A critical analysis of visualisation techniques for public consultation in coastal defence schemes

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September 2017

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Abstract

This paper provides a critical investigation into the use of visualisations with in public consultation, and in particular their use within the coastal zone. As the threat of flooding and erosion increase in coastal areas sustainable management of these coastal zones is vital. The concept of integrated coastal zone management (ICZM) enables this sustainable management. The integration of relevant parties is imperative, with the most important line being that between 'the experts' and the public.

This project investigates how visualisations are used within this communication to illustrate landscape and visual impacts, and their use within ICZM public consultation. Data from the public was collected via two methods; online and onsite questionnaires. This data confirms that visualisations can help improve understanding, with 87% of online participants identifying this. This research also recognised that most participants (85% of online and 61% of onsite) prefer a visualisation which is of a computer generated photographic style. Onsite questionnaires confirmed that visualisations are a useful tool within ICZM public consultation.

These results have allowed this project to conclude by presenting a number of recommendations for the use of visualisations within the 'communications toolkit' and within ICZM public participation, as well as highlighting how this research could be built upon.

Acknowledgements

I would like to thank those that have been so understanding and supportive over the last five months. Firstly, my tutor Brian Baily for always being willing to answer my many questions, and Jonathan Potts for running this course. I would like to thank all those who shared by online questionnaire via social media and word of mouth, and those who completed both this and my onsite question. Also those within local planning who answered my email questionnaires. Thanks to the Solent Forum whom have provided funding for this project via the Professor Mike Clark Award. Last, but by not means least, I would like to thank my friends, family and food for riding this roller-coaster with me. Particularly my mum, for not only dealing the joys and stresses of this dissertation but for being my proof reader throughout this course, and reading so much about the delights of ICZM.

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Chapter 1. Introduction

1.1 Introduction

This project provides a critical investigation into the use of visualisations with in public consultation, and in particular their use within the coastal zone. This introductory section identifies the focus and rationale for this project, followed by the aims and objectives and the structure of the proceeding chapters.

1.2 Focus of the Project and Rationale

"The landscape around us is an important part of people's lives, contributing to individual, community and national identity and offering a wide variety of benefits in terms of quality of life, well-being and economic activity." (Landscape Institute & Institute of Environmental Management and Assessment (IEMA), 2013, para. 1.1). Previously, these natural assets have been harmed by anthropogenic impacts, but since the 1950's there has been increasing interest in environmental issues (Glasson, Therivel & Chadwick, 2012). This project focuses on the assessment of the landscape and visual impacts of human defence mechanisms upon the 'seascape'.

Humans have defended against the threat of the sea for hundreds of years, with little consideration for the impacts that these actions have upon the environment (French, 2001). Since the 1990's the concept of integrated coastal zone management (ICZM) has arisen (Cicin-Sain & Knecht, 1998). This concept attempts to manage the coastal zone in a sustainable way (Cicin-Sain & Knecht, 1998), unlike that of the past which could have detrimental consequences. For example Figure 1, which shows adjacent defended and undefended cliffs along a council boundary line, and the effects which can take place downdrift (Brown, Barton & Nicholls, 2011). Through the use of a set of nationwide Shoreline

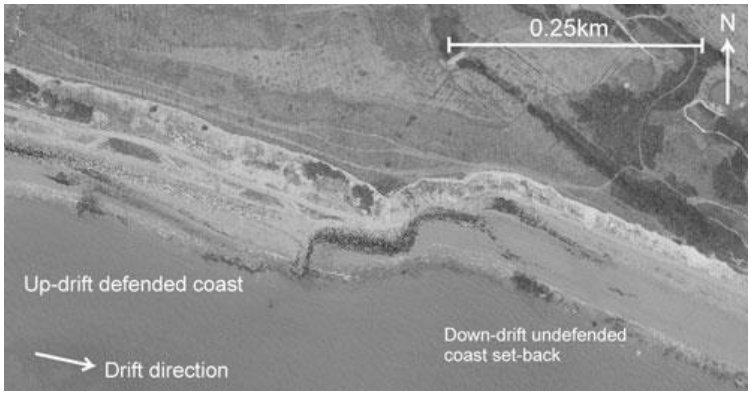


Figure 1 Cliff set-back down-drift of defences (Barton-on-Sea, Hampshire) (Brown, Barton & Nicholls, 2011)

Management Plans (SMPs), ICZM can avoid such effects and aims to bring all parties together within the planning framework, including the public (Cicin-Sain & Belfiore, 2005; Chaniotis & Stead, 2007; Hastings & Potts, 2013; Potts, Pita, O'Higgins & Mee, 2016).

Public participation (PP) has become a major part of planning since the 1960's (Squirrell, 2012; Shipley & Utz, 2012). PP provides a fundamental part of the democratic process (Shipley & Utz, 2012), which attempts to overcome conflict through communication (Squirrel, 2012). PP is fundamental for the success of ICZM (Cicin-Sain & Belfiore, 2005; Chaniotis & Stead, 2007; Hastings & Potts, 2013; Potts et al, 2016), and although the concept seems simple (Morgan, 1998) its success is difficult to access (Shipley & Utz, 2012).

One tool within the "comprehensive communications toolkit" (Adrian Thomas, pers. coms, August, 2017) of PP is visualisations. Visualisations are used within many fields, and within them can be defined differently (Schroeder, Martin & Lorensen, 2006). However as Schroeder and colleagues (2006, p. 1) describe "informally, a visualization is the transformation of data or information into pictures". The visualisations within this project attempt to facilitate the communication of information about proposed developments, between expert and layman. Recent technological advances have made way for the development of new visualisation techniques, such as virtual reality (Al-Kodmany, 2002). These techniques are being brought into the planning world. However, to understand the use of that these technologies can have within public participation, we must first appreciate the role that prior technologies, which have led to these advances, play within information transfer (Al-Kodmany, 2002).

Importantly, "the underlying question remains as to whether we are doing it [PP] right" (Shipley & Utz, 2012, p. 22). This research attempts to add to the wealth of literature which attempts to answer this question. Within the wide topic of PP, this research will specifically investigate public understanding and opinion of visualisations, and attempts to explore this within coastal defence planning. There is limited research into the perceptions of visualisations in a coastal defence setting (Jude, 2008). Of this research much investigates the use from an expert point of view (Jude, Jones, Bateman & Andrews, 2003; Jude, Jones, Andrew & Bateman, 2006; Jude, 2008) and that research which has investigated the views of the general public (Matthews, Scarpa & Marsh, 2017) has not done so 'on location'.

1.3 Aims and Objectives

The aim of this project is to critically evaluate the role of visualisations within public consultation, using coastal defence schemes from the Solent as examples.

Four research objectives which will achieve this aim have been identified. They are;

1. To undertake a literature review into the need for public participation within coastal management and environmental impact assessment, with specific focus on visual impacts
2. To critically analyse public understanding and opinions towards the use of visualisations in general and within a coastal defence setting
3. To evaluate the usefulness of visualisations within public consultation in the context of coastal defence
4. To propose a series of recommendations for effective public participation and use of visualisations

1.4 Dissertation Structure

This introductory chapter shall be followed by critical review of literature relevant to the aims and objectives of this research. This second chapter will begin with an overview of the underpinning issue of environmental impacts which will set the general scene for this research. This will be followed by an investigation into the concept of ICZM, the coastal planning framework within England, the need and growth of environmental impact assessment (EIA) and public participation. Following on from this landscape and visual impacts will be investigated in depth, and well as the need for public participation within EIA. Finally, this chapter will review visual communication techniques.

The third chapter of this project will evaluate the research methods used to undertake this study. This chapter is divided into five sections. Firstly, an in-depth assessment of questionnaires as a research method will be carried out, followed by specific sections into the use of online questionnaires, on-site questionnaires, and email questionnaires. The final section of this chapter will provide a context of the three case study sites used within this research.

The results of these methodologies, will be presented and discussed within the fourth chapter. This chapter will first present the results from the online questionnaires, the results will be cross-referenced and discussed in reference to the literature and feedback from expert opinions. Following on from this the results from onsite questionnaires will be presented, and discussed with reference to the preceding online results as well as the literature and expert opinion.

The penultimate chapter will include a critique of the research in addition to recommendations for effective public participation and use of visualisations and suggested future research.

Finally, chapter six will conclude upon the results of this research, and the success of the aims and objectives outlined in Section 1.3.

Chapter 2. Literature Review

"Clouds are not spheres, mountains are not cones, coastlines are not circles, and bark is not smooth, nor does lightening travel in a straight line" (Mandelbrot, 1983, p.1)

2.1 Introduction

This chapter will aim to meet the requirements of objective one, by carrying out a literature review into the wide range of topics relevant to this research. Due to the extensive variation in areas relevant to this research topic, and the time constraints of this project, this chapter focuses on the literature identified as critical. This literature will provide a support the research throughout the proceeding chapters.

This chapter begins with a general context of environmental impacts and the fundamental themes of sustainable development and ecosystem services. Following this, the key topics of coastal management within England, environmental impact assessment and public participation shall be investigated. Finally, these topics shall be brought together to investigate landscape and visual impact assessment and previous research into public participation and the use of visualisations within this context.

2.2 Environmental Impacts

"Environmental management has taken on a new urgency [since] the 1990's. There has been, at last, widespread political recognition of the seriousness of the environmental problems facing humanity at all scales, from local communities through to the entire planet." (Morgan, 1998, p. 1). Previously only impacts upon the biophysical systems of nature where considered as environmental impacts. However, this has now been broadened to include impacts on people and their culture and socio-economic activities (Morgan, 1998).

As understanding of anthropogenic pressures has increased these impacts have entered the spotlight as humanity realises climate change is the "most serious long-term threat to the natural environment" (Landscape Institute and IEMA, 2013, para. 3.29). The natural environment provides people with services and benefits (Landscape Institute and IEMA). These can be divided into four broad categories (Figure 2). Landscapes provide cultural services, contributing to quality of life (Landscape Institute and IEMA, 2013).

Four broad categories of ecosystem services;

1. *The supporting services,* these that underpin all those services, i.e. soil creation
2. *The provisioning services,* the provision of the necessities of life, i.e. food
3. *The regulating services,* those that regulate ecosystem processes; i.e. water quality
4. *The cultural services,* the benefits that people obtain from the environment which contribute to wellbeing and quality of life

Figure 2 The four broad categories of ecosystem services (Landscape Insitute and IEMA, 2013)

In light of the pressures upon these vital services, the concept of sustainable development was developed within the United Nations 1987 report, Our Common Future. This report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987, Chapter 2, para. 1) (Illustrated in Figure 3). This concept relies on the ability of humans to anticipate the implications of our actions, and therefore environmental impact assessment (EIA) is vital (Morgan, 1998). As well as underpinning EIA, sustainable development is a fundamental concept of integrated coastal zone management.

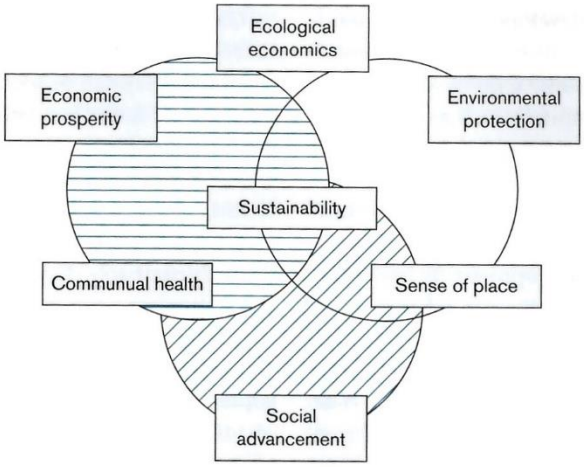


Figure 3 An integrative perspective of the dimensions of sustainability . (Glasson, Therivel & Chadwick, 2012)

2.3 Integrated Coastal Zone Management

Until recently coastal management was based on a sectorial, project-by-project approach (Olsen, 2003; Burbridge & Humphrey, 2003). However, after the rise of sustainable development and such documents as Agenda 21, in the 1990's saw a turning point within coastal management (Cicin-Sain & Knecht, 1998). This led to the emergence of integrated coastal zone management (ICZM). ICZM has no fixed definition (Kay & Adler, 2005), as well as no fixed 'name' – also being known as Coastal Zone Management, and Integrated Coastal Management (Cicin-Sain & Knecht, 1998). Cicin-Sain and Knetch define ICZM as "a continuous dynamic process by which decisions are made for the sustainable use, development and protection of coastal and marine areas and resources" (1998, p. 1). Regardless of the name, or definition, ICZM promotes the overarching concepts of sustainable development and integration (Cicin-Sain & Belfiore, 2005). Sustainable development is achieved within ICZM by using a

strategic approach. This approach requires long-term adaptive goals which are multi-dimensional and multi-objective (Kay & Alder, 2005), particularly vital in the dynamic coastal environment (Hanson & Lindh, 1993).

Although both integration and sustainable development are principal concepts of ICZM, it is integration which is of most importance to this study. Integration, which is required on five levels to be effective (Figure 4), is the unifying of parts to create a whole (Cicin-Sain & Belfiore, 2005). Integration is imperative for the success of ICZM (Cicin-Sain & Belfiore, 2005; Hastings & Potts, 2013; Potts, Pita, O'Higgins & Mee, 2016). An ecosystems approach aids integration, by ensuring that plans meet the needs of the whole area, rather than just one interest group (Stojanovic, Ballinger & Lalwani, 2004). These concepts are embedded within Olsen's Policy Cycle (Figure 5), which illustrates the theory behind sustainable ICZM policy.

- *Intersectoral integration* (bringing together agencies and groups from different sectors such as fisheries, tourism, oil and gas development, etc.).
- *Intergovernmental integration* (bringing together the several levels of government: national, provincial, local) which typically have authority in the coastal zone and ocean).
- *Spatial integration* (bringing together management issues concerning the land side of the coastal zone (including up-river issues related to watersheds and river basins) and issues related to the ocean side).
- *Science-management integration* (applying practical knowledge from the natural and social sciences to managerial decisions about the oceans and coasts).
- *International integration* (especially in cases where there are important transboundary issues that cross national boundaries).

Figure 4 Types of Integration for effective ICZM (Cicin-Sain & Belfiore, 2005)

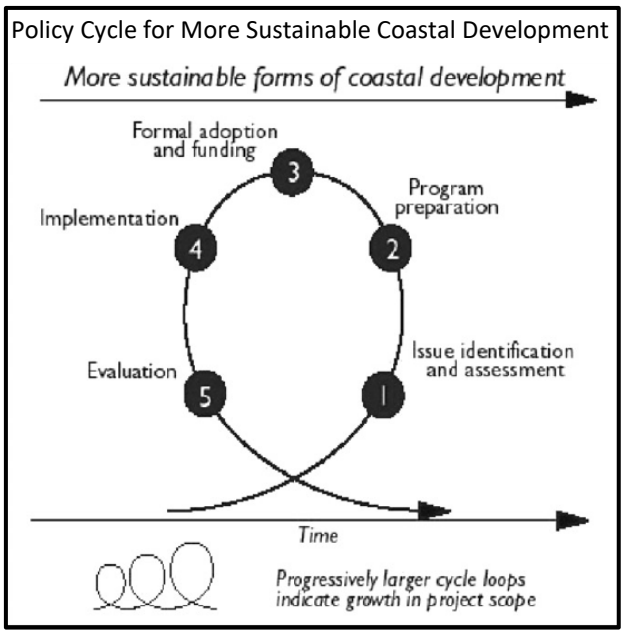


Figure 5 Olsen's ICZM Policy Cycle (Olsen, 2003)

These concepts, and the idea of ICZM, first drew international attention at the Rio Earth Summit in 1992 (Billè, 2008). This event initiated an essential shift in thinking (Cicin-Sain & Knetch, 1998). Within Europe, the European Union (EU) provides the major policy guidance for ICZM (Stojanovic & Ballinger, 2009) via the EU recommendations of ICZM implementation (Council Recommendation 2002/413/EC, 2002). The principles seen in Figure 6 suggest how to implement these concepts of ICZM. These principles have been criticised by some (McKenna, Cooper & O'Hagan; Ballinger, Pickaver, Lymbery, & Ferreria, 2010). Although all are important, of most interest to this study is Principle F which is directly concerned with the integration in of the public into plans.

(a) a broad overall perspective (thematic and geographic) which will take into account the interdependence and disparity of natural systems and human activities with an impact on coastal areas;

(b) a long-term perspective which will take into account the precautionary principle and the needs of present and future generations;

(c) adaptive management during a gradual process which will facilitate adjustment as problems and knowledge develop. This implies the need for a sound scientific basis concerning the evolution of the coastal zone;

(d) local specificity and the great diversity of European coastal zones, which will make it possible to respond to their practical needs with specific solutions and flexible measures;

(e) working with natural processes and respecting the carrying capacity of ecosystems, which will make human activities more environmentally friendly, socially responsible and economically sound in the long run;

(f) involving all the parties concerned (economic and social partners, the organisations representing coastal zone residents, non-governmental organisations and the business sector) in the management process, for example by means of agreements and based on shared responsibility;

(g) support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate;

(h) use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management.

Figure 6 The principles of ICZM according to the European Parliament (Commission Recommendation of 30th May 2002, 2002)

Integration is not only a relatively new concept within coastal management (Shipley & Utz, 2012). The arrival of integration can also be seen within terrestrial management in the last 60 years (Claydon, 2006), and more recently within marine management (Ehler & Douvere, 2009; Jay, 2010). This not only highlights the infancy of the concept, but also the importance of research into the area. With change experienced across the breadth of planning, subsequent change has been seen in a wide range of policy and practice.

In England this time of change saw the development of Shoreline Management Plans (SMPs). In 1993 the Ministry of Agriculture, Food and Farming (MAFF) (the predecessor of the Department for the Environment, Food and Rural Affairs (Defra) and the Welsh Office (the predecessor of the Welsh Assembly Government), published a 'Strategy of Flood and Coastal Defence' (Potts, Carter & Taussik, 2005). This document encouraged the development of non-statutory SMPs Defence (Potts et al, 2005). A SMP "provides a large-scale assessment of the risks associated with coastal processes and present

a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner" (Defra, 2001, p. 1). The first guidance, published in 1995, has since been built upon (Figure 7) (Defra, 2006; Famuditi, Potts & Bray, 2014). Each of the 22 plans attempts to provide a sustainable plan for their area by considering each of the options provided by Defra (Table 1) (Defra, 2006). These SMPs work towards achieving integration by bringing together authorities, but also through the use of public consultation (Defra, 2006). Defra guides authorities to consult stakeholders throughout the development of the plans, allowing input within the scoping, planning and draft SMP (Defra, 2006). In accordance with EU law, these defence schemes are subject to environmental impact assessment.

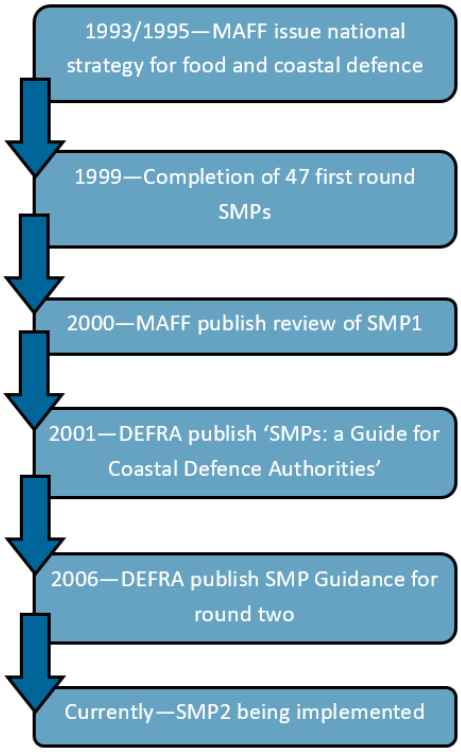


Figure 7 The development of Shoreline Management plans in England (Author's Own, information from Defra, 2006)

Policy Name and Abbreviation	Policy Description
Hold the line (HTL)	Maintaining or changing the standard of protection. This includes defences in front of existing defences, or defences behind existing defences where they form an essential part of maintaining current defence
Advance the line (ATL)	"Building new defences on the seaward side of original defences… Should be limited to units where… land reclamation is considered"
Managed realignment (MR)	"Allowing the shoreline to move backwards or forwards, with management to control or limit movement"
No active intervention (NAI)	"No investment in coastal defences"

Table 1 Policy options available for strategic coastal defence (Defra, 2006, p 13-14)

2.4 Environmental Impact Assessment

The last half century has seen a notable growth of interest in environmental issues (Glasson, Therivel & Chadwick, 2012). With groups such as the Royal Society for the Protection of Birds (RSPB) increasing in membership from 10,000 in 1960 to over 1.1 million in 2016 (the highest membership has been) (RSPB, n.d.), and documentaries such as 'An Inconvenient Truth' coming to the forefront of cinema (Nolan, 2010). This increase in interest has led the introduction of EIA worldwide, with EIA systems established in 140 countries (Glasson, Therivel & Chadwick, 2012) (Figure 8).

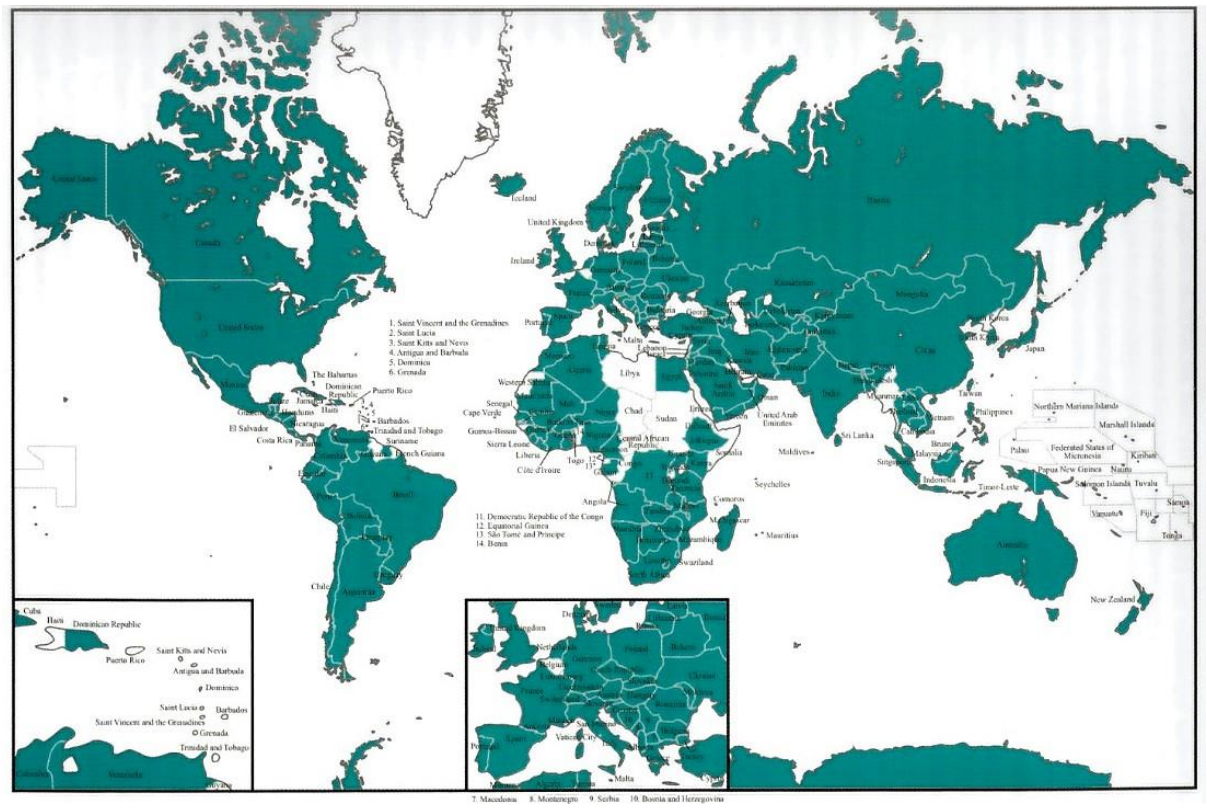


Figure 8 EIA systems worldwide. The countries marked in green represent, to the best of their knowledge, those with EIA legislation. (Glasson, Therivel & Chadwick, 2012)

Many definitions are possible for EIA, Morgan (1998) identifying ten from the contrasting, multi-disciplinary perspectives of the subject. Classically Munn (1979, p. 5) defines EIA as "to identify and predict the impact on the environment and on man's health and well-being of legislative proposals, policies, programmes, projects and operational procedures, and to interpret and communicate information about the impacts". Ultimately an EIA can help decide whether or not a proposal should go ahead (Jay, Jones, Slinn & Wood, 2007), in a systematic, holistic and multidisciplinary way (Glasson, Therivel & Chadwick, 2012). An EIA considers impacts in a number of areas (Figure9), on a number of scales (Figure 10). Simply an EIA "is the evaluation of the effects likely to arise from a major project…

Environmental Components	
Physical Environment	**Socio-economic Environment**
• Air and atmosphere • Water resources and water bodies • Soil and geology • Flora and fauna • Human beings • Landscape • Cultural heritage • Climate • Energy	• Demography • Economic base – direct • Economic base – indirect • Housing, transport, recreation • Other local services • Socio-cultural

Source: adapted from DoE, 1991; DETR, 2000; CED 2003

Figure 9 The components which make up the environment (Remade from Glasson, Therivel, Chadwick, 2012)

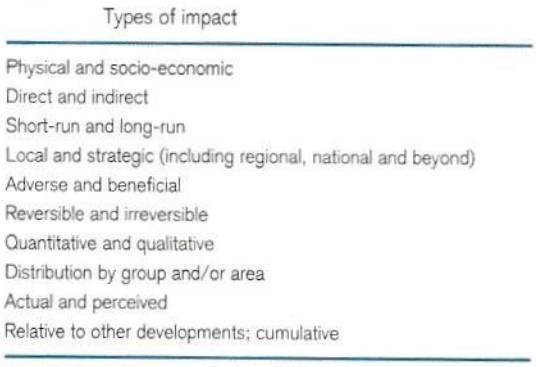


Figure 10 The types of impact considered within an EIA (Glasson, Therivel, Chadwick, 2012)

significantly affecting the environment" (Jay et al, 2007, p. 287), but "its apparent simplicity hides a multitude of problems" (Morgan, 1998, p. 3).

EIA was first legally introduced in the USA in 1970 (Morgan, 1998; Morris & Therivel, 2009), having been informally carried out before this (Fuggle, 1990). This legal introduction led to the EC 'EIA Directive' (Council Directive 85/337ECC, 1985). This directive introduced uniform requirements of EIA to all EU member states, and helped initiate the worldwide spread (Morgan, 1998; Glasson, Therivel & Chadwick, 2012). This directive, which has subsequently been amended and updated (Council Directive 97/11/EC, Council Directive 2003/35/EC, Council Directive 2009/31/EC, Council Directive 2014/52/EU), lists two sets of projects; one which identifies whose for which an EIA is compulsory, and another for which EIA is compulsory dependent on characteristics, such as size. Sea defences fall into this second category (Directive 2011/92/EU, Annex II, 10 (k), although regardless of size an EIA must be completed.

The UK has carried formal EIA legislation since 1988, with several laws implementing the EIA Directive (and its above-mentioned amendments). However, EIA was meet with resistance in the UK with scepticism even coming from the then Department of the Environment (now Department of Environment, Food and Rural affairs) (Glasson, Therivel, Chadwick, 2012). Since 1947 local planning

authorities had been required to anticipate likely development pressures, under the statutory land-use planning system, and planners saw these assessments as sufficient and EIA's as costly and time-consuming (Glasson, Therivel, Chadwick, 2012).

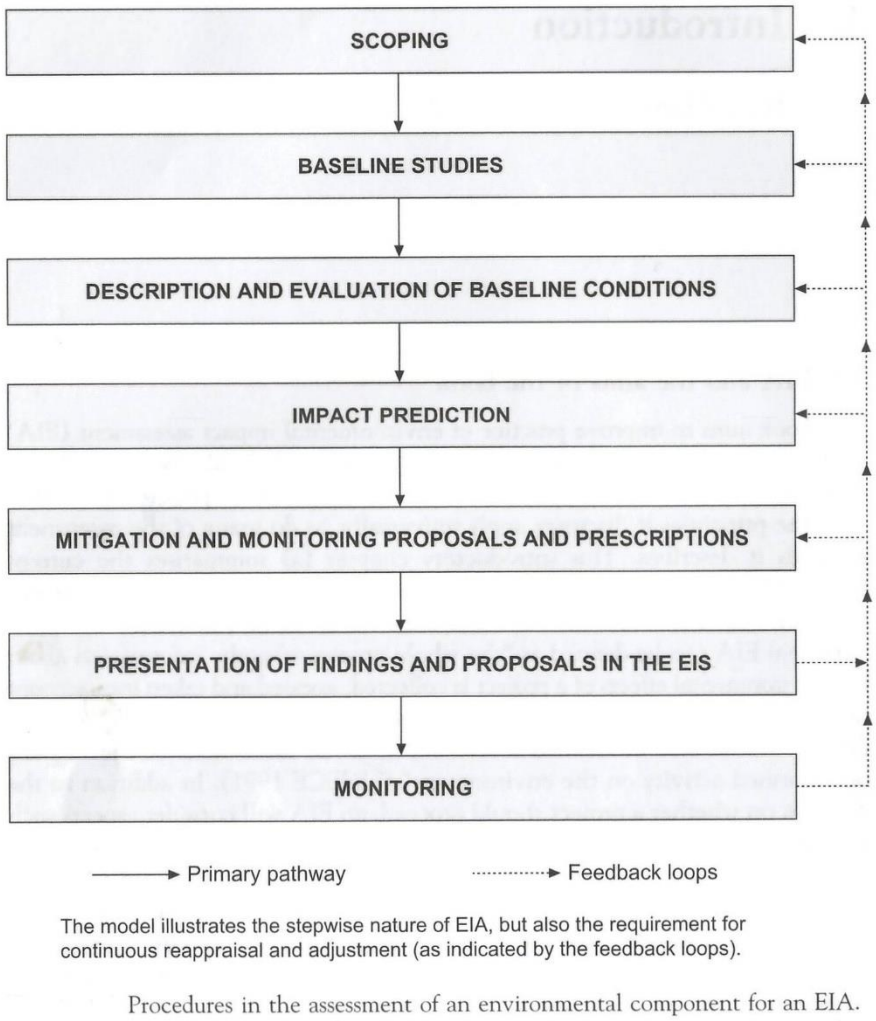


Figure 11 Model illustrating the EIA process (Morgan, 1998)

Within the EIA process (Figure 11) the participants carry different roles (Figure 12), but all are united by the need for reliable information about human-initiated effects on the environment (Morgan, 1998). Of particular interest to this project is the role of the public, and the communication between the planners and the public. There is growing need for EIA to take account of climate change, and the effects that the proposed development may have on both the mitigation of climate change and our adaptation to it (Landscape Institute and IEMA, 2013)

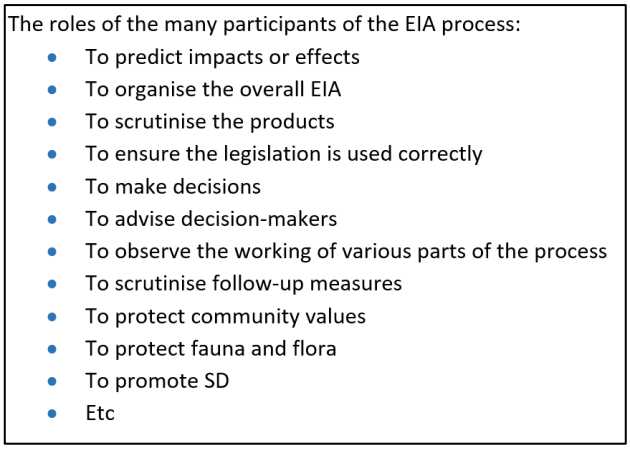


Figure 12 The roles of the many participants of the EIA process (Morgan, 1998, p. 22)

2.5 Public Participation

It is widely accepted that public participation will form healthier communities, better politics and more innovative institutions (Lee, McQuarrie and Walker, 2015). Public participation (PP) has become a major part of planning in the last 40 years (Squirrell, 2012; Shipley & Utz, 2012), and is a technique expected to grow in time (Roberts, 2004). The term can be used interchangeably with many others; civic engagement, citizen participation, public consultation, public involvement, and popular participation (Morgan, 1998; Shipley & Utz, 2012). Although Morgan (1998) defines PP and public consultation differently[1]. Public participation (PP) is used throughout this paper to mean "a participatory process of ongoing, proximate self-legislation and the creation of a political community capable of transforming dependent private individuals into free citizens and partial and private interests into public goods" (Barber, 1984, p. 151 in Roberts, 2004)". However, like many terms with interchangeable names, PP is "plagued with definition problems" (Roberts, 2004, p. 318).

The most basic concept of PP is the idea of democracy (Shipley & Utz, 2012). Historically, plans have been made via a centrally directed approach where the public has not been consulted, however, this began to change in the revolt against the urban renewal of the 1960s (Shipley & Utz, 2012). PP aims to achieve transparency and resolve the conflict between and within the 'professionals' and the public (Squirrell, 2012), however, the success of this can highly vary. Arnstein's (1969) 'A Ladder of Citizen Participation' provides a classic illustration of the varying forms of PP. Each rung on Arnstein's ladder (Figure 13) represents a form of PP. 'Nonparticipation' can be seen at the lowest point – where participants do not participate but are told what to think about the issue at hand. At the top of the

[1] Morgan (1998, .p 164) defines PP in the context of EIA as "involve[ing] an active role for the public with some influence over any modifications to the project and over the ultimate decision, and public consultation as "an exercise concerning a passive audience: views are solicited, but respondents have little active influence over any resulting decision".

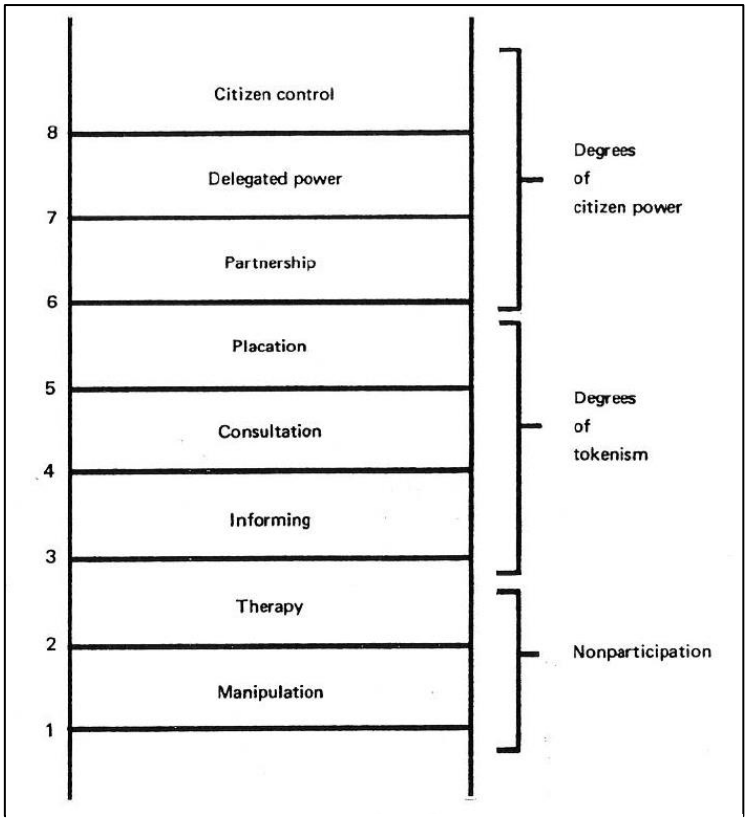


Figure 13 Arnstein's Ladder of Citizen Participation (1969)

ladder is 'citizen control' where "participants or residents can govern a programme . . . be in full charge of policy and managerial aspects, and be able to negotiate the conditions under which 'outsiders' may change them" (Arnstein, 1969, p. 181). Although this relationship between the 'professionals' and the public aims to overcome conflict, conflict can arise out of PP. The two entities can hold opposing goals - with 'professionals' expecting consultation to result in broad project direction and the consultees expecting more action-oriented results (Shipley, Feick, Hall & Earley, 2004).

This is just one of the many problems which surrounds the 'simple' concept of PP (Morgan, 1998). Another is engaging with the public. With the burdens of modern life, many citizens who may intend on partaking with PP do not (King, Feltey & Susel, 1998; Iannaccone & Everton, 2004), and certain demographic groups can be systematically excluded (Roberts, 2004). These factors can lead to PP which does not represent the community in question (Morgan, 1998). To overcome this PP may require specifically designed procedures to include marginalised groups, for example, non-written submissions to include the illiterate (Morgan, 1998)

Trust can be an issue for both those who do, and those who do not participate and can be a fundamental flaw of the 'traditional' PP mechanisms (Halvorsen, 2003). If PP is seen to be used as a tool for manipulation, a cycle of distrust can be established between the 'professionals' and the public.

However, one exposure to 'high-quality' participation can change one's view of a government agency, seeing them as significantly more responsive (Halvorsen, 2003). O'Neil (2002, cited in Squirrel, 2012, p. 9) says the increase in PP and "our revolution in accountability has not reduced attitudes of mistrust, but rather reinforced a culture of suspicion. We are galloping towards central planning by performance indicators, reinforced by obsession with blame and compensation".

2.6 Landscape and Visual Impact Assessment

LVIA and EIA

Landscape and Visual Impact Assessment (LVIA) formally form part of an EIA (Landscape Institute and IEMA, 2013). For developments not requiring an EIA, LVIA can take an informal part in an appraisal for a development (Fothergill, 2013). A LVIA "aims to ensure that all possible effects of change and development both on the landscape itself and on views and visual amenity, are taken into account in decision-making" (Landscape Institute and IEMA, 2013, para 1.4). Guidelines have been produced by the Landscape Institute and IEMA in 1995, 2002, and most recently in 2013. These guidelines aim to, and have, ". . . played a very significant role in encouraging higher standards in the conduct of LVIA" (Landscape Institute and IEMA, 2013, para. 1.4) with LVIA included within more than 85% of ES in 2010 (IEMA 2011, in Fothergill, 2013).

Landscape and visual effects vary from the other topics covered by an EIA due to; the degree to which LVIA relies on judgement and the extent to which those who carry out a LVIA may also be engaged in the design of a development (Landscape Institute and IEMA, 2013). Although some changes can be quantified, i.e. the number of trees lost, other aspects such as the significance of changes to the character of the landscape rely on professional judgement (Landscape Institute and IEMA, 2013). In addition, those carrying out a LVIA tend to be core members of the design team, which can help to minimise or avoid adverse effects (Landscape Institute and IEMA, 2013).

Landscape and Visual Impacts

LVIA "moves beyond the idea, which is still prevalent, that landscape is largely a matter of aesthetics and visual amenity. Instead, it encourages an equal focus on landscape as a resource in its own right." (Landscape Institute and IEMA, 2013, para. 2.4). Landscapes can provide a number of services (Figure 14). Simply the "Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe, 2000, p. 2). LVIA can

be broken down into two aspects; the landscape as a resource and the visual amenity the landscape provides. The distinction between the two is important (Figure 15).

The landscape can provide;

- A shared resource which is important in its own right as a public good
- An environment for plans and animals
- The setting for day to day lives – for living, working and recreation
- Opportunities for aesthetic enjoyment
- A sense of place which in turn can contribute to individual, local and national identity
- Continuity with the past through its relative permanence and is role in acting as a cultural record of the past
- A source of memories and associations, which is turn may contribute to wellbeing
- Inspiration for learning, as well as for art and other forms of creativity
- Economic benefits; by providing an essential resource for recreation and tourism and impact on health and wellbeing

Figure 14 The opportunities and resources the landscape can provide (Landscape Institute and IEMA, 2014).

Landscape effects assessment: deals with changes to landscape as a resource. Society as a whole has an interest in this and it is recognised as one of the key dimensions of environmental interest, alongside matters such as biodiversity, or cultural heritage. It is concerned with issues like protected landscapes, the contribution of landscape character to sense of place and quality of life for all, and the way that change may affect individual components of the landscape

Visual effects assessment: is concerned with how the surroundings of individuals or groups of people may be specifically affected by change in the landscape. This means assessing changes in specific views and in the general visual amenity experienced by particular people in particular places.

Figure 15 The definitions of Landscapes effects assessment and visual effects assessment (Landscape Institute and IEMA, 2013, para. 2.10)

The 'Seascape'

Landscapes can be broken down into 'types'. More recently townscapes and seascapes have emerged as their own types of landscape and require special (Landscape Institute and IEMA, 2013). Of particular interest to this project is the 'seascape' (Figure 16). The concept of seascapes has developed from the increasing importance of coastal and marine environments. Pressures upon these types of environments are rising with the need to manage coastal risk defences, and with the growth and necessity of new renewable technologies (Landscape Institute and IEMA, 2013). Although seascape can be identified as a type of landscape, when considering coastal environments both the seascape

"Seascape should be taken as meaning landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other".

Figure 16 Description of 'seascape'. (HM Government, 2011, para. 2.6.5.1)

and landscape (that up to the landward side of the high water mark) should be considered (Landscape Institute and IEMA, 2013). "The interrelationship between the two is clearly critical and any assessment of the landscape and visual effects of change in coastal environments should seamlessly relate the two together, and also take account for possible requirements to consider the open sea" (Landscape Institute and IEMA, 2013, para 3.6). Figure 17 illustrates the considerations that should be given within a marine setting.

LVIA within a marine context should account the need of;

- Views to and from the sea;
- Particular qualities of the open sea where land may be virtually invisible;
- The importance of ephemeral changes due to weather and tides;
- Change in seascapes due to coastal processes;
- The nature of people with an interest in seascapes, from those who make a living from the sea to those who enjoy it for recreation;
- Contributions of coastal features to orientation and navigation at sea.

Figure 17 Considerations of a LVIA within a marine setting (Landscape Institute and IEMA, 2013, para. 3.8)

Landscape and Visual Impacts – A Wider Context

Many of the topics covered in EIA (Figure 9) interact with LVIA. The most important of these interactions is of that between landscape and visual impacts, and cultural heritage and ecological impacts (Landscape Institute and IEMA, 2013). These interactions are illustrated in Figure 18. An "Understanding of these topics can add to understanding of the character and origins of the landscape but can also have a positive influence on the design of a scheme and on mitigation measures by helping to ensure that proposals are sensitive to the influences that history and ecology have in shaping current character of the landscape." (Landscape Institute and IEMA, 2013, para. 3.10)

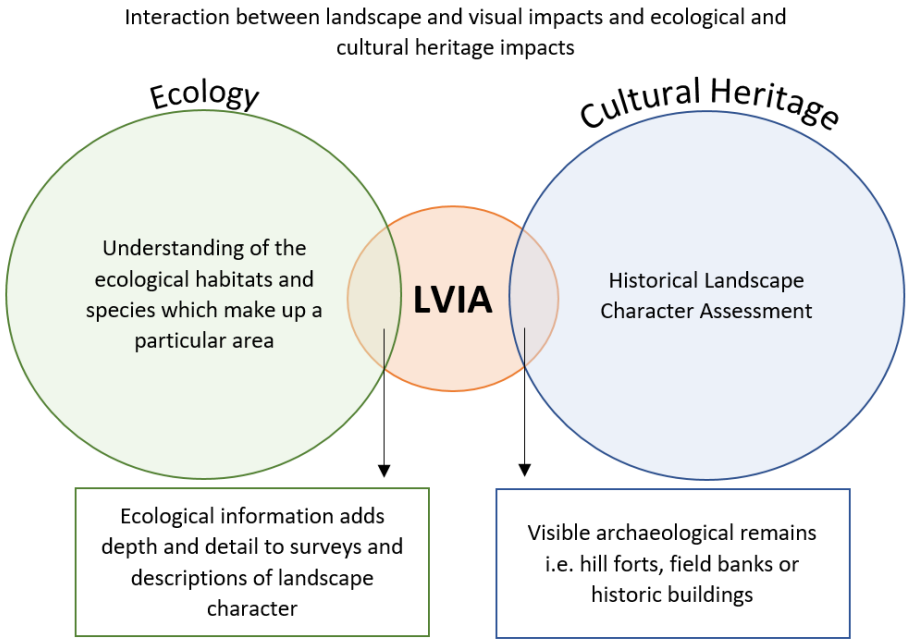


Figure 18 The interaction between landscape and visual impacts and ecological and cultural heritage impacts (Author's Own, information from Landscape Institute and IEMA, 2013).

As previously discussed, environmental issues are evolving, concern is growing and therefore the methods used to address these issues must evolve with them. Within the context of sustainable development it is important to remember that landscapes are dynamic; not all change is detrimental and societies needs and attitudes change over time (Landscape Institute and IEMA, 2013). This makes the 'professional judgements' previously discussed ever more challenging, especially when attempting to achieve sustainable development (Landscape Institute and IEMA, 2013). For example, an offshore wind farm might be viewed as visually unappealing, but the renewable energy it provides might be seen to outweigh these negative impacts. These professional judgements can even more challenging when strong local views are held, i.e. NIMBYism (Not In My Back Yard) (Glasson, Therivel, Chadwick, 2012), where for example local residents identify different opinions to those who are not local (Wang et al, 2016).

Within a coastal environment the landscape can be altered by the construction or absence of sea defence, but again this choice will be fuelled by sustainable development. Climate change changes the baseline conditions against which decisions are made (Landscape Institute and IEMA, 2013). Direct effects, such as flooding or coastal erosion, and indirect effects, such as changes in soil water regimes, will affect how the landscape appears.

2.7 Public Participation – In an Environmental Context

The Public of an EIA

"Public involvement is critical to the success of EIA" (Morgan, 1998, p. 147), with the public interconnected to all the principal parties (Figure 19). The term 'public' is "convenient, but also misleading" (Morgan, 1998, p. 154) and covers a "complex amalgam of interest groups, which changes over time and from project to project" (Glasson, Therivel & Chadwick, 2012, p. 147). Figure 20 provides three broad reasons for including the public. This 'public' can have very different interests and resources to hand, which can be broadly classified into two main groups (Glasson, Therivel &

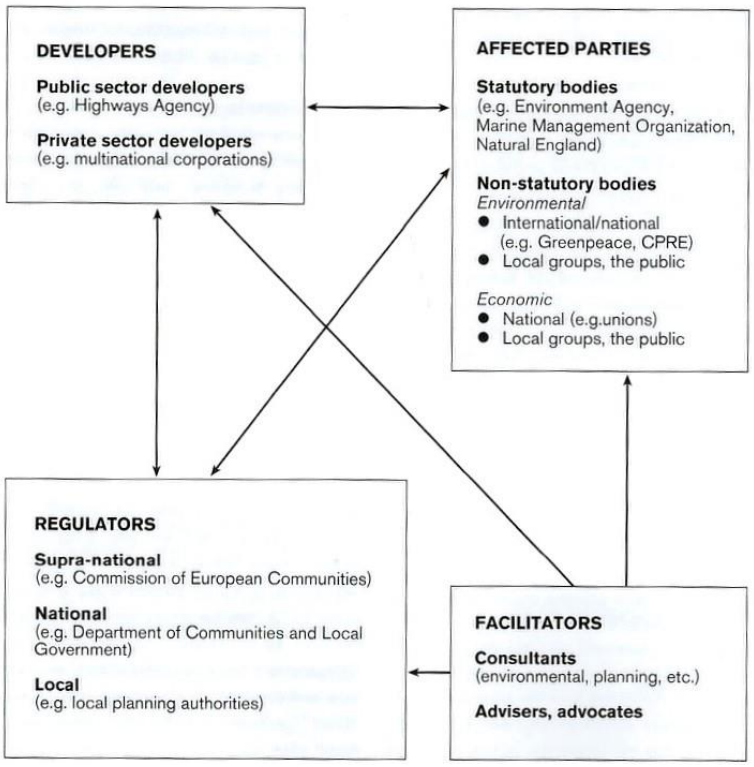


Figure 19 Principal parties in the EIA planning and development process (Glasson, Therivel & Chadwick, 2012)

Broad purpose	Specific purposes and activities
Obtain public input into decisions taken elsewhere	1. Provide information to public 2. Fill information gaps 3. Information contestability 4. Problem solving and social learning
Share decision making with public	1. Reflect democratic principles 2. Democracy in practice 3. Pluralist representation
Alter distribution of power and structures of decision making	1. Involve marginalised groups 2. Shift the locus of decision making 3. Entrench marginalisation

Figure 20 Purposes of PP in EIA (O'Faircheallaigh, 2010)

1. Voluntary groups, quasi-statutory bodies or issues-based pressure groups that are concerned with a specific aspect of the environment or with the environment as a whole
2. The people living near a proposed development who may be directly affected by it

Figure 21 The two main groups of which the public within an EIA can be classed into (Glasson, Therivel & Chadwick, 2012

Chadwick, 2012) (Figure 21). These different groups are characterised by their social, cultural, economic and ethnic differences, and the values expressed by these differences (Morgan, 1998). Susskind (1985 in Morgan, 1998) categorises community EIA participants into four groups (Figure 22). These participants can be identified in a number of ways (Figure 23) (Hyman & Stifel, 1988 in Morgan, 1998).

Four categories of community participants within EIA;

1. The preservationists, who oppose all economic development proposals on the grounds of environmental or social damage
2. The boosters, who support all development proposals for the economic benefits that will results
3. The non-participants
4. The guardians, who are capable of being swapped either way, depending on how far and open the decision-making process is , and who may constructed up to 50% of the community

Figure 22 The four categories of community participants within EIA (Susskind, 1985 in Morgan, 1998)

Methods for Identifying Target Groups within an EIA

- Self-identification of groups: recognising interest groups on the basis of petitions and lawsuits, or monitoring who is attending hearings and meetings or is requesting information
- Third-party methods: committees of local community representatives are used to identify groups within the community
- Direct searching methods: assessors use census information, lists of community associations, local newspapers and magazines, interviews etc to suggest important local groups

Figure 23 Methods for identifying target groups of EIA (Hyman & Stifel, 1988 in Morgan, 1998)

Communication Techniques

The major communication link within EIA is between that of the technical experts and the public (Morgan, 1998). A strategy should be developed for this, encompassing the whole EIA process (Figure 24 & 25). Morgan (1998) identifies two fundamental components of communication; the information itself and the mechanism employed for transferring the information. The transfer of information is one of the biggest challenges (Morgan, 1998) and that of particular interest to this study. Table 2 lists the possible methods of communication. The appropriate method will depend on the stage of the engagement (Squirrell, 2012). Although EIA reports tend to use minimal presentation methods with jargon-laden text, in general people react better to information presented with visually with spatial emphasis (Morgan, 1998). Within public participation these visual tools are vital, as they overcome racial, social and language barriers, that might otherwise be excluded from participating (Al-Kodmany, 2002).

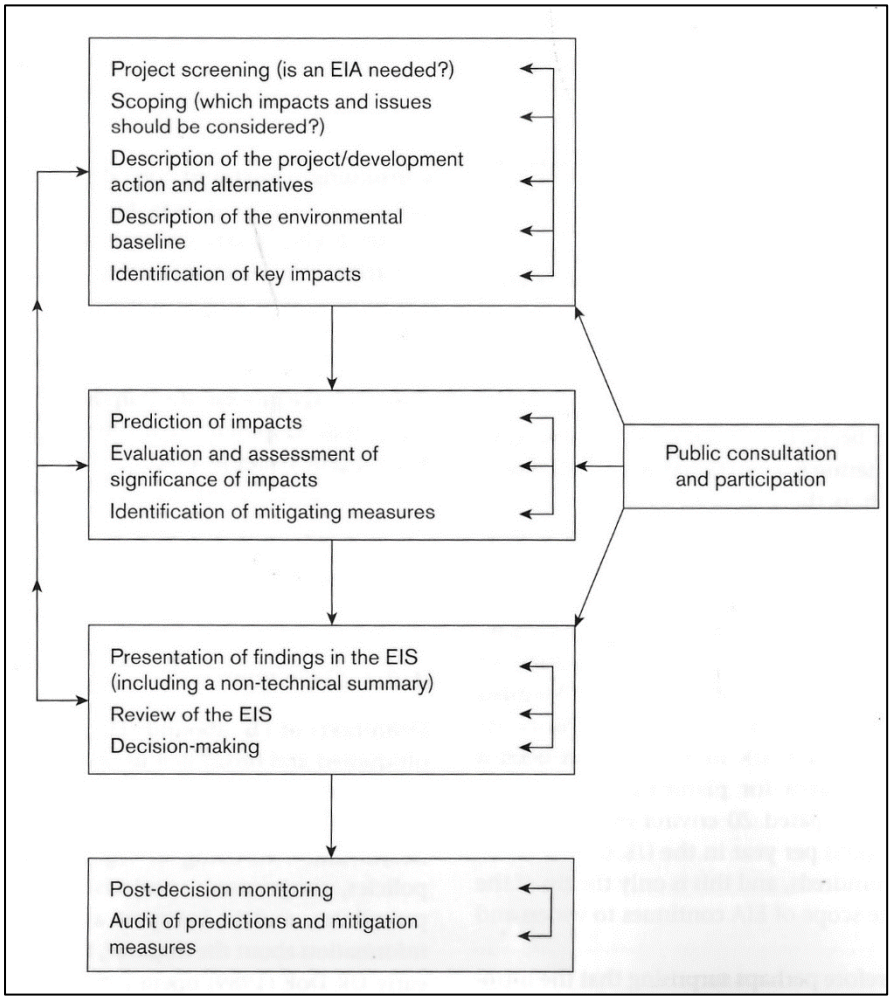


Figure 24 The EIA process, showing how public participation should be involved throughout the process . (Glasson, Therivel & Chadwick, 2012)

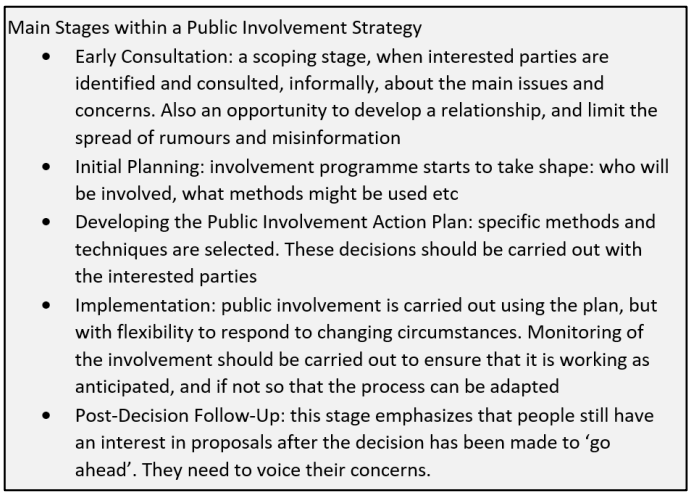


Figure 25 The main stages within a public involvement strategy (Adapted from Roberts, 1995 in Morgan, 1998)

Methods	Description
Methods Primarily for Informing and Educating	
Advertisements	Public information notices or more extensive advertisements in local papers and other accessible locations
Printed materials	Leaflets, information packs, brochures, reports
New conferences and press releases	Targeted at the media. Useful for alerting the public.
Displays and exhibitions	Organised at central locations, with generous opening times
Direct mailing of leaflets and brochures	Useful for very local issues, and for very dispersed populations who would not visit information displays or attend meetings
Computer bulletins broads and Internet sites	Electronic locations can be used to store information which the public can then consult
Methods Primarily to Seek Public Input	
Questionnaire surveys and interviews	Classic methods for collecting individual attitudes and concerns
Written submissions	Minimalist form of participation
Email	Electronic equivalent to written submission
Talkback radio and television	Debate in the public arena
Methods to Promote Information Exchange and Interaction	
Open houses, field offices	'Drop-in' centres staffed by personnel involved in a proposal
Hot lines	Useful in societies where access to telephones is high
Community liaison officer	Employed by the proponent, ideally chosen for their integrity in the eyes of the public. Targeted at avoiding conflict
Community advisory committees	Representatives of the community who conduit information flow
Group presentations	Directed at specific groups
Panels, workshops and conferences	Designed to allow more detail and technical discussion
Public meetings	Most widely used
Public hearings and inquiries	More formal than public meetings
Delphi processes	A means of eliciting values and concerns by using a ranking scale
Charrettes	Workshops designed to operate within a strict time-limit to push towards outcomes

Table 2 Public involvement methods (Adapted from Morgan, 1998)

2.8 Visual Communication Techniques

Visual tools are part of everyday life (Goodchild, 1999), whether they be a road sign, a painting or an architectural plan, and communicate messages quickly (Sheppard, 2005). These tools are able to trigger people's emotions, reflexes, and feelings (Sheppard, 2005).

Historic Context

Visual tools have been used since about 465BC, with perspective invented 100 years afterwards (Lange, 2001). In the 16th century, the technologies of surveying and cartography developed, offering modelling of the Earth onto a flat sheet of paper (Goodchild, 1999). Classic visualisations tools include; plans, sketches, perspective drawings, and data plots (Lange, 2001; Al-Kodmany, 2002).

Humphry Repton (landscape architect, 1752 -1818) was an early pioneer of using visualisations. Within his 'Red Books' he represented images of the landscape as it was before, and after his proposed changes (Lange, 2001). In the 1970's and 80's physical models were a popular visual tool, and since innovations in technology have moved towards 3D imagery (Lange, 2001). It is now possible to create "a multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data" - termed a 'Digital Earth' by Al Gore in 1998. This concept recognises the role of technology will play in humanities response to environmental change (Wang et al, 2016). Technology is now going even further with virtual reality allowing people to explore landscapes, at their own leisure, from the past, present and future (Wang et al, 2016).

Visualisations can be used within a community to improve awareness of landscape features and to communicate different aspects of change (i.e. flooding, vegetation change) (Wang et al, 2016). There are three basic elements that a visualisation must represent; terrain, built objects and vegetation (Lange, 2001). However, the world is more complex than just these features, and achieving the 'real world' is fundamentally difficult (Foley & van Dam, 1987).

Presentation of Landscape and Visual Effects

"The choice of appropriate presentation techniques [when presenting a LVIA] is crucial to good communication" (Landscape Institute and IEMA, 2013, para. 9.11). This presentation should be carried out via written text, supported by maps, illustrations and photographs (Landscape Institute and IEMA, 2013). Illustrations can communicate information more quickly and easily than text, and are their use is especially important for the portrayal of landscape and visual effects (Sheppard, 2005). However, these illustrations need to work alongside text, which should complement and support each other,

rather than duplicate (Landscape Institute and IEMA, 2013). These illustrations should demonstrate how the development will appear within the surrounding landscape, from specific viewpoints relevant to particular groups of people, and should do so 'as realistically as possible' (Landscape Institute and IEMA, 2013). This choice of words,– 'as realistically as possible' – within the LVIA Guidance, is fundamental and this vagueness is continued throughout (Downes & Lange, 2013) (Figure 26). However, this could be attributed to the need for this guidance to be appropriate for wide range and scale of projects.

> "Similarly approaches to visualisations of change should be agreed, as should the levels of accuracy, which again should be appropriate to the task in hand". (para. 9.12)
> "Maps, at appropriate scales and showing appropriate levels of detail, should be prepared using appropriate digital methods. . ." (para. 9.13)

Figure 26 Sections from the Landscape and Visual Impact Assessment Guidance (Landscape Institute and IEMA, 2013)

Visual effects can be presented in a number of ways and the 'right' choice requires careful consideration (Landscape Institute and IEMA, 2013), and with a lack of guidance their presentation can vary greatly and has left them open to criticism (Downes & Lange, 2013). Photographs can be used to communicate the current landscape character and its setting, but to illustrate change visualisations must be used (Landscape Institute and IEMA, 2013). Figure 27 shows the progression of visualisation tools as technology has improved. The appropriate type is dependent on each project. Visualisation methods include, but are not limited to, those represented in Table 3.

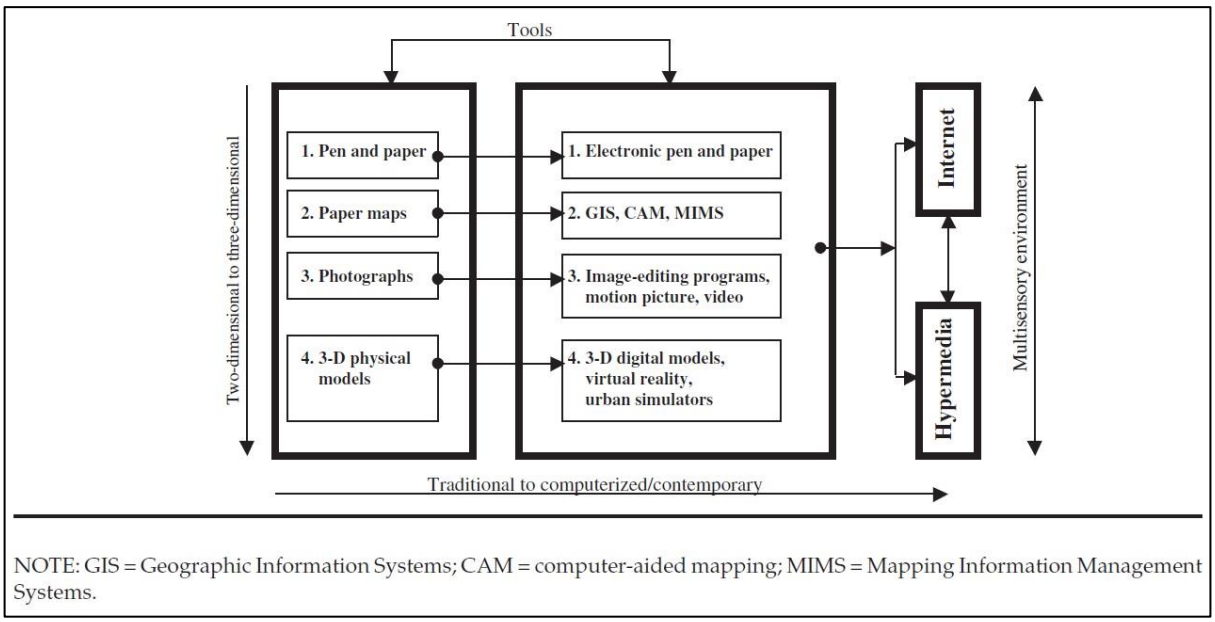


Figure 27 Progress of visualisation tools from traditional to computerised/contemporary (Al-Kodmany, 2002)

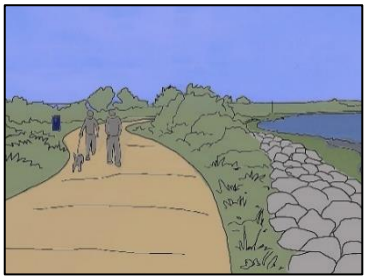
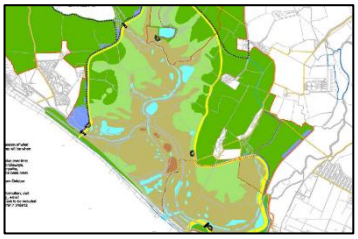
Style of Visualisation	Example
Wholly computer generated images	
Computer generated elements combined with photographic elements	
Computer generated model embedded on to a photograph	
Computerised sketch	
Hand-drawn artistic impression	
Map	

Table 3 Styles of visualisation with examples (Adapted from Downes and Lange, 2013) Images (from top to bottom) Downes & Lange, 2013; Downes & Lange, 2013; RSK eon, n.d., Downes & Lange, 2013; ESCP, n.d. a; Environment Agency, 2009).

The traditional visualisation methods, such as wireframe drawings or hand drawn impressions, which came prior to the 'computerised tools' which are now rarely used, partly because they are time-consuming to produce and suffer accuracy problems (Al-Kodmany, 2002; Landscape Institute and IEMA, 2013). This style cannot provide the sophisticated analysis and display of their more modern counterparts but, can initiate interaction with between stakeholders, and create a more social consultation environment (Al-Kodmany, 2002). Physical models have also traditionally been used but again, these are expensive to produce (Landscape Institute and IEMA, 2013). Due to their structural nature, these models can only be viewed within an exhibition or meeting setting, which restricts viewing access (Landscape Institute and IEMA, 2013). They can, however, be useful tools for those who find reading two-dimensional drawings challenging (Al-Kodmany, 2002).

Computerised visualisations are more commonly used, and "can significantly enhance, or even transform, public participation planning" (Al-Kodmany, 2002, p. 190). Photomontages are "the superimposition of an image onto a photograph for the purposes of creating a representation of potential changes to any view" (Landscape Institute and IEMA, 2013, para. 9.19). Figure 28 provides requirements for their development. Photomontages show the development within the "real" landscape and from known viewpoints, and are the most popular technique (Landscape Institute and IEMA, 2013). Careful consideration should be given to the viewing audience, with visualisations for non-experts being more straightforward (Landscape Institute and IEMA, 2013). Ideally, photomontages would be viewed in the field, enabling them to be compared to the 'real' landscape, however, this is generally not practical (Landscape Institute and IEMA, 2013).

Key requirements of photomontages

- all viewpoints that are to be used should be photographed at detailed locations that are representative of the view in question and of the character of the location;
- high quality photography should be used as the starting point for the manipulation of the images and weather conditions should be representative of those prevailing in the area;
- photomontages should show relevant components of the development that are predicted to be visible from each viewpoint, including access and any associated land use change related to the proposal;
- rendering of the photomontages should in general be as photorealistic as possible (although for large scale urban development's block models are often used, illustrating scale, massing, arrangement, but not details and these cannot be photorealistic) and should as far as possible show the development in conditions of maximum visibility;
- field of view and image sizes of the completed photomontages should be selected to give a reasonably realistic view of how the landscape will appear, if the image is held at a recommended viewing distance from the eye (usually between 300mm and 500mm);
- photographs and photomontages should be printed, or published digitally, at an appropriate scale for comfortable viewing at the correct distance.

Figure 28 Key requirements for photomontages (Landscape Institute and IEMA, 2013, para. 9.23).

Computerised 3D models provide a more advanced approach to visualisations and are an important means of communication across different interest groups (Lange & Hehl-Lange, 2005). These models can represent the wider setting and are made up from map data, digital terrain models and aerial photographic data (Landscape Institute and IEMA, 2013). Although 3D models can provide a high level of detail, as well as provide animations which as portray complex development in more detail, they are time-consuming and costly to produce (Landscape Institute and IEMA, 2013). Importantly, this complex material may only be accessible with certain technology and therefore only be available to some stakeholders via public meeting or exhibition, which only reach a limited number of stakeholders (Landscape Institute and IEMA, 2013).

More recently planning visualisations have been taken to a new level with the introduction of virtual reality (VR) (Al-Kodmany, 2002). This ability to interact with the visualisation "may fundamentally change the way in which planners communicate ideas and developments to the public" (Ad-Kodmany, 2002, p. 190). But to understand the use of these new technologies, we must first understand the role that visualisations already play within public participation.

With such a wide, and growing, choice of visualisation tools, it is important to pick the most appropriate (Table 4). These visualisations are mostly used to visualise the final result with no intention of changing the proposal (Lange & Hehl-Lange, 2005). Regardless of the technique used "visual representations can never be the same as the real experience of the change that is to take place" (Landscape Institute and IEMA, 2013, para. 9.24).

Step 1	Discuss the project with the client and the competent authority to work out what is required for illustration of the assessment. Consider the type of graphics and presentation likely to be most appropriate for the proposed development, taking account of the scale and complexity of the proposal and taking steps to ensure that the approach is proportionate - there is little advantage in using advanced techniques if a simple thumbnail sketch may be more appropriate.
Step 2	Explore further to determine which options should be pursued, from 2D photomontages to 3D animation or fully interactive virtual reality. This may reflect time constraints, resource issues and the needs of the different audiences involved.
Step 3	Consider the level of costs and benefits associated with each approach to enable the client to make an informed choice.
Step 4	Identify delivery dates for the presentation material and relate this to critical project milestones such as a submission of the planning application, to ensure appropriate time is allowed for key steps, such as delivery of Ordnance Survey data or preparation of a site survey, as well as for work with the project design team..
Step 5	Agree with the client the technique to be used, the projected costs and a programme and inform the competent authority of the approach to be used..
Step 6	Allow time for consultation with the client and the competent authority at an intermediate stage to permit slight changes in the direction or emphasis of the project.

Table 4 Steps for choosing the appropriate illustrative technique (Landscape Institute and IEMA, 2013, p. 138 & 139).

Critique of Visualisations

The literature provides four methods for assessing the effectiveness of visualisations (Downes & Lange, 2013) (Table 5). Previous research has used a range of these methods. Many of these, like this project, have investigated perception. These perceptions are difficult to explore as for example, vertical elements on the landscape are considered differently with church towers often treated as landmarks but others such as radio towers and tall buildings considered to be 'visual nuisances' (Lange & Hehl-Lange, 2005).

Method	Description
Quantitative perceptual	Asking people about judgements
Qualitative perceptual	Asking people to describe differences between the presented stimuli
Quantitative analytical	Developing metrics to estimate the degree of differences e.g. before and after images
Qualitative analytical	Describing objective differences between images

Table 5 Methods of assessing existing landscape and proposed future landscapes (Downes and Lange, 2013, p. 136)

Lange & Hehl-Lange's (2005) research found that all stakeholders they asked all found visualisations helpful on some level, with 66% also finding them realistic. Lange's previous study (2001) that 75% of test persons considered at least one type of visualisation to have a 'very high degree of realism' and photomontages with a simulated background, but real foreground were found to be the most realistic. This study also found no differences in how different demographic groups rated the realism of visualisations, but did find that different groups used a five-point scale slightly different, with non-local lay persons rating images higher, than local lay-persons (Lange, 2001). Appleton and Lovett (2005) found that those from a planning background were most familiar with traditional visualisation techniques, and less so with computer-based. These planning individuals also identified that "in general, the public do struggle to turn 2D maps and plans into 2D mental images" (Appleton & Lovett, 2005, p. 328).

Within a coastal setting recent research has found that virtual reality can be used within coastal erosion management to improve engagement, retain audience attention and reduce choice error (Matthews, Scrapa & Marsh, 2017). Previously, coastal managers have highlighted the usefulness of interactive coastal visualisations (Jude et al, 2003). Jude and colleagues (2006) subsequent research has identified the role visualisations can play in "illustrating the relationships between individual SMP management units" (p. 1535) but also "in communicating management interventions planned for individual sites" (p. 1535). Coastal planning experts also identified that technology can help to facilitate participatory coastal management (Jude, 2008). Ultimately, visualising the coasts is

particularly difficult due to the inherent uncertainties of these landscapes and as visualisations are often required to present landscapes 100's of years in the future (Jude et al, 2003).

Downes and Lange (2013) evaluated a range of urban development visualisations, against photographs sites after construction. Their results found an inconsistent range of issues across the images (Figure 29), which could result in misleading information exchange. Lange (2001) notes of the limitations of visualisations in comparison to the real world, where environments change daily and throughout the seasons, and site boundaries are not visually limited (Downes & Lange, 2013). The view portrayed by visualisations can affect the prevalence of landscape features, making futures look smaller or larger than they would actually appear (Macdonald, 2007 in Downes and Lange, 2013). Visualisation can be based on inaccurate data, whether intentionally or accidentally, therefore portray a visually appealing, yet missing leading visual representation (Downes & Lange, 2013). With the growth of public participation, and the need to persuade the public of developments worth, visualisations could be biased (Appleyard, 1997 in Downes & Lange, 2013). Ultimately the developers are the visualisation commissioners and those who can change things about the visualisation, for example, viewpoints (Downes & Lange, 2013). These ethical issues, and the effectiveness of visualisations, are important to consider (Sheppard, 2005), and The role of 3D visualisations within the public planning process is a relevantly new area to be explored (Lange & Hehl-Lange, 2005).

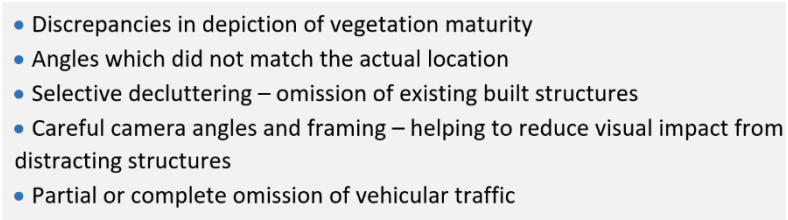


Figure 29 Issues found with visualisations analysed by Downes and Lange (2013)

2.9 Conclusion

This chapter has provided an overview of the extensive research and guidance into coastal management and environmental impact assessment, and highlighted the importance of public participation within these topics. The literature has highlighted the need for this research as public participation is difficult to get right (Shipley & Utz, 2012), and the vital role that visual communication methods play if used effectively.

This chapter has achieved objective one by providing a literature review into the topics relevant to this research. This literature will allow a comparison to be made between the results in Chapter Four, and will be used to develop a methodology within the next chapter.

Chapter 3. Methodology

3.1 Introduction

This chapter discusses the methods used to carry out the research aims and objectives identified in Section 1.3. The first half of this chapter investigates the use of questionnaires the data collection method used for the three parts of this project. Following on from this the three types of questionnaire used for this research (online, onsite and email) shall be examined. This will be followed by the identification of the sites (case studies) used for onsite questionnaires. Finally, the chapter will introduce the methods by which the collected data will be analysed and presented.

3.2 Questionnaires

Questionnaires (also known as surveys) are one form of research method (Sapsford, 2007; Fink, 2017). 'A survey describes a population, it counts and describes 'what is out there" (Sapsford, 2007, pg. 3). Through asking questions questionnaires investigate how people portray what they think, know or feel (Manigrove, 2005; Secor, 2010; McLafferty, 2016). The research aim and objectives of this study are to investigate the opinions of the public, therefore questionnaires are the most appropriate research method. McLafferty (2016) comments on the use of questionnaires in the field of geography, where they are useful in determining attitudes and opinions about social, political and environmental issues – such as those in this study.

The terms 'questionnaire' and 'survey' can be used to mean the same or different research methods (Oppenheim, 1992). The two terms can be used interchangeably (Secor, 2010), 'although, strictly speaking, the [survey] is the process of assessing a sample/population and the [questionnaire] the instrument through which you do that' (Secor, 2010, p. 196). This study will use the term questionnaire throughout, and will define it as one set of questions. There are five general considerations for any questionnaire (Figure 30) (Oppenheim, 1992). Like other research methods, questionnaires carry advantages and limitations (Table 6). Ultimately the quality of the questionnaire and the sampling technique used will directly affect the reliability of the results (Secor, 2010).

FIVE GENERAL CONSIDERATIONS FOR ALL SURVEYS

1. The main ***type of data collection instruments*** which we shall need, such as interviews, postal questionnaires, content analysis of records, observational techniques and so on;
2. The ***method of approach to respondents*** (after their selection through the sampling procedures), including sponsorship, stated purpose of research, length and duration of our questionnaire;
3. The ***build-up of question sequences*** or modules within the questionnaire, and the ordering of questions and scales within a general framework;
4. For each variable, the ***order of questions*** within each module, using approaches such as funnelling;
5. The ***type of question*** to be used; for example 'closed' questions with pre-coded answer categories versus free-response questions.

Figure 30 Five general considerations for all surveys (Adapted from Oppenheim, 1992, p. 101)

Advantages	Limitations
They can be a cheap and efficient way of collecting data	It can be difficult to get people to complete. The repose rate of postal questionnaires is particularly low
They can collect a large amount of data relatively quickly	Respondents often have limited choices of answers. They may not reveal or express their real views or attitudes if they don't match the 'forced choices' Data collection possibilities are pre-limited by the researcher, as respondents can only provide responses to a restricted range of questions or scales
They are relatively reliable as a method of data collection	Unless they questionnaire is conducted face-to-face, the researcher can't be sure of the true identity of the respondent
A comparison of respondents' answers is possible	The respondents tend to be people who have strong views or attitudes on the subject being surveyed
	If the questionnaire is posted, the researcher can't be sure that respondents have understood the questions and can't use follow-up questions to explore unusual answers

Table 6 The advantages and limitations of questionnaires as a data collection method (Walsh, 2001, p. 64)

Questionnaire Distribution

A questionnaire can be carried out in several manners (Secor, 2010; McLafferty, 2016; Fink, 2017). Table 7 gives an overview of these methods. Although all questionnaires, each of these methods of distribution carries different advantages and disadvantages (Table 8) (Feitelson, 1991; Edwards et al, 2009; Secor, 2010; McLafferty, 2016; Fink, 2017).

Explanation of Questionnaire Distribution Methods

Method of Distribution	Explanation
Face-to-face	Interviewer administered via in person contact
Telephone	Interviewer administered via telephone contact
Postal	Self-administered – posted out to participant, posted back by participant via stamp addressed envelope
Drop and pick up	Self-administered – questionnaire hand delivered to respondent, and collected at pre-arranged time
Online	Self-administered – accessed via web link which can be distributed by email or social media
Email	Self-administered – sent directly to participant email address as the body of an email or an attachment

Table 7 Explanation of questionnaire distribution methods (Information compiled from Oppenheim, 1992; Coughland, Cronin & Ryan, 2009; Olsen, 2012; McLafferty, 2016; Fink, 2017)

Regardless of the method of distribution, the questionnaire must be written appealingly to secure a significantly sound response rate (Faircough, 1977; Feitelson, 1991; Secor, 2010; McLafferty, 2016). For any survey the following components must be considered; sampling, question design, interviewing and total survey design (Fowler, 1993).

Type of Survey	Advantages	Disadvantages
Face-to-Face Interviewing (including those referred to as 'Street Surveys')	• Ability to show response cards • Ability to show stimulus material • More complex questions can be asked • Can ensure all questions are answers • Questions can be clarified	• Self-presentation bias • Selection bias • Third-party bias • Labour intensive • Costly • Time consuming (both parties) • Requires skilled interviewer • Not appropriate for sensitive subject matters • High non-response rate • Affected by external factors; i.e. weather, day of the week • Interviewers can change the way questions are asked
Telephone Interviewing	• Relative anonymity can reduce bias • Relatively non-time consuming • Cheaper than surveys requiring an interviewer • Can ensure all questions are answers • Questions can be clarified • Minimal inconvenience to participant	• Use of prompts can be difficult • Difficult to show stimulus material • Bias sample – not everybody has a phone • High non-response rate (no answer and abrupt termination) • Requires skilled interviewer • Interviewers can change the way questions are asked • Selection bias • Cost of phone calls
Postal – Self-Administered	• Cheaper than surveys requiring an interviewer • Relative anonymity (sensitive subject matters)	• Questions can be skipped • Questions can be misunderstood • Dependent on participant returning questionnaire within time limit • Requires cover letter of explanation • Cost of postage, return postage and printing • Requires more closed questions
Drop and Pick-Up – Self-Administered	• Cheaper than postal • Questions can be clarified when questionnaire is collected • Less inconvenient than postal	• Requires more closed questions • Time consuming for researcher
Online – Self-Administered	• Covers wide geographic area • Can reach a large number of people • Software can skip irrelevant questions depending on participate response • Produces results quickly – data is available in real time	• Technology/infrastructure can be costly • Researcher must learn how to use questionnaire construction software • Privacy and confidentiality concerns • No way to control who participates • Bias sample – not everyone has internet access • Requires more closed questions • Requires cover-message of explanation
Emailed – Self-Administered	• Quick to distribute • Cheap (no associated costs) • Easy to carry out	• Requires more closed questions • Questions can be misunderstood • Requires access to email list

Table 8 Advantages and disadvantages of each survey distribution technique (Information compiled from Hibberd & Bennett, 1990; Bourque & Fielder, 2003; Brace, 2008; Bryman, 2008; Sue & Ritter, 2012; Fink, 2017)

Question Formats

McLafferty (2016) provides some basic guidelines for designing questionnaire questions (Table 9). The type of questions used within the questionnaire can predetermine the distribution type (Fietelson, 1991), for example in self-administered methods fixed response questions are most successful

Guidelines for Designing Survey Questions

Basic principles	Things to avoid
Keep it simple	Long, complex questions
Define terms clearly	Two or more questions in one
Use the simplest possible wording	Jargon
	Biased or emotionally charged terms
	Negative words

Table 9 32 Guidelines for designing questionnaire questions (McLafferty, 2016).

(McLafferty, 2016). The type of question used also governs the data type – qualitative or quantitative (Walsh, 2001; McLafferty, 2016), and analytical method (Myatt, Scrimshow & Lester, 2003). Broadly speaking there are two types of question; open or closed (Oppenheim, 1992). Open questions, or free-response questions, are not followed by any pre-determined choice (Oppenheim, 1992; Walsh, 2001; Shackleton, Potts, Carter & Ballinger, 2011; Fink, 2017). Closed questions provide a limited scope of answers (Oppenheim, 1992, Walsh, 2001; Olsen, 2012; Fink, 2017). Closed questions can be presented in many formats (Table 10). A mixture of both styles is advisable (Fink, 2017), as they both produce advantages and disadvantages (Tables 11 & 12). Repeating and rewording a question into each format is advisable (Oppenheim, 1992). For example, Myatt et al (2003) undertook a mixture of attitude statements, closed questions and free response spaces for additional explanation to explore public perceptions of forthcoming managed realignment.

Formats of Closed Questions
Yes/No Questions
Checklist
Categories
Statement of Something on Continuum
Scale of Agreement – Continuous Line or Likert scale

Table 10 Formats of closed questions (Information compiled from Oppenheim, 1992; Walsh, 2001; Shackleton et al, 2001; Fink, 2017)

Open Questions – Advantages and Disadvantages

Advantages	Disadvantages
Freedom and spontaneity of the answers	Time-consuming
Opportunity to probe	In interviews: costly of interviewer time
Useful for testing hypothesis about ideas or awareness	Coding: very costly and slow to process, and may be unreliable
	Demand more effort from respondents

Table 11 Advantages and disadvantages of open questions (Fink, 2017, p. 115)

Closed Questions – Advantages and Disadvantages

Advantages	Disadvantages
Require little time	Loss of spontaneous responses
No extended writing	Bias in answer categories
Low costs	Sometimes too crude
Easy to process	May irritate respondents
Make group comparisons easy	
Useful for testing specific hypotheses	
Less interviewer training	

Table 12 Advantages and disadvantages of closed questions (Fink, 2017, p. 115)

Questionnaire Length and Order

There is a wealth of research into the effects of questionnaire length on response rate and results. "Common sense suggests that the shorter the questionnaire, the more likely a high response rate, and persons studying questionnaire efficiency have tended to accept this belief in spite of little empirical evidence to support it… Surprisingly few studies actually have examined correlations between length of questionnaires and rate of response, and those studies that have done so generally have yielded confusing results" (Berdie, 1973, p. 278 cited by Bogen, 1996, p. 1). For example, Galesic and Bosnjak (2009) found that length had a strong effect on response rate; when participants were told the questionnaire length was 10 minutes long 75% responded, whereas 63% responded when presented with a questionnaire 30 minutes in length. In addition, of those who started the questionnaire more participants completed the questionnaire when it lasted 10 minutes than 30 minutes - where more "lost their breath" (Galesic & Bosnjak, 2009, p. 358). However, Bradbun (1979, cited by Bogen, 1996) suggests that longer length questionnaires may suggest questionnaire importance, to both the interviewer and interviewee, and may increase response rate. When investigating respondent decision making whilst completing questionnaires Helgeson and Ursic (1994) found that longer questionnaires might yield inaccurate results. Respondents were found to reduce the difficulty of the mental task, resulting in them "employing more automatic affective decision making and using less cognitive and affective process interaction" (Helgeson & Ursic, 1996, p. 506). Nonetheless, the common assumption is that a shorter questionnaire will receive a higher response rate, although the this is not well supported by experimental research (Bogen, 1996).

As well as the number of questions, the order in which those questions are presented to the participant is important. “All surveys should be preceded by an introduction and the first set of questions should be related to the topic described in it” (Fink, 2017, p. 68). It is advisable to begin with questions which ask for objective facts, this allows participants to better understand the purpose of the questionnaire before going on to more subjective questions (Fink, 2017). The order of questions can also affect response. The ‘part-part consistency effect’ may be apparent when participants try to appear consistent by responding in line to their previous answers (Houtkoop-Steenstra, 2000). In addition, Fink (2017) provides a number of guides for question order (Table 13).

Guide to Question Order
Ask relatively objective questions before the subjective ones
Move from the most familiar to the least
Follow the natural sequence of time
See to it that all questions are independent
Relatively easy-to-answer questions (including demographic questions) should be asked at the end
Avoid many items that look alike
Sensitive questions should be placed well after the start of the survey, but also well before its conclusion
Questions should be in a logical order

Table 13 Guide to Question Order (Fink, 2017, p. 71)

Questionnaire Sample

“Sampling is a key issue in survey research because who responds to a survey can have a significant impact on the results” (McLafferty, 2016, p. 137). The sample is a selection of individuals from within the target population to whom the questionnaire will be administered (Secor, 2010; McLafferty, 2016). Sampling is particularly important when the population is large and to include everyone is impractical (Bell, 1999; Gillham, 2000). For generalisations to be made the sample should be a fair representation of the whole population (Bell, 1999; Walsh, 2001; Secor, 2010; McLafferty, 2016). The sampling frame must initially be identified, this recognises all those who have a chance of being included in the sample, for example, a telephone survey excludes all who do not have a telephone (McLafferty, 2016). Afterwards a sampling method (Table 14) can be chosen. The sampling method is occasionally determined by the nature of the study or time and financial constraints (Krasovskaia, Gottschalk, Sælthun & Berg, 2001; McLafferty, 2016). For example, Myatt-Bell, Scrimshaw, Lester and Potts’ (2002) sample was pre-determined by the population who attended an on-site exhibition, and Krasovskaias and colleagues’ (2001) sample was determined by overlaying flood zone maps and maps of municipalities to select the relevant population. Sample size must also be reviewed, and depends on subject matter and how representative of the population results need to be (Secor, 2016).

Generally, the larger the sample size the more accurate generalisations (Feitelson, 1991; McLafferty, 2016).

Sampling Methods

Method	Description
Random Sample	Individuals selected at random - each member of the population has an equal chance of being included
Systematic Sample	Individuals are chosen at regular intervals i.e. every forth house
Stratified Sample	Population is divided into subgroups and then random or systematic samples are taken – ensures subgroups are adequately represented
Opportunity Sample	Individuals are selected by their availability/ willingness to take part – option when random sampling is too difficult

Table 14 Four possible methods of population sampling (Compiled from Bell, 1999; Secor, 2010; McLafferty, 2016)

Questionnaire Piloting

Once a questionnaire has been written and is considered 'ready' a pilot study of the questionnaire and associated procedures should be carried out (Fowler, 2014; Fink, 2017). This ensures that the questionnaire is understandable, collects the necessary data and works under realistic conditions (Fowler, 2014, Fink, 2017). This is particularly important in self-administered questionnaires, where there is no interviewer to answer questions (Fowler, 2014). The best way to pilot a self-administered questionnaire is in person (Fowler, 2014). Test participants complete the questionnaire and fed back on the clarity of the instructions and questions (Fowler, 2014). Fink (2017) adds to this with some basic rules for piloting (Table 15). Once piloted, and amended where appropriate the questionnaire can be carried out (Figure 31).

Basic Rules for Pilot Testing
Anticipate actual circumstances
Test out selected portions of the questionnaire
Choose respondents similar to those whole will complete the questionnaire
Enlist as many people as seems responsible without wasting resources
Focus on the clarity of questions and format of the questionnaire

Table 15 Basic rules for pilot testing (Fink, 2017)

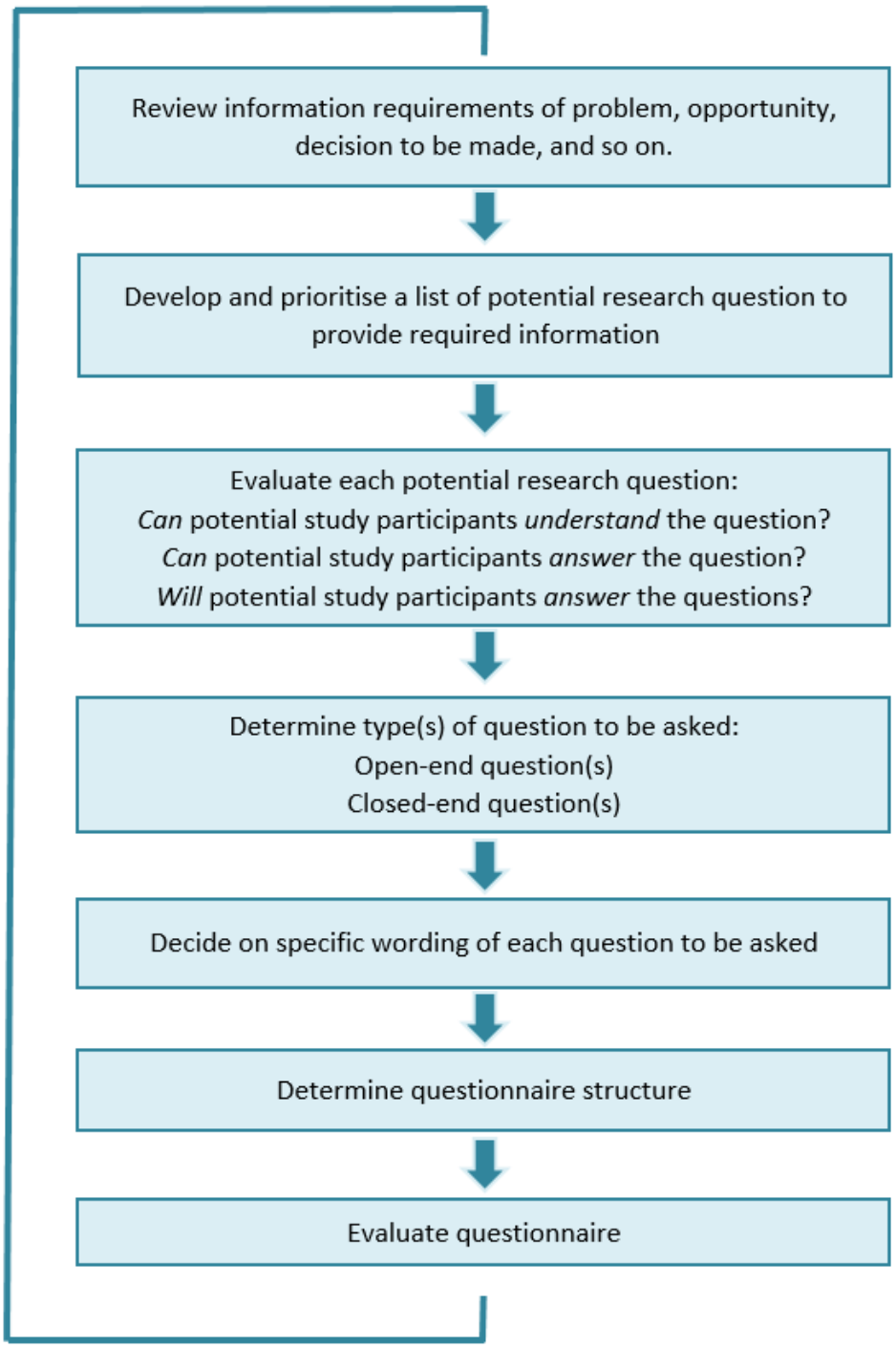


Figure 31 The process of developing a questionnaire (Fowler, 1993)

3.3 Method One – Online Questionnaire

An online questionnaire was used for the first part of this research. This method was chosen as; a large amount of responses were required, time constraints of the study required quick turnaround and there were few constraints as to who could participate (Sue & Ritter, 2012). This questionnaire covered participants past experience of visualisations, aiming to create a scoping of visualisation experiences and preferences in general. These questions required the use of images and videos within, which were only possible to include in an online questionnaire (Sue & Ritter, 2012). These were presented in a variety of formats, as a combination of question types is advisable (Oppenheim, 1992; Fink, 2017). Closed questions offered 'yes/no/don't know' options and open questions asked for elaboration on closed question answers.

The questionnaire was created using Google Forms, a free service provided by Google. This was chosen primarily due to the cost in comparison to other charging services. This service is also quick and easy to use, providing a range of question and answer options (multiple choice, linear scale, dropdown etc), the ability to embed images, YouTube video's and use the university logo. Previous research has found that the use of a university logo can improve response rate (Edwards et al, 2009). Google Forms is also compatible with both computer's and mobile devices, important at a time when mobile devices provide new opportunities for data collection (Mavletova, 2013). Google Forms also provides direct data entry into Google Sheets, which is transferable to Excel.

A pilot study was carried out for this method. In response to answers from the pilot study participants, the introduction to the survey was slightly revised, and the term 'public consultation' was re-clarified. More response options were considered for a closed question, however, this was unnecessary as the option 'other' was given. Two questions were changed from non-compulsory to compulsory. This pilot study also discovered a problem with the output data. The output of questions 10 and 12 'Why do you prefer this option', did not state which option participants preferred and therefore which option their answer is in reference to. Using the pilot study data is was possible check the output data could be manipulated to show both question results together.

Once finalised the online questionnaire was distributed in a variety of ways. Primarily social media was used, mostly Facebook. This involved a link to the questionnaire being posted on the researchers profile, and other groups and pages. This method allows for a quick, explanation of the questionnaire to persuade viewers to participate. Although free, and easy to use (Kayam & Hirsch, 2012), using social media in this way does come with problems (Sue & Ritter, 2012). Most importantly participants cannot

be randomly selected, and therefore like other nonprobability samples the resulting data has limited external validity (Sue & Ritter, 2012). Although, by using this sampling technique participants volunteer themselves and therefore will feel less pressure to please the researcher (Kayam & Hirsch, 2012). Social media users are a 'certain type of person' (Table 16), and therefore any generalisations

Problems with Questionnaire Distribution via Social Media
Many people are not engaged in social media
Of the millions of users who are engaged, many are lurkers or spectators
Individuals who are actively engaged are likely to be opinion leaders
Those engaging tend to be under 40 years old
Relies on those people who volunteer themselves into the research
No control over who takes part

Table 16 The personal attributes of those who take part in questionnaires via social media, and other problems with questionnaire distribution via social media (Sue & Ritter, 2012)

from this method alone would only be able to be made about social media users (Dillman, Smyth & Christian, 2014). This online questionnaire was also distributed via 'word of mouth' and subsequent emails by the researcher and their friends and family. This method also suffers from the limitations of nonprobability sampling.

3.4 Method Two – Onsite Questionnaire

The second method of data collection carried out for this study was onsite questionnaires. This method is similar to face-to-face interviews (Table 8) as respondents are approached by a researcher in person. The method used differs from face-to-face interviews as questions are pre-set (Houtkoop-Stennstra, 2000). These site specific questionnaires aimed to build upon the general data collected in method one. Three case studies were selected for onsite questions, discussed in Section 3.6. A general questionnaire was developed for all three sites, and then small adaptations were made for each site.

Onsite questionnaires were chosen as site specific opinions were required, for example, questions about visual changes after a coastal defence development. This aimed to create data about; how a coastal defence development changes an area, if people thought this change is positive or negative and whether they felt that the area looked like the visualisation. By approaching people face-to-face visual aids could be used as part of the questions (Sue & Ritter, 2012; Fink, 2017). These factors meant onsite questionnaires were the appropriate method, as a comparison between the visualisations and the site could not be made elsewhere. The questionnaire could possibly have been carried out via a local interest group or via the post with photographs, however, these would not have reflected the ambiance of the site (Gibson, 2002). However, carrying out face-to-face questionnaires is problematic, as confirmed by Chanitos and Stead (2007) who attempted to carry out interviews at the coast, but due to logistics and time constraints included email and postal questionnaires too.

With a researcher present, it is important that questions are standardised, as small changes in wording can sometimes produce very large changes in response (Houtkoop-Stennstra, 2000). Fowler and Manigone (1990, in Houtkoop-Stennstra, 2000) formulate four rules of standardised interviewing

Interviewer Rules for Standardised Interviewing
Read the questions exactly as worded
If the respondent's answer is incomplete or inadequate, probe for clarification or elaboration in a non-direct way
Record the answers without interviewer's discretion
Do not provide any positive or negative feedback regarding the specific content of respondent's answers

Table 17 Interviewer rules for standardised interviewing (Fowler & Manigone, 1990 in Houtkoop-Stennstra, 2000, p. 9)

(Table 17). Face-to-face questionnaires also carry financial and time-consuming costs. Although this study did not require numerous interviewers to be trained, travel costs to sites were evident (Oppenheim, 1992). This travel to, and time on-site, as well as the time spent processing open-ended questions, was also time-consuming (Oppenheim, 1992). Finally, stopping people 'on the street' can be ". . . morale-sapping, very tiring physically and mentally" (Oppenheim, 1992, p. 84) for the interviewer. The specific issues found within this study's onsite questionnaire are included in Section 5.3.

The questionnaire went through a number of versions. Initially, the questionnaire consisted of 31 questions mainly consisting of list tick boxes with a variety of question topics, including why the participant was visiting and how often they visited as well as questions brought forward from the online questionnaire. By including questions in the online questionnaire it was hoped that a comparison between the two sets could be made. The first review concluded that the questionnaire was too long, and general questions were removed (for example what is the purpose of your visit). In addition, some 'yes/no' questions were changed to Likert scales, to create data with more depth.
A pilot study was carried out on one onsite with draft two (this version consisted of 24 questions). The pilot study, of five participants, concluded that the questionnaire was still too long, especially given the onsite setting. As participants had been randomly stopped when the questions continued for more than five minutes it was clear that they were annoyed. The pilot study also discovered that some questions were repetitive. As a result, the questionnaire was severely edited. The final questionnaires (for all sites) consisted of five questions (Table 18). These questions were selected from the drafts as they solely focused on the participants basic understanding of the visualisation, a Likert scale question about how the area looked.

Question	Aim of Question
Q1. *Can you describe this image to me?	This aimed to establish the participants basic understanding of what the visualisation was showing, and was whether it was reflected the development plans
Q2. *€ (a) Do you think this image gives a realistic impression of this location? (b) Does this image help you to understand how the area might look after the development?	These aimed establish whether the post-construction area looked like the visualisation, or whether the visualisation was effective at improving understanding of plans where pre-construction
Q3. Please explain why	This question leads on from question 2, with the aim to collect data with more detail
Q4. £ These images show different styles of visualisation which have been used to illustrate how a coastal defence scheme will look. Which style do you least and most prefer?	This aimed to see if there were styles which were consistently least and most favoured, and could be compared with answers from online questionnaires.
Q5. Please explain why	This question leads on from question 4, with the aim to collect data with more detail

* Participants were shown a visualisation of the site, used within the public consultation, with this question
€ This question was the only difference between post-construction sites (Milton Common and Medmerry) and Southsea. A was used at post-construction sites, and B at Southsea.
£ Participants were shown a set of four visualisations of different styles, with this question

(Please see Appendix 3 for the visualisations used)

Table 18 The aim of onsite questionnaires

3.5 Method Three – Email Questionnaires

To gain an expert view on the findings of the results of the previous two methods representatives of local authorities and other relevant bodies were invited to comment on the results. This was carried out via email, for the convivence of those taking part (Fink, 2017). Most of the representatives contacted were approached to take part in the early stages of the project, to increase the likelihood of a response (Fink, 2017). Those who were contacted, and those who responded can be seen in Table 32.

Organisation	Name	Response
Chichester District Council	MPP Project Officer	Yes
Eastern Solent Coastal Partnership	N/A	No
Environment Agency	N/A	No
Solent Forum	Karen McHugh	Yes
RSPB	Adrian Thomas	Yes
Hampshire County Council	Simon Cramp	Yes

Figure 32 'Experts' contacted via email questionnaires

A standard document was sent to each representative, providing some key results from the study and open questions relating to these results (Appendix 4). Open questions were used to gain in-depth qualitative data from these respondents (Fink, 2017). This document was attached to a standardised email which explained how to answer the questions, a date of return and their consent for their views and name to be used within the final document. The data from these email questionnaires, has been

added to the discussion of the results from methods one and two, as well as a the recommendations and conclusions.

3.6 Case Studies

Case Study Selection

The Solent (Figure 33), is a body of water in southern England divides the Isle of Wight from the mainland. The area is susceptible to coastal flooding, with a long history of events (Ruocco, Nicholls, Haigh & Wadey, 2011). Although there has been an increase in extreme sea levels in the area since the 1970s the occurrence of damage from flood events has remained constant due to the maintenance of defences (Ruocco et al, 2011). The area carries a variety of human uses; from densely populated cities to small towns and villages, as well as natural environments of local, national and international importance (New Forest District Council, 2010). For these reasons case studies were chosen from the Solent.

A number of stages were used in the case study selection process (Figure 34), via this selection process three were chosen; Milton Common, Southsea and Medmerry. These sites all fall under the management area of the North Solent SMP (Figure 35). The North Solent SMP considered each of the four management options (Figure in Literature Review) for the 386km stretch of coast (New Forest District Council, 2010). Within the SMP the three sites fall under two strategies and are managed by different organisations (Figure 36).

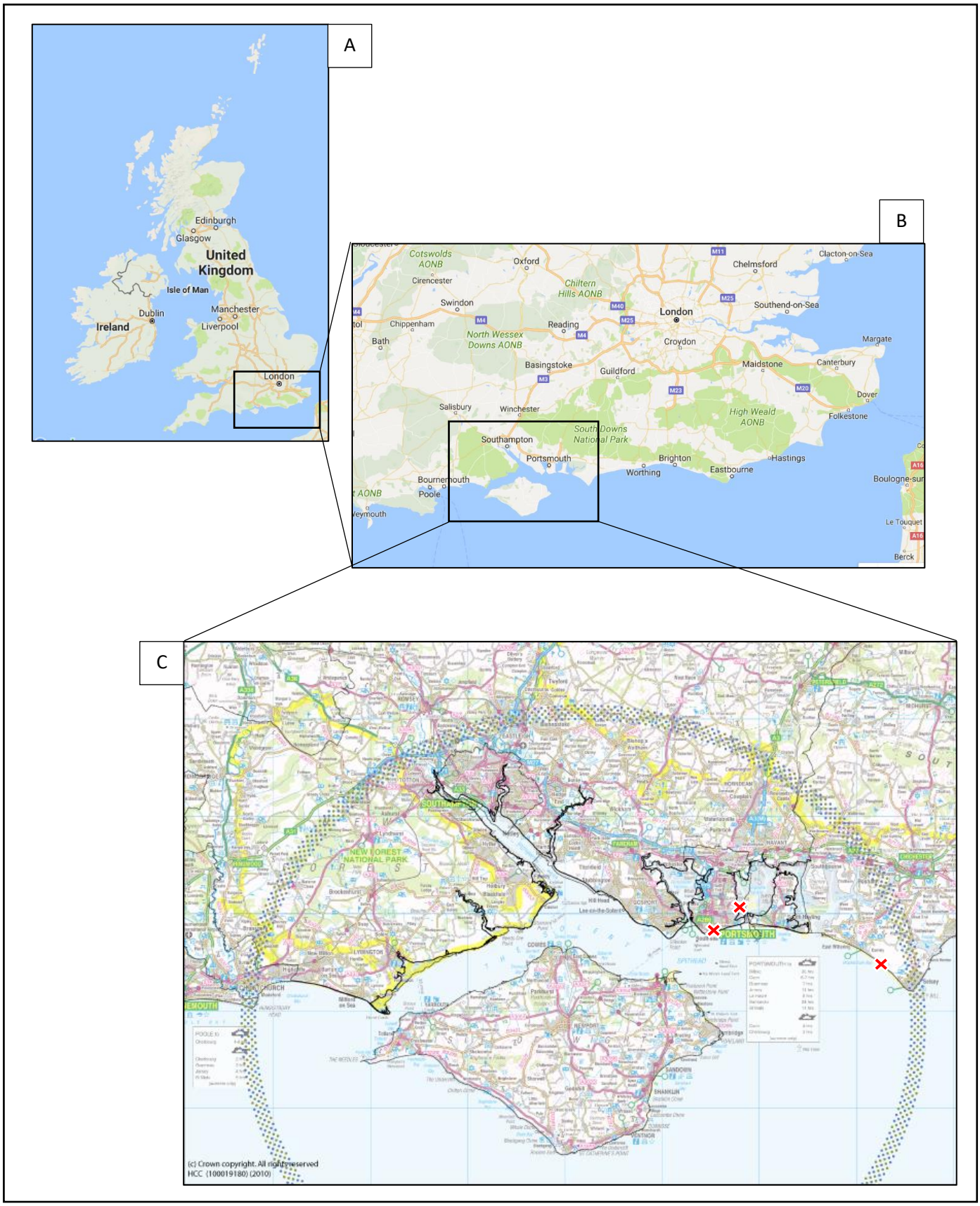


Figure 33 The location of the Solent (Google, 2017; Google, 2017; Solent Forum, n.d, Annotations Author's Own) (Red cross's mark case study locations)

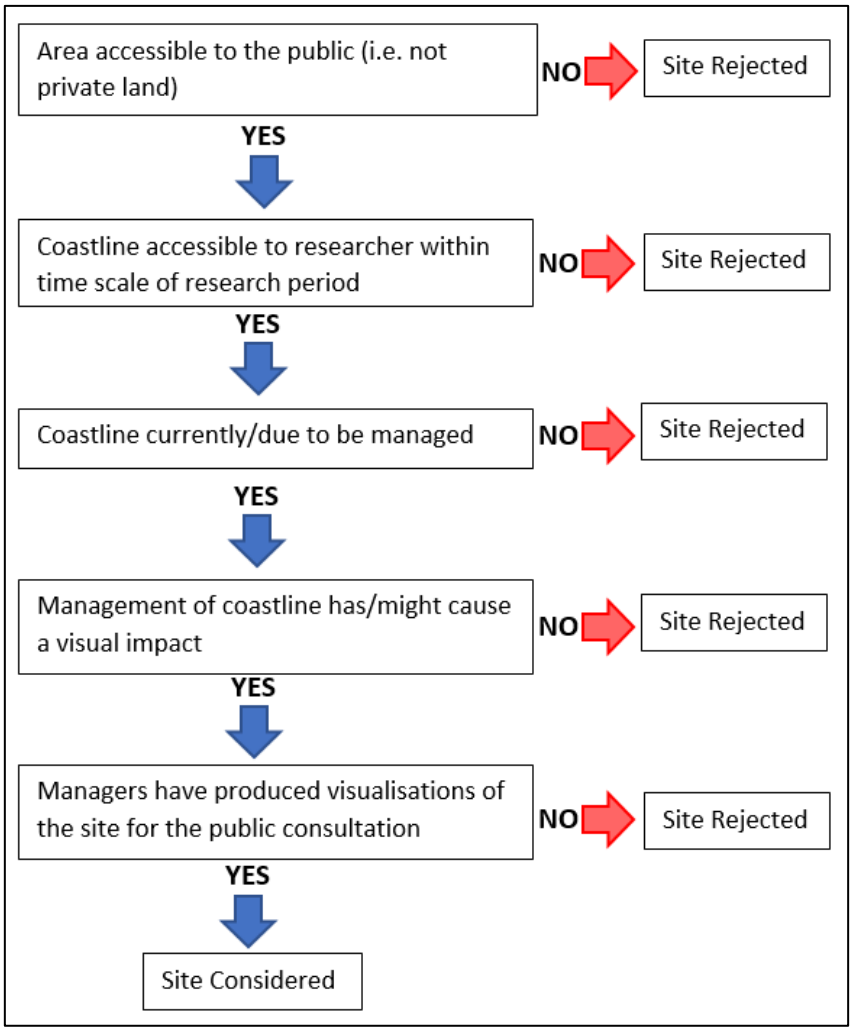


Figure 34 Case study selection process

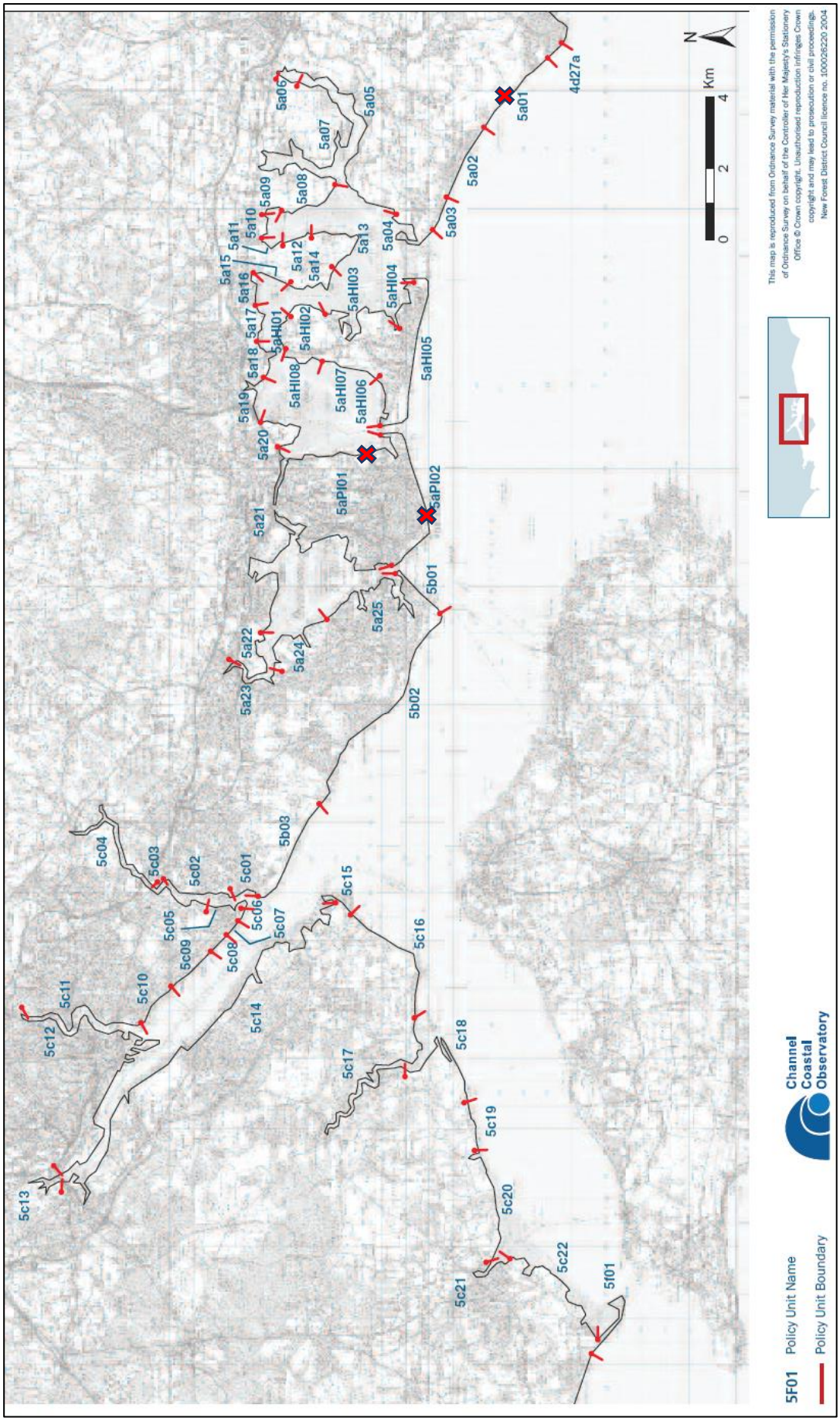


Figure 35 The area covered by the North Solent SMP, showing the coastline divided into management unites. (New Forest District Council, 2010, Annotations Author's Own) Red crosses mark location of case studies.

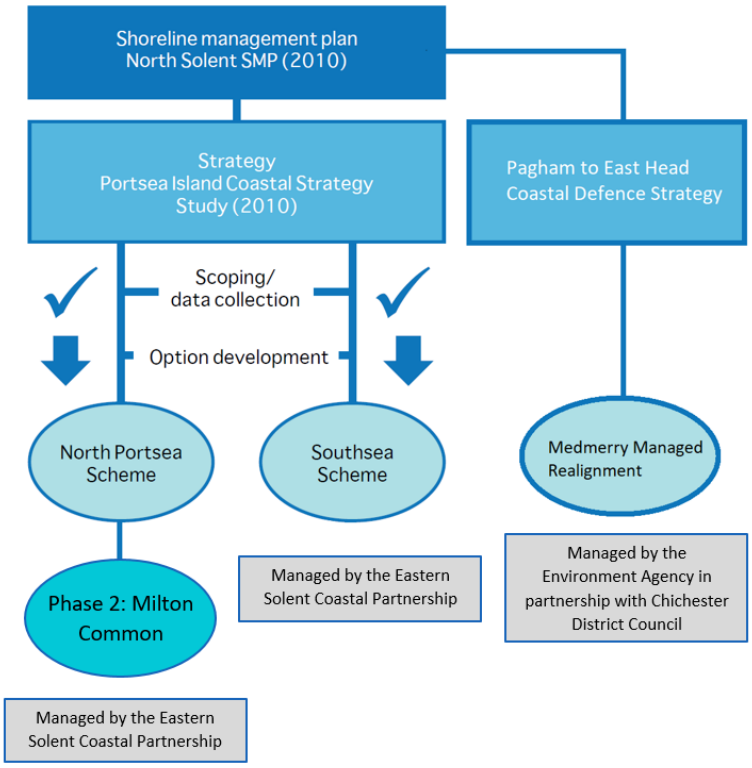


Figure 36 Management break down for the three sites used; Milton Common, Southsea and Medmerry (Adapted from ESCP, n.d.a)

Case Study – Milton Common

The Milton Common scheme covers 750 meters of the coastline of Portsea Island adjacent to Langstone Harbour (Figure 37) (ESCP, n.d. a). The defences in at Milton Common work towards protecting 1,414 residential and 147 commercial properties which are at risk of flooding (Figure 38) (ESCP, n.d. a). The scheme, which was carried out between April and November 2016, consists of rock revetments and earth bunds (ESCP, n.d. a). Public exhibitions were carried out in March 2014 and ESCP "incorporated feedback received from the(se) public exhibitions" (ESCP, n.d. a, p. 11).

Figure 37 The location of Milton Common Coastal Defence Scheme (Ordnance Survey, 2017; Google, 2017, Annotations Author's Own) (Red cross marks the location where onsite questionnaires were carried out)

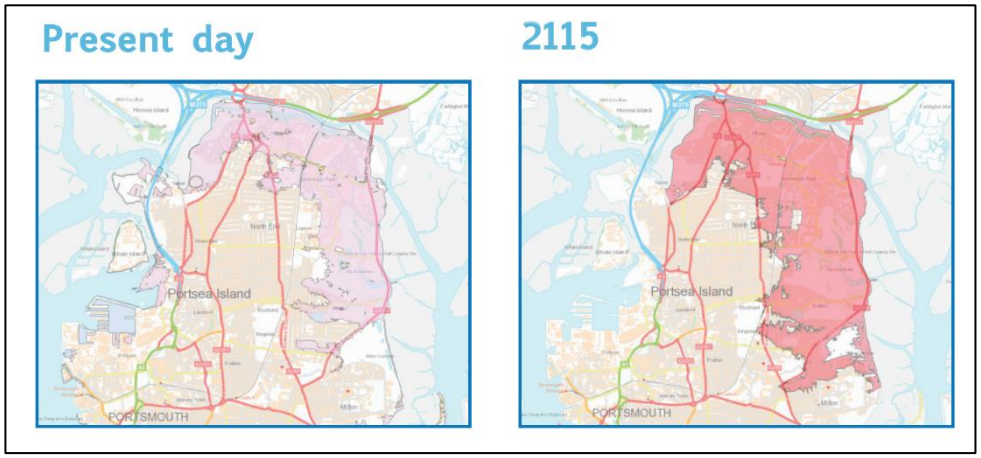


Figure 38 Flood maps indicating the extent of flooding in the north of Portsea Island from a 1 in 200 year event, if the coastline was left undefended. At present 1,414 residential and 147 commercial properties are at risk, in 2115 4,234 residential and 490 commercial properties would be at risk. (ESCP, n.d.a).

Case Study – Southsea

The Southsea Scheme is, at the time of writing, in the final stages of planning and due for public consultation soon (Rachel Cook, pers. coms, July 2017). The Southsea Scheme covers 2.8 miles of the south frontage of Portsea Island (ESCP, n.d. b) (Figure 39 A). The scheme will protect 2,311 residential and 202 commercial properties from flooding (Figure 40) (ESCP, n.d. b). The frontage is broken into 7 sub-frontages – each of these frontages has a different type of defence and character (ESCP, n.d. b) (Figure 39 B). Specifically, sub-frontage 4 – Southsea Castle was used as the questionnaire location. A public consultation took place in November/December 2014.

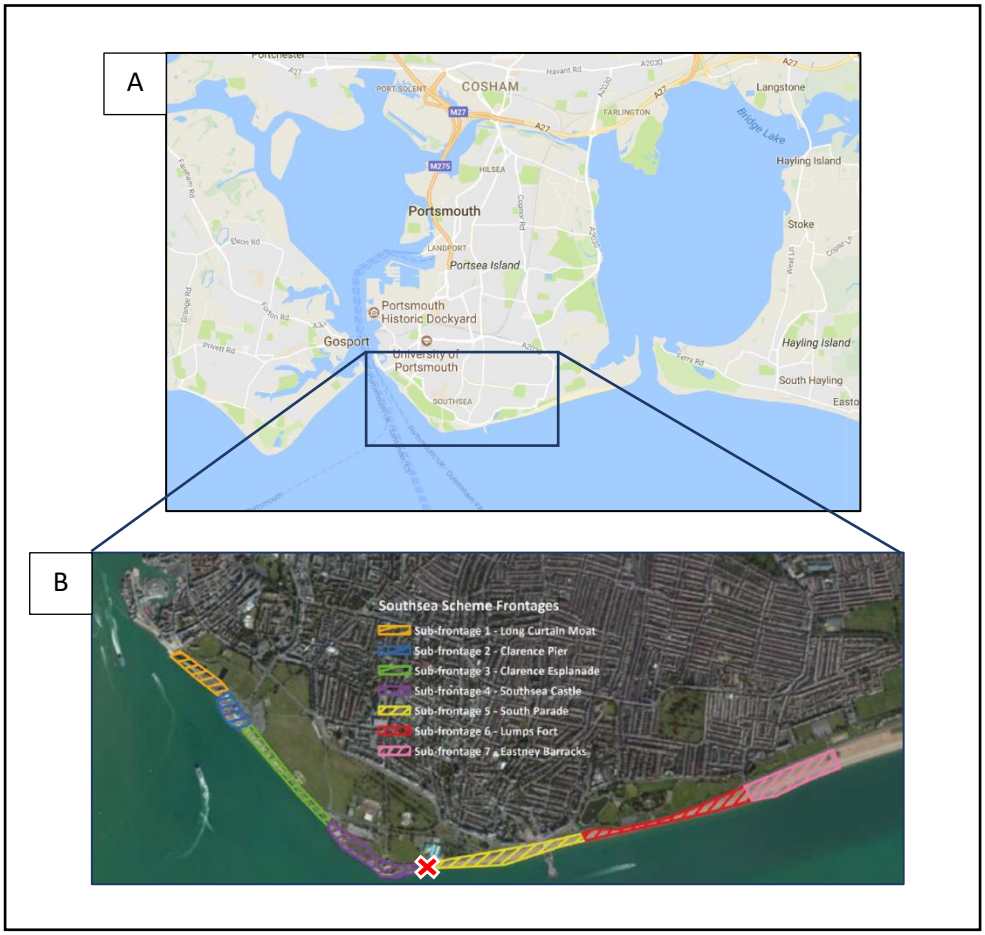


Figure 39 A:The location of Southsea scheme on Portsea Island. B: The localation in more detail, with the frontage divided into sub-frontages (Google, 2017; ESCP, n.d. b, Annotations Author's Own) Red cross indicates the location where onsite questionnaires took place.

Figure 40 Flood map indicating the effect of flooding without defences in an 1 in 200 event in the present day and in 2115. Currently 2,311 residential and 202 commercial properties are at risk, by 2115 3,932 residential and 377 commercial properties are predicted to be at risk. (ESCP, n.d. b).

Case Study – Medmerry

Unlike the other case studies, Medmerry is not located on Portsea island. Medmerry can be found on the Manhood Peninsula in West Sussex (Environment Agency, 2007) (Figure 41), and is one of the largest managed realignment sites in the UK (Chichester District Council and Arun District Council) (Environment Agency, 2007). In September 2013, after a long process of planning and public consultation which began in 2008, a controlled breach of the shingle beach was carried out, (Environment Agency, 2016). Although the plans were initially controversial with locals, and the group 'Save Our Selsey' was established in protest (Save Our Selsey, n.d.), the previous defences only provided a 1 in 1 year level of protection (Environment Agency, 2016). Visualisations were an important tool which helped to overcome this hostility (Adrian Thomas, pers coms, 12th July 2017). The extensive site, contained within 4.25 miles of flood embankment, is now managed by the RSPB (Royal Society for the Protection of Birds).

Figure 41 Location of the Medmerry site (within rectangle) (Google, 2017).

Figure 42 Aerial photograph of Medmerry looking south. (Environment Agency, via Institute of Civil Engineers, 2015, Annotation Author's Own)

3.7 Data analysis and presentation

Data Analysis

The data collected from these three techniques will be presented together within Chapter 4. Both online and onsite questionnaires data will be analysed within Microsoft Excel. Onsite questionnaire data will be manually inputted, whereas online questionnaire data will be exported from Google Sheets into Excel. The qualitative nature of the data collected from the open questions within email questionnaires is not appropriate for statistical analysis within Excel (Fink, 2017). Therefore, useful quotes and relevant information within these responses will be added to the discussion of results, and as well as the recommendations within Chapter 5.

Data Presentation

Quantitative data collected from online and onsite questionnaires shall be presented within tables and visually within pie and bar charts. Data within survey samples will be cross-referenced where appropriate, which will offer a more valuable discussion. In addition, data from both online and onsite questionnaires will be discussed together, with additional comments from expert email questionnaires.

Qualitative data will be analysed, and interesting or common comments will be identified and presented simply within figures. In addition, large qualitative data sets shall be analysed for common words and presented within Word Clouds. A word cloud is a "visual depiction of words. The more frequent the word appears within the text being analysed the larger the word becomes" (Ramsden &

Bate, 2008, p. 1). This presentation technique allows the viewer to quickly identify key words (Ramsden & Bate, 2008). This will be carried out via free, internet software (https://wordart.com/; https://wordcounter.com/).

3.8 Conclusion

This chapter has provided a thorough investigation into the use and development of questionnaires as a research method. This has allowed the most appropriate methods of data collection for this research topic to be identified. The development and use of these three methods; online, onsite and email questionnaires, has been explained.

The three locations selected for onsite questionnaires have been identified as; Milton Common, Southsea and Medmerry. The coastal management which has taken place, or is due to take place, at these collections has been introduced.

Finally, this chapter has outlined the methods by which the results from these methods will be analysed and presented. The subsequent presentation and discussion of results forms the next chapter.

Chapter 4. Results and Discussion

4.1 Introduction

This Chapter contains the results, and subsequent discussion, of the research methods outlined in Chapter Three. Firstly, the results from online questionnaires will be presented. This will be followed by the results from onsite questionnaires. Throughout this presentation of results, the discussion shall refer back to those results already presented as well as to the feedback provided by experts via email questionnaires. This chapter will aim to achieve objectives two and three, as outlined in Section 1.3.

4.2 Online Questionnaire Results

The online questionnaire (Appendix 2), was divided into five sections:

1. General Questions
2. Settings of Visualisations
3. Preference
4. Opinion
5. Other Information (Demographic Questions)

The results from these sections have been reordered and cross referenced within the following discussion and figures.

The questionnaire was completed by 164 participants between 27th June 2017 and 28th July 2017. It is difficult to say what is it a 'good' sample size (Fink, 2017). This is especially difficult for online questionnaires shared by social media as participants volunteer themselves. Considering Kayam and Hirsch (2012) conducted an online questionnaire also shared via social media but over a three month period, and considered 232 participants to be "a great success" (p. 65), 164 responses over one month can also be considered successful. All participants successfully completed each question, due to the online format, and therefore there was no need to remove incomplete responses (Myatt et al, 2003).

Respondent Characteristics

Table 19 shows the breakdown of all respondents by age group. The literature indicates that using social media as the primary distribution method may result in responses only from those under 40's (Sue & Ritter, 2012). However, under 44's made up only 61% of respondents (Figure 44). People 45 and over made up 38% of responses. Although, no generalisations can be made about the general public due to a nonprobability sampling technique (Sue & Ritter, 2012). Figure 44 shows respondents by highest level of education. 43% of respondents indicated undergraduate degree as their highest

level of education. This, again, may to attributed to the method by which the questionnaire was shared. This age and education data will be reused within the following sections to investigate any trends.

Age	Count
Not Disclosed	1
16-24	46
25-34	37
35-44	17
45-54	26
55-64	18
65-74	14
75 plus	5
Total	164

Table 19 Total online questionnaire respondents by age group

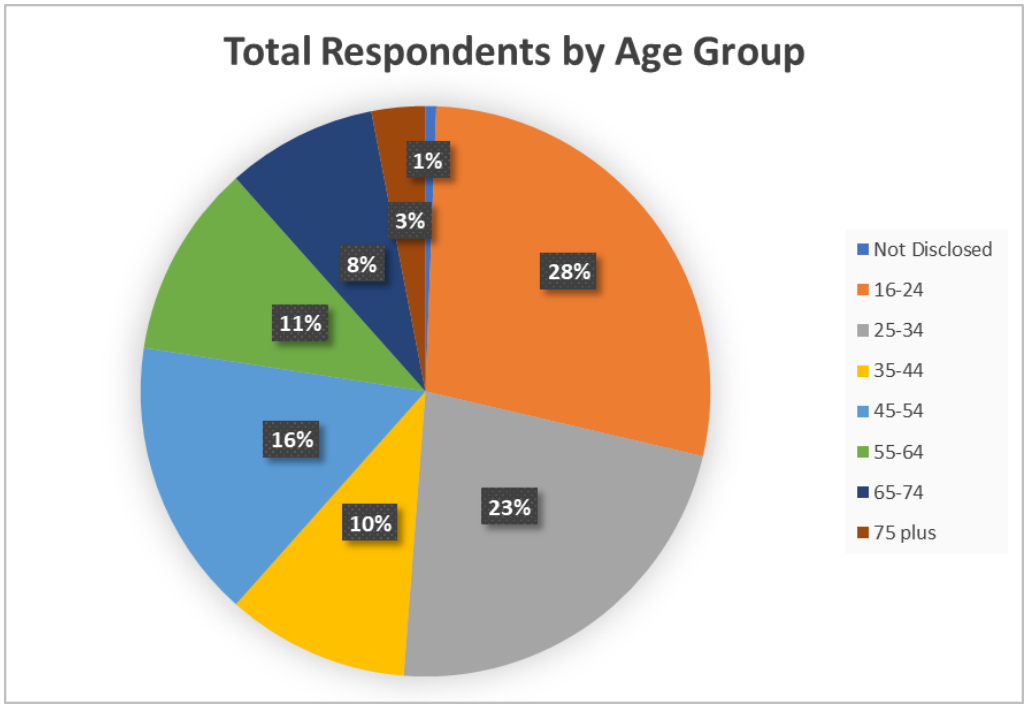


Figure 43 Percentage of online questionnaire respondents by age group

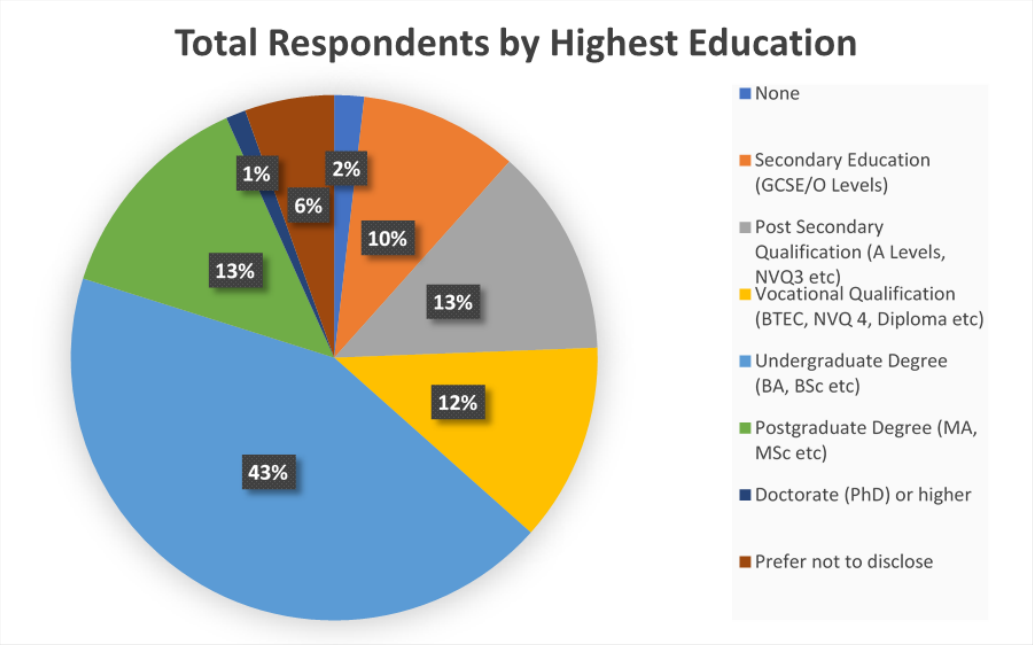


Figure 44 Percentage of online questionnaire respondents by highest education

General Questions

66.5% of online questionnaire respondents had not taken part in a public consultation (Figure 45). This was expected as participating within PP can be time-consuming, and the pressures of modern life normally take priority (King et al, 1998; Iannaccone & Everton, 2004). Although only 32.3% of participants reported that they had previously taken part, this may display a 'good' level of public interest (Adrian Thomas, pers. coms, August 2017). It is hard to define what would be considered as a 'good' level of public interest (Adrian Thomas, pers. coms, August 2017). To engage more of the public publicity for consultation "needs to be really 'in your face", as it isn't that the public are not interested,

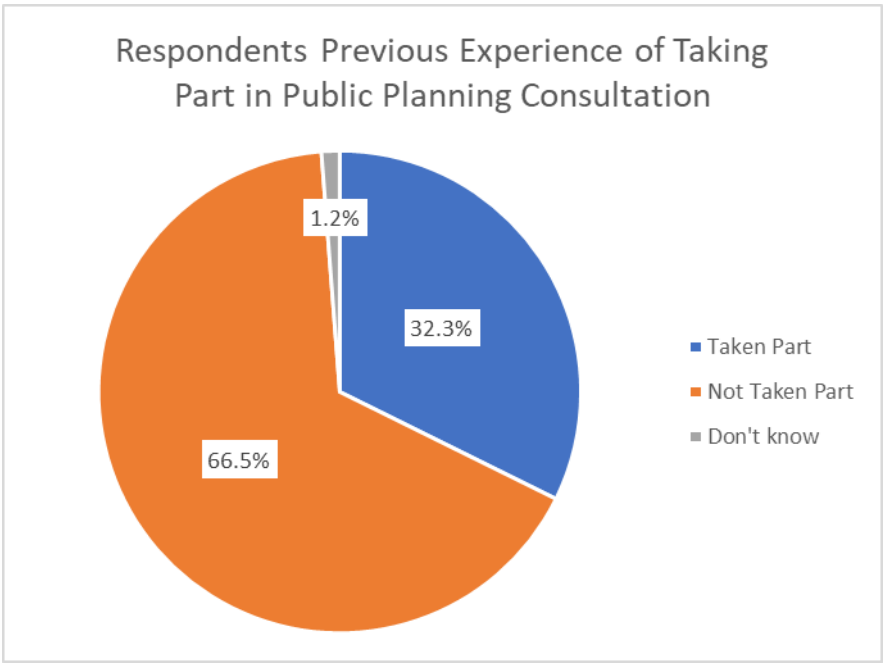


Figure 45 Participants previous experience of public planning consultation

but they simply may not be aware (MPP Project Officer, pers. coms, August 2017). This could be especially true of coastal management. To increase engagement there are a wide array of tools which can be used, and diverse group agencies which must work together (Adrian Thomas, pers. coms, August 2017; Simon Cramp, pers. coms, August, 2017).

This data can be broken down age group and education level. Table 20 shows that those over 35 are more likely to have taken part in PP than those who are 34 and under. However, Figure 46 identifies the number of participants within each age group and shows that there were fewer participants in the over 35 categories, meaning these results could be unrepresentative. A clear trend cannot be seen in Table 21, as 44% of those with secondary education identified that they had taken part in PP, whereas much less of those with post-secondary education (10%) had taken part. Figure 47 illustrates this data by participant numbers, and shows that significantly more participants with undergraduate education took part than other categories. Although this data does not evenly represent age or education, it does show that participation across age and education levels is not the same, and shows that demographic groups can be systematically excluded (Roberts, 2004), and that specific methods of PP should be used in attempt to include these groups (Morgan, 1998).

Age Group	Taken Part	Have Not Taken Part	Don't Know
16-24	20%	80%	0%
25 -34	16%	81%	3%
35-44	47%	53%	0%
45-54	46%	54%	0%
55-64	39%	56%	6%
65-74	43%	57%	0%
75 plus	80%	20%	0%

Table 20 Cross-tabulation of previous experience of public planning consultation and age, by percentage.

Level of Education	Taken Part	Not Taken Part	Don't Know
None	0%	100%	0%
Secondary Education (GCSE/O Levels)	44%	56%	0%
Post Secondary Qualification (A Levels, NVQ3 etc)	10%	90%	0%
Vocational Qualification (BTEC, NVQ 4, Diploma etc)	30%	65%	5%
Undergraduate Degree (BA, BSc etc)	35%	65%	0%
Postgraduate Degree (MA, MSc etc)	32%	64%	5%
Doctorate (PhD) or higher	50%	50%	0%

Table 21 Cross-tabulation of previous experience of public consultation and education level, shown by percentage.

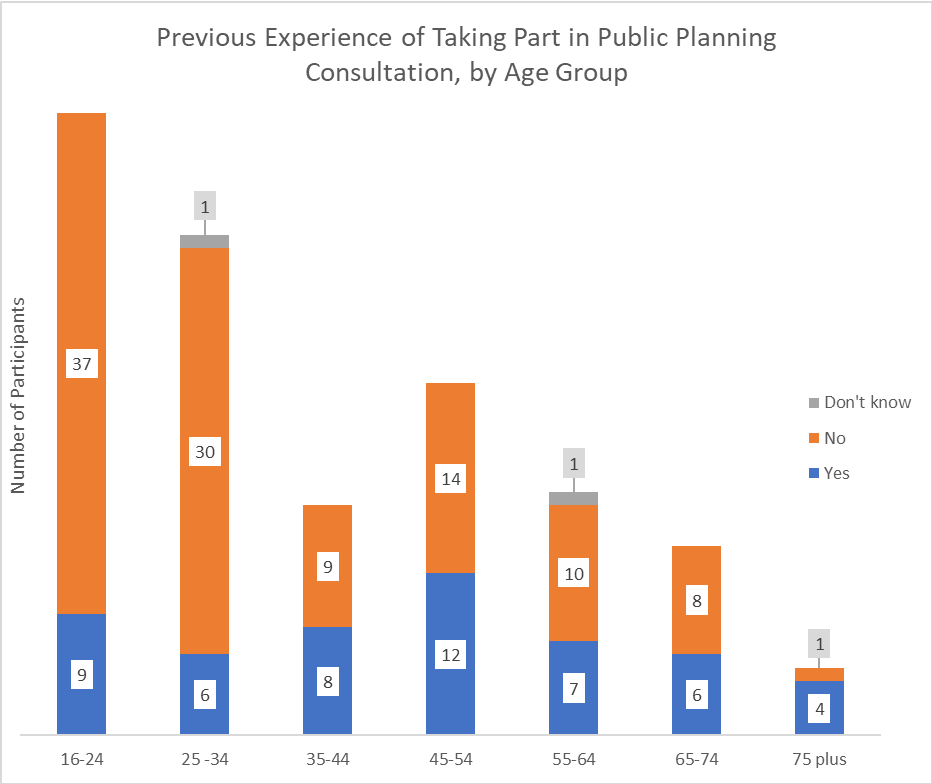


Figure 46 Cross-tabulation of previous experience of public planning consultation and age shown in a stacked column chart

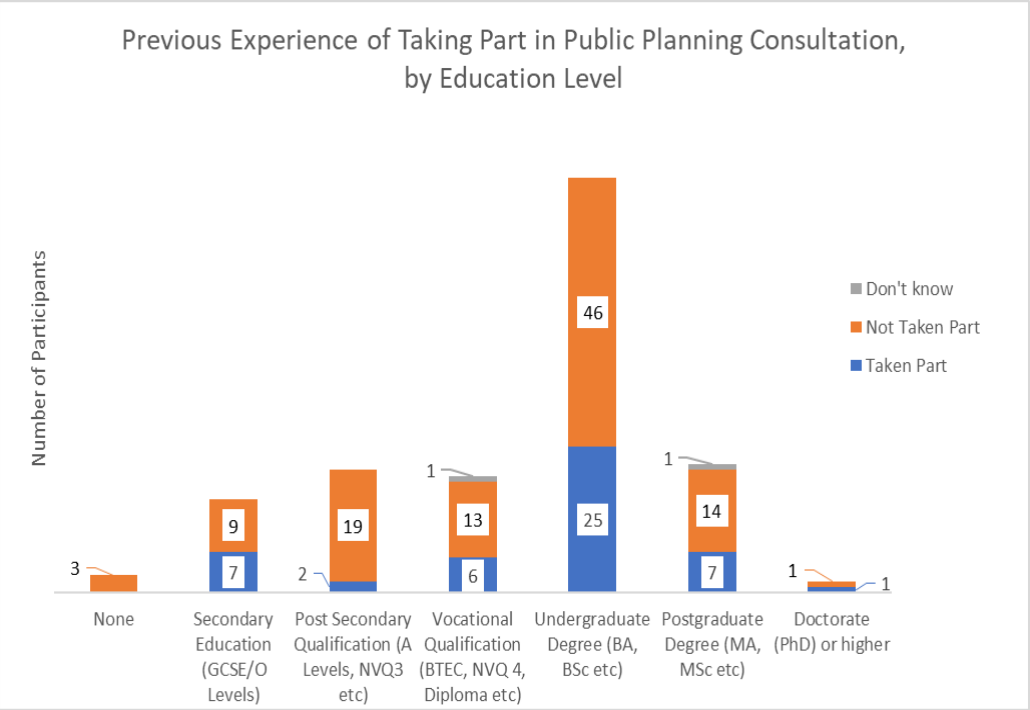


Figure 47 Cross-tabulation of previous experience of public planning consultation and education level shown in a stacked column chart

Figure 48 shows respondents understanding of visualisations. This question was included to establish respondents basic understanding of visualisations, as this may have a profound effect on their answers to the proceeding questions. This question provided three fixed responses (seen in the legend of Figure 48), with a free-response option of 'Other'. These response options were shuffled for each participant, to avoid a trend due to ordering. Figure 48 shows that 86% understood visualisations to be 'used to help the public understand how the development might affect them'. This shows that most respondents correctly understood the purpose of visualisations. Only one respondent choose the 'Other' option (Figure 49). This respondent also demonstrated an understanding of visualisations via their response. 13% of respondents did not completely understand the purpose of visualisations, however, their responses to subsequent questions are still valid. This data shows that not all members of the public understand that visualisations can be of use to them, and therefore more should be done to include these individuals, and help them use visualisations affectively (Morgan, 1998).

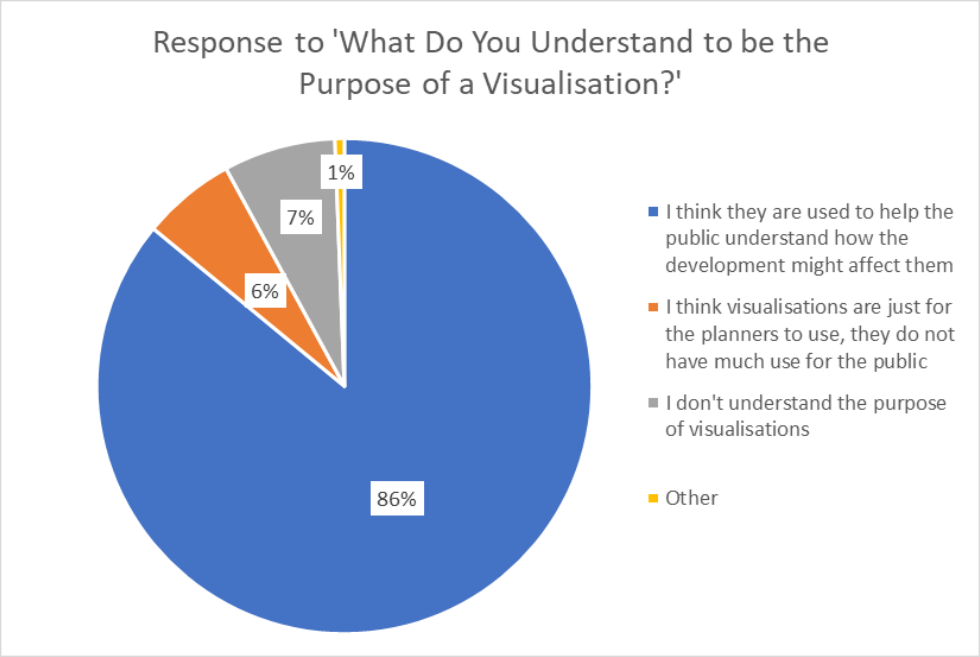


Figure 48 Participants understanding of the purpose of visualisations

> *"A visualisation provides many facets of information in a cheeentvfirm and can demonstrate (sometimes complex) relationships, plans, designs or concepts to a wide audience or stakeholders. This enables further discussion, planning, risk reduction, modifications or just simply and understanding to an audience who otherwise might have only a small or incomplete understanding of the situation."*

Figure 49 Free-response answer from one respondent for the question 'What do you understand to be the purpose of a visualisation' – direct quote

Settings of Visualisations

Respondents were shown five visualisations within different settings; a major events development, a small town retail development, a residential development, an offshore wind farm and a coastal defence development, and asked to indicate whether they had previously seen a visualisation within that type of setting. These questions helped to establish the type of visualisations respondents are imagining when answering, and how many had experienced visualisations of coastal defence schemes. Figure 50 shows that most respondents had previously seen visualisations in a major events, small town retail or residential development setting. Fewer respondents, 65% and 74%, had experienced visualisations in an offshore wind or coastal defence scheme setting. This was expected, as it could be presumed that those who don't live by the coast would be less likely to be targeted within an offshore wind or coastal defence public consultation. However, given the amount of research around the visual effects of offshore wind farms (Lange & Hehl-lange, 2005) it interesting that this was the least identified setting. 25 of the 164 respondents answered question 8 and identified other settings that they had experienced visualisations. Table 22 shows that road developments were the most mentioned.

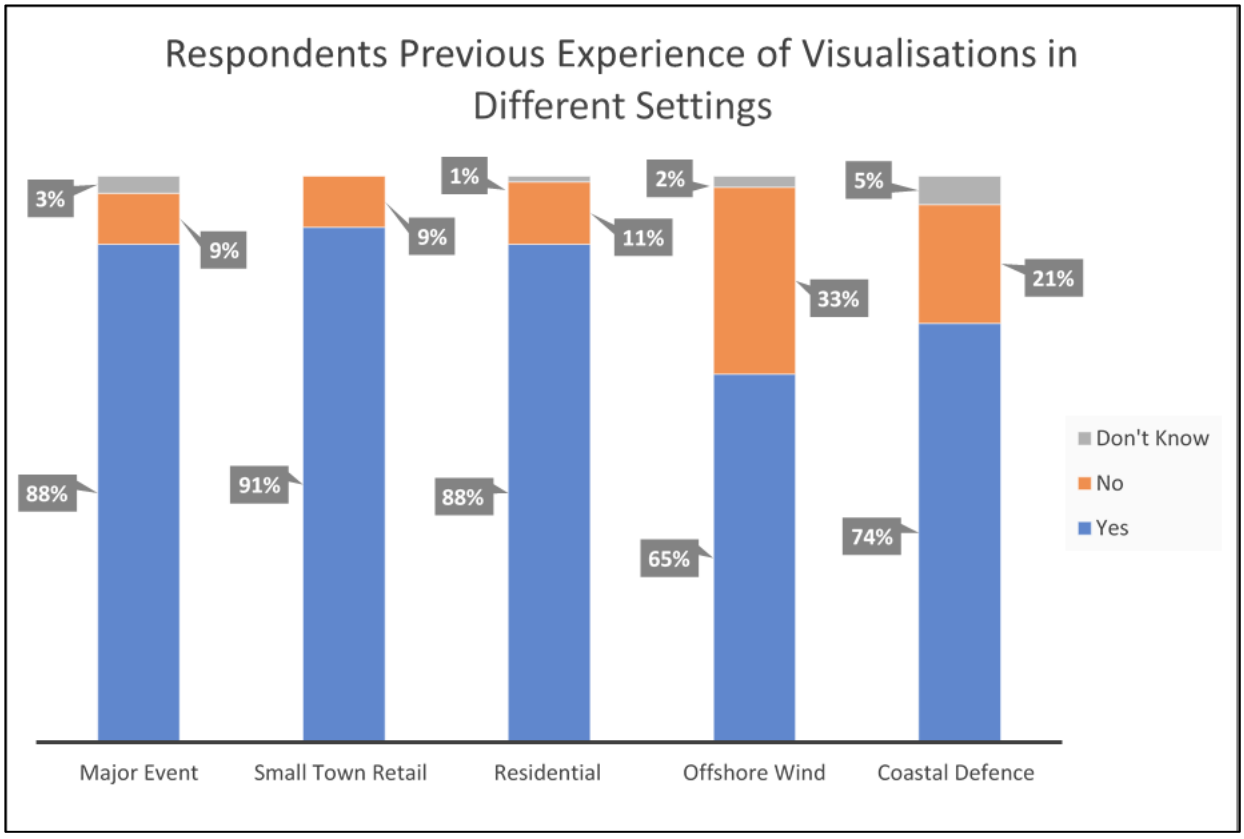


Figure 50 Participants previous experience of visualisations

Type of Setting	Number of instances mentioned
Road development (inc. bypasses)	9
Railway development	4
Town Centre	3
Road development (tunnel)	2
Major high-rise (inc. The Shard)	2
Airport development	2
Theatre Complex	1
Shopping Centre	1
School building	1
Parks/Green Spaces	1
Hospital development	1
Environmental development	1

Table 22 The other settings of visualisations which respondents identified, and the number of instances they were identified (settings covered within the previous questions have been omitted)

Preference in Style

Respondents were asked one closed question about their preference between an artistic impression and a photographic impression, and another about their preference between a still and moving impression. Each of these questions was followed by an open question asking why they preferred their choice.

Figure 51 shows that 85% of respondents preferred a photographic impression to an artistic impression. The preference for a photographic is interesting, considering Appleton & Lovett (2005) found that most respondents found artist impressions the most familiar, and computerised images based on map and GIS data the least familiar. This choice in preference was analysed by age and education, but as most participants choose the photographic impression this data was inconclusive.

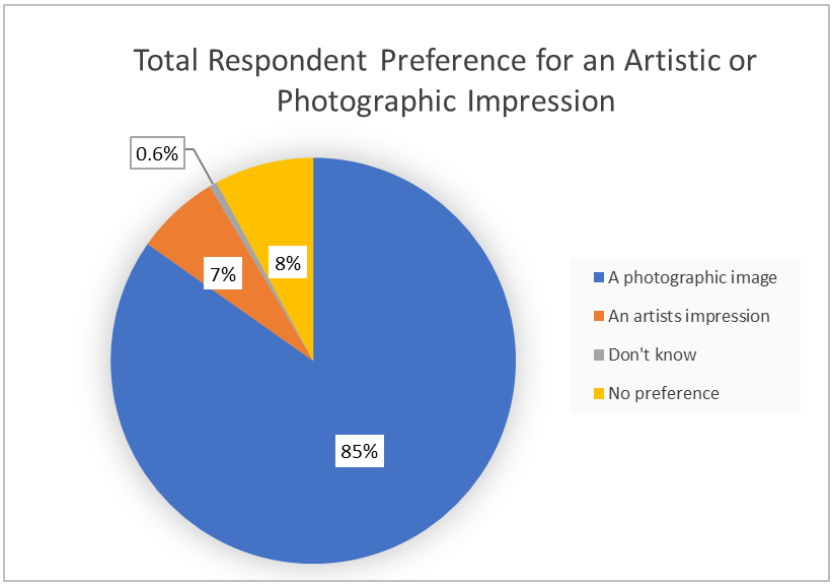


Figure 51 Participants preference for an artistic or photographic visualisation

Figure 52 shows some of the most commonly used words to explain why participants preferred a photographic option. 'Realistic' was the most used word (mentioned 44 times), showing that most respondents preferred a visualisation which was more lifelike. This shows the importance of providing a point of view which is relevant to the audience (Simon Cramp, pers. coms, August 2017). Some respondents who preferred a photographic impression also used this open-question to comment on why they did not like the artist impression. Figure 53 shows some of these comments. Many centre around the artist style being an impression, and open to artistic licence. The final comment is particularly interesting, which comments that the visualisation looks like a child's drawing. These positive comments about the realism of a photographic impression agree with the LVIA guidance (Landscape Institute and IEMA, 2013).

Figure 52 Word Map of reasons why respondents preferred a photographic impression rather than an artist impression. Diagram includes 23 of the 50 most used words, from the 139 respondents whom preferred this option.

11 respondents preferred an artist impression. However, their comments show that their reasoning as to why they preferred this image could possibly centre around other factors rather than the visualisation style. Figure 54 shows seven of these responses, six of whom mention the perspective of the image – being eye-level, and one mentioned the artist impression not being pixelated. Therefore, it could be that these respondents may have preferred the photographic style if it was from a different

"…artists impression is just an impression."
"I am inclined to mistrust an artist's impression, where details and proportions are more easily fudged for aesthetic appeal."
"The artist was a good drawing, but did not show the bigger picture."
"Artist takes artistic licence, photograph gives actual picture."
"…the artist visualisation looks like it's been draw by a child"

Figure 53 Comments from respondents who preferred a photographic impress, explaining why they did not like the artist impression.

perspective or 'not pixelated'. This confirms that a realistic 'eye-level' perspective is preferable (Downes & Lange, 2013). The other four respondents who preferred an artist impression commented that it was clearer, warmer, more passionate and looked nicer. These comments confirm that preference is very much a personal opinion (Sheppard, 2005).

"It gives a brief as seen from ground level as if you are actually there"
"This is what I would see if I was there"
"It is was it would look when standing beside new buildings"
"It is at ground level as you would see it"
"It is at ground level looking up. Feels like you are there"
"The artists impression isn't pixelated"
"It looks as it would if you were walking by it."

Figure 54 Responses from 7 of the 11 respondents who preferred an artist impression

13 respondents had no preference between the two options. Of these respondents, five did not give a reason as to why they did not have a preference. Another five made comments that the images were both either equally good or bad. One respondent mentioned that their preference would depend on the type of development, agreeing with the LVIA Guidance (Landscape Institute and IEMA, 2013).

Participants were then shown a moving and still visualisation, and asked which they preferred and why. Figure 55 shows that 58% of respondents preferred a moving image. Figure 56 shows 20 common words used by these respondents when describing why they preferred this option. Together this qualitative data shows those respondents preferred moving visualisation as it shows the development from more angles and therefore felt it was clearer, gave more detail and was more realistic. This agrees

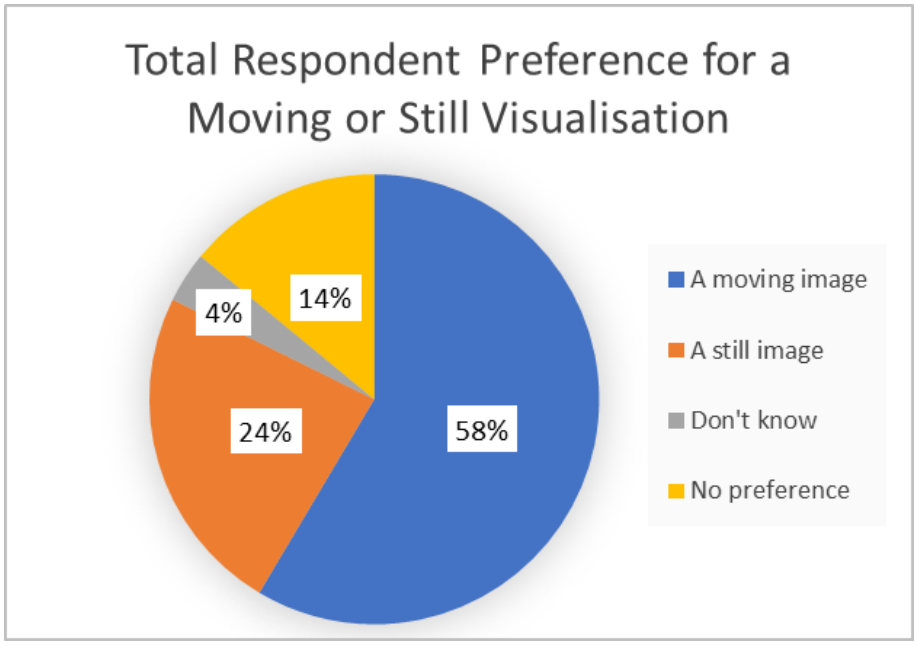


Figure 55 Participant preference for a moving or still visualisation

with research into 360° panoramas and virtual reality, which by allowing participants to 'look around' increased their sense of presence (Higuera-Turjillo, Maldonado & Millan, 2017).

Figure 56 20 commonly used words in respondents responses whom preferred a moving visualisation

39 respondents identified that they preferred the still visualisation, and gave comments as to why. 24 comments, or parts of comments, were about why they preferred the still image. Figure 57 shows 19 common words used within these comments. This word cloud illustrates these participants preferred the still image as they considered it to contain more detail, be easier to focus on and be clearer. 18 comments, or parts of comments, from these participants were about why they did not prefer the moving image. Table 23 has categorised these comments by type. This shows that most

Figure 57 19 common words, used by at least two respondents, who made a comment as to why they preferred the still visualisation

Type of Comment	Count
Didn't add anything/no detail	6
Motion of the video/nausea	4
Confusing	4
Lost interest/too long	3
What the planner wants you to see	1

Table 23 Categorised comments from participants who preferred a still visualisation, as to why they did not prefer a moving visualisation

comments about the dislike of a moving image were due to its lack of detail. Although Al-Kodmany (2002) comments that motion pictures are illustrative and engaging, they agree that 'off-the-shelf' software can suffer from a lack of detail and realism. Four comments were made about the moving image being confusing, and another four said it made them feel 'giddy' or even 'nausea inducing'. Side effects such as nausea have been previously found, but within head-coupled immersive virtual reality (Regan, 1995). One respondent who commented on the length of the moving visualisations did suggest that they lost interest as they do not have a stake in the development shown, suggesting if they felt more emotive towards the visualisations their opinion might differ. This agrees with Lange (2001), who found that those local to developments felt more emotive about visualisations.

Figure 58 breaks down this preference by age group by number of participants, and Table 24 shows them as a percentage of each age group. Stereotypically it is seen that older people are more adverse

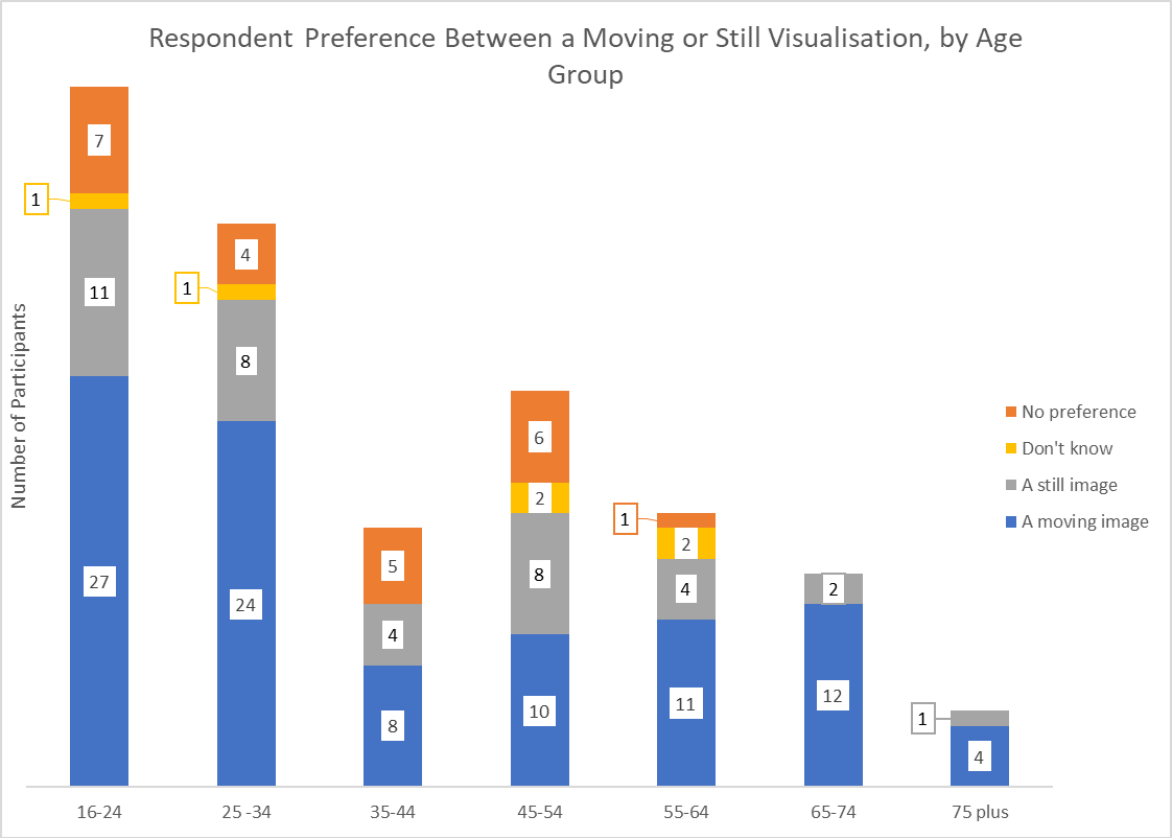


Figure 58 Cross-tabulation of preference between moving or still visualisations and age, presented in a stacked column chart

Age Group	A moving image	A still image	Don't know	No preference
16-24	59%	24%	2%	15%
25 -34	65%	22%	3%	11%
35-44	47%	24%	0%	29%
45-54	38%	31%	8%	23%
55-64	61%	22%	11%	6%
65-74	86%	14%	0%	0%
75 plus	80%	20%	0%	0%

Table 24 Cross-tabulation of preference between moving or still visualisations and age, by percentage of age group

to technology (Mitzner et al, 2010), and therefore it could be assumed that older people would be more inclined to prefer a still, less technologically complex image. This data shows there isn't a particular trend between preference of still or moving and age, which is confirmed by Mitzner (2010) and colleagues findings, who found that contradictory to stereotypes older people show positive attitudes towards technology.

Opinion Questions

Respondents were asked if they felt that visualisations helped them to understand the proposed plans for new developments. Figure 59 shows that 94% of participants said that visualisations would help their understanding of proposed plans. Only ten of the 164 participants said that either were not

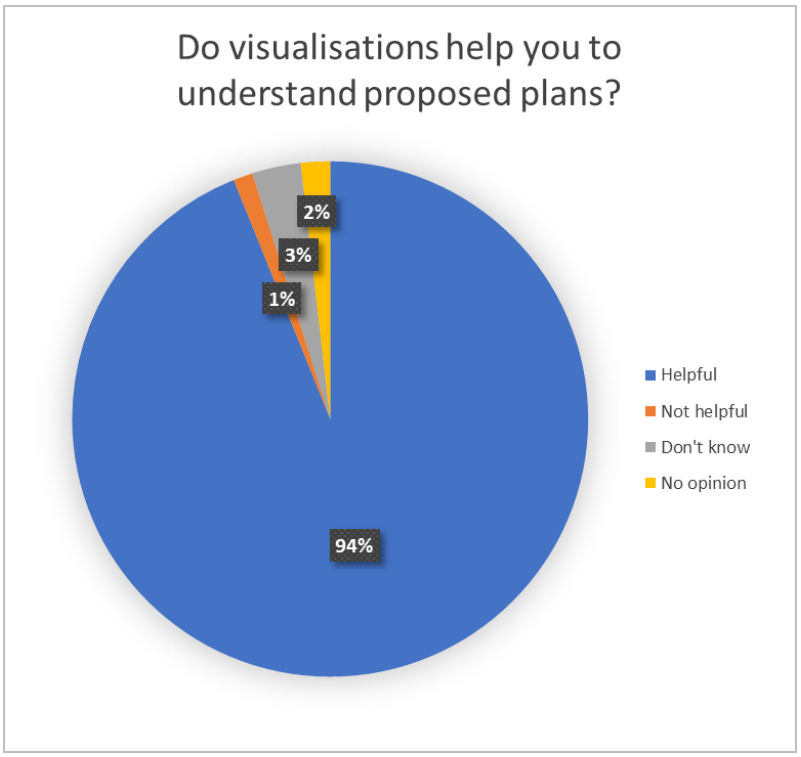


Figure 59 Pie chart showing whether participants found visualisations helped their understanding

helpful, they didn't know or had no opinion. This response agrees with that of Lange & Hehl-Lange (2005) who found that all stakeholders asked found visualisations helpful.

Respondents were much more divided when asked whether they trusted visualisations. Trust can be a fundamental factor in public participation (Walters, Aydelott & Miller, 2000; Halvorsen, 2003). Figure 60 shows that trust was nearly evenly divided between trust, don't trust and don't know – with only 40% of participants saying that they trusted visualisations. 29% of participants identified that they do not trust visualisations. In previous research mistrust within PP has been identified towards political systems and government agencies (Tress & Tress, 2003; Myatt et al, 2003), therefore participants may carry across this mistrust onto visualisations, especially if they presume that visualisations have been created by, or for, these agencies. This is especially true if people have experienced a poor consultation strategy previously (Adrian Thomas, pers. coms, August 2017). Although visualisations may be distrusted by some this does not mean that they are not useful (Karen McHugh, pers. coms, August, 2017), and this is confirmed by Figure 59, as 94% of the same sample said that they found visualisations helpful.

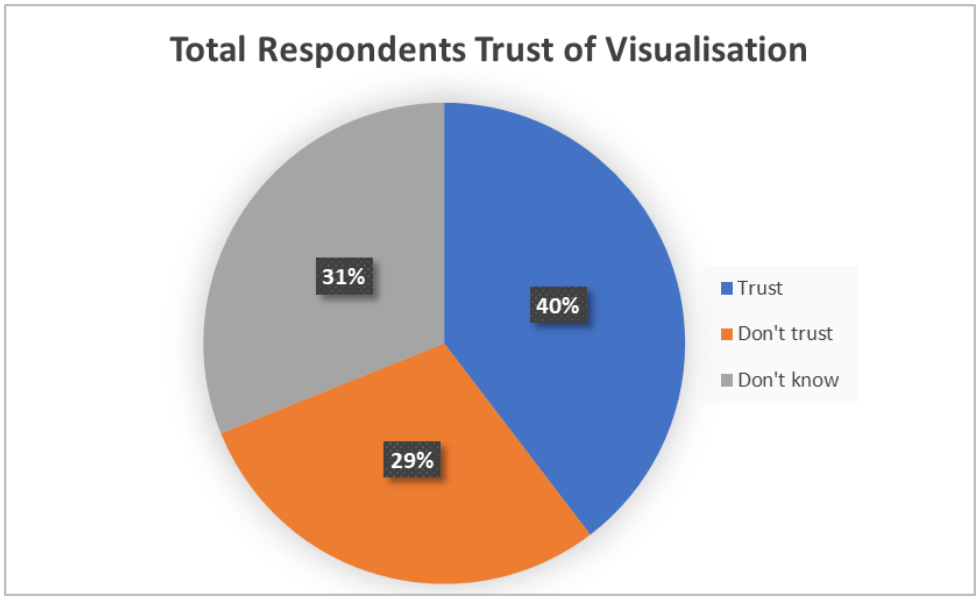


Figure 60 Participants trust in visualisations

Participants were asked to explain why they trusted or did not trust visualisations. These responses were highly varied, and therefore it was not possible to code them. 62 respondents identified that they trusted visualisations, 11 of these expressed that they 'knew' that there would be small changes to the plans, and 4 drew upon previous positive experience. Figure 61 shows 12 interesting comments from these participants. Comments 1-3 comment on how the professionalism of those involved in the planning and production of the visualisation would improve their trust. Comment 4 suggests that the

visualisation presented to the public would show the final plans – however, if this is the case then there is no ability for the public to change the plans. Comments 5 and 6 show trust of the planning authorities to ensure that visualisations are representative. Comments 7 – 10 question why planners would create a miss representative visualisation, with one participant (Comment 8) saying that the question has "got me thinking!". Comments 11 and 12 say that although they trust the visualisation more information would be needed – "in isolation they do not provide context", which would be true in a 'real world' consultation (Adrian Thomas, pers. coms, August 2017).

1. I trust that they will be a realistic representation of the plans by a professional company, not intended to deceive.
2. I'd hope the time/money spent on producing the visualisation would be accurate.
3. I would trust that the contractors, architects and developers would be working with the same design as the visualisations would be showing…of course there's room for change and often nothing really can prepare you for the real thing.
4. I think by the time it has got to the stage that a visualisation is being created, the plans must be pretty concrete and so it is unlikely that they will change in any foreseeable way. I would trust that anyone with a better understanding than me would have checked and been able to see any discrepancies between written plans and the visualisation.
5. They would have to be realistic or they wouldn't be allowed by the planning authority.
6. Overall I do trust that this is what the final and true representation of the development will be, I do understand that small changes and issues can arise during construction, however planning permission dictates that you must stick to the plan which would give me more peace of mind.
7. Why would a developer place incorrect information given that it may well be built and then judged against the visualisation.
8. You would hope that those responsible would be honest about something so important. It never occurred to me that they might not be. Now you've got me thinking!
9. You hope that what you are shown will be what is planned. If I was shown an image I would want that to be what I'm expecting and if something different was built, what was the point in the visualisation in the first place?
10. As it would be force to representative a plan of new development by giving the wrong image of it. To get people views and on board you need to give the right image of the development otherwise what's the point of getting people to produce the image at the beginning. It is also a good method for marketing the development.
11. I would need more information about the location, the reason for building it, the time frame etc (especially if I were a resident in the local area where this development would affect me).
12. In isolation they do not provide context, and need to be supported by text and/or narrative. If supported in this way they provide a very powerful communications method.

Figure 61 Participants responses as to why they trust visualisations

Of the 47 participants who said they did not trust visualisations, 24 gave their reasoning as the plans would change. This highlights the importance of information transfer between parties, and the use of visualisations alongside other methods (MPP Project Officer, pers. coms. August 2017). 51% of those surveyed by Myatt and colleagues (2003) identified that they would prefer to be consulted whilst there were a number of options to choose between. If this was to happen then plans would not be finalised. This raises the question of when within the planning framework the public are consulted, as confusion

may arise when visualisations change. To build and maintain trust it is vital that the consultees are provided up-to-date, accurate and reliable information (Simon Cramp, pers. coms, August, 2017).

Figure 62 breaks down this trust data by age group. As can be seen in this Figure age groups are not fairly represented, and therefore general assumptions cannot be made. Figure 63 shows this information via the percentage of each age group. Figure 63 shows that there is no clear pattern spanning all age groups. But the amount of trust does clearly decrease between the ages of 16-24 and 45-54. 52.2% of 16-24-year-olds trusted visualisations, this number steadily decreases to 23.1% within the 45-54 age group. This somewhat agrees with Diduck and Sinclair (2002), who found that those

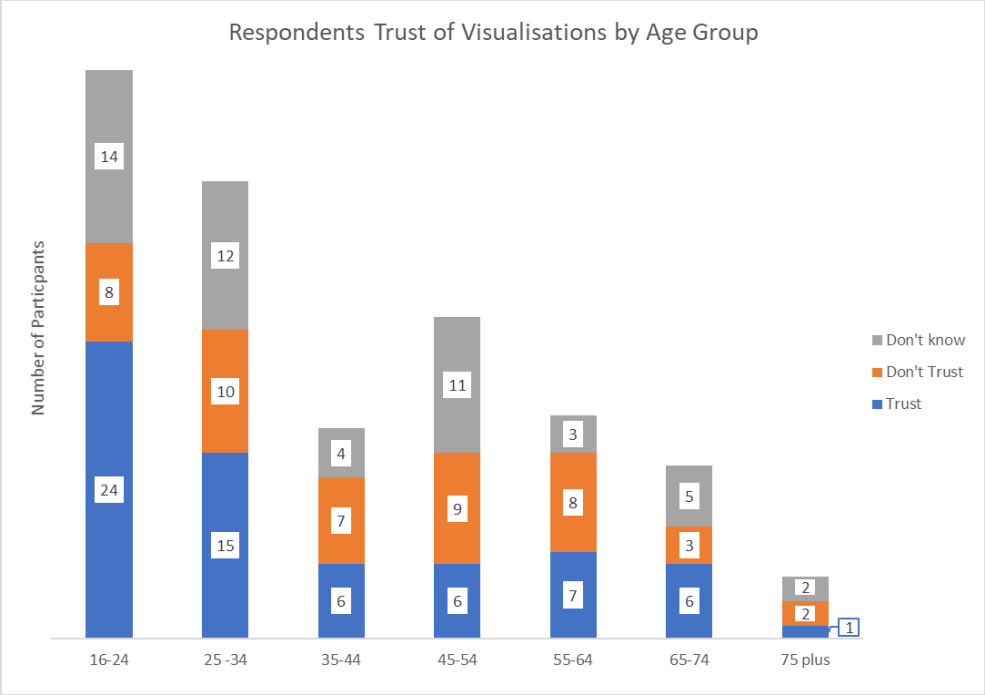


Figure 63 Cross-tabulation of trust and age, presented as a stacked column chart

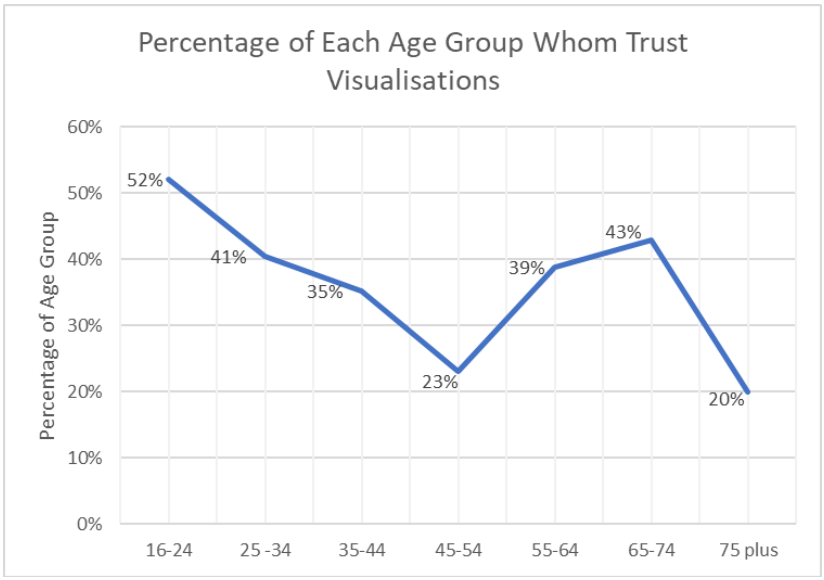


Figure 62 Cross-tabulation of trust and age, presented as percentage of age group, in a scatter graph

over 56 years were more likely identify mistrust with the government as a reason to not participate within PP. Due to these results, and the trend seen between the ages of 16 and 54 in Figure 63 it could be assumed that trust decreases with age. However, this would be incorrect as this Figure also shows a higher level of trust in the age groups of 55-64 and 65-74.

Figure 64 shows level of trust by education level. Again, this graph shows that the survey population does not represent these education levels evenly. However, using Figure 65 and the percentage of each age group whom trust visualisations can be seen. Although there is no clear overall pattern, there is a steady increase in trust as education level increases from post-secondary qualifications to post graduate degree. However, Lipster and Schneider (1983, in Myatt et al, 2003) disagree with this trend, with an increase in education being attributed to a decline in trust. Regardless, it would be wrong to presume that trust increases with education, as those with secondary education qualifications were more trusting than those with post-secondary or vocational qualifications, and those with the highest level of education (Doctorate or higher) showed no trust. In addition, due to the sample size and representativeness of the data it is not possible to draw generalised conclusions.

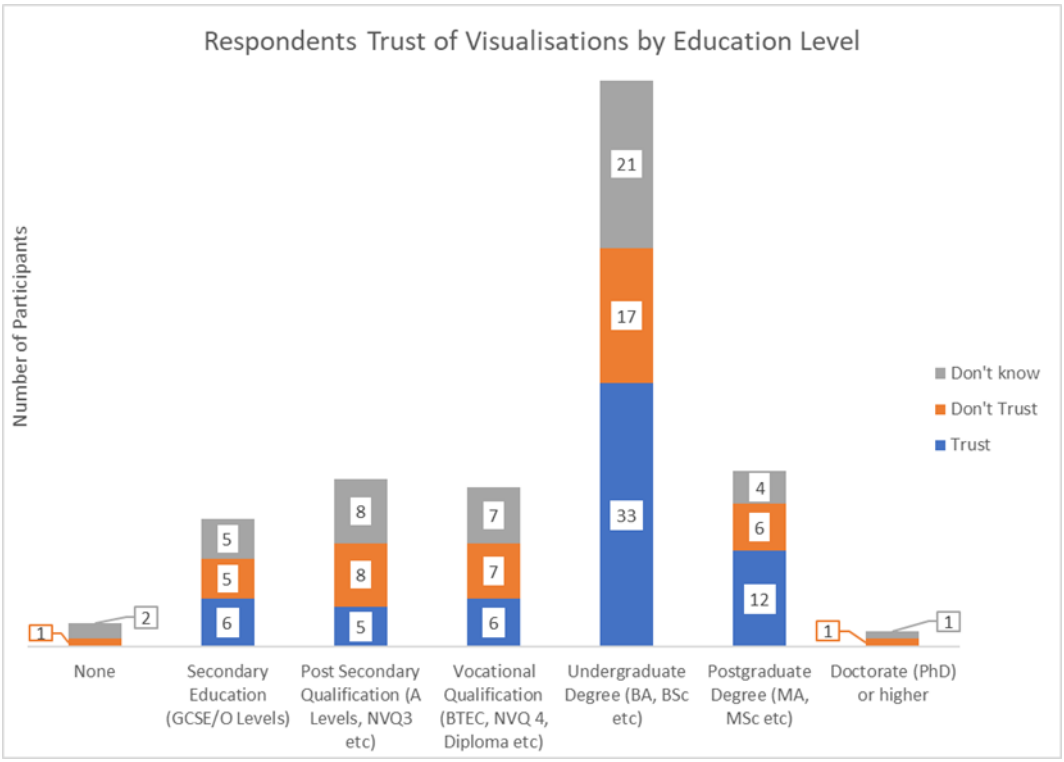


Figure 64 Cross-tabulation of trust and level of education, presented as a stacked column chart

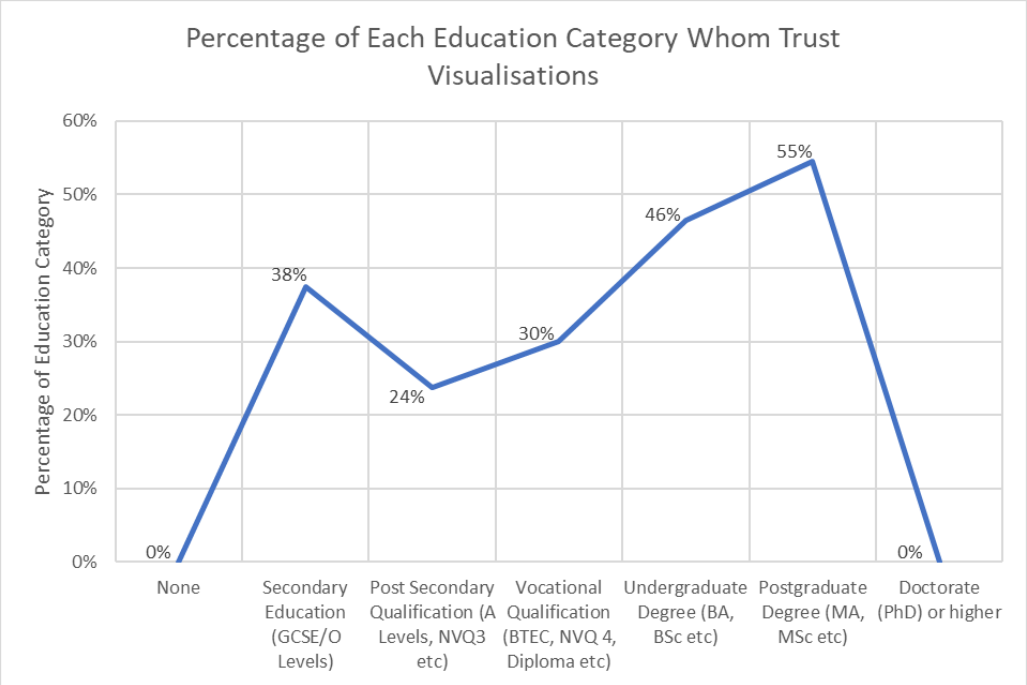


Figure 65 Cross-tabulation of trust and level of education, by percentage of education level, presented in a scatter graph

Figure 66 shows participants level of trust in comparison to their previous involvement with public consultation. This shows that those who had taken part in public consultation were more distrustful of visualisations (34%), than those who had not (26%). This contradicts Diduck and Sinclair (2002), who identify those who do not participate as more distrustful of government agencies. However, the largest proportion of previous non-participants (38%) identified that they did not know if they trusted the visualisations. This could be due to their lack of previous experience, which some participants used within their explanations as to why.

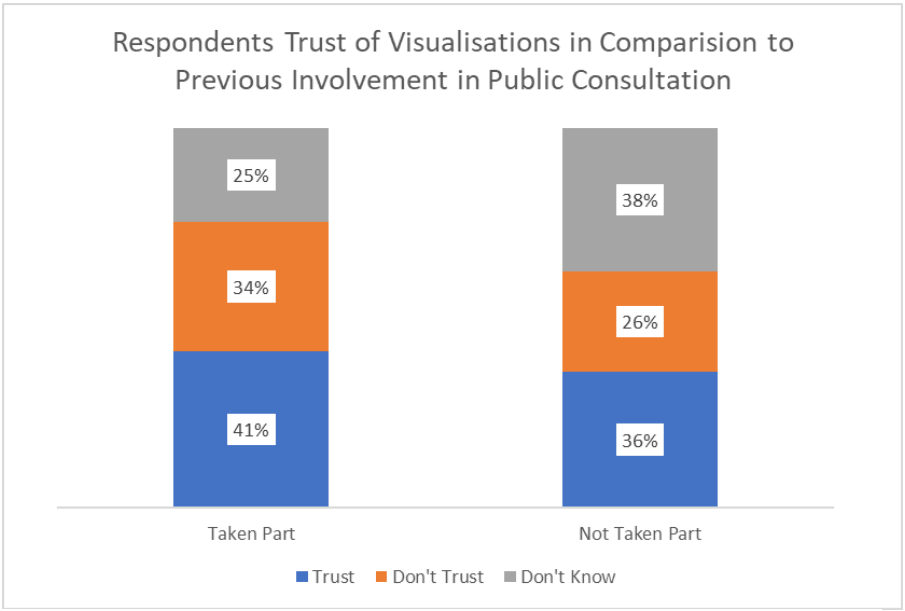


Figure 66 Cross-tabulation of trust and previous involvement in public planning consultation

4.3 Onsite Questionnaire Results

Onsite questionnaires were planned for three sites, as discussed in Chapter Two. Due to unforeseen circumstances discussed in Section 5.2 data was only collected from two of these sites; Milton Common and Southsea. These questionnaires were short consisting of five questions, due to piloting. As the defences at Milton Common had been constructed, and the defences at Southsea had not, the questionnaires were the same, except for questions 2 and 3. For these site specific questions a visualisation of the site was used. The visualisation used a Milton Common was classed as an artists impression, and that at Southsea a photographic impression. The results from these site specific questions will first be presented, plus any other comments made by participants at each site, followed by the results from questions carried out on both sites.

Total Number of Responses

25 responses were received at Milton Common, over three days of surveying. Of those who were approached to take part, only two declined, giving a 93% response rate. 16 responses were received at Southsea, from one day of surveying. Of those who were approached to take part, only two declined, giving an 89% response rate. This compares favourably with previous research using a mixture of methods including onsite questionnaires (Humphrys, 2008), which received response rates of between 100% and 68.4%. In total, 41 responses were received from onsite questionnaires. This very similar to the number of responses received by Myatt and colleagues (2002), and is higher than the work of Shackleton and colleagues (2011).

Of the 41 responses six participants were unable to answer either one or two of the questions. Although some previous researchers (Myatt et al, 2003; Shackleton et al, 2011) have removed these partly completed responses, others (Kaplowitz, Hadlock & Levine, 2004) have not. Due to the lack of data collection at one site, it was decided to include these partially completed responses as they are still of interest.

Milton Common Results

Participants at Milton Common were asked to rate whether the visualisation gave a realistic impression of the area. Table 25 shows that most (72%) participants considered the visualisation to be either a realistic or very realistic representation of the site post construction. This data agrees with previous research into visualisation realism; Lange (2001) found that 75% of participants found at least one type of presented visualisation realistic, and Lange and Hehl-Lange (2005) found that 66% of participants found visualisations realistic to some level.

Rating	Description	Count	Percentage
1	Very realistic	4	8%
2	Realistic	16	64%
3	Don't know	2	12%
4	Unrealistic	3	16%
5	Very unrealistic	0	0%

Table 25 Table showing how realistic all participants at Milton Common rated the visualisation, in comparison to real life.

Participants were then asked the elaborate upon their rating. Two participants, who both rated the visualisation as 'very realistic', were unable to answer this question. Table 26 presents each of these responses. Those respondents who rated the visualisation 'very realistic' and answered this open question, did not provide much elaboration. The 16 participants who rated the visualisation 'realistic' did provide a range of criticisms, even though they rated the image so. Some mentioned that it lacked in detail, that certain areas of the landscape were not the same, and that the general setting of the area was missing. One commented that it was 'mostly a foreground image', with another saying that is was 'more of a diagram'. These criticisms are fair of artist impressions, with the literature (Al-Kodmany, 2002; Landscape Institute and IEMA, 2013) commenting on the lack of accuracy with this technique.

Rating	Why
1	Colour of image
1	Clearly see the rocks
2	Pretty true to life. Missing some setting - monument, trees
2	Very simple - but don't what is too be over complicated. Slightly idealistic - i.e. no rubble. Its basic, but enough
2	8/10. Looks more robust in image.
2	Lacking detail. Poor quality. Not informative. Childlike. Could have done more. "Looks like the back of a turtle"
2	Missing road & hills in background - setting. Mostly a foreground image.
2	Cartoon impression
2	Just looks the same
2	Shows what is there. Beach in the image doesn't look the same yet.
2	Reasonable correlation with real life. More of a diagram. Good enough to express what you've got
2	Real life is more overgrown. Picture is idealistic.
2	Missing trees on top of boulders
2	Boulders are accurate
2	Reasonable correlation with real life. Some setting. Lacking some detail.
2	Missing rubble - detail
2	Quite accurate. Planting is different but due to dry weather - didn't go to plan
2	Boulders. Simplistic - in a good way - shows what it needs to
3	Simplified. Image is more pristine
3	Vegetation is not the same.
4	Less rocks in real life
4	Image is neat and tidy. Missing rubble - looks sandy in image.
4	Number of boulders in image is not the same. Colour of water - unrealistic

Table 26 Milton Common participants explanations as to why the found the visualisations realistic or not realistic (1 – very realistic, 2 – realistic, 3 – don't know, 4 – unrealistic, 5 – very unrealistic

Others commented that the image was simple, both in a positive and negative manner. A more simple image can be more accessible (Landscape Institute and IEMA, 2013), however, simplicity can limit the ability to transfer complex information, again a problem with artistic impressions (Al-Kodmany, 2002). Three participants rated the image as 'unrealistic', these participants commented that the number of boulders visible in real life was different to the visualisation, and that the colours used were

unrealistic. One of these participants said that the 'image was neat and tidy', similarly to those who choose 'don't know'. These comments which consider the image 'more pristine' show how the image could be considered unrealistic, as the detail of rubble and patches of grass and soil are missing in the image. These small details are a problem with artistic impressions (Al-Kodmany, 2002).

Five participants at Milton Common made additional comments (Table 27). Participant MC-5 commented on the weather within the image, and how different conditions effects how an area looks. This is a criticism of visualisations in general (Foley & van Dam, 1987; Downes & Lange, 2003; Landscape Institute & IEMA, 2013). Participant MC-5 also made similar comments to that of the literature (Al-Kodmany, 2002; Landscape Institute and IEMA, 2013) and mentioned that the type of visualisation depends on the circumstances and that visualisations need an explanation alongside them. Both participants MC - 8 and MC-17 both commented that the visualisation of Milton Common looked like a child's drawing. This was also identified by a participant who took part in the online questionnaire. Within a public consultation this type of negative view towards the information presented, and how money is being spent, could result in a loss of trust (Sheppard, 2005) which is slowly gained, but quickly lost (Adrian Thomas, pers. coms, August, 2017). A number of participants, but in particular participant MC-10, made comments about the actual defences either in addition, or instead of commenting about the visualisation. Following standardised interviewing procedure (Fowler & Manigone, 1990 in Houtkoop-Stennstra, 2000), the interviewer repeated the question and re-clarified the research subject but did not push the participant for the 'right' answer.

Participant #	Additional Comments
MC – 5	Comment on the weather within the image. The type of visualisation depends on circumstances. Visualisations need an explanation alongside them. Public consultation - bit of a cynic. They seem to have already made the decision.
MC – 8	When public money is spent on a visualisation you would expect the image to be better quality (than the one used in the questionnaire)
MC – 10	Spent all this money but the defences aren't any higher
MC – 17	The visualisation (used within the body of the questionnaire) looks like a kids drawing
MC – 24	Interested in defences. Had seen posters up at the time of construction.

Table 27 Additional comments from participants at Milton Common

Southsea Results

Participants at Southsea were asked to rate, on a scale, if the visualisation presented to them improved their understanding. Table 28 shows the responses to this question. 67% of participants (11 participants) felt that the visualisation improved their understanding on some level. Of the remaining five, four identified that the visualisation did not improve their understanding, with one saying that the visualisation decreased their understanding. Respondents were then asked to explain their answer, two participants at Southsea were not able to answer this question.

Rating	Description	Count	Percentage
1	Very much improved	2	13%
2	Much improved	3	19%
3	Somewhat improved	6	38%
4	No improvement	4	25%
5	Decreased understanding	1	6%

Table 28 Table showing how all participants at Southsea rated the visualisation in affecting their understanding

Table 29 shows that those who found the visualisation the most useful (very much improved, and much improved) said this because they found the image clear and appreciated a visual aid. The clarity identified with this image can be attributed the visualisation style (Al-Kodmany, 2002).

Rating	Why
1	It's clear
1	Clear, realistic view
2	Being able to see it makes it easier to understand
2	Visual - can see how it will look
3	Being able to see it makes it easier to understand
3	Needs explanation and labelling to be more useful
3	Doesn't look that different
3	Puts it into the setting
3	Needs more detail, useful perspective
4	Looks the same, can't tell what will change
4	Looks no different
4	Before and after images would be more useful
4	Looks the same
5	Confusing, surroundings are not going to change, don't understand the 'defence' - it needs explanation

Table 29 Southsea participants explanations as to why the visualisation affected their understanding

Five participants commented that the visualisation somewhat improved their understanding, again the usefulness of a visual aid was mentioned but they also commented that the visualisation required more detail and explanation. This need for an explanation alongside the visualisation is a critique of the study, considered in Section 5.4.

The four participants who said they found no improvement in their understanding commented on how the image looked the same as the location at present, i.e. they could not tell that the defences were changing at all. This could be related to the type of defence, rather than the visualisation. However, this does show that though visualisations can show change (Landscape Institute and IEMA, 2013), comparing before and after images may be more helpful to some. This technique would be helpful, alongside a clear, descriptive text (MPP Project Officer, pers. coms. August, 2017; Karen McHugh, pers. coms, August 2017), and is something already used where possible (Adrian Thomas, pers. coms, August 2017). The one participant who found the visualisation to decrease their understanding said that the inclusion of the surroundings which were not going to change was confusing. This view contradicts the literature, which commends the inclusion of the wider context (Downes & Lange, 2003), which is an important part of the landscape (Landscape Institute & IEMA, 2013).

Two participants at Southsea made additional comments, outside of the research questions. Table 30 shows these comments. Participant S-6's comment agrees with the usefulness of visual aids discussed in the literature (Kaplan, 1984 in Morgan, 1998). Participant S-7's comment brings to attention the issue of accessibility. Although this image was provided by the planning authority, it would be fair to describe the image as pixelated. This pixilation might be due to the method or size of printing. These accessibility issues can become a problem for the public when attempting to engage with public consultations (Landscape Institute and IEMA, 2013).

Participant #	Additional Comments
S-6	A picture is always useful
S-7	The visualisation is pixelated

Table 30 Additional comments from participants at Southsea

Comparable Results

At each site participants were asked to describe the visualisation shown to them. This question was included to check participants understanding of the image. Figure's 67 and 68 show responses to these questions via Word Maps. These Figures show that most participants were able to identify the main features of the visualisation.

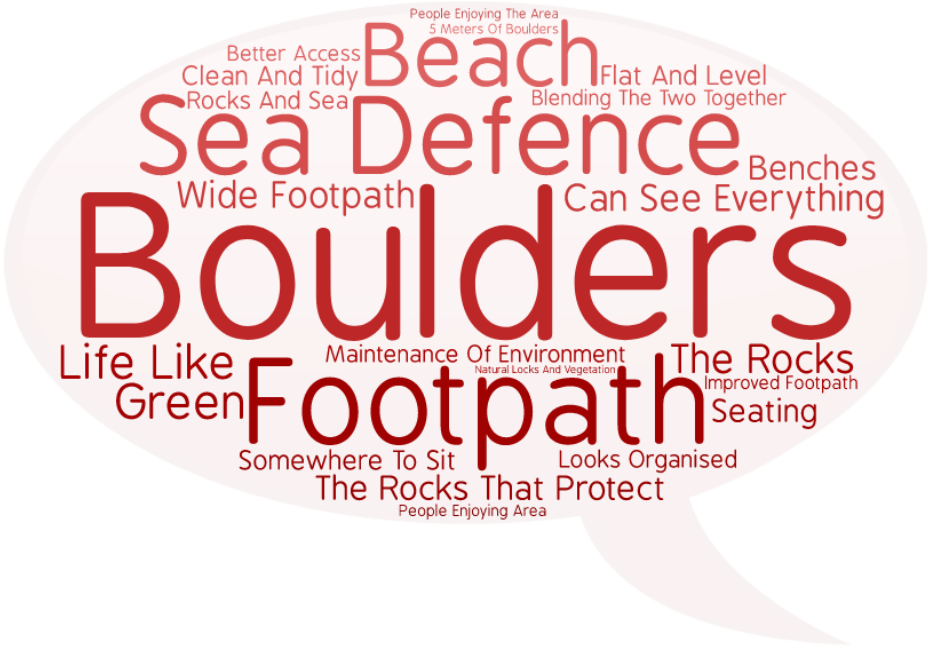


Figure 67 Word Map of the responses participants gave when describing the visualisation shown at Milton Common

Figure 68 Word Map of the responses participants gave when describing the visualisation shown at Southsea

One participant at Milton Common simply described the image as 'meaningless, it shows the area but meaningless' and did not elaborate upon this. However, this participant also commented on the height of the defences, and how they had not been changed. Therefore, it is possible that this participant was more focused on the defences in place, rather than the visualisation. At Southsea, some participants used words such as 'fake rocks' and 'the beach being removed'. This shows that

participants may have not completely understood what the visualisation was attempting to represent, and highlights the importance of explanation alongside these images (Al-Kodmany, 2002; Landscape Institute and IEMA, 2013)

At both sites, all 41 onsite participants, were asked the same questions regarding their preference in visualisation style. This was carried out via four different styles of visualisation (Appendix 3), all previously used within the public consultation of sea defences. Figure 69 shows that over both sites most participants (61%) preferred a photographic impression, with an artist impression the second most popular (29%). Participants expanded on this choice by saying that these styles were more realistic and gave an eye-level impression, whereas the other visualisations gave birdseye views and therefore to not provided a perspective realistic to the general public (Downes & Lange, 2013). Three participants identified that they preferred a map, and elaborated by saying that they understood or liked maps in general. Personal preference, such as these, are one of the key challenges of visual impressions and judging visual impacts (Landscape Institute and IEMA, 2013). Table 31 shows participants explanation for this choice of visualisation.

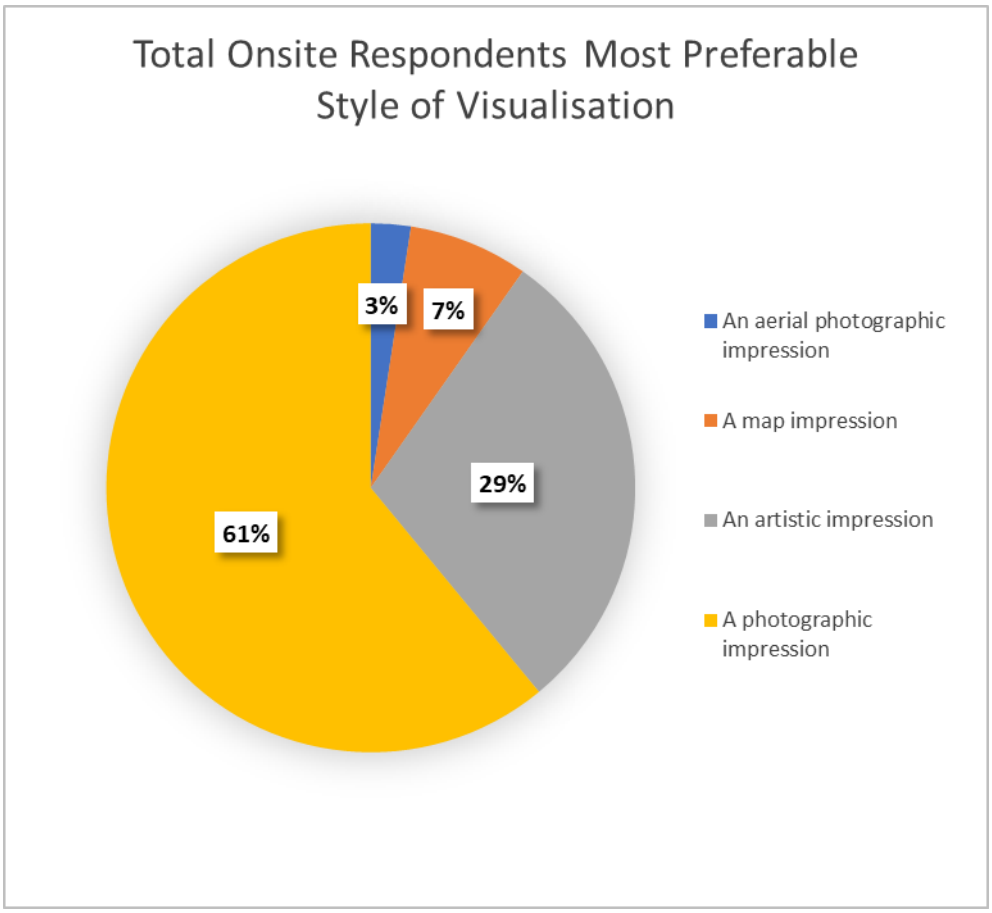


Figure 69 All onsite respondents most preferable style of visualisation

Preference	Explanation For Choice	Site
A	More appealing - can see that you can walk down the path	Southsea
A	Basic, understandable	Southsea
A	Helps understanding.	Milton Common
A	It is clearer	Milton Common
A	Gives an eye level impression	Milton Common
A	Clearer	Milton Common
A	Clear	Milton Common
A	Shows the greenery (vegetation)	Milton Common
B	Can see what has changed - view from above	Southsea
C	Aerial, prefer maps	Southsea
C	Understand maps better	Milton Common
C	Like maps	Milton Common
D	More realistic, eye level	Southsea
D	Can see what is being proposed - more realistic	Southsea
D	Realistic 'as you are looking at it'	Southsea
D	Gives surroundings and aerial view	Southsea
D	More realistic	Southsea
D	Realistic, eye-level	Southsea
D	Realistic, setting	Southsea
D	More realistic	Southsea
D	More realistic	Southsea
D	Realistic	Southsea
D	Realistic	Southsea
D	3D, more realistic	Southsea
D	More realistic and has more information/detail	Milton Common
D	More detail	Milton Common
D	3D - 'virtual reality'. More realistic	Milton Common
D	Realistic	Milton Common
D	More realistic. 3D and includes soundings	Milton Common
D	Clearer and has more detail	Milton Common
D	Clear and detail	Milton Common
D	Realistic	Milton Common
D	3D, realistic	Milton Common
D	More detail	Milton Common
D	Looks realistic	Milton Common
D	Eye-level view	Milton Common
D	Realistic - what it will look like	Milton Common

Table 31 Participants most preferred style of visualisation, and the explanation as to why. A – an artist impression, B – an aerial photographic impression, C – a map impression, D – a photographic impression

Figure 70 shows the preference by site. This was investigated in case the previous questions and exposure to a site visualisation had an influence on preference. Figure 70 shows that this may have occurred, as 40% of participants at Milton Common (who had already been shown an artistic impression) preferred an artist impression, whereas at Southsea only 13% preferred this option. Similarly, 75% of those at Southsea (who had already been shown a photographic impression) choose a photographic impression This shows that part-part consistency effects may have been present (Houtkoop-Steenstra, 2000). However, over both sites, a photographic impression was the most favoured (Figure 69), therefore these effects may not have affected the overall result.

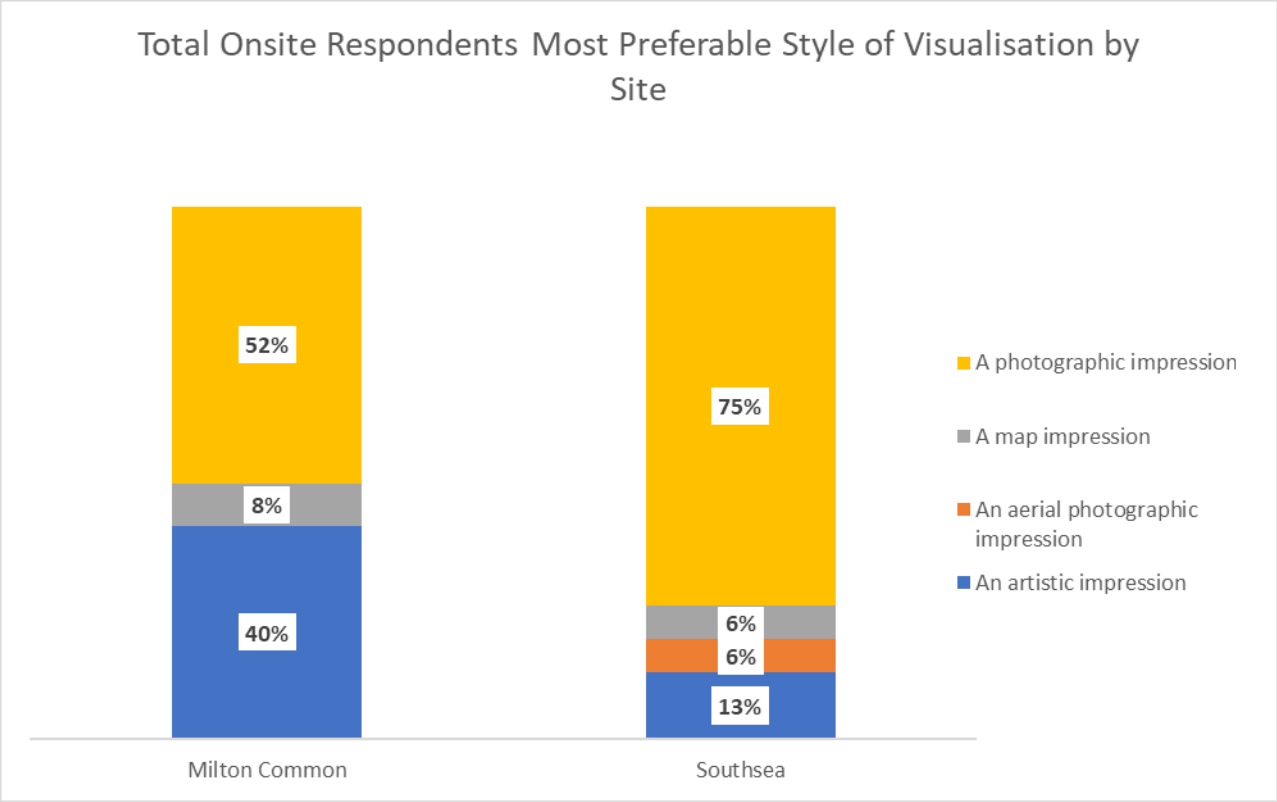


Figure 70 Most preferable style of visualisation, by site

These results, and those from the online questionnaire, have a positive correlation, as 85% of online participants preferred a photographic impression over an artistic impression. Although it is difficult to make a true comparison between these two data sets, it would be fair to say that most participants, both online and onsite, preferred a photographic impression. This was somewhat expected, as a computer generated visualisation can provide more detail and be more accurate (Landscape Institute & IEMA, 2013).

Table 31 shows those who preferred an artist impression did so because they thought the image was clear and basic. Those of preferred a map impression, identified that they prefer maps in general. Of the 25 participants who preferred a photographic impression 18 (75%) said that they choose it because was it was realistic. The remaining six commented that there was more detail in the photographic impression, that it gave an eye-level view and included the surrounding landscape.

Figure 71 shows onsite participants least preferable style of visualisation. This shows that 44% of participants least preferred an aerial photographic impression, with a map impression the next least preferred (29%). Both of these visualisations gave a birdseye view. This result, and the result of more preferred style, indicates that participants prefer an image which provides a relatable eye-level perspective, which agrees with Downes & Lange (2013). This concept is confirmed by the comments made by participants (Table 32). Although chosen by some as their most preferable, 22% of participants said that an artist impress was their least preferable style. Table 32 shows these participants found the artist impression to be lacking detail or any setting, factors which were identified as criticisms by online participants too. This view agrees with the literature (Al-Kodmany, 2002), and confirms that there are many different opinions about what looks appealing (Landscape Institute and IEMA, 2013). Two participants (5%) choose the photographic impression as their least preferable style. Of these, only one could elaborate as to why. This participant elaborated by saying that this image was 'too real'.

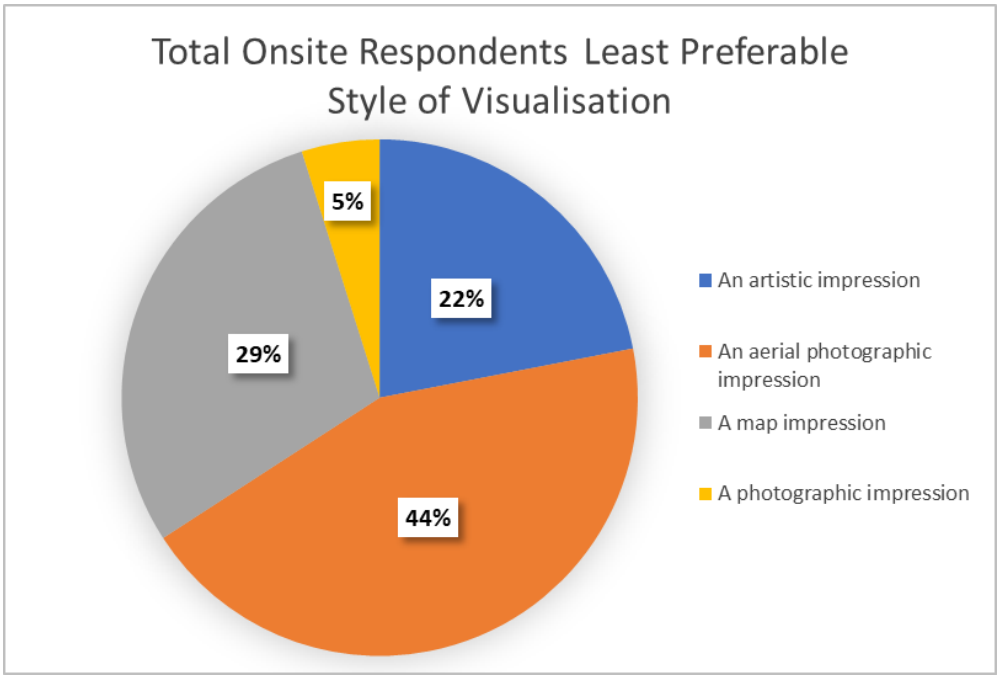


Figure 71 All respondents least preferable style of visualisation

Preference	Explanation For Choice	Site
A	Lacking info/detail	Southsea
A	Doesn't mean anything, no detail, just colours	Southsea
A	Could be anywhere, missing setting	Southsea
A	Could be anywhere, missing setting	Southsea
A	Doesn't show much - basic	Southsea
A	It is an artist impression - lack of trust	Southsea
A	Lacking info/detail	Southsea
A	Just a map - it doesn't show much	Milton Common
A	Child like - doesn't show enough	Milton Common
A	An 'artist impression' - has been open to interpretation	Milton Common
B	Don't understand it	Southsea
B	Can't understand	Southsea
B	Doesn't show anything, just areas	Southsea
B	No point of reference - not a realistic eye view	Southsea
B	Aerial - unrealistic view	Southsea
B	Unrealistic view	Southsea
B	Don't understand maps	Milton Common
B	Don't understand maps	Milton Common
B	It just shows water and land	Milton Common
B	Hard to read and understand	Milton Common
B	Doesn't show much. Hard to understand because it is aerial	Milton Common
B	Unrealistic view	Milton Common
B	Not as clear. Less detail.	Milton Common
B	Aerial. Not understandable	Milton Common
B	Less understandable - just land and sea	Milton Common
B	Aerial. Can't really see anything.	Milton Common
B	Less detail - doesn't show much	Milton Common
C	Doesn't show it will look - perspective	Southsea
C	Doesn't show how it will look - perspective	Southsea
C	Doesn't show how it will look - perspective - unrealistic	Southsea
C	More complicated - would spend less time looking at it.	Milton Common
C	Just a map	Milton Common
C	No idea what A is showing. Unrealistic colouring and colours are too bold	Milton Common
C	Doesn’t show as clearly what it will look like	Milton Common
C	Just a map. Takes longer to understand/process	Milton Common
C	Don't like maps. Lacking detail	Milton Common
C	Aerial doesn't show what they are doing to do	Milton Common
C	Aerial - lacking detail	Milton Common
C	Aerial - more difficult to visualise how it will look from an eye level. Difficult to transfer traditional map.	Milton Common
D	Too real - it doesn't look realistic	Milton Common

Table 32 Participants least preferred style of visualisation, and the explanation as to why. A – an artist impression, B – an aerial photographic impression, C – a map impression, D – a photographic impression

Figure 72 considers the least preferable style of visualisation by site. This shows that significantly more participants (44%) at Southsea, identified an artist impression as their least preferable, than at Milton Common (8%). As previous discussed, this shows that part-part consistency effects by have been present (Houtkoop-Steenstra, 2000). However, the result from both sites (Figure 71) clearly shows that an aerial photographic impression was the least preferable style, and that the lowest percentage of participants (5%) choose a photographic impression as their least preferable.

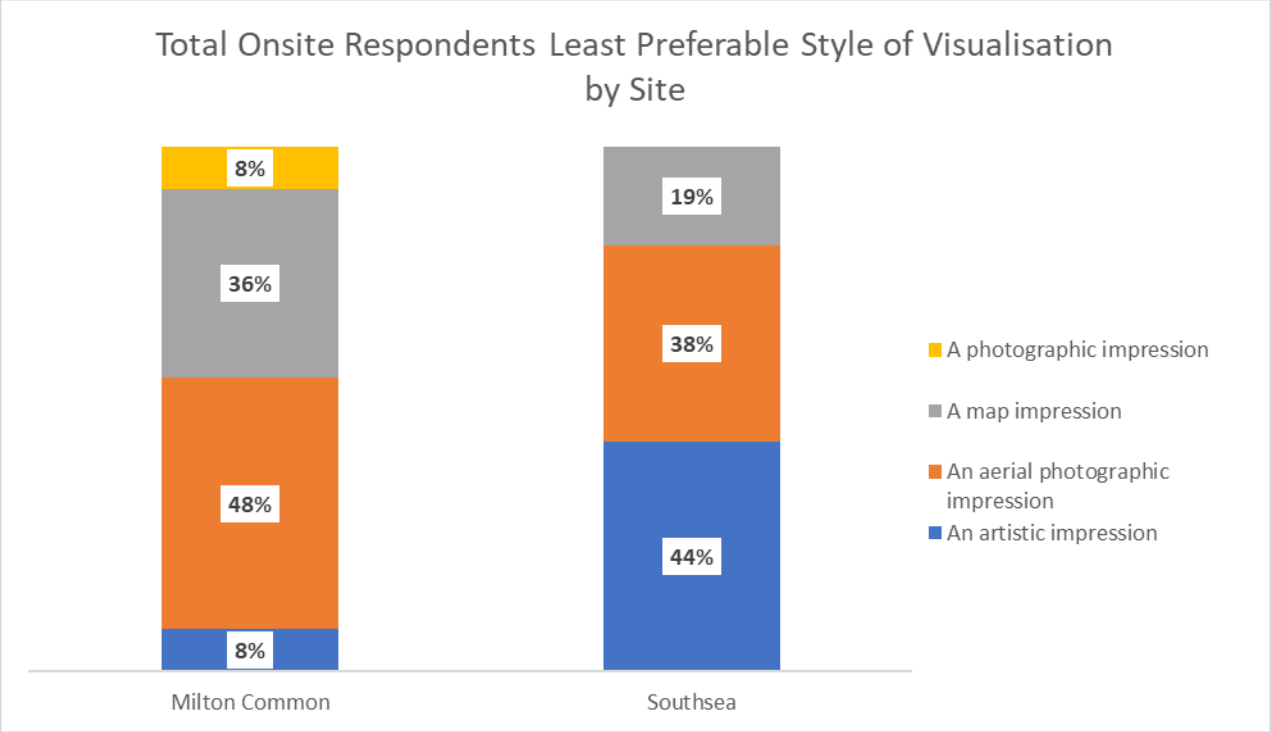


Figure 72 Least preferable style of visualisation, by site

Table 33 presents these preference results together. This table shows that those who most prefer an artist impression are most likely to least prefer an aerial photographic impression. This table also shows that those who most prefer a photographic impression are most likely to least prefer a map impression. Although it is difficult to give reason to these specific trends, this reconfirms that the

Preference - Low	Preference -High			
	A	**B**	**C**	**D**
A		1	1	7
B	10		0	8
C	2	0		10
D	0	0	2	

Table 33 Cross-tabulation of participants highest and lowest preferable style of visualisation. A – an artist impression, B – an aerial photographic impression, C – a map impression, D – a photographic impression

perspective of visualisations is important when they are going to be viewed by the public (Downes & Lange, 2003). Table 33 also shows that both participants who disliked the photographic impression, most preferred the map impression. This shows that those within the planning authority must take into consideration the different preferences that the public will have, and provide multiple styles if possible.

4.4 Conclusion

This chapter set out to achieve objectives two and three (Section 1.3). By using the methods outlined in Chapter Two a critical analysis has been carried out into public understanding and feelings towards the use of visualisations. This has led to an evaluation of their usefulness within public consultation in the context of coastal defence.

The results within this chapter identify that although 94% of online participants find visualisations useful, opinion is more varied when it comes to preferred style and trust. The onsite question results build upon this data and focus on visualising a coastal setting. The expert opinions gained via email questionnaires have helped to formulate a discussion around these results.

The following final two chapters will provide a critique of this research, along with recommendations and conclusions which can be consequently made.

Chapter 5. Critical Reflection

5.1 Introduction

The results and discussion presented within Chapter 4 confirm the usefulness of visualisations, but also the differences of opinion due to personal preference. This chapter shall provide a critique of this project, reflecting on the use of online questionnaires and onsite questionnaires. A critique of the visualisations which were used and the way in which they were applied to the methodology will also be included, before final recommendations are made for the use of visualisations. This chapter will also provide suggestions for further research opportunities.

5.2 Reflection on Online Questionnaires

An online questionnaire provided most of the data for this project, however, problems arose with the data output from this method. The results and analysis within Section 4.2 presents the findings from 164 responses, but 169 responses were received online. Whilst reviewing the results from this method it became apparent that there were six responses exactly the same, which had been completed within 20 minutes of each other. Therefore it was assumed that these responses were from the same participant, given that they were typed exactly the same, and five of the responses were removed. Had these responses not been removed then these six identical responses may have altered the results and conclusions of the project. This could have been avoided, as the system used to create the online questionnaire, Google Forms, gives the option to 'limit to 1 response'. However, during the pilot study it was discovered that to limit the number of responses participants had to 'sign in' to Google. This sign in could have limited the number of responses in two ways. Firstly, to sign into Google the respondent must have a Google account, therefore limiting the survey to these with a Google account. Secondly, sign in requires the use of an email address, and although email addresses would not have been collected might-be-respondents may deterred by this, not trusting that their personal information would be kept safe.

5.3 Reflection on Onsite Questionnaires

A number of practical problems arose due to the nature of asking people onsite questionnaires. Figure 73 outlines some of the issues experienced onsite. These are problems which could have been expected with an onsite questionnaire, however, this issues have a greater effect on a survey at a location where there is less footfall. For instance, no responses were received from Medmerry as the

site is so large and few people were seen, and those who were seen were running or cycling and therefore not stoppable.

Practical Problems Experienced During Onsite Questionnaires

- Coastal locations are windy making holding both visualisations and questionnaires challenging
- Using a tablet to present information, for example moving visualisations, is impractical – adding to what needs to be held and is difficult to see in bright light
- It is impractical to stop; people who are running or cycling, or those within large groups or dog walking
- Within a large site it is difficult to predict where the people will be
- Often two people were stopped, but only one could be asked the questions, and the respondent may have been influenced by the presence of the other person

Figure 73 Practical problems found with onsite questionnaires

Of those who did participate, it was clear that some did not understand the questions. This may have been overcome by more rigorous piloting, however, as Houtkoop-Stennstra (2000, p. 8) says "a serious pre-test of a questionnaire is too difficult for most research because of time and money constraints". Some respondents criticised the site visualisation used for the state of the tide it represented, if it differed from that at the time. As the visualisations used were not created specifically for the research it was not possible to create two visualisations representing high and low tide.

Choice of Southsea and Research Timing

The forthcoming development of defences at Southsea was chosen due to the size and complexity of the project, but also the number of residents and business that are protected by these defences. At the start of this research (May, 2017), these defences were within the mid-stages of planning, with options outlined by the planners and due for public consultation within 6 months (Autumn 2017). However, in July a 'counter proposal' to that of the council was presented, bring with it a lot of tension and confusion about both proposals. This included some hostile emails about the research project. It was anticipated by both the researcher and the council planning body that onsite questionnaires at Southsea could be met by hostility, although luckily this was not the case. Although somewhat inconvenient, this shows the passion and interest that people in general have about the sea defences in their local area.

5.4 Reflection on Choice of Visualisations

Lone Visualisations

Both online and onsite participants commented on the usefulness of visualisations without any explanation. One onsite participant said that 'visualisations need an explanation alongside them'. Comments to this effect were also made by a number of experts (MPP Project Officer, pers. coms, August, 2017; Adrian Thomas, pers. coms. August, 2017; Simon Cramp, pers. coms. August, 2017).

Within a 'normal' public consultation setting a visualisation would be presented alongside descriptive text, and therefore it could be said that the visualisations within both the online and onsite questionnaires were miss represented. But, due to practicalities it was not possible to provide an explanation with the visualisation. In addition, the research was only concerned with the usefulness of visualisations, additional information explaining the visualisations may have changed peoples understanding.

Visualisation Style Questions

Although presented differently, both the online and onsite questionnaires included questions about preference in style of visualisation. These questions presented a number of pre-made visualisations, in different styles, representing different coastal defence schemes. This brought about confusion in two ways; participants commented on the style of coastal defence within the image and participants also made preference choice dependent on the perspective shown in the visualisation. This way have skewed participants choices, and therefore the results. This could have been overcome by creating different visualisations in different styles of the same location. This would have improved the usefulness of the results of the project. However, due to time constrictions this was not possible.

Site Visualisations

The literature provides an expert critique of visualisations, and by reviewing the visualisations used within onsite questionnaires it is fair to say that they are imperfect. Although the visualisation used at Southsea was a computer generated image which provides a high level of detail (Landscape Institute and IEMA, 2013), the perspective it portrayed was not accessible to the public. Downes and Lange's (2013) work suggests that those visualisations which do not provide an accessible view point should not be used. The visualisation planned to be used at Medmerry also provided an inaccessible perspective, in the form of an aerial map. In addition to the criticism provided by Downes and Lange (2013), this research has shown that 29% of onsite participants identified that they least prefer a visualisation in the style of a map. Many of these participants explained that they did not like, or did not understand maps. The visualisation used at Milton Common provided a realistic perspective, however can be classed as an artist impression. Artists impressions are rarely used due to technological improvements as well as occurring accuracy problems (Landscape Institute and IEMA, 2013). However, due to time constraints and the objectives of the research it was important to use visualisations from the public consultation. Moreover, Downes and Lange's (2013) research found no relationship between style of visualisation and levels of accuracy or realism.

5.5 Recommendations

Although this project has encountered issues, it has successfully analysed public understanding and opinions towards the use of visualisations. The recommendations below (Table 34) have been established from the results of this project, and the comments from experts (listed in Section 3.5) upon these results.

Recommendation	Explanation
Recommendation 1	
Visualisations can enhance public understanding of proposed plans, however, they should be used within an 'effective communications toolkit'.	Most participants said that visualisations helped to improve their understanding of plans, but when asked whether they trusted visualisations opinion was more divided. To increase this trust in visualisations, trust must increase within the whole public consultation process.
Recommendation 2	
A well-planned and implemented public consultation strategy should be ensured, and this should provide up-to-date, accurate and reliable information.	Recommendation 1 requires the increase of public trust of visualisations, but also of public consultation altogether. For this to be achieved reliable information transfer is essential.
Recommendation 3	
The style which a visualisation should carry is very much personal preference. To accommodate this experts should prepare alternative illustrations, so participations can view the one they find most understandable.	Results from both online and onsite questionnaires were not unanimous as to the most and least understandable style of visualisation. Although general consensus was towards computerised photographic visualisations being the most useful, experts should attempt to meet the needs of all so as not to exclude them.
Recommendation 4	
Where possible post-construction consultation should be carried out, which should investigate the effectiveness of public participation, but also the accuracy of visualisations	This study successful carried out a post-construction consultation at one site. Although many (72%) of participants considered the visualisation of the site to be realistic, even these participants criticised the image. Post-

	construction consultation can allow those who plan and carry out public participation to learn from previous experience
Recommendation 5	
Visualisations are a useful tool within coastal defence scheme consultation	By investigating the use of visualisations within a coastal management context, and carrying out two successful surveys of public opinion at coastal locations, this research has found that most participants (67%) find visualisations of coastal defences helpful.

Table 34 The recommendations from this research

5.6 Future Research

Upon reflection of this research, and considering the recommendations presented, a need for future research can be seen. The recommendations, as well as previous research, demonstrate the number of 'unknowns' within public participation and the use of visualisations. Therefore, it is suggested that this future research is carried out, but alongside a 'real' consultation. With fewer time-constraints future research could be embedded within a consultation, and carried out in association with the responsible authority. Questionnaires could be presented at the end of public exhibitions or meetings to enable the evaluation the role that visualisations have played within the whole event. This would allow a number of the limitations of this research to be avoided, as presented in Table 35.

Limitation within this Research	Method for Overcoming this in Future Research
Participant confusion – commenting on the defences presented within visualisation, rather than the style of visualisation	Creation of custom made visualisations, presenting the same scheme from a number of angles and in a number of styles
No additional text or information presented alongside visualisations	By carrying out questionnaires in a consultation setting the usefulness of visualisations can be assessed in the context of the whole 'communications toolkit'.
Lack of participation at one site	Participation will be available from those already in attendance at exhibitions and meetings

Table 35 Suggestions of how future research can avoid the limitations overcome within this project

5.7 Conclusion

This study has added to the wealth of literature in public participation, and provided new research into the use of visualisations within coastal management. The recommendations presented in this

Chapter will help to achieve more effective public participation and use of visualisations in the future. Although this research has overcome a number of limitations this has enabled the researcher to suggest future research methods which will avoid these limitations.

Chapter 6. Conclusion

6.1 Introduction

This project will now be concluded via a brief overview of the research presented in the previous chapters. This will enable the success of the aims and objectives, in Section 1.3 to be reviewed.

6.2 Summary of Research

This project investigated the opinions of members of the public towards visualisations, and specifically did so within a coastal management setting using three research methods. Online questionnaires show that most (87%) respondents understood how visualisations could help them to understand how a new development might affect them. In addition, 94% of those sampled indicated that they found that visualisations helped their understanding of proposed plans. However, within the same sample population only 40% specified that they trusted visualisations. These results show that visualisations have the ability to enhance information transfer, however this must be carried out within a well-planned consultation strategy so as to gain trust.

Both online and onsite questionnaires investigated preference of visualisation style. Although general consensus was in preference for a computer generated photographic impression (85% of online participants, and 61% of onsite participants), others did prefer more traditional methods such as artists impressions or maps. Most (58%) online participants preferred a moving visualisation, to a still one, but those who preferred a still image complained of such issues as; a lack of detail, nausea, and confusion. These results conclude that preference is divided, and that those who plan public consultation should consider this.

Within a coastal setting 72% of participants found that a post-construction site fared well with a visualisation used within the consultation. 67% of those at the pre-construction site found that a visualisation improved their understanding of plans. These results show that visualisations can be effective within coastal defence consultation, but that these need to be used alongside other communication techniques.

These methods and results have allowed this project to successfully achieve its aim to critically evaluate the role of visualisations within public consultation, using coastal defence schemes from the Solent as examples. This was achieved via four research objectives;

1. A literature review into the need for public participation within coastal management and environmental impact assessment, with specific focus on visual impacts, within Chapter 1
2. A critical analysis of public understanding and opinions towards the use of visualisations in general and within a coastal defence setting, within Chapter 4
3. An evaluation into the usefulness of visualisations within public consultation, in the context of coastal defence, within Chapter's 4 and 5
4. Finally, a series of recommendations for effective public participation and use of visualisations were proposed within Chapter 5

6.3 Conclusion

This project has added to the wealth of research which attempts to answer "the underlying question . . . as to whether we are doing it [PP] right" (Shipley & Utz, 2012, p. 22). Although this question remains, this project has confirmed the role that visualisations play in public understanding. This project has questioned the effectiveness of visualisations within coastal management, from a public on-location perspective, for the first time. Challenges have been met, and subsequently overcome. The lessons learnt in this project led the way for future research.

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Appendix 1 – Ethics Form

University of Portsmouth, Department of Geography
Ethics Review Checklist: MSc Version

To be completed by <u>all</u> MSc CMRM Students

- You are required to undertake an ethics review of your Independent Study Research Proposal. Before completing this checklist please read through the guidance documents on the Fieldwork and Research Methods Moodle site.
- When you have completed the checklist, submit it Dr M. Bray. This form must be submitted and approved BEFORE you start any data collection.

Student Name Elizabeth Inwards ..... Student Number 480506
Preferred Supervisor (if known) Brian Baily
Independent Study Title
A critical investigation into the role of visualisations within coastal defence scheme stakeholder consultation lifecycles – examples from the Solent, England

Please indicate Yes or No (fill in a square use a tick etc.):-	Yes	No
[A] Is the study likely to involve human research subjects or participants?	☑	☐

*If **'Yes'**, please go to **Section [B]** on page 2*

*If **'No'**, please answer the following:-*

a) Are there risks of damage to physical and/or ecological environmental features – especially if within protected areas (nature reserves, SSSIs, national parks, EU designated habitats)?	☐	☐
b) Are there risks of damage to features of historical or cultural heritage?	☐	☐
c) Are there risks of harm to any animal?	☐	☐
d) Could the research outputs potentially be harmful to third parties?	☐	☐

If you have answered 'yes' to a), b), c) or d), then please provide details (in the space below) of how you plan to minimise any risks identified. You may attach additional information if necessary.

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Now go to page 4 and sign the Declaration (Section D)

[B] You intend to involve human research subjects. Will your data collection methods involve:-

TICK **ONE** BOX ONLY

1. Secondary sources (i.e. data that have already been collected and are in the public domain such as the UK Census of Population, data from web-resources such as ONS Neighbourhood Statistics or the various Government Departments' statistical pages) ☐
2. Primary sources (e.g. face-to-face interviews or questionnaires, focus groups or observational methods)? ☐
3. Both secondary and primary collection methods:- ☑

*If you ticked statement **number 2 or 3**, please go to **Section C** on the next page (page 3).*

*If you ticked **number 1** then please indicate whether there are any other potential problems relating to research ethics:-*

Please indicate Yes or No :-	Yes	No
4. Are there risks of damage to physical and/or ecological environmental features, especially if within protected areas (nature reserves, SSSIs, national parks, EU designated habitats)?	☐	☐
5. Are there risks of damage to features of historical or cultural heritage?	☐	☐
6. Are there risks of harm to any animal?	☐	☐
7. Could the research outputs potentially be harmful to third parties?	☐	☐

If you have answered 'yes' to 4), 5), 6) or 7), then please provide details (in the space below) of how you plan to minimise any risks identified. You may attach additional information if necessary.

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Now go to page 4 and sign the Declaration (Section D)

[C] In terms of the primary data collection methods on human subjects, please answer the following:-

Please indicate Yes or No:-	Yes	No
1. Will the study involve NHS patients, staff or premises?	☐	☑
2. Do human participants/subjects take part in studies without their knowledge/consent at the time or will deception of any form be used?	☐	☑
3. Does the study involve vulnerable or dependent participants (e.g. children or people with learning difficulties)	☐	☑
4. Are drugs, placebos or other substances (e.g. food, vitamins) to be administered to participants?	☐	☑
5. Will blood or tissue samples be obtained from participants?	☐	☑
6. Is pain or more than mild discomfort likely to result from the study?	☐	☑
7. Could the study induce psychological distress or anxiety in participants, or third parties?	☐	☑
8. Will the study involve prolonged or repetitive testing or participants?	☐	☑
9. Will financial inducements other than reasonable expenses be offered?	☐	☑

Please indicate whether there are any other general problems relating to research ethics:-

10. Are there risks of damage to physical and/or ecological environmental features (especially protected areas, nature reserves, SSSIs etc.)?	☐	☑
11. Are there risks of damage to features of historical or cultural heritage?	☐	☑
12. Are there risks of harm to any animal?	☐	☑
13. Could the research outputs potentially be harmful to third parties?	☐	☑

If you have answered 'yes' to 2, 3, 8, 9, 10, 11, 12 or 13 then you must provide additional details (in the space below) of how you plan to minimise any risks identified e.g. use of participant information sheets or consent forms. Please attach any additional materials if necessary.

Interviews: Letter of invitation + Participant info sheets + Written consent.

Questionnaire participants will be shown information sheets beforehand, make clear their right to leave the questionnaire at any point.
Interview participants may not be able to be kept annonymous - due to their expert position. This will be discussed with them beforehand. If so use elite named interview consent form. Will need to offer participants the opportunity to review their transcript.

Now go to page 4 and sign the Declaration (Section D)

Use University template docs.

[D] Declaration
I confirm that the information provided is a complete and accurate record of my plans at present and that I shall resubmit an amended version of this form should my research alter significantly such that there is any significant variation of ethical risk. I confirm that I have read the University Ethics Policy (2017) and have read "Research Ethics Guidance, Geography Staff and Students" both available on the Fieldwork and Research Methods Moodle site.

If I need to construct a questionnaire or set of questions to use in an interview, then I will seek my supervisor's approval of the final wording and format. Where necessary, I will also provide a covering letter/information leaflet and consent form, which should be approved and countersigned by my Dissertation supervisor. NB Approved interview/questionnaire schedules will be eligible for letters of support, which can be obtained from your supervisors. By printing my name below and by submitting this form I understand that I am taking responsibility for this ethics review and for the conduct of the research.

Signed ..... Innes ..... (Student)

Date 25/04/17

[E] APPROVAL RECORD *(completed by Departmental Ethics Representative <u>after</u> you have submitted the checklist)*

Dr M. Bray will study your ethics checklist and will tick one of the boxes below. If there is a recommendation to undertake more work in terms of ethics (e.g. undertaking a more detailed ethics review) then instructions will be included with the returned form. If your proposal is <u>not</u> ethically viable then this will also be made clear and you will be asked to rethink your Independent Study proposal or topic.

Favourable opinion : INSIGNIFICANT risk/issues arising ☐

Favourable opinion : INSIGNIFICANT risks subject to comments listed below ☑

Risks assessed as SIGNIFICANT referred for rethink/DETAILED Ethics Review ☐

Opinion not possible – reasons specified below ☐

..... See comments on p3 .....

Signed..... Malcolm Bray ..... (Departmental Ethics Officer)

Date ..... 25/04/2017 .....

Appendix 2 – Online Questionnaire

Your experience of visualisations

This short questionnaire will ask you questions about your experience and preferences of visualisations. A visualisation is an image, which provides a realistic representation of how a landscape will look after a change. Over the next 5 sections of this questionnaire you will be shown examples of visualisations and be asked to provide some preferences, please answer all of these questions to the best of your ability. The last section includes some general demographic questions, these questions are not compulsory however providing this information will be of great help to this study.

To participate in this questionnaire you need to be over 16 years old and live within the UK. The information provided for this questionnaire will be anonymous. The results from this questionnaire will be used within the final thesis and any subsequent reports - these results will be available via the contact details at the end of this questionnaire.

Have you ever taken part in a public planning consultation?
A public consultation is when the public is given the opportunity to voice their opinion about a development which might affect them. This could be in person or via an online consultation.
Yes/No/Don't know

What do you understand to be the purpose of a visualisation?
I think visualisations are just for the planners to use, they do not have much use for the public/ I don't understand the purpose of visualisations/ I think they are used to help the public understand how the development might affect them

Settings of visualisations

Visualisations can be used within different settings and used for different developments. Looking at the examples below please indicate whether you have ever seen similar images.

Have you ever seen a visualisation like the below image, an example of a major events development?
Yes/No/Don't know

Have you ever seen a visualisation like the below image, an example of a small town retail development?
Yes/No/Don't know

Have you ever seen a visualisation like the below image, an example of a residential development?
Yes/No/Don't know

Have you ever seen a visualisation like the below image, an example of an offshore wind farm?
Yes/No/Don't know

Have you ever seen a visualisation like the below image, an example of a coastal defence development?
Yes/No/Don't know

Are there any other examples of visualisation settings that you would like to mention? Please use the below box to describe the type of development and general geographic location if possible.
(Open Answer)

Preference
Visualisations can take different styles, please view the two examples below. One is an artist impression, the other a photographic image.

Which visualisation style do you prefer?
An artists impression/ A photographic impression/ No preference/ Don't know

Why do you prefer this option?

Visualisations can take different forms, please view the two examples below. One is a moving image, the other a still image.

Which do you prefer, a moving image or a still image?
A moving image/ A still image/ No preference/ Don't know

Why do you prefer this option?

Opinion
Do visualisations such as those viewed in this questionnaire help you to understand the proposed plans for new developments?
Yes/ No/ No opinion/ Don't know

Thinking about the visualisations you have seen, do you trust these images to be a true representation of the proposed development?
Yes/ Np/ Don't know

If you answered yes please explain your answer (Open answer)
If you answered no please explain your answer (Open answer)

Other Information
This section covers general demographic questions. This information is not required, however it will help to find trends between different locations and ages.

Please provide the first half of your postcode (Open answer)

Please indicate your age from the groups below;
16-24/ 25-34/ 35-44/ 45-54/ 55-64/ 65-74/ 65 plus

Please indicate your highest completed level of education
None/ Secondary Education (GCSE/O Levels)/ Post Secondary Qualification (A Levels, NVQ3 etc)/ Vocational Qualification (BTEC, NVQ 4, Diploma etc)/ Undergraduate Degree (BA, BSc etc)/ Postgraduate Degree (MA, MSc etc)/ Doctorate (PhD) or higher/ Prefer not to disclose

If you have anything you would like to add to your response please use the space below (Open answer)

Appendix 3 – Onsite Questionnaire

Southsea Questionnaire

Q1. Can you describe this image to me?

Q2. Does this image help you to understand how the area might look after development?

1	2	3	4	5
Very much improved my understanding	Much improved my understanding	Somewhat improved my understanding	No improvement to my understanding	Decreased my understanding

Q3. Please explain why.

Q4. These images show different styles of visualisation which have been used to illustrate how a coastal defence scheme will look. Which style do you least and most prefer?

Least	Most

Q5. Please explain why.

☐ Receive results of study

Respondent Email:

Southsea Visualisation

Milton Common and Medmerry Questionnaire

Location MC/MM

Q1. Can you describe this image to me?

Q2. Do you think this image gives a realistic impression of this location?

1	2	3	4	5
Very realistic	Realistic	Don't know	Unrealistic	Very unrealistic

Q3. Please explain why.

Q4. These images show different styles of visualisation which have been used to illustrate how a coastal defence scheme will look. Which style do you least and most prefer?

Least	Most

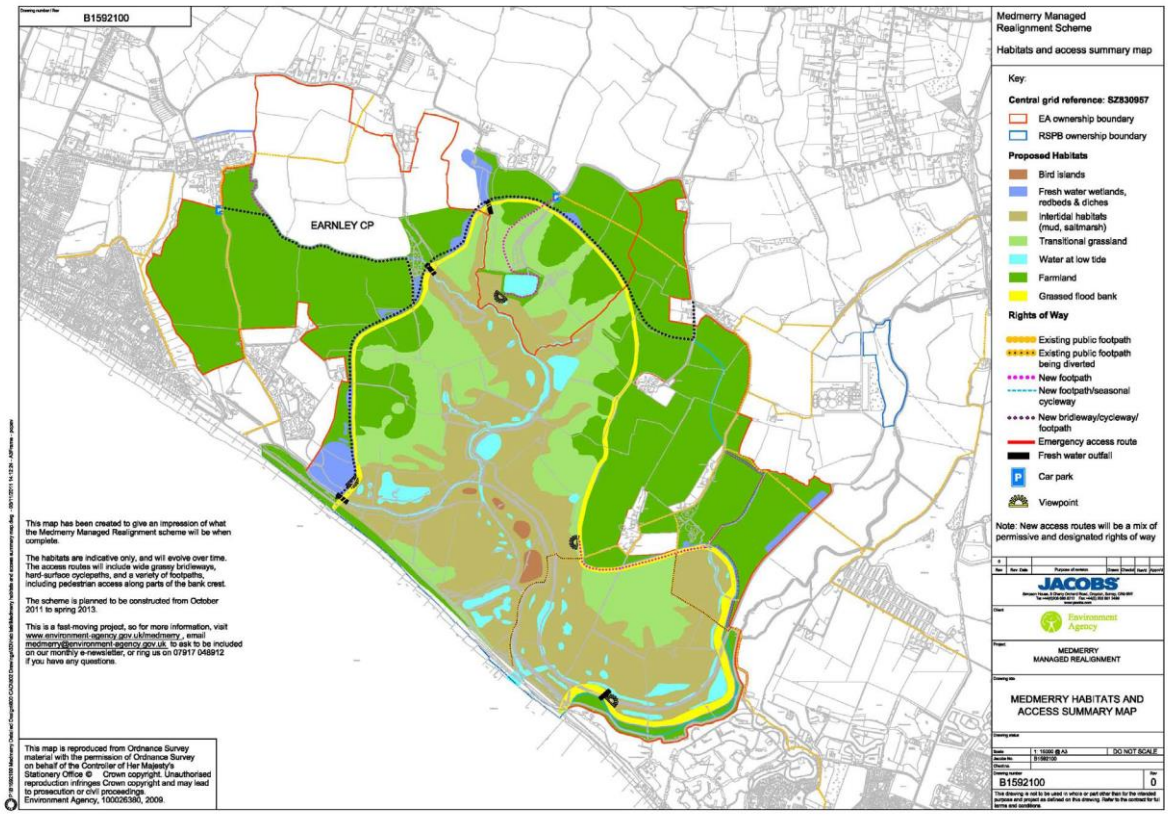
Q5. Please explain why.

☐ Receive results of study

Respondent Email:

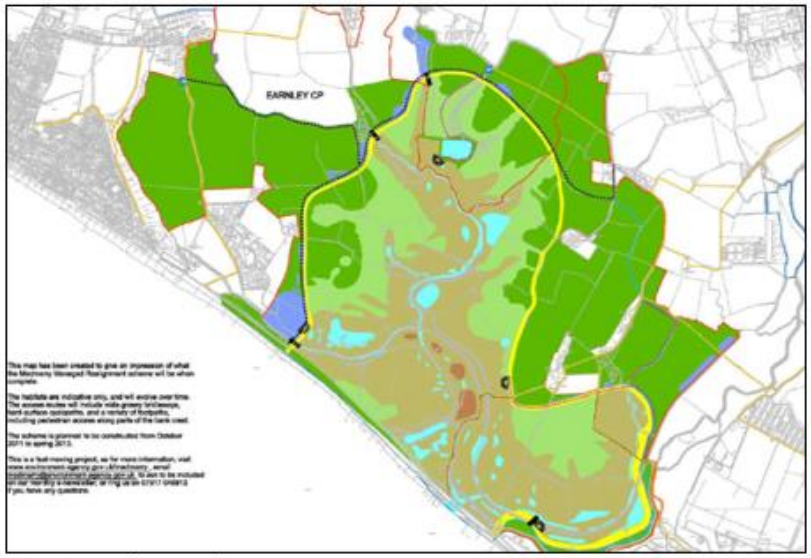
Milton Common Visualisation

Medmerry Visualisation



A – An artistic impression

B – An aerial photographic impression



C – A map impression

D – A photographic impression

Appendix 4 – Email Questionnaire

Standard Email Questionnaire Invitation Email

Hi Adrian,

I hope you are well. Thank your help with my dissertation project last month. I've come to the end of my project, and was wondering if you are still able to answer some questions about the results please? The attached document contains a brief overview of the project and the results, and six questions (in blue).

Within the body of a reply email please:
Answer either all of the questions, or those which you find most relevant to your role
Include the name of your role, and organisation
Indicate whether you would prefer to be anonymous within the write up

Please reply by the 1st September.

Your opinion at this final stage of the project would really be appreciated.

Thanks,
Liz

Email Questionnaire Attachment

Project Overview and Questions: A critical investigation into the use of visualisations with public consultation, using coastal defence schemes from the Solent

Project Aim: to investigate the use of visualisations within the public consultation of developments, using coastal defence schemes from the Solent as examples

Project Objectives:

- To undertake a literature review into the use of visualisations with public consultation, and the overall public consultation progress of coastal defence schemes
- To examine public understanding, appreciation and views towards the use of visualisations within coastal defence scheme consultation, using case studies from the Solent
- To conclude on the effectiveness of visualisations within coastal defence scheme consultation
- To propose a series of recommendations for the effective use of visualisations within the consultation of future coastal developments

Methods:

- Online Questionnaire – investigating the public's previous experience and views of visualisations
- Onsite Questionnaires – investigating the public's view of site specific visualisations
- Feed-back online and onsite questionnaire results to those from a planning background

Results:

Participation

The online questionnaire found that only 32% of those surveyed had taken part in some type of public consultation which concerned a planning matter. However, this is not new news.

1. **What do you think can be done to overcome this lack of public interest?**

Trust

The online questionnaire found that only 40% of participants said they trusted visualisations. The remaining 60% either said they did not trust visualisations or they did not know either way. Those who said they did not trust visualisations (29%) commented that plans tend to change after the visualisation has been created, that visualisation can lack detail and that actually viewing the plans would improve their trust.

Given these findings;

2. **Does the lack of trust identified by those surveyed concern you?**
3. **Do you think that planners can attempt to improve the trust that the public have in there visualisations? And if so, what methods could be used?**

Pre-construction Consultation

Onsite questionnaires were carried out at one site where construction was yet to take place. 16 participants were asked whether a visualisation (shown to them on location) improved their understanding of how the area would look. 67% felt that to some degree it would improve their understanding. Although 44% of participants did say they found it confusing/couldn't tell what had changed.

4. **One participant suggested before and after images, to clearly show the changes taking place. Do you think this is something which would be useful to future consultation?**

Post-construction Consultation

Onsite questionnaires were carried out at one site where construction had already taken place. 25 participants were asked whether they felt that a visualisation used within the public consultation was a realistic representation of how the area currently looked. 72% answered that the visualisation was very realistic or realistic. However, even those who considered the visualisation realistic criticised it.

A post construction consultation may allow for evaluation and review of the success of projects, and could improve future public consultation.

5. **Is this something that you think should be considered for future developments?**

Project Critic

A major flaw of this study was timing, especially in regards to the pre-construction site. From the usefulness of the answers participants gave it seems that a questionnaire alongside a public consultation meeting or exhibition would be of more use. For example, attendees could view the information and once complete answer questions on which parts improved their understanding most.

6. **Is this something you would consider in the future?**