form of the literature review. Undertaking primary research has allowed the identification of commodification and people's perceptions of the site and subsequently adds to the knowledge of the current literature.

The philosophical approach applied in this research project is existentialism. It is argued by Malik and Akhter (2013) that existentialism deals with the emotional life, the feelings, the moods, and affects through which people are involved in the world. An existentialist approach is complementary to answering the aim of this project as it investigates perceptions and feelings.

Ethnographic research is commonly used when studying tourism. O'Gorman et al., (2014) describe ethnographic research as the systematic study of people and cultures. The practice of ethnographers is to reflect explicitly on lived experience. Despite its importance, lived experience is a comparatively neglected area of consumer experience in tourism research (O'Gorman et al., 2014). As recognised by Tribe and Airey (2007), like tourists, researchers are also embodied since they have gender, age, ability, interests and a complex psychology of likes and dislikes. This research embraces the researcher's positionality as it cannot be avoided even if it was desirable due to the emotional nature of this topic.

The qualitative methods undertaken within this study are questionnaires, interviews and observation. The questionnaires were distributed online using Google Forms in February 2017. The questionnaire was sent to people who have been to Ground Zero who then, using the snowballing sampling affect, sent it to people they knew had visited the site. The questionnaires were used to gain an understanding of why people visit Ground Zero and their perceptions of the site and its consequential tourism. Using the method of questionnaires enabled the gathering of perceptions from many people, including both US and UK citizens. Results of the questionnaire have been quantified in the form of graphs to show the findings. The questionnaires were open coded to identify themes.

Four semi structured interviews via video call were undertaken. Interviews provide an alternative means for exploring issues in more depth than is generally possible using questionnaires. Selective sampling was used to choose the participants for the interviews to guarantee they had been to Ground Zero. Two participants were chosen who live in the USA, near to New York, and two participants from the UK. The differences between the UK and USA participants were compared.

Tracy (2013) suggests that interviewers consider how their positions might impact the interview process and its results. By choosing people I knew, this created a more relaxed setting for the participants, making it more likely to get truthful and detailed answers. This also benefited the interviewee because it is a sensitive topic and knowing the interviewer created a more comfortable setting. Due to the emotional topic of this study, questions were carefully decided as to not cause emotional distress to the participant. All four interviews were recorded, transcribed and coded. Open coding was used to analyse recurring themes in the interviews, compared with questionnaire responses and the literature reviewed.

During January 2017, I visited Ground Zero in New York City, viewing the Memorial site, visiting the Museum and the One World Observatory in the One World Trade Center. I have also visited Ground Zero multiple times before, including in July 2016. The aim of the observation was to analyse how people act while at the site.

As the location is a public place I was able to observe freely, record notes and take photographs. However, I chose not to interview members of the public at the site of Ground Zero. Photographs and field notes were analysed to gain a better understanding of how people act at Ground Zero. The results are analysed in the discussion and are used in conjunction with responses from the questionnaires and interviews.

RESULTS AND DISCUSSION

The results of the questionnaires, interviews and observation at the site were analysed to determine why people visit Ground Zero, identify behaviour of people at the site and explore whether people believe the site is being commodified. This section also analyses the difference between UK and US respondents' perceptions.

Participants

The total number of questionnaire respondents was 91. 18.8% of the respondents were from the US and 80.2% were from the UK. 56% of US participants noted that they themselves or someone they know was directly affected by the events of 9/11. No UK respondents identified this.

A total of four interviews were undertaken. Table 1 lists each interviewee number and their background.

Table 1: Interviewee backgrounds

Interviewee Number	Background
Interviewee 1	Lives in northern New Jersey, 30 minutes from New York City.
Interviewee 2	Lives in central New Jersey. Knows a family that lost a child in 9/11.
Interviewee 3	Lives in the UK. Has visited Ground Zero multiple times.
Interviewee 4	Lives in the UK. Has visited the World Trade Center site before and after 9/11.

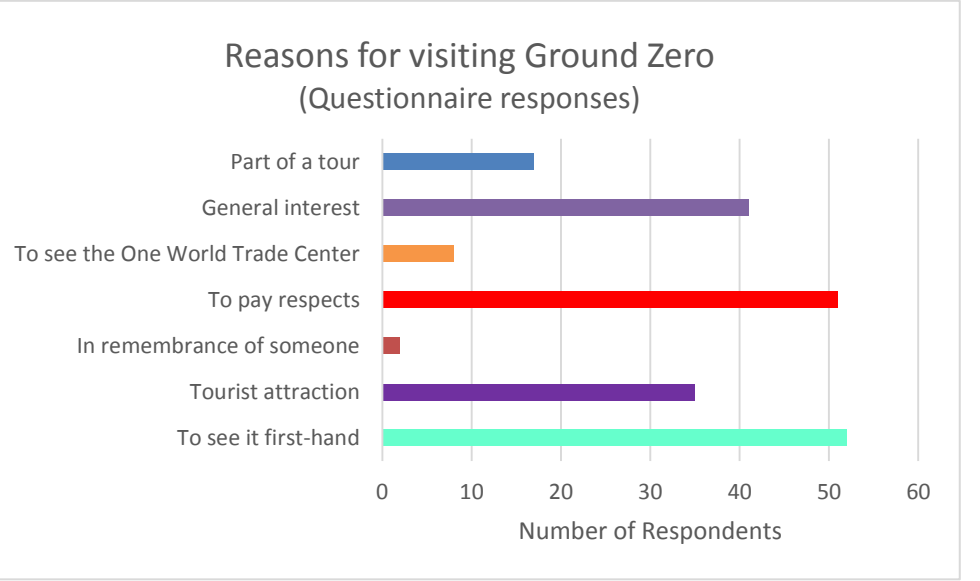
The different backgrounds of the interviewees enabled the collection of different opinions from varying perspectives.

Visitor Motivation

The first objective of this study is to determine why people visit the site of Ground Zero. The work of White and Frew (2013) recognised that the modern-day interest in famous places and the development of communication that

produces images of violence and tragedy may support an individual's desire to visit such sites. Whilst Lisle (2004) suggests that it was the desire for confirmation of proving that September 11th really did happen that drove thousands of people to make the journey to New York. Figure 4 shows the reasons why the respondent visited Ground Zero.

Figure 4: Questionnaire responses to reasons for visiting Ground Zero



The most common answer was 'to see it first-hand'. This complements what Lisle (2004) has suggested in her work. As these results show, significantly more people visited out of general interest or because it is a tourist attraction than in remembrance of someone. However, the second most popular answer was to pay respects which may imply that people are also visiting to honour those lost not solely because it is a tourist attraction.

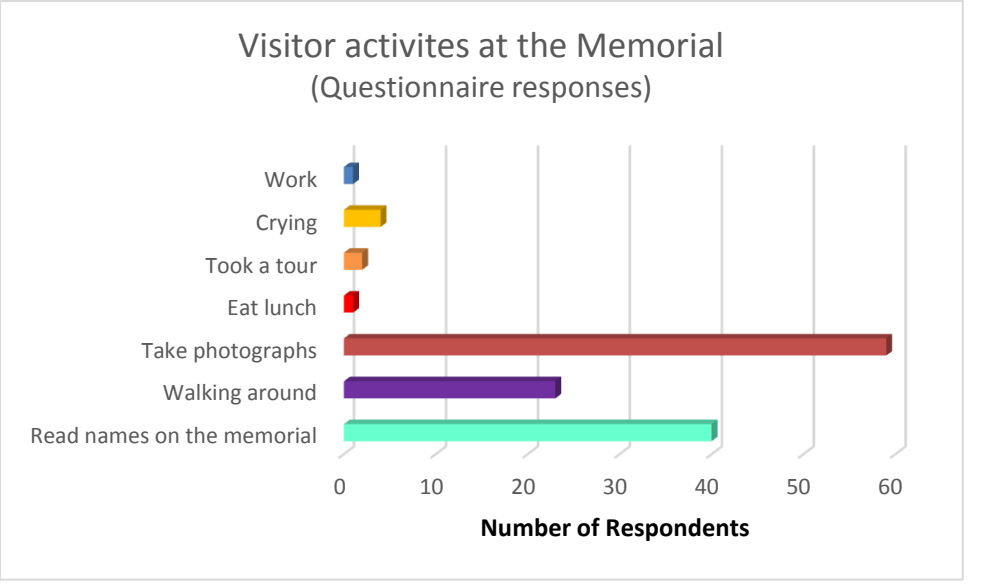
Interviewee 1 said, *"I just wanted to see it for myself having lived through that"*. Similarly, Interviewee 2 said "*I needed to see it for myself… We are not that far away. There were people from this town that died. We could literally see the smoke clouds from here… Friends went up there and worked at Ground Zero for several days. Life changed dramatically that day and it definitely affected us all so much. I wanted to go back… to where it began"*. In comparison to this, Interviewee 3, who is from the UK, said that their reason for visiting Ground Zero was because *"It's a landmark in New York"*. Whilst Interviewee 4, who is also from the UK, said their reason was *"partly because of curiosity and it's an iconic*

site in history terms now". The responses from US residents and UK residents are evidently very different. As these responses imply, UK residents visit more because of the site being a tourist attraction, whereas the US residents wanted to see for themselves where the events took place and what the site is now.

Visitor Behaviour

The research also focuses on how people behave at the site and the perceptions that others have of this behaviour. As identified in the literature review of this study, Gutman (2009 p66) understands that the most popular activity among visitors at dark tourist sites is taking photographs. The questionnaire asks what the respondent themselves did at the memorial and what other visitors did. Figure 5 displays a combination of these responses.

Figure 5: Questionnaire responses to visitor activities at the Memorial



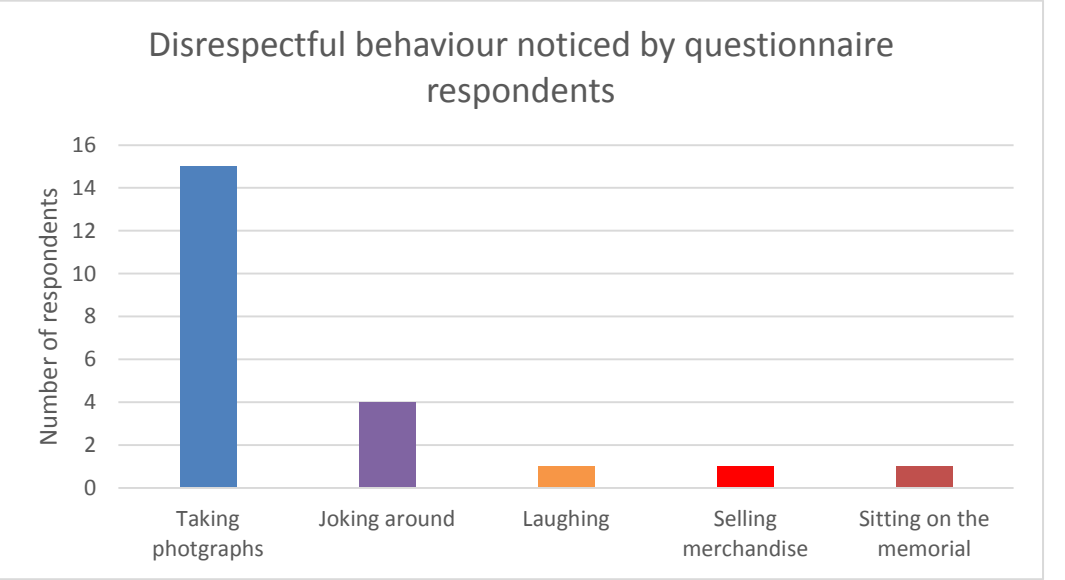
Again, the responses to this question confirm what is identified in the literature. Taking photographs is the most common activity among the respondents by far. This was clearly visible whilst observing the site.

When I was at the site I discovered that almost every person had a camera or a phone out taking photographs. Other activities mentioned in the questionnaire results are people eating lunch or doing work, which was also noticeable when undertaking primary research at the site. I discovered that people, likely to be locals, use the site as a place to sit on their breaks from work. The site is the only open space I noticed in the area which may be why workers use the site as a place

to sit outside during a break. This suggests that Ground Zero isn't exclusively treated by the public as a memorial or tourist attraction.

Behaviour deemed to be disrespectful is discussed regularly in the literature, for example, Smith (2012) quoted a first responder, who feels that the site isn't being treated like a memorial. The questionnaire asks, 'Did you notice any behaviour you deemed to be disrespectful?'. If the respondent answered yes, they were directed to a question asking what behaviour they saw. The responses to this question are presented in Figure 6.

Figure 6: Disrespectful behaviour questionnaire responses



The most frequent activity that the respondents deemed to be disrespectful was taking photographs. 'Joking around' was also mentioned by a few respondents. One interviewee answered "People from further away, based on accents, seemed to be having a lot of fun, laughing and joking in line. Felt like people were definitely affected differently". Answering this question, Interviewee 2 said "We had… seen the smoke in the sky. They'd seen it on TV like they were watching the Olympics". This implies that the local people who visit the site believe that tourists do not treat it like a memorial.

Both the literature and the questionnaire responses express that people have been seen sitting or leaning on the memorial. This is deemed to be disrespectful behaviour in the results of the questionnaire. This was also evident during observation at the Ground Zero site, as seen in Figure 7.

Figure 7: People leaning on the Memorial to take a photograph (Source: Author)

Figure 8: A sign at the Memorial site (Source: Author)

In contrast to this, Interviewees 1, 3 and 4 all said they did not notice any behaviour they deemed to be disrespectful. Interviewee 2, who knows people directly affected by the events of 9/11, was the only interviewee who believed people were being disrespectful. This suggests that people who have more of a connection to the site and who are going in memory of someone are more likely to pick up on the behaviour of others. This may be because it is more of a memorial to them and not just a stop on a tour of the city.

Management at the site are trying to control the tourists and deter disrespectful behaviour. There is no acknowledgment of this in the literature. Most of the literature highlights that there is disrespectful behaviour at the Ground Zero site but doesn't focus on what is being done about it. Rules to limit what is deemed disrespectful behaviour have been put into place at each location of Ground Zero and are enforced by the security presence. An example of this can be seen in Figure 8.

Commodification

A recurring topic in the literature around dark sites and Ground Zero is commodification. Stone (2013) feels that death and dying is used as a commodity within the visitor economy. The Museum and Memorial are both non-profit. However, the One World Observatory is separate. The One World Observatory has been built inside the new One World Trade Center which is the replacement for the old 'Twin Towers'. There is also an official store inside this location. I visited the observatory as part of my observation. The Observatory costs $34 per adult. These are examples of attracting tourists to the area. It is possible that this is to recoup the money it cost to build the One World Trade Center and the area surrounding it.

None of the interviewees had noticed any new businesses or sites set up since the Memorial was opened. However, as I have visited Ground Zero multiple times over the years, I have noticed some significant changes. Stone (2013) stated that death sites have become the locations for service industries to intervene in the journeys made by visitors. This is evident at Ground Zero where there are now souvenir outlets and a Westfield shopping centre. Arguably the most significant intervention is a new $4 billion train station that has recently opened right next to the 9/11 Memorial.

As displayed in Figure 9, the new train station (named the Oculus) overlooks the 9/11 Memorial. It is an artistic building that changes the whole view of the memorial site. The location of the Oculus suggests that it has been built to accommodate the mass amounts of people who are now travelling to this area of Lower Manhattan. As stated in the literature, the site now attracts millions of people each year. Companies have taken advantage of this by setting up stores inside the Oculus building. This is more evidence of commodification, further confirming the opinions in the literature.

Figure 9: The Oculus (Source: Author)

The interviewees were asked whether they agreed with the statement made by Ellen Shea, who Lisle (2004 p9) quotes, "it is so sad for me that people do not call it for what it is – a ghoulish attraction, a money-maker". Interviewee 3, who has visited the site multiple times, declared *"No, I didn't see many souvenirs being sold, but, yes and no because you have to pay to go into the museum"*. The majority of questionnaire respondents believed that the site is not being commodified. Overall, it appears that commodification at the site does not appear to be evident to visitors. Most tourists have visited the site only once and therefore do not have comparators to what the site was like before.

Results Summary

There is difference in opinion between US and UK respondents. Within the US participants, there are both people who were affected by 9/11 and people who were not. This gives more value to the findings of this study because it encompasses perceptions of people with a strong connection to Ground Zero and people who have just visited as a tourist.

The most common response of questionnaire participants regarding why they went to the site was to see it 'first-hand'. It was discovered in the interviews that respondents from the UK visited as a result of the site being a tourist attraction. This was also a common response in the questionnaire results. The most frequent behaviour was taking photographs. Research has shown that local people, or people who have a connection to the site, disagree with some behaviour such as

taking photographs and joking around. 53% of questionnaire respondents disagreed that the site is being exploited by the tourist industry. The few people who did agree tended to be US respondents who were affected by 9/11. In contrast, my observation contributed to the research as I noticed multiple aspects of commodification at the site.

CONCLUSION

This section summarises the key findings of the research into the perceptions of tourism at Ground Zero. As dark tourism is a fairly contemporary topic within tourism research there were gaps in the already existing literature. The objectives of this project were aimed at filling these gaps.

Firstly, limited attention had been paid to exploring why tourists may be drawn to dark sites, including Ground Zero. The literature review highlighted that one of the most popular reasons people visited such sites is to see the site 'first-hand'. Whilst the results from the questionnaires and interviews showed this was true, another significant motivation factor was the fact that the site is a tourist attraction. The interviewee responses when asked their reason for visiting suggest that the UK residents visited due to the site being a tourist attraction, whereas the US residents wanted to see the site for itself after experiencing the events more closely.

The second research objective was to identify how people act at the site. Since most of the literature was written before the Memorial opened, primary research has contributed to the literature by discovering how people act now the site is a memorial. The literature established that the most common activity undertaken by visitors to the site is taking photographs. This has been confirmed in the questionnaire results, the interviews and observation. However, this activity is deemed by some people as disrespectful. Other disrespectful behaviour noticed was joking around and leaning on the Memorial. The results of the questionnaires and interviews suggest that people who were affected by 9/11 were the ones who noticed disrespectful behaviour the most. The site is attempting to control the behaviour of visitors by displaying rules on signs at the Memorial and with a security presence.

The literature mentions the exploitation of dark sites and states that Ground Zero is being commodified, mainly in the form of souvenirs. The observation discovered that the selling of souvenirs is not the only way the site is being commodified. Despite the Memorial and Museum being non-profit venues, it is suggested that the influx of tourists to the area has led to more commercial opportunities and sometimes interference. This can be seen where there is a new train station and shopping mall adjacent to the Memorial.

Undertaking both primary and secondary research, including seeing the site first-hand, has enabled this research to add to and challenge current literature. The interviews from both UK and US participants added depth to opinions and themes and enabled the comparison of the two. Overall it was mainly US visitors who believed there was disrespectful behaviour at the site and commodification, whilst results have shown that UK residents visited because it is a tourist attraction.

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