Appendix B

Wider Benefits Assessment

Langstone Flood & Coastal Erosion Risk Management Scheme

Eastern Solent Coastal Partnership

60578525

April 2019

Eastern Solent Coastal Partnership
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1. Introduction

1.1 Background

AECOM was commissioned by the Eastern Solent Coastal Partnership (ESCP) to undertake an option appraisal study and develop an outline business case for a tidal flood risk management scheme at Langstone. As part of this, AECOM is undertaking a wider benefits assessment which will form a key part of determining the preferred management option.

This assessment compares the impact of a Do Nothing scenario against the scheme options to identify the wider benefits which could be provided by the scheme. These wider benefits represent considerations which are not measured in the FCERM appraisal process as part of the PF calculator, though they may present economic, social or environmental benefits to the local community.

1.2 Wider Benefits

Wider benefits of the scheme options at Langstone have been evaluated as part of four different assessments. Each of these assessments supports the business case for the tidal flood risk management scheme, using information gathered from stakeholder engagement, businesses within Havant and independent surveys.

- Gross Value Added (GVA) Assessment: The first round and dynamic economic impacts of the do nothing scheme option scenario have been calculated to highlight other local economic impacts as part of the evidence base;
- Tourism and Recreation Disruption: The potential impact of flooding on tourism and recreation around greenspaces within Langstone has been estimated using the ORVal tool, and an analysis of coastal visitor surveys which were conducted within Langstone;
- Disruption to Hayling Island: As the A3023 provides the only road access onto Hayling Island, the potential impact of flooding along the A3023 on transport and business within Hayling Island has been explored; and,
- Ecosystem Services Assessment: The value of the natural coastal environment within Langstone has been measured, highlighting the potential impacts of the proposed scheme option scenarios on the delivery of Ecosystem Services within the area.

1.3 Economic Footprint

In addition to the wider benefits assessments within this report, the potential impacts of flooding on the local economy have been ascertained through stakeholder engagement by assessing employment locations of residents. Of those who attended the stakeholder engagement event, 21 are in employment, with 11 of those working within Havant Borough, and 10 commuting outside of the Borough.

The indicative economic footprint based on the limited available sample (Figure 1-1:). This shows the potential spillover impacts on the wider economy of flood risk impacting residents of Langstone who are in employment elsewhere. Two of the attendees commute UK wide, and one commutes to London; this highlights the potential wide reaching impacts of flooding in Langstone. Furthermore, the impact on different employment sectors is shown in Figure 1-2, which indicates that flooding in Langstone has the potential to impact at least 10 different employment sectors.

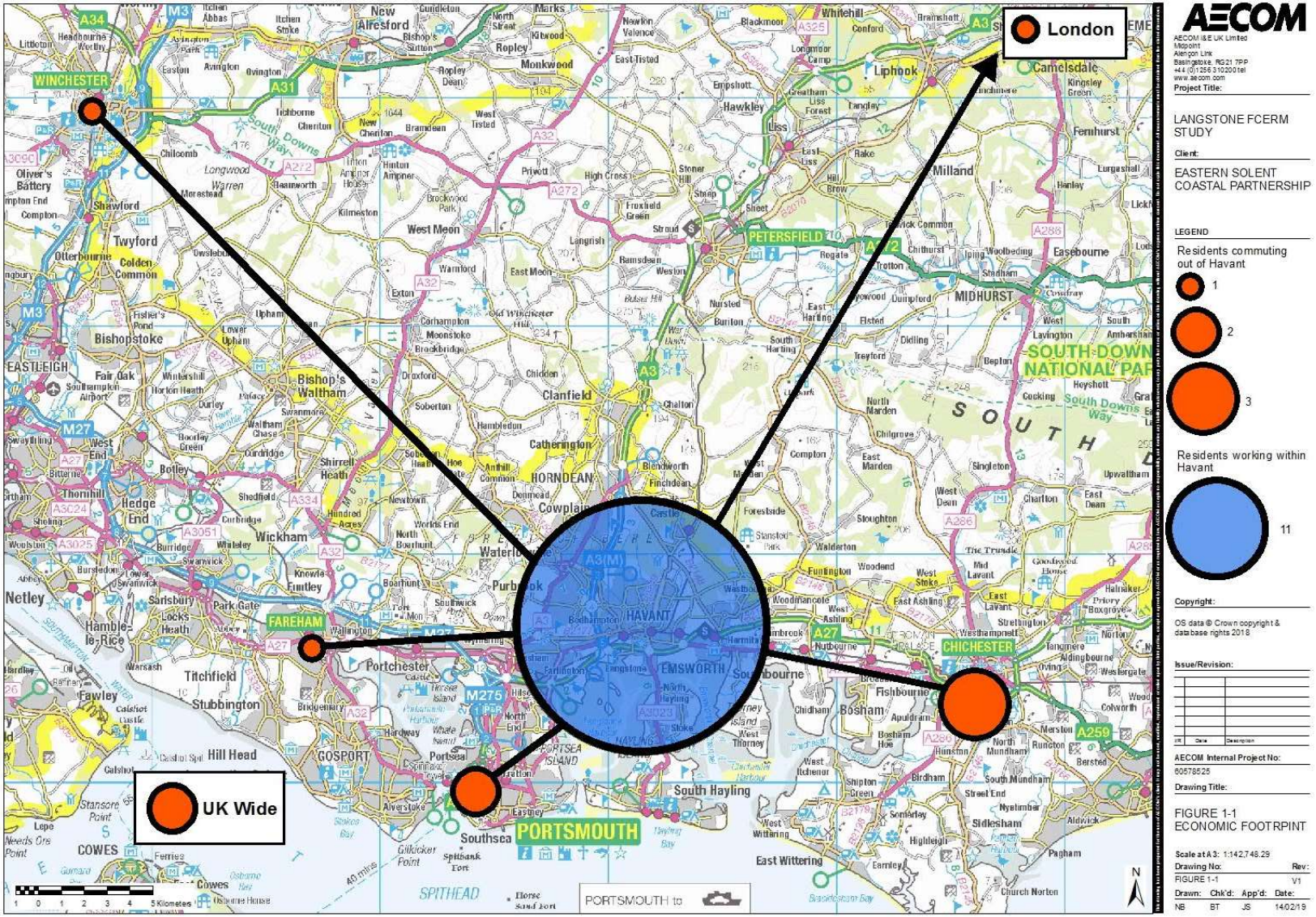

Figure 1-1: Spatial Extent of Economic Impact of Flooding in Langstone

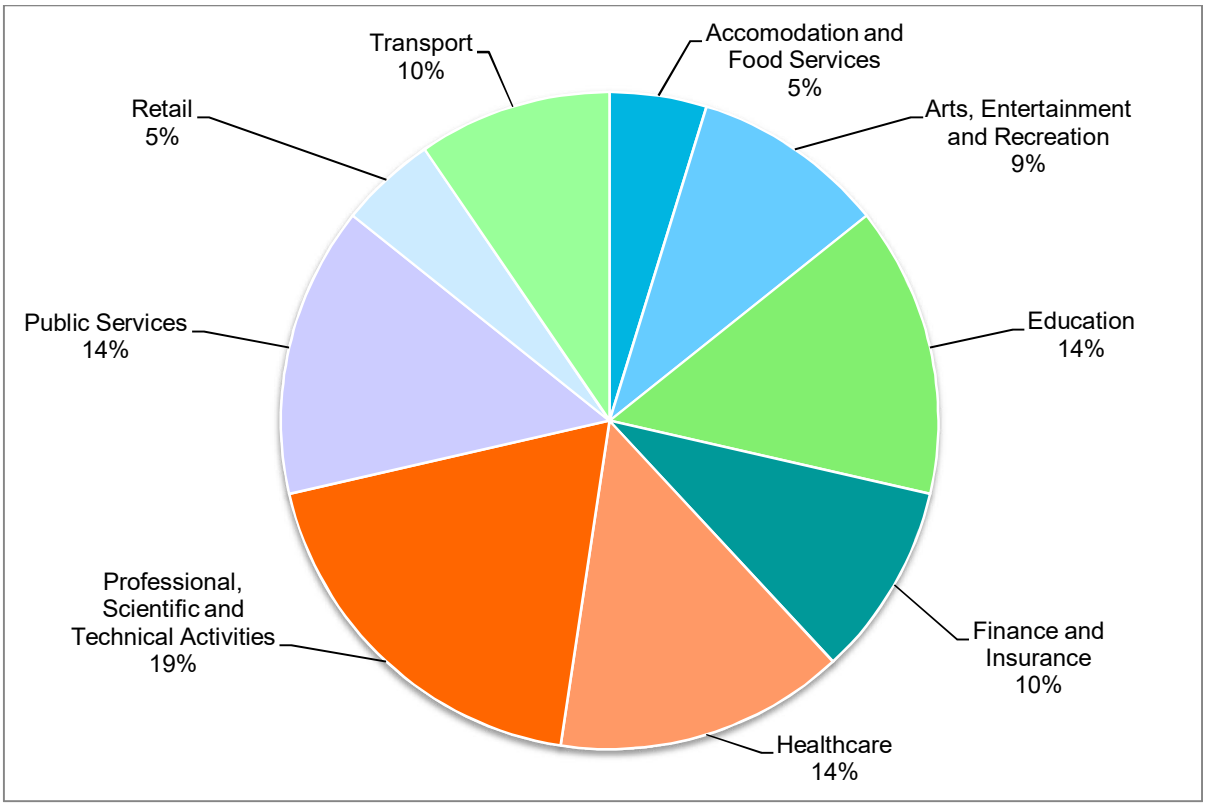

Figure 1-2: Employment Sectors of Residents of Langstone

2. GVA Assessment

2.1 Wider Economic Impacts of Do Nothing

The Gross Value Added (GVA) assessment determines the wider economic impacts of a 'Do Nothing' scenario which are not measured in the Environment Agency FCERM methodology, in the form of 'Dynamic Impacts'. The economic impacts assessed within the FCERM framework, such as the expected annual average damage to properties, relate specifically to impacts in the short term. These are termed 'First Round Impacts' and include losses which are applicable to the economic in a national context.

2.2 First Round Impacts

The estimated 'first round 'damages for a Do Nothing scenario typically may include the following aspects:

- Expected damage to residential and commercial properties (premises, inventories, machinery etc.);
- Damage to public infrastructure (utilities, for example);
- Education and Schools;
- Vehicle damage;
- Risk to life;
- Emergency clean up and temporary accommodation;
- Intangible damages (e.g. mental health, loss of personal items);
- Accommodation and subsistence;
- Traffic and travel disruption;
- Heritage and tourism loss from impacts on bespoke features (e.g. if there is no equivalent feature elsewhere, or there is no potential for displacement or transfer of this related tourism).

Table 2-1 below shows the estimated values of the first round impacts, as valued in the FCERM economic assessment. Each of the values is presented in present value terms (i.e. discounted PV damages). Where FCERM interventions prevent some or all of these first round impacts, the benefits are eligible to be included in FCERM assessments, Partnership funding and Grant in Aid applications.

Table 2-1: Summary of first round (FCERM eligible) impacts for Langstone

Category	Do Nothing First Round Impact (50 years)
Damage to residential and commercial properties	£11,010k
Damage to public infrastructure	£910k
Damage to education and schools	£0k
Vehicle damage	£706k
Damage associated with risk to life	£3,477k
Emergency clean up and temporary accommodation	£589k
Intangible damages	£48k
Traffic and travel disruption	£756k
Heritage and tourism loss	£0k*

*No National losses counted as displacement or transfer anticipated to occur to similar nearby sites.

The first round impacts can trigger business responses. This in turn leads to dynamic impacts. The scale and significance of these dynamic impacts on the local economy, in part depends on the geographical area under consideration. The relationship of GVA and FCERM Appraisal Guidance impacts, and the categorisation of first round and dynamic impacts, is shown in Figure 2-1.

Figure 2-1: Overlap of current FCERM-AG economic impacts and additional impacts on the local economy.

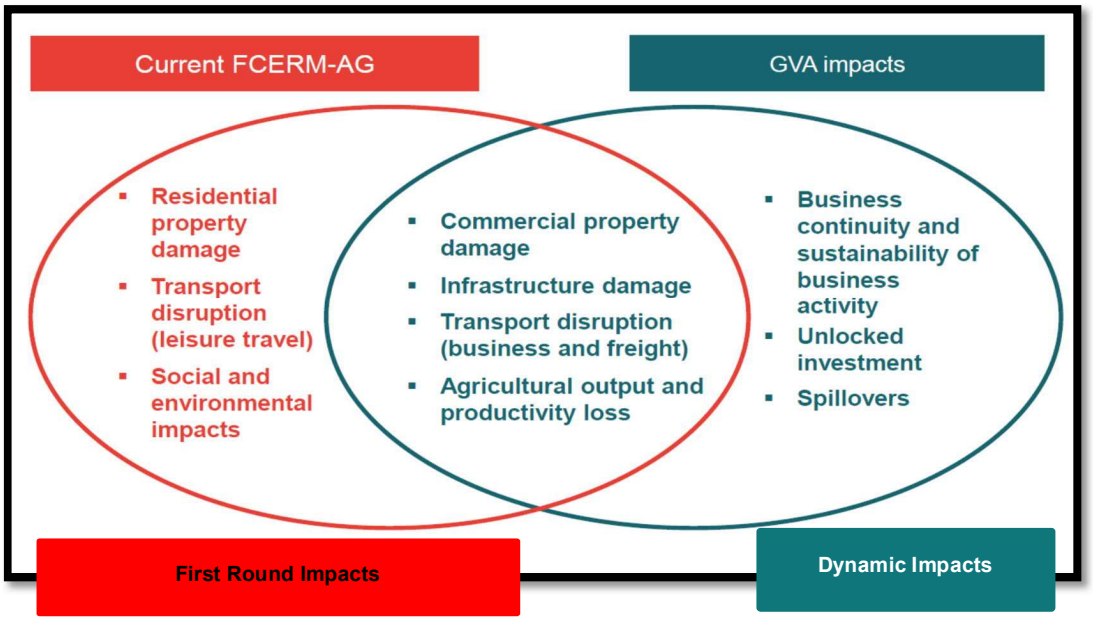

Figure 2-1: Overlap of current FCERM-AG economic impacts and additional impacts on the local economy.

2.3 Dynamic Impacts

Dynamic impacts reflect the outcomes for a local economy over time as businesses respond to changes in flood risk. Strategic tidal flood risk management intervention is likely to:

- Support business continuity and sustainability of business activity in an area;
- 'Unlock' investments that might otherwise have been constrained or unattractive given the flood risk; and,
- Lead to 'spill over' impacts which reflect interdependencies or other intangible impacts on economic activity.

By evaluating the potential contribution to the local economy of investing in flood risk management measures it helps build an understanding of their potential impacts on the local economy. This would be expected to increase the propensity for local partners to contribute funding to FCERM as part of the government's Partnership Funding approach.

2.4 Methodology of Dynamic Impacts Assessment

The contribution to the economy is quantified where possible and measured as Gross Value Added (GVA). This is complemented with qualitative assessments. The full method is described in the Flood and Coastal Erosion Risk Management and the Local Economy TOOLKIT (2014)[1].

The primary focus is on local GVA, and associated key drivers of the impacts on the local economy. As the methodology for assessing GVA impacts of FCERM, and its application, are in their infancy, it is likely that the approach, data and assumptions will need to be reviewed and updated over time as a richer evidence base comes to light.

A high level proportionate GVA assessment was applied in this study using the AECOM LEVI (Local Economic Valuation of Impacts) Tool. The Tool which adopts the GVA toolkit methodologies has been used to estimate the wider impacts on economic activity by explicitly considering businesses' likely responses to flood risk. Within Langstone this assessment is based upon the two public houses – the Ship Inn and the Royal Oak – using data on the number of employees and their salaries.

[1] Frontier Economics (2014) *Flood and Coastal Erosion Risk Management and the Local Economy TOOLKIT*. Available from: http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2662_full_toolkit.sflb.ashx [Accessed 3 January 2019].

Typically, a GVA assessment is undertaken using a 10 year period, as this period reflects that where direct impacts can be reasonably attributed or linked to specific interventions. Beyond that the envelope of uncertainty grows significantly and other factors may become more influential in determining the futures experienced; therefore a 10 year appraisal period has been adopted in this study.

The GVA estimations are based on an average annual figure for the period which is then presented as a discounted (Present Value) total for the whole period. The base year of appraisal used was 2018 with a discount rate of 3.5%.

The dynamic impacts assessment for the Langstone FCERM scheme focussed on quantitative estimations of disruption to existing businesses, including valuation of potential losses from flood risk detrimentally impacting on business continuity and operation.

2.4.1 Business responses to flood risk

Using the estimated range of business responses, we can explore the likely dynamic impacts of flooding and FCERM. In the absence of FCERM intervention, evidence suggests that disruption to business activity could last many weeks. Frontier guidance suggests that without intervention, a business could be disrupted for around 16-24 weeks because of flooding, and 2-4 weeks with the FCERM intervention. For this assessment the length of business disruption without intervention is assumed to be 8 weeks, according to consultation with the business owners within Langstone, and 4 weeks with FCERM intervention.

Businesses operate in the context of uncertainty about when, how, what scale, how long and how often they may experience flooding. They have to make business decisions to manage the risks they face. In response to flood risk, businesses respond in one of 4 ways:

- Stay and do nothing
- Stay and adapt
- Move
- Shut down

Following consultation with the businesses to underpin an assessment of potential business behaviours (with respect to flood risk), two scenarios have been used in the valuation of impacts:

1. Both businesses will ‘Stay and Do Nothing’; and
2. Likely business response where both businesses will ‘Stay and Adapt’.

2.5 Results from Dynamic Impacts Assessment

The analysis shows that the potential worst case scenario dynamic impact cash cost to the local economy is £27k per annum, which equates to a total potential PV damage of £231,600 over the next 10 years (Table 2-2:).

This GVA total is additional to the first round impacts associated with commercial, infrastructure and transport damage avoided, which is counted under FCERM-AG as a national economic loss.

Table 2-2: Summary of Cumulative Estimated Dynamic Impacts over next 10 years (Present Value)

	Do Nothing Scenario Total Dynamic Impacts
Existing business disruption & loss of earnings (Assumed both businesses ‘Stay & Do Nothing’)	£231,600
Existing business disruption & loss of earnings (Likely business response ‘Stay & Adapt’)	£115,800

An 8-week disruption period caused by flooding would also impact the revenue of the two commercial properties. Consultation with the Ship Inn suggested that this period of disruption would result in the loss of approximately £200k (per major flood event). Although this is not recorded within the GVA assessment, it supports the business case for strategic tidal flood risk management at Langstone, exemplifying that flooding has the potential to impact both the Ship Inn and Royal Oak functioning as profitable businesses.

2.6 Likely GVA Benefits of Preferred Option

The delivery of a flood protection scheme will maximise the opportunity to turn the dynamic impacts (damages) estimated for a Do Nothing Scenario into benefits (disruption to businesses avoided). Although the final SoP of the scheme is still to be defined, by providing a strategic FCERM intervention which delivers a high standard of protection to Langstone, the potential GVA damages valued under Do Nothing (Table 2-2:) will almost entirely be claimed as a benefit through significantly improved protection against tidal flooding.

The GVA assessment demonstrates significant local value (beyond simply traditional FCERM valuation of benefits) of the proposed FCERM intervention, and this provides a more comprehensive evidence base and greater justification to seek partner funding from the potential beneficiaries thus helping to enable the schemes required.

2.7 Recommendations

Further GVA Benefits could be calculated by evaluating the impact of flooding on residents of Hayling Island, commuting off of the Island for work. Flood events in Langstone have the potential to reduce access to the A3023, preventing safe egress from Hayling Island, which will result in a loss of earnings for residents of Hayling Island who cannot commute to their workplace. Although an assessment of the cost of traffic disruption on the A3023 has been calculated as part of the Do Nothing damages, the loss of earnings caused by traffic disruption should be calculated to add to the GVA value. This would require a survey to be undertaken by residents of Hayling Island, to determine the average loss of earnings of commuters from Hayling Island in a flood event.

3. Disruption of Tourism and Recreation

3.1 Background

Flooding and the associated impacts are likely to lead to disruption of tourism activities at recreational locations in Langstone. The natural character of the site makes it a popular coastal destination within the Solent region for tourists, through identifiable features such as Langstone Spit. There are a variety of recreational activities available, including fishing and water sports in the Harbour.

Langstone has popular greenspaces and areas which are recognised internationally for importance in nature conservation, particularly for aquatic wildlife and a variety of bird species. The area is also considered to have cultural and historical significance, in sites such as the Mill, which is a factor in attracting both residents and visitors.

The following tools and surveys have been used to assess the current value of tourism and recreation within Langstone, and the potential impact of flooding on the contribution of tourism to the local economy.

3.2 ORVal Tool

The Land, Environment, Economics and Policy Institute (LEEP) at the University of Exeter have developed the Outdoor Recreation Valuation Tool (ORVal)[2]. This tool is used to measure the value of currently available greenspace to the economy at various locations across the whole of the UK, including the frontage at Langstone.

The value of outdoor recreation is provided as a welfare value per year, with other information including the number of visitors per year, and transport modes of visitors to the site. Here the welfare value is defined as the monetary equivalent of the welfare enjoyed by individuals as a result of having access to having access to the green space, which can also correspond to a willingness to pay value for the site.

ORVal estimates that there is an average of 43,147 visitors to Langstone each year for outdoor recreation, worth a welfare value of £178,147. The impacts of potential flooding would likely reduce the value of outdoor recreation in Langstone, by limiting the access and availability of greenspaces. The timing, scale and extent of the reduction in visitors is difficult to quantify with any certainty, but if defences deteriorate, coastal access will become difficult and with increasing flood risk under a Do Nothing scenario it is highly likely a significant proportion of visitors would chose an alternative nearby coastal destination for leisure and recreation activities.

3.3 Solent Visitor Surveys

Footprint Ecology carried out surveys of visitors to the Solent region in Winter 2017/18[3], on behalf of the Solent Recreation Mitigation Partnership. The purpose of the study was to develop a baseline understanding of visitor numbers and access patterns from 10 recreational locations across the Solent, using both interviews and counts of visitors to the locations. The interviews developed profiles on the types of visitors, including factors that influence behaviour.

The survey location for Langstone was situated on the shore adjacent to the parking area at the end of Southmoor Lane. As an indicator of the sphere of influence of Langstone, the interviews found that 79% of visitors visited Langstone for day trips or just a short visit from home. However, 72% of visitors drove to the site, emphasising the importance of the road networks for travel to and from Langstone for tourism purposes.

Surveys were also carried out on Hayling Billy trail, Hayling Island. Although this area is not within the Langstone study area, the results help to demonstrate the impact that flooding in Langstone would have on access to popular tourist locations on Hayling Island. The path junction on Hayling Billy trail coastal path was surveyed. The surveys found that on average, 95% of those surveyed visit for a day trip or short visit from home and the remaining 5% of visitors were tourists staying away from home; therefore it is likely many will have to access Hayling Island via the A3023, which would be difficult during flood events.

Overall, the main activities of visitors to the Solent region were walking (21%) and dog walking (66%), emphasising the importance of maintaining footpath access within the shortlisted options. A further 93% of visitors accessed the

[2] Land, Environment, Economics and Policy (LEEP) Institute (2018) *Outdoor Recreation Valuation (ORVal) Tool*, University of Exeter. Available from: https://www.leep.exeter.ac.uk/orval/ [Accessed 10 December 2018].
[3] Liley, D., Panter, C. (2018) *Solent Visitor Surveys, Winter 2017-18.* Unpublished report by Footprint Ecology for the Solent Bird Aware Project.

shoreline during their visits, so access to the foreshore remains important to visitors of the Langstone frontage and should be protected as part of the scheme.

3.4 Langstone Coastal Survey

Havant Borough Council conducted a study[4] with 25 respondents on the use of Langstone Harbour as a key coastal site for tourism and recreation to understand both visitor and resident uses of the site, and their perspectives on potential changes to the existing coastal defences.

Paths along the frontage were viewed as a favourite aspect of the site by 100% of the respondents, and walking was the most common way that visitors use the coastline; 83% of respondents stated they would like the existing footpath access to be improved. This emphasises the need to limit the disruption caused by flooding on footpath. A further 68% stated that access to the water was their favourite aspect of the site, highlighting that access to the foreshore should also be protected as part of the scheme.

72% of respondents stated that they use the site for its historic setting, and 56% said that this was one of their favourite aspects of the site. Flooding has the potential to disrupt the access to the historical parts of Langstone, potentially reducing the tourism value of the area. This should encourage the implementation of defences which protect the historic setting and also retain the cultural value of the site, as 88% of respondents stated that the look and feel of the design of coastal defences should be one of the most important considerations.

[4] Havant Borough Council (2018) *Langstone Coastal Survey.*

4. Access and egress disruption to Hayling Island

Extreme flood events in Langstone are likely to impact access to the A3023, which is a critical piece of transport infrastructure linking Langstone to Hayling Island. Flooding of this main access road has the potential to disrupt businesses operating on Hayling Island, residents commuting from the Island, future development and access for emergency services and safe egress.

4.1 Travel and Business

Flooding of the A3023 will impact residents of Hayling Island commuting off of the Island for work, as exemplified in a travel and transportation survey[5] conducted by Havant Borough Council as part of the evidence base for the Local Plan 2036. The survey found that 34% of respondents travel off of the island for work related purposes, and 92% of residents use road vehicles for travel off of the island. Although 55% of those leaving the island are travelling to other areas of Havant, a number of other locations are listed as destinations including Chichester, Fareham, London, Portsmouth and Southampton, which demonstrates the large spatial economic impact of the A3023 flooding.

Reduced access to Hayling Island may impact the hundreds of businesses operating there by preventing both employees and customers from getting to and from the Island. A large proportion of the businesses are aimed at visitors to the Island, including tourist accommodation and marine activities. With these visitors unable to access the Island due to flooding of the A3023, these businesses are likely to suffer economically.

4.2 Future Development

The draft Local Plan 2036[6] has established the need for the development of 9,549 new homes (including a windfall allowance) across the Borough between 2016 and 2036, including the potential for sites on Hayling Island. Four regeneration areas of mixed use development have been proposed for the Island composed of around 195 dwellings, leisure centres and retail spaces. However there are challenges to development on Hayling Island due to the single access road, and these challenges would be exacerbated by flooding.

The Local Development Scheme[7] highlighted uncertainty in development due to the highway capacity via the A3023, therefore two studies are currently underway to explore whether the highway infrastructure will be a constraint to development. If these studies identify that development on Hayling would not be considered sustainable, then the Borough's need for housing would not be met[8]. Therefore flooding of the A3023 from Langstone is a concern for development targets across the Borough and not just Hayling Island.

4.3 Safe Egress

Flooding of the A3023 has implications on safety procedures for Hayling Island during emergencies as it is the only road providing egress from the Island. In an extreme flood event, emergency services will have reduced access to Hayling Island. Although there are fire and rescue services based on Hayling Island, there is no permanent police presence. There is also no ambulance station, and those at Havant, Fareham and Gosport have now been closed[9]. This would make it extremely difficult for ambulance services to respond to emergencies.

The greatest proportion of calls to ambulance services come from Eastoke, where there is a larger elderly population. This is likely to increase as the dependency ratio is expected to rise to 80% by 2021, as the percentage

[5] Havant Borough Council (2017) *Hayling Island Travel and Transportation Survey, Local Plan 2036*. Available from: http://www.havant.gov.uk/sites/default/files/documents/Hayling%20Island%20Travel%20Report%20External%20Version.pdf [Accessed 10 December 2018].
[6] Havant Borough Council (2018) *Where next for housing in Havant Borough?* Available from: http://www.havant.gov.uk/sites/default/files/documents/The%20Draft%20Local%20Plan%202036_for%20web%20with%20policy%20numbers%20%281%29.pdf [Accessed 10 December 2018].
[7] Havant Borough Council (2017) *Local Development Scheme, Local Plan 2036.* Available from: http://www.havant.gov.uk/sites/default/files/documents/Local%20Devleopment%20Scheme%20%28December%202017%29.pdf [Accessed 10 December 2018].
[8] Havant Borough Council (2017) *Constraints and Supply Analysis, Local Plan 2036.* Available from: http://www.havant.gov.uk/sites/default/files/documents/Housing%20Constraints%20and%20Supply%20Analysis%20%28December%202017%29_0.pdf [Accessed 10 December 2018]
[9] Havant Borough Council (2017) *DRAFT Infrastructure Delivery Plan, Local Plan 2036.* Available from: http://www.havant.gov.uk/sites/default/files/documents/Draft%20Infrastructure%20Delivery%20Plan%20%28December%202017%29.pdf [Accessed 10 December 2018].

of residents aged 65 and over is predicted to increase as the Island remains an attractive retirement destination[10]. This will place more pressure on the South Coast Ambulance Service (SCAS) Community First Responders and Co-Responders based on the Island to reach callers and provide early intervention, particularly in extreme flood events.

Havant Borough Council has produced an Incident Plan[11] for Hayling Island, in the event of the closure of the A3023 over the Langstone Bridge in an emergency event such as flooding. The plan co-ordinates the use of other existing infrastructure in emergencies, as part of an agreement with Hampshire County Council's emergency planning resilience unit. The plan identified that helicopters and landing crafts (via slipways) can be utilised during emergencies to reach Hayling Island, though the use of these will be dependent on weather conditions. Furthermore, departure and landing sites have been identified on the Island for hovercrafts during emergencies, though the use of these will require specific permission is required from the Langstone Harbour Master. The use of this alternative infrastructure relies on many factors and therefore it may still be difficult to implement this plan during extreme flood events.

[10] Havant Borough Council (2018) *Havant Borough Profile, Local Plan 2036.* Available from: http://www.havant.gov.uk/sites/default/files/documents/Havant%20Borough%20Profile.pdf [Accessed 10 December 2018].
[11] Havant Borough Council (2017) *Hayling Island Emergency Planning Framework.* Available from: http://www.havant.gov.uk/sites/default/files/documents/Hayling%20Island%20EP%20Framework%20public%20version%20171120.pdf [Accessed 10 December 2018].

5. Ecosystem Services Assessment

5.1 Background

An Ecosystem Services (ES) Assessment has been undertaken as part of the wider benefits assessment to highlight the value of natural capital across Langstone in the form of ES, using a bespoke ES Assessment tool developed by AECOM, ESIVI (Ecosystem Services: Identification, Valuation & Integration). The tool was created to support the option appraisal process by including an assessment of the value of ES in the scheme selection process. ESIVI allows for the identification of ES provided by the study area, and an assessment of the impacts and benefits of potential scheme options on the provision of each ES. This provides an aggregated appraisal score for each scheme option to inform the option selection process.

ES provided by coastal environments are undervalued by traditional assessments within the FCERM process. Highlighting the economic, social and environmental cost of impacting ES, or the benefits of improving them, has the potential to improve the business case for FCERM. This can lead to increased stakeholder contributions, and provides a more comprehensive measure of the value of ecosystem functions which can be difficult to assign a monetary value to.

The ES assessment has determined the existing baseline of ES delivery within Langstone at year 0 in a scoping process. The Frontage consists of a number of different environments, delivering a range of ES which are valued by the local community. The delivery of these ES will be affected by the coastal defences in place and the scheme options selected. The impact of the potential scheme options on the delivery of ES have been assessed against the baseline in an appraisal process for the entire Frontage, including an assessment of the Do Nothing, Do Minimum, Maintain and Improve options. The impact of the scheme options will be assessed over the lifetime of the scheme, from year 0 to year 99.

ES identified in this assessment are divided into three groups of services which provide different benefits:

- Provisioning Services: products that are obtained from ecosystems;
- Regulating Services: benefits obtained from the regulation of ecosystem processes; and,
- Cultural Services: non-physical benefits that people obtain from ecosystems.

Each of these groups of services, and the specific ES identified within them, has different beneficiaries. Only those ES with significant beneficiaries will be recognised by the assessment. ESIVI provides a high level assessment of the ES provided in the study area, although each ES can be measured further using different methods, to provide both monetary and non-monetary values.

5.2 Methodology

ESIVI has been used to assess the impact of the scheme options on the delivery of ES within Langstone. The potential ES delivered at Langstone are given in a pre-determined list, based on the type of ecosystem selected within ESIVI. For Langstone, the ecosystem selected is Coastal. Further ES can be added into the assessment if they are deemed to be delivered at the study area.

5.2.1 Scoping

To determine the impacts and benefits of the scheme options on ES across the Langstone Frontage, the existing baseline of ES delivery has been assessed in a scoping process using the ESIVI tool.

The scoping process assigns a significance score of ‘Negligible’, ‘Low’, ‘Medium’ or ‘High’ to the delivery of each ES based on the following factors:

- Is the service provided by any of the ecosystems within the study area;
- Could habitat creation or restoration as part of the scheme lead to the provision of this service;
- Is this service of significant importance to any of the beneficiaries of the service;
- Is the scheme likely to impact the ecosystem which provides this service;
- Is the scheme likely to impact on any benefits people derive from this service.

ES with an indicative significance score of 'High' or 'Moderate' are scoped-in to the appraisal process and the next step of the assessment. This initial assessment is based on the existing baseline delivery of ES (year 0).

5.2.2 Appraisal

The potential impact or benefit of each scheme option (Do Nothing, Do Minimum, Maintain or Improve) is assessed for each scoped-in ES in the appraisal process. Each ES is scored based on the indicative impact across the scheme option life (year 99) against the baseline (year 0). The appraisal impact scores are defined in Table 2.

Table 5-1: Appraisal Impact Scores

Impact or Benefit	Score
Major Benefits	+2
Benefits	+1
No Net Impact	0
Adverse Impacts	-1
Major Adverse Impacts	-2

The appraisal process provides a score for the impact of each scheme option on each ES, and an aggregated score for each scheme option which is indicative of the overall impact or benefit of the scheme option on the delivery of ES across the Langstone Frontage.

5.3 Baseline (Year 0)

The scoping process within the ESIVI assessment provides a baseline for the ES currently delivered within the Langstone Frontage, and determined that there are no Provisioning Services.

5.3.1 Regulating Services

Several Regulating Services were identified as being delivered across the Frontage and of importance to the beneficiaries of the site.

Global Climate Regulation refers to carbon sequestration through active vegetation in the ecosystem, reducing the effects of climate change. Throughout the study area there are significant areas of vegetation which contribute to the delivery of this service, such as the vegetated river bank at Langbrook Stream in ODU 1a, the grassed area in ODU 3g, and the areas of saltmarsh in front of the defence at ODU 4b.

Local Climate Regulation occurs through variations in land cover which can affect local temperature, wind, precipitation and shading through evapotranspiration and surface albedo. The presence of vegetation throughout the Frontage contributes to the delivery of this service, as well as some of the formal hard defences including the sea wall at ODU 1b.

Pollination is delivered through the distribution, abundance and effectiveness of natural pollinators which regulate the ecosystem. At Langstone this is delivered in areas of vegetation with ecological value, such as Langbrook Stream in ODU 1a, the grassed area in ODU 3g, and the areas of saltmarsh in front of the defence at ODU 4b.

Hazard Regulation is delivered throughout the Frontage where coastal defences are in place, limiting the impact of flooding and coastal erosion and maintaining the integrity of the ecosystem. The existing formal coastal defences at ODUs 1b, 3b, 3d, 4a and 4b provide some protection against flooding and coastal erosion of the Frontage. There are also other informal defences in various locations which deliver varying levels of Hazard Regulation.

Sediment Transport Regulation is delivered at the Frontage where maintenance of soil cover, levels of suspended sediment loads and shoreline stabilization occurs. Similarly to Hazard Regulation, this takes place where formal coastal defences are in place to prevent coastal erosion and aid shoreline stabilization at ODUs 3b and 4a, as well as the area of salt marsh in front of the defences at ODU 4b.

5.3.2 Cultural Services

The Langstone Frontage also delivers all of the potential Cultural Services defined in ESIVI.

Tourism and Recreation is one of the most important services delivered throughout the Frontage, as with many coastal areas which provide activities that are attractive to visitors of the site. Several areas along the Frontage are recognised for Tourism and Recreation, particularly the National Cycle Route at ODU 2b, the Sailing club at ODU 2c, areas of ODU 3 around the Ship Inn and footpaths within ODU 3 and 4b. There are also several areas within ODU 3 which provide access to the foreshore, a key component of the Frontage for the community. Natural areas are valued for Tourism and Recreation at Langstone Spit at ODU 2a and the salt marsh in front of the defences at ODU 4b.

The Frontage delivers Cultural and Spiritual value in the historical and cultural benefits seen at different sites. The listed heritage buildings within ODU 3g provide cultural value, and the Mill at ODU 4a is historically valued by the local community as a listed building, providing character to the local community.

Scientific and Educational value is delivered through opportunities for scientific learning, for both research and educational purposes. This is prevalent in Langstone where there are ecological benefits at Langbrook Stream in ODU 1a, the salt marsh in front of the defences at ODU 4b and several other locations of the foreshore across the Frontage. Similarly, Wild Species Diversity is delivered at these locations where the site possesses a diverse range of flora and fauna.

Aesthetic Value is provided through the appearance of the site at several locations, including Langstone Spit at ODU 2a and the Mill at ODU 4a; both are valued by the local community as providing character to the area.

5.4 Do Nothing

The Do Nothing scheme option describes a ‘walk away’ scenario, where the defences are left to fail over time. This would have an overall negative impact on the delivery of ES across the Langstone Frontage, affecting the ES which are currently protected.

The scheme option would have adverse impacts on the delivery of Local Climate Regulation, Global Climate Regulation and Pollination as flooding and coastal erosion would no longer be prevented. The vegetation across the Frontage would be compromised, reducing the delivery of these services.

The scheme option would have major adverse impacts on the delivery of Hazard Protection over time as all of the defences would be diminished, and no protection provided to the Frontage. Similarly the scheme option would have major adverse impacts on the delivery of Sediment Transport Regulation, as the lack of coastal defences would lead to shoreline destabilization through coastal erosion.

Over the lifetime of the scheme, the scheme option would have a major adverse impact on the delivery of three of the cultural ES: Tourism and Recreation, Cultural and Spiritual and Aesthetic Value. The sites which are valuable for tourism such as the National Cycle Route at ODU 2b and the Sailing club at ODU 2c would have no protection and eventually be impacted by flooding. Furthermore the existing footpaths would be lost through flooding and coastal erosion where they exist close to the shoreline, removing the access to the foreshore. Sites such as Langstone Spit and the Mill which are highly valued under Cultural, Spiritual and Aesthetic Value would potentially be lost, having a large negative impact on the character of the area and the local community.

Both Scientific and Educational value and Wild Species Diversity would be adversely impacted by the scheme option, where opportunities for scientific learning at sites with high biodiversity (particularly Langbrook Stream at ODU 1a) would be lost through flooding and coastal erosion impacts.

5.5 Do Minimum

The Do Minimum scheme option involves patch and repair of the coastal defences, with reactive maintenance. This option would have an overall negative impact on the delivery of ES across the Langstone Frontage, to a lesser extent than the Do Nothing option.

This scheme option is likely to have no impact on the delivery of Local Climate Regulation, Global Climate Regulation and Pollination services at the Frontage. The process of reactive maintenance of the existing coastal defences will maintain these services, such as the presence of vegetation throughout.

This option would lead to adverse impacts on the delivery of Hazard Protection over time, as the reactive maintenance would allow the existing coastal defences to be diminished to some degree, prior to maintenance. This could allow the impacts of flooding and coastal erosion to impact the local community through flooding of residential properties, commercial properties, roads and the natural environment. Similarly Transport Regulation would be reduced through the impact of coastal erosion, particularly in areas such as Langstone Spit.

The scheme option would have major adverse impacts on the delivery of Hazard Protection over time as all of the defences would be diminished, and no protection provided to the Frontage. Similarly the scheme option would have major adverse impacts on the delivery of Sediment Transport Regulation, as the lack of coastal defences would lead to shoreline destabilization through coastal erosion.

The scheme option would have an adverse impact on each of the Cultural services identified. Although patch and repair of the defences will provide some protection to the services along the Frontage, it is likely that they will not be delivered to the same extent. For example sites valued for Tourism and Recreational benefits such as footpaths for foreshore coastal access may be damaged, and impacts of coastal erosion on the Langstone Spit could reduce the Cultural, Spiritual and Aesthetic Value. Similarly to Do Nothing, the Scientific and Educational Value and Wild Species Diversity of several sites including Langbrook stream could be adversely affected.

5.6 Maintain

The Maintain scheme option would involve proactive repair and larger scale maintenance of the existing defences. This option would benefit the delivery of ES at the Frontage in most cases, through the provision of better flooding and coastal erosion defences.

Maintaining the existing defences with this scheme option is likely to have no impact on the delivery of Local Climate Regulation, Global Climate Regulation and Pollination through vegetation. The services will be maintained through proactive repair of the defences where they are delivered.

The scheme option would have benefits on Hazard Regulation and Sediment Transport Regulation, improving the delivery of these services. Proactive repair and large scale maintenance will prevent the existing defences from deteriorating and improve on the existing level of protection provided against flooding and coastal erosion for properties and the environment. This would support improved shoreline stabilization at ODUs 3b and 4a.

Maintaining the existing defences would be likely to benefit the delivery of Tourism and Recreation and Cultural and Spiritual Value. Sites that are valued for all of these services would be better protected against the impacts of flooding and coastal erosion, enabling full access to the benefits of the services. This is particularly relevant for recreational areas such as footpaths which enable coastal access throughout the Frontage, the National Cycling Route, the Sailing club and the Ship Inn. The cultural sites such as those buildings at ODU 3g and the Mill will also be protected, retaining the cultural value for the local community.

The value of Scientific and Educational services and Wild Species Diversity will be maintained by the scheme option. It will provide flooding and coastal erosion protection benefits to the delivery of these services at Langbrook Stream and the salt marsh in front of the defences at ODU 4b. However to retain these services, the defence structures should not lead to encroachment and adversely impact the ecology. Similarly, the Aesthetic Value of the Frontage will not be impacted, as the proactive repair of the defences should maintain the standard of protection, and therefore maintain the benefits provided by the services at Langstone Spit and the Mill.

5.7 Improve

The Improve scheme option would effectively improve the standard of protection provided by raising the height of existing defences, or constructing new defences. This scheme option has the greatest benefits of any scheme option on the delivery of ES at the Frontage.

The impact of the scheme option is dependent on the extent of improvements made to the defences, though it is anticipated the scheme will adversely impact the delivery of Local Climate Regulation, Global Climate Regulation and Pollination services throughout the Langstone Frontage. Constructing new defences is likely to reduce the existing area of vegetation located in ODUs 1a, 3g and 4b, although the impact of defence structures on ecology may limit the extent of frontline defences.

Hazard Regulation and Sediment Transport Regulation would experience major benefits from this scheme option. Improving the standard of protection for the existing defences provides Hazard Regulation and Sediment Transport Regulation (through shoreline stabilization) to the greatest extent possible, minimising the impacts of flooding and coastal erosion on the local community. This is applicable to areas which currently have formal coastal defences (ODUs 1b, 3b, 3d, 4a and 4b) and any informal defences which will be improved as part of the scheme option.

Similarly to the Maintain option, this scheme option will provide major benefits for Tourism and Recreation and Cultural and Spiritual services. All of the sites which deliver these services will be better protected against flooding and coastal erosion, enabling and potentially improving access to the benefits of these services. Recreational areas such as footpaths will be improved, allowing better access to the Frontage. The cultural sites such as those buildings at ODU 3g and the Mill will be better protected, retaining the cultural value for the local community.

This scheme option will provide benefits to the Aesthetic Value of the Frontage, by better protecting Langstone Spit and the Mill from flooding and coastal erosion impacts. Furthermore, improving the existing formal and informal defences along the Frontage will increase the general Aesthetic Value of the Frontage. However, where the height of existing defences are raised or new defences constructed, the Aesthetic Value of the natural elements of the site may be negatively impacted.

The value of Scientific and Educational services and Wild Species Diversity will be maintained by the scheme option. The benefits currently delivered at Langbrook Stream, and the salt marsh in front of the defences at 4b will be retained and better protected against the impacts of flooding and ecology. However to retain these services, the defence structures should not lead to encroachment and adversely impact the ecology.

5.8 Summary

Each of the Scheme Options has an impact on the ES currently delivered at the Langstone Frontage as described in Sections 5.4 – 5.7. The appraisal scores for each ES and each scheme option (Figure 5-1) provide a total aggregated appraisal score to highlight the overall benefit of each scheme option.

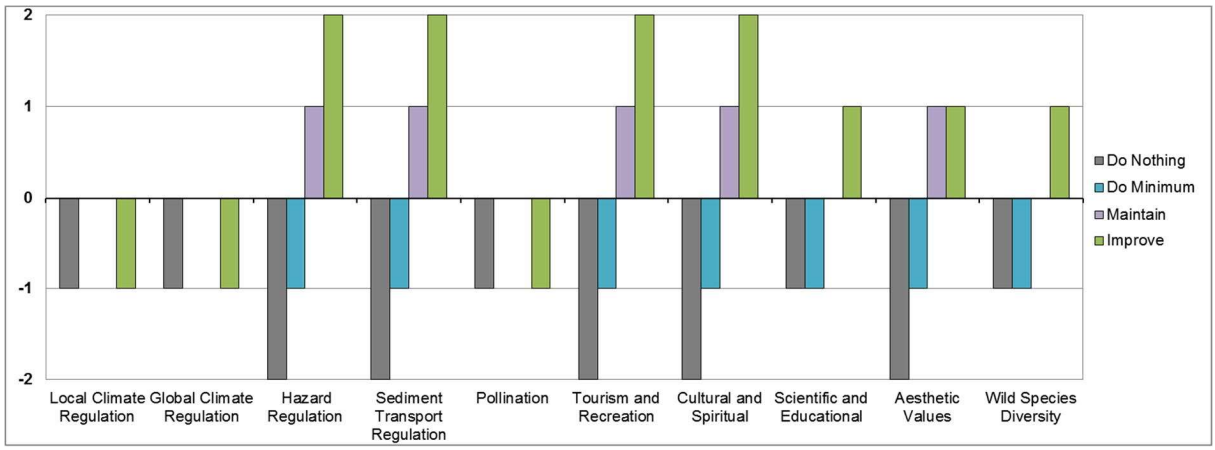

Figure 5-1: Summary of ecosystem service impacts

The Scores are calculated according to Table 5-1: where a score of zero is representative of the scheme option having no net impact on the delivery of the ES, rather than the ES not being delivered.

The total aggregated appraisal scores (Table 5-2:) show that the Do Nothing option would have the highest overall negative impact on the ES delivery, and the Improve scheme option would have the highest overall positive impact on the benefits delivered by the ES in the Langstone Frontage. Improving the standard of protection of the defences facilitates the benefits of the ES by reducing the impact of flooding and coastal erosion on their delivery. However, the impact of the scheme options on the ES is only estimated based on the general overview of each scheme option. The final impact of the scheme will be dependent on the specific defence mechanisms implemented along the frontage.

Table 5-2: Appraisal Impact Scores for the Scheme Options

	Ecosystem Service	Scheme Option			
		Do Nothing	Do Minimum	Maintain	Improve
Regulating Services	Local Climate Regulation	-1	0	0	-1
	Global Climate Regulation	-1	0	0	-1
	Hazard Regulation	-2	-1	1	2
	Sediment Transport Regulation	-2	-1	1	2
	Pollination	-1	0	0	-1
Cultural Services	Tourism and Recreation	-2	-1	1	2
	Cultural and Spiritual	-2	-1	1	2
	Scientific and Education	-1	-1	0	0
	Aesthetic Values	-2	-1	1	1
	Wild Species Diversity	-1	-1	0	0
Total Aggregated Appraisal Score		-15	-7	4	6

6. HEAT Assessment

6.1 HEAT Tool

The Health Economic Assessment Tool (HEAT) for walking and cycling by WHO/Europe has been used to conduct an economic assessment of the health impacts of walking and cycling in the study area. The HEAT estimates the value of reduced mortality that results from specified amounts of walking or cycling, answering the following question:

> *If x people regularly walk or cycle an amount of y, what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?*

The tool can be used to assess changes over time and 'before' and 'after' situations where measures have been taken.

6.2 Baseline

The Do Nothing scenario has been used as the baseline for the HEAT assessment and the potential health impacts associated with erosion of the main public footpath along the frontage has been assessed (between the Ship Inn and Royal Oak). Used in this way, the HEAT tool has produced a Do Nothing damage value for the increase in mortality that could result from people reducing the amounts of physical activity (walking) that they do because the existing footpath is not available. Should the footpath be protected as part of the scheme, this will be converted into an economic health benefit because people will be able to continue with current levels of physical activity.

6.3 Inputs

The HEAT tool has a number of input fields which need to be populated to determine the economic health impact. The following values were input into the tool:

- The length of coastal path lost under the Do Nothing scenario was estimated to be 156m.

- An average adult population age was assumed, between 20-74 years.

- The total population included in the assessment was 308. This has been based on the number of properties protected by the scheme (134) multiplied by the UK average number of persons per household (2.3).

- In the event of the footpath being eroded, it has been assumed that 50% of the existing users of the footpath will find an alternative route for their recreation activities. However, it has been assumed that the remaining 50% of the existing users would not find an alternative route and would cease to undertake this particular physical activity.

- A 50 year appraisal period has been adopted as this is the likely duration of the scheme.

6.4 Results

Based on the inputs to the tool the impact to health with the Do Nothing scenario is estimated to be approximately £320k over 50 years. This value is the discounted value in present day terms. Loss of the footpath under the Do Nothing scenario would lead to a loss of approximately 2 walking minutes per day, which could lead to 0.005 premature deaths per year across the population. Over the 50 year appraisal period this equates to 0.3 premature deaths.

Converting the estimated damages to a benefit, relative to the Do Nothing scenario the health impact of protecting the footpath as part of the scheme is estimated to be £320k over 50 years.

7. Summary

Table 7-1 summarises the findings of the various assessments outlined in chapters 2 to 6.

Table 7-1: Summary of wider impacts of flood risk at Langstone

Assessment	Key findings
Economic footprint	Approximately half of the residents employed travel outside the borough for work (based on limited sample size from attendance at consultation events) demonstrating the potential spillover impacts on a spatial scale of flooding at Langstone.
FCERM first round impacts under Do Nothing scenario (next 50 years)	- £11,010k damage to residential and commercial properties - £910k damage to public infrastructure - £706k damage to vehicles - £3,477k damage associated with risk to life - £589k damages for emergency clean up and temporary accommodation - £48k intangible damages - £756k traffic disruption damages
GVA dynamic impacts under Do Nothing scenario (next 10 years). Focussed on Ship Inn and Royal Oak businesses	- Approximately £232k business disruption loss to the public houses over the next 10 years (local economy impact) - An eight week clean-up period after a flood event expected to lead to an additional loss of approximately £200k business turnover due to closure.
Tourism impacts	-Langstone is a key location for tourism in the area - ORVal tool estimates over 43,000 visitors per year at the site, generating a welfare value of £178k. Under a Do Nothing scenario a significant proportion of these visitors is likely to be lost to local alternative destinations. - Survey found that 79% of visitors on day trips to Langstone and that 72% of visitors drove to the site.
Link to Hayling Island	- Flooding of the A3023 in Langstone has potential to restrict access and egress from Hayling Island. - Approximately 34% of Hayling island population travel off the island for work purposes; flooding at Langstone would prevent this. - Flooding at Langstone could restrict emergency access to Hayling Island, and alternative ways of transport would need to be used (e.g. helicopter).
Ecosystem services (ES)	- Do Nothing scenario would have adverse impact on ES; negatively impacting climate regulation, hazard regulation, pollination, tourism and recreation, culture, science and education, aesthetic values and wild species diversity. - Constructing a scheme at the site has the potential to improve hazard regulation, sediment transport regulation, tourism and recreation, culture, science and education, aesthetics and wild species diversity.
WHO HEAT tool	- Loss of the public footpath between Ship Inn and Royal Oak has potential to decrease physical activity levels of the population. This is estimated to lead to £320k damages over the next 50 years due to premature deaths. - Protection of the footpath would result in £320k benefit