TECHNICAL APPENDIX
MEASUREMENT APPROACH

1. TOURISM

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Determining the amount of economic activity and the number of jobs currently supported by coastal (and marine) tourism in respective local authorities of the UK.	ONS Business Register Employment Survey[1] (BRES) Beatty et al[2] Marine Scotland[3]	BRES data provides an estimation of tourism jobs and businesses broken down by local authority. However, these represent total tourism jobs, independently of whether these are coastal or not. We consequently use data from Beatty et al and Marine Scotland to estimate the fraction of total tourism-related jobs in coastal local authorities, which can be considered as coastal-related. We also use these studies to calculate the ratio of gross value added (GVA) per job, in order to infer the total gross value added supported by coastal tourism in respective UK coastal local authorities. The sectors we classified as tourism-related are: a) accommodation; b) food and drinks; c) recreation and d) heritage.
2. Determining the potential growth rate of coastal tourism income.	Deloitte and Oxford Economics[4]	According to Deloitte and Oxford Economics' estimation, UK tourism income could grow by 3.8% per year to 2025. According to BRES data, tourism has grown by 2.2% in coastal local authorities since 2009 – this is lower than UK average. A strategy to increase coastal tourism should at a minimum ensure that coastal tourism growth keeps up with UK average (i.e. a 3.8% yearly growth rate compared to the current 2.2%). We also model the potential impacts of a more aggressive strategy, aiming to achieve a higher than UK average growth rate – by increasing coastal tourism revenue by 5% per year to 2025.
3. Measuring the additional income and employment impacts of stronger coastal tourism revenue growth in UK coastal local authorities.	Based on above sources and calculations	The impacts in terms of jobs and GVA are based on growth rates of respectively 3.8% per year (moderate scenario) and 5% per year (high growth scenario) to 2025. The final figures represents the additional amount of jobs and GVA which could be supported by 2025. Our calculations also allow an estimation of additional employment and GVA impacts for each year to 2025. A key assumption is linearity: all coastal experience the same growth rate to 2025, regardless of their starting point. Although this assumption is debatable, it was not possible to gauge site-specific potential growth rates at a disaggregated, Local Authority level. Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

2. RENEWABLE ENERGY
2.1 OFFSHORE RENEWABLE ENERGY

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Estimating existing capacity of offshore (marine) renewable energy and baseline jobs and GVA supported by offshore (marine) renewable energy.	Department for Business, Energy and Industrial Strategy (BEIS) (a)[5] BEIS (b)[6] UK Energy Research Centre[7]	The Renewable Energy Planning Database provides detailed information on marine renewable energy capacity installed by site and type of renewable. However, it is challenging to link offshore sites to specific coastal local authorities. The baseline figures have consequently been aggregated by main regions and countries of the UK. BEIS data, and a UK Energy Research Centre report, were then used to estimate the amount of economic activity and jobs supported. To do that we estimate the GVA and employment intensity per MW, based on a range of existing estimations. Sensitivity analysis has been used to test the variation of results relative to jobs and GVA intensity assumptions.
2. Determining the potential growth rate of offshore (marine) renewable energy.	Fraser of Allander Institute[8] Centre for Economics and Business Research[9]	Both the Fraser of Allander Institute and the Centre for Economics and Business Research provide a range of estimates on potential additional offshore and marine renewable energy deployment by 2020. We used those estimates as benchmarks in the context of this study: we consider one scenario whereby offshore capacity reaches 12GW by 2020 and another where capacity reaches 15GW.
3. Measuring the additional jobs and gross value added supported by further deployment of respective offshore (marine) renewable technologies.	Based on above sources and calculations	Based on two core scenarios, we used the calculations carried through in steps 1 and 2 to measure the additional impact in terms of GVA and jobs, in a moderate growth scenario (to 12GW) and a high growth scenario (to 15GW). Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

2.2 ONSHORE RENEWABLE ENERGY

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Estimating existing capacity of onshore renewable energy and baseline jobs and GVA supported by onshore renewable energy in coastal Local authorities.	BEIS (a)[10] BEIS (b)[11] UK Energy Research Centre[12]	The Renewable Energy Planning Database provides detailed information of onshore renewable energy capacity installed per site, broken down by type of generation (e.g. wind, solar, etc.). This data has been used as a basis to derive onshore renewable energy capacity at a coastal local authority level. BEIS data, and a UK Energy Research Centre report, are then used to estimate the amount of economic activity and jobs supported, at current MW capacity. To do that we estimate the GVA and employment intensity per MW, based on a range of existing estimations. Sensitivity analysis is used to test the variation of results relative to jobs and GVA intensity assumptions.
2. Determining the potential growth rate of onshore renewable energy in coastal local authorities.	No estimations available at local authority level. NEF three scenarios: respectively a cumulative 10% (minimum), 50% and 100% (maximum) increase of onshore renewable capacity in coastal local authorities by 2020.	These three core scenarios were used to illustrate the potential for further renewable energy deployment in UK coastal local authorities. The maximum estimate (a doubling of renewable capacity by 2020) is equivalent to the growth of total UK onshore renewable capacity from 2012 to 2015.
3. Measuring the additional jobs and gross value added supported by further deployment of onshore renewable energy in coastal local authorities.	Based on above sources and calculations	Based on the three core scenarios, we use the calculations of steps 1 and 2 to calculate the additional impact in terms of GVA and jobs. In the absence of alternative plausible assumptions, we assume linearity: the increase of onshore capacity in each respective local authority is symmetrical to its original capacity. This assumption can be debatable, as some large projects may increase the capacity of an area exponentially, while other areas may already be too spatially saturated to support further renewables deployment to the same extent. Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

3. ENERGY EFFICIENCY

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Baseline assessment: determining the number of private properties with an EPC rating below C in coastal local authorities.	National Energy Efficiency Data-framework (NEED), DECC[13]	The NEED dataset provides the number of all residential properties by local authority, broken down by EPC rating.
2. Measuring the household savings (avoided expenditures), involved with lifting all properties below an EPC rating of C to an EPC rating of C in coastal local authorities.	Washan *et al*, 2014[14]	For non-fuel-poor households, the household savings are net of the cost of energy efficiency measures required to lift properties to an EPC C rating. For fuel poor households, the cost is assumed to be directly covered by the state (or other public authorities). This assumption is in line with previous quantitative work on energy efficiency.
3. Measuring the impact of additional consumption expenditures (enabled by fuel savings) on the value added of various sectors in coastal local authorities.	Office of National Statistics (ONS) (a)[15] ONS (b)[16]	We assume that a fraction (5.9%) of household benefits (avoided fuel payments) are saved rather than consumed. 5.9% is average UK saving rate. The rest is used to cover additional household expenditures, which we assume to be in line the breakdown of average household consumption expenditures as per the ONS household consumption survey. Additional spend in one sector (e.g. retail) translates into a symmetrical additional turnover for that sector. We then use the GVA to turnover ratio, as per the ONS Business Survey, for deriving the additional GVA supported. Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.
4. Measuring the employment impact of additional value added supported in coastal local authorities.	ONS (b)[17]	We use the employment intensity per unit of GVA ratio of each respective sector to derive the additional employment supported.

4. FISHERIES

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Using BEMEF model output to estimate: a) current landings (tonnes) and current value (£) of quota species' landings per UK port and b) project landings (tonnes) and projected value of landings (£) per UK port if quota species' stocks are restored by fishing at scientific advice (Maximum Sustainable Yield).	Bio-Economic Model of European Fleets (BEMEF)[18]	The BEMEF model incorporates the most recent data from the EU's Data Collection Framework (the 2016 data call) while integrating information on key economic relationships and incorporating data from other sources such as fuel prices, interest rates, and technological change. To model fleet performance at a state of maximum sustainable yield (MSY), estimates of MSY biomass and yield are taken from scientific literature and converted into a level of total allowable catch. As the MMO publishes data on landings by port broken down by gear and length, the economic performance of fleets of a particular gear and length can be linked to particular ports. This linkage allows the potential fishing gains at MSY to be distributed across UK ports.
2. Linking each port of landing to respective coastal district authorities to estimate landings (tonnes) and value of landings (£) by coastal district authority and by UK countries and regions.	Townslist website[19]	Unlike for other sectors, we here use district authorities rather than local authorities, due to challenges in linking UK ports to local authorities. The database developed by Townslist links all towns and villages of the UK (including ports) by district authority and main country/region.
3. Translating the value of landings (£) into gross value added and employment currently supported (baseline), and potentially supported in a scenario where fish stocks are restored. Subtracting the latter by the former to estimate the net additional impact on gross value added and jobs supported by the sector.	EU Scientific, Technical and Economic Committee for Fisheries (STECF)[20] ONS Annual Business Survey[21]	The STECF report provides estimations of landings, GVA and employment – job count and full-time equivalent (FTE) jobs. We used this data to estimate the ratio of GVA per unit of landing (£) and the ratio of employment and FTE per unit of gross value added (£). These ratios are then used to translate the value of landings under the two scenario (baseline and sustainable fishing) in GVA and jobs terms. Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

5. AQUACULTURE

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Estimating the economic activity (expressed in GVA) and number of jobs currently supported by marine aquaculture per coastal local authority.	ONS Business Register Employment Survey[22] Seafish[23]	The BRES provides the number of jobs in marine aquaculture broken down UK local authorities. We combine this information with data provided in a recent Seafish report, dealing with the jobs and economic activity supported by different types of aquaculture in England, Wales and Northern Ireland. Our focus is not marine aquaculture, including both finfish and shellfish. We also use Seafish and ONS data to estimate the baseline GVA supported by aquaculture in coastal local authorities. This was done by calculating the ratio of GVA per job for respective aquaculture activities (e.g. mussel farming, oyster farming, etc.).
2. Determining the potential growth rate of marine aquaculture – broken down by type of aquaculture – per coastal local authority.	Seafish[24] Marine Scotland[25] Welsh government[26]	We use information provided by Seafish and official government targets in Scotland and Wales to estimate the growth potential of different forms of aquaculture. These growth potentials were then matched to respective coastal authorities, accounting for the fact that some forms of aquaculture can only be undertaken in some areas. For example, Scotland's official targets are to grow finfish production by 3% per year to 2020 and shellfish production by 10% per year to 2020. Similarly, the Welsh government has set an objective of a 20% annual growth in the overall value added of the sector by 2020, effectively doubling aquaculture income. The figures were used as a benchmark to forecast possible future impacts of expanding the sector.
3. Calculating the additional economic activity (expressed in gross value added terms) and number of jobs which could be supported in respective coastal local authorities if potential growth rates materialise.	Based on above sources and calculations	We combine potential growth rates with baseline economic activity (gross value added) and jobs data to obtain the additional economic activity and jobs supported. The figures can be expressed both in annual terms (additional economic activity and jobs per year) as well as in cumulative terms to 2020 (2020 being the time frame set out by existing targets). Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

6. COASTAL MANAGEMENT
6.1. COASTAL EROSION

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Estimating the number of dwellings, including households and business, threatened by coastal erosion.	HR Wallingford[27]	HR Wallingford data encompasses the number of residential and non-residential properties at risk of coastal erosion across English and Welsh local authorities.
2. Determining the potential risk reduction of mitigation measures for households and business threatened by coastal erosion.	HR Wallingford[28]	HR Wallingford data distinguishes between properties in and out of Shoreline Management Plans in respective local authorities. This data can be used to estimate the reduction in number of properties at risk when coastal areas are object of shoreline management plans. The probability of being at risk of coastal erosion is significantly reduced through such plans, and this probability reduction was used to subsequently estimate the avoided losses with implementing shoreline management plans across the UK coast.
3. Measuring the economic value (avoided losses) implied by mitigation measures which reduce the number of household and businesses at risk of coastal erosion.	ONS[29]	In order to translate the reduction of number of properties at risk in economic terms, we use house prices statistics provided by the ONS, and combine them with the probability of being at risk of coastal erosion a) in a business-as-usual scenario (no further action to mitigate risks) and b) in a scenario where more plans are implemented, resulting in a reduced probability of being at risk. The difference between the two represent the benefits (avoided losses) of tackling the economic consequences of coastal erosion across English and Welsh coastal local authorities. All figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

6.2. FLOODING AND FLOOD PREVENTION

CALCULATION STEPS	SOURCES OF ASSUMPTIONS	DESCRIPTION
1. Estimating the number of dwellings, including households and business, threatened by flooding in coastal areas.	HR Wallingford[30]	HR Wallingford data encompasses the number of residential and non-residential properties at risk of flooding across English and Welsh local authorities – including coastal ones, which are object of our analysis. Properties are broken down by risk magnitude, i.e. high (3.3% per year), medium (1% per year) and low probability (0.1% per year).
2. Determining the potential risk reduction of mitigation measures for households and business threatened by flooding in coastal areas.	NEF assumption: moving from medium and high probability of flooding to low probability as per Environment Agency classification[31].	Because of inconclusive aggregate quantitative evidence dealing with the potential impact of concrete risk reduction measures, we model the impacts of a hypothetical reduction of flood risk to a low probability for all properties currently being at a medium and high probability risk. We also use sensitivity analysis on this assumption in order to obtain a range of possible estimates.
3. Measuring the economic value (avoided losses) implied by mitigation measures which reduce the number of household and businesses at risk of flooding.	Chatterton et al (a)[32] Environment Agency (b)[33] HR Wallingford[34]	To express reduced probability in economic terms, we use the average cost of flooding for residential and non-residential properties, as estimated by Chatterton et al. Figures are adjusted to £GBP 2015 to ensure comparability with other estimations of the economic analysis.

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