PORT OF DOVER

Climate Change Adaptation Report 2021

Contents

1.0 Introduction

The Port of Dover's Climate Change Adaptation Report (2021) has been undertaken in response to the Department for Environment, Food and Rural Affairs', (DEFRA) request, under their Adaptation Reporting powers, for a report on progress in planning for climate change. As a statutory undertaker and a critical service provider, the Port actively engages in this process as a commitment to ensure a robust approach is maintained towards providing a resilient part of the United Kingdom's and Europe's transport infrastructure. This updated report follows the second Climate Change Adaptation Report (2015) and reviews the mitigation and adaptation measures proposed to improve the Port's resilience to climate change.

2.0 Background

The Climate Change Act (2008) conferred powers to the Secretary of State to direct certain "reporting authorities" to produce reports which evaluate their risks from climate change and to provide details of their adaptation strategy towards these risks. The Adaptation to Climate Change (ACC) cross-government body highlighted the Port of Dover as being a significant provider to the UK economyDover Harbour Board (DHB), as the owner and operator of the Port of Dover, falls under the definition of "reporting authorities" and therefore was required to pass on to government a Climate Change Adaptation Report. This was submitted by DHB in March 2011, in accordance with the direction from the Secretary of State. This report contained:

a) An assessment of 2011's current and predicted impact of climate change in relation to DHB's functions;
b) A statement of DHB's proposals and policies for adapting to climate change in the exercise of its functions and the time-scales for introducing those proposals and policies.

In meeting this requirement, DHB followed guidance issued by DEFRA, supplemented by a risk assessment framework developed by Cranfield University and the Environment Agency's supplementary guidance. The report was developed to meet this reporting requirement by documenting the Climate Change Risk Assessment process that was carried out. Information was provided on the function of DHB; the approach undertaken to assess the risks of climate change on the organisation; a summary of those risks and the proposals which were to be taken forward in order for DHB to adapt.

A second round of voluntary reporting was requested by Defra, using their Adaptation reporting powers, providing an update on the progress made since 2011, the first round of adaptation reporting. This request was fulfilled with the 2015 document which updated the information in the first report, and which helped the government understand the level of capacity to adapt in the sector. Assessments were carried out using the probabilistic output data of the United Kingdom's Climate Projections 2009 (UKCP09) for both rounds of reporting. The information provided informed the next government Climate Change Risk assessment published in 2017 and the National Adaptation Programme published in July 2018.

This third round of voluntary reporting aims to build on 2015's report and to demonstrate how DHB has progressed in it's understanding of climate risks and the steps taken to mitigate the future effects of climate change. One major change from 2015's report is the use of UKCP18 climate projections to inform this report. The information provided in this report will be used by the Government to write the next National Adaptation Programme (2023) as well as wider evidence gathering and evaluation on the UK's resilience to climate impacts.

2.0 Organisational Structure and Function

2.1 Overview of Dover Harbour Board

DHB was established by Royal Charter in 1606 and entrusted with the administration, maintenance and improvement of the harbour at Dover. Subsequent statutes have amended the terms of the Charter but its responsibilities remain substantially the same.

DHB is an independent statutory body governed by unique Acts of Parliament and controlled by an independent board of eight members. It is subject to national legislation and a number of port related statutory instruments. The Trust Port status means there are no shareholders and funds generated are reinvested in the Port for the benefit of its customers and other stakeholders. It also puts funding into the Port of Dover Community Fund to support the local community.

DHB supplies services to the ferry, cruise and cargo operators who use the Port of Dover as well as their customers. Other stakeholders include statutory authorities (such as UKBF, Police aux Frontieres, Kent Police), other port users (such as concessionaires), property tenants, freight agents, marina users and the local community.

The Port of Dover is one of the busiest international ferry ports in the world. The core business is the roll-on/roll-off ferry operation supported by other commercial activities, including cruise, cargo and marina. Trade at the Port consists of freight and tourist vehicles, ferry and cruise passengers and conventional deep-sea cargoes.

In 2020, a third ferry operator, Irish Ferries, joined P&O and DFDS in providing cross-Channel services to Calais and Dunkirk from the Port. There were an average of 17,000 vessel entries per year between 2015-2019, however we are yet to see where vessel entry numbers will settle post Brexit and Pandemic. Dover is one of Europe's most important ports, 99 per cent of its freight traffic is intra-EU. Before the pandemic, freight traffic stood at 2.4 millions units (2019 Figures) and Dover now handles over £100 billion of trade per annum.

A wealth of additional information about the Port of Dover can be found on the website at www.doverport.co.uk

DHB is the land owner of the Port and operates the ferry and cruise terminals and the marine side of the cargo terminal. All landside operations within the cargo terminal are now run by Port of Dover Cargo Ltd (PODCL), which is a wholly owned subsidiary of DHB.

The Organisation provides appropriate infrastructure for delivery of its services according to statutory and regulatory obligations and requirements.

2.2 Main Shipping Activities

The Port facilities at Dover are split into two locations: the Eastern Docks and the Western Docks. The Eastern Docks are located to the East of the town centre. They are the primary focal point for the ferry operation. The Western Docks are located to the South West of the town centre. They consist of freight clearance, two terminals for cruise liners and a marina. The new cargo terminal opened in December 2019 and now operates out of the Western Docks giving the Port the opportunity to handle a whole range of cargo including breakbulk, grain, containers, agribulk and fresh produce.

2.3 Statutory Functions

The statutory functions of DHB can be found in local acts of parliament, such as the Dover Harbour Consolidation Act 1954 and the Dover Harbour Act 1963, as well as general statute relating particularly to harbours such as, the Harbours, Docks and Piers Clauses Act 1847 and the Harbours Act 1964.

Douglas et al. (1997) describes, in general terms, the statutory functions of a Harbour Authority as follows;

i. "*the provision and maintenance of harbour facilities, i.e., quays, wharves, etc;*
ii. *navigational safety functions, including lighting and buoying the harbour, the removal of wrecks and other obstructions and maintenance dredging;*
iii. *regulating activities of other persons in the harbour including, in particular, regulating the movement and berthing of ships in the harbour by means of directions and by-laws and licensing dredging and the construction of works in the harbour by other persons;*
iv. *carrying out harbour operations including, in particular, cargo-handling activities;*
v. *the provision of a pilotage service; and*
vi. *of increasing importance, the prevention of pollution and nature conservation*."

In this case DHB is the landowner and has jurisdiction over the waters within the harbour walls and up to 1 nautical mile from them. Therefore functions i to ii and function vi are carried out within this area. The conditions of the Port's pilotage service require any vessel greater than 50m in length or with over 12 passengers on board to be brought in to the harbour by a DHB pilot or a Pilotage Exemption Certificate (PEC) holder. PECs are issued by DHB following an examination and a ship handling review and are revalidated every 5 years. Some cargo handling services are offered by DHB but the majority are carried out by third parties who are licensed to operate within the harbour or lease a quayside from DHB. There is no statutory requirement to maintain certain types of shipping and cargo handling operation within the harbour. The types of facility available and the contractual arrangements surrounding them therefore remain commercial decisions.

2.4 Business Direction

2.4.1 Our Business Mission

The mission statement from the Business Direction is 'Working smarter together, we are building the Port of Choice that sets the standard'.

2.4.2 Business Goals

The Port has three goals set out that aim to guide us towards the mission statement. They fit into three categories: Our Team, Our Operations and Our Busines as outlined in table 1.

Table 1 DHB's business goals.

	Our Team	Our Operations	Our Business
Purpose	Developing the capability in our business and creating a dynamic working environment that encourages and supports our people to achieve.	Providing Britain's key maritime gateway safely, seamlessly, securely and delightfully. Ensuring our facilitiyes and infrastructure are safe, secure and sustainable.	Growing our business through collaboratibe development with our customers and partners.
Goal	A great place to work.	National Recognition of our first class performance.	Port of choice for our customers.

2.4.3 Objectives

The Environment Policy Statement outlines the Port's environmental commitments:

- Implementing this Environment Policy Statement throughout the Port of Dover group of companies;
- Maintaining our registration to ISO 14001:2015 and continually improving our environmental management system;
- Support the development of a sustainable transport network, recognising the Port of Dover is an essential transport hub;
- Reduce the pressure we put on environmental resources;
- Reduce our carbon footprint each year as we move towards a carbon neutral port;
- Prevent pollution and reduce air quality impacts;
- Adapt to climate change;
- Preserve and promote the local character and historic assets of Dover;
- Contribute to global improvements by contributing to the UN Sustainable Development Goals;
- Complying to all applicable legal and other requirements that the Port subscribes to as a minimum standard.

2.4.4 Our guiding principles

- We seek to improve and maintain the facilities and levels of service offered to all our customers, we aspire to become the best port in the world.
- We intend to grow and add value to the Port business and to hand on to future generations a thriving organisation and a modern and efficient infrastructure.
- We will facilitate competition where it is in the best interest of the consumer and improves consumer choice.
- We place responsible safety and security management at the core of our activities ensuring a safe environment for all those who work in or visit the Port of Dover.
- We will seek to provide for environmental sustainability in the management of existing assets and in all future developments, lowering our ecological footprint and delivering on our environmental responsibilities.
- We will market and promote the Port of Dover and the work of the Dover Harbour Board to a wider public both nationally and, where it is in our interests, internationally, to government, the EU and any other agencies and bodies we wish to influence or whose decisions and actions affect our organisation.
- We are committed to closely following the guidance on consultation, transparency of reporting and accountability detailed in Modernising Trust Ports Second Edition.
- We aspire to excellence in business efficiency, continuously improving our business processes, policies and the management of our resources.
- We will always endeavour to be a good neighbour to our community.

3.0 Major Port Projects and Development Plans since 2015

In the 2000's, DHB was the first port to undertake Master Planning. The work showed that the Port of Dover's Eastern Docks roll-on roll-off ferry terminal was nearing capacity and in need of renovation. With rapidly growing freight traffic figures, a 30 year Master Plan for development of the Western Docks was created and the Dover Harbour Revision Order 2012 was approved. A substantial amount of renovation work within the Eastern Docks, including berth refurbishments and the introduction of a traffic management system coupled with an increase in ship size has significantly increased the capacity of the Eastern Docks but the long term need for further capacity is imperative to the resilience of UK trade flows. The Dover Western Docks Revival (DWDR) project has begun since 2015. It is a large scale regeneration of the Western Docks co-financed by the European Union. The projects below are ongoing as part of the continual improvement of the Port or have been completed since the last report.

3.1 Traffic Management Improvement (TMI) Project

TMI was part of an £85 million upgrade programme focused on the Eastern Docks. The project was co-financed by the European Union as part of the Trans-European Transport Network. The physical works for the TMI project have improved the resilience of the Port operation. It will also, as required, help manage the throughput of traffic within the confines of the Port and reduce congestion on the external road network through a new holding area with a capacity to hold up to 220 freight vehicles (equivalent to almost four kilometres of traffic).

3.2 Outbound Controls Project

With the demolition of the old cargo terminal in the Eastern Docks completed, work has begun on the outbound controls project. The outbound controls project aims to restructure and streamline the check in process for ferry passengers and freight vehicles. The increased efficiency from the new layout will lead to shorter journey times and allow traffic flow throughout Dover to be managed. This will lead to less idling vehicles on the Port and in the town, helping to increase air quality.

3.3 Dover Western Docks Revival

Since 2015 a huge amount of work has been completed on the Dover Western Docks Revival Project. At the end of 2019 the new cargo terminal was officially opened allowing the Port to handle a whole range of cargo including breakbulk, containers, agribulk and fresh produce. The new terminal has an additional cargo berth, increasing the Port's capacity and enabling it to handle more trade.
In June 2021 Clock Tower Square was opened at the beginning of the Marina Curve. This recreational space combines fresh design features with artefacts from Dover's inspirational history to provide the perfect site for the local community to relax and enjoy the Dover seafront. The project has received two 'Excellent' CEEQUAL awards for sustainability so far.

4.0 Climate Change Risk Assessment Scope

Risk can be described as follows:

"…risk is the threat that an event will adversely affect the ability to achieve objectives. It arises as much from the likelihood that something good will not happen as it does from the threat that something bad will happen" (Turnbull).

Or alternatively:

"risk is the effect of uncertainly on objectives" (ISO 31000:2009).

"Major disruption to operations arising from bad weather, industrial action or other factors," is cited as one of the major risks to the long term primary objective: *"To maintain and continually develop our vibrant, financially and operationally robust and profitable business."*

Weather is therefore a key consideration of DHB operations and therefore the changing weather patterns associated with climate change will have an effect on our operations.

4.1 Functions Impacted by Climate Change

Adverse weather can cause timetabling delays and in certain more extreme cases port closures. This in turn leads to a loss of revenue and could affect the Port's ability to function as a robust transport node. With the future expected to bring wetter winters, higher sea levels and possibly more stormy conditions a thorough risk assessment has been carried out to ensure that the necessary steps are taken for effective adaptation.

Table 2 sets out in broad terms how the high level statutory functions (as described in section 2.3) are currently affected by the weather and the broad trends that could be expected in the future due to climate change. It demonstrates that all but one of our statutory functions are currently impacted by the weather and therefore have the potential to be affected by climate change. As part of operating a weather sensitive facility DHB has in place a number of thresholds above which operations cannot be continued or known problems arise. These are also outlined in Table 1. Between 2011 and 2015 improvements were made to the efficient operating temperature for refrigerant units, from 30° to 34°C. This positive change is due to upgrades made by DHB to the equipment as part of the maintenance and renewal programme to equipment in the Port. The upgrade programme has continued and newer more efficient

refrigerants have been installed across the Port since 2015. The Port has an annual 5% energy reduction target and the upgrade programme contributes to achieving this.
Since 2015, quay walls have been raised and new dock gates that are able to withstand storm surges have been developed as part of the DWDR project. The new marina berths have also been designed to be able to cope with storm surges.

Table 2: Weather Effects on Statutory Functions.

Statutory Function	Current Weather Impacts	Potential Future Impacts	Known Thresholds
Maintenance of harbour facilities	High winds, storms and storm surges cause flooding and damage to infrastructure.	Potential for increased storminess to increase the frequency and severity of damage to infrastructure.	Overtopping of the Admiralty Pier occurs at wind speeds of 37 knots and above. Storm surges greater than 8m cause flooding to the car parks around the marina. Vessels cause damage to berths in wind speeds of over 45 knots from a South South Westerly and West South Westerly direction or swells of over 1.5m.
Navigational safety functions	High winds and storms can cause timetabling delays, damage to navigational aids and in certain cases port closures. Fog can cause timetabling delays.	Potential for increased storminess and more days of fog could lead to an increase in the frequency and severity of delays and an increased frequency of port closures.	The Port is closed during sustained wind speeds above 55 knots from a South South Westerly and West South Westerly direction.
Regulating activities of other persons in the harbour including, in particular, regulating the movement and berthing of ships in the harbour by means of directions and bye-laws and licensing dredging and the construction of works in the harbour by other persons	High winds from a West South Westerly or South South Westerly direction can lead to berth closures. Pushing operations by the tug become limited in high energy seas and the dredger is unable to go to sea to spoil. High winds and stormy conditions can delay engineering works.	Potential for increased storminess could limit operations and engineering works more often and lead to increased delays.	The Port is closed during sustained wind speeds above 55 knots from a South South Westerly and West South Westerly direction. Damage is caused during pushing operations in swells greater than 1.5m. Tug operations switch to towing lines. The Dredger cannot go to sea to spoil in swells greater than 1m.
Carrying out harbour operations including in particular cargo-handling activities	High winds prevent crane operations and refrigerant units become less efficient at maintaining temperature in extremely hot weather.	Potential for increased storminess to limit crane operations leading to delays. Potential for temperatures sensitive areas to not be maintained at the correct temperature.	Harbour cranes cannot be operated in winds of 44 knots greater. Road mobile cranes are more sensitive to wind and vary according to crane type and location. Operations are therefore closed down in winds upwards of 37 knots. The cranes are able to stand in winds of up to 60 knots. Refrigerant units become less efficient in temperatures of greater than approximately 34°C.

Provision of pilotage	High winds from a West South Westerly or South South Westerly direction can lead to port closures and curtail pilotage.	Potential for increased storminess could limit operations more often.	The Port is closed during sustained wind speeds above 55 knots from a South South Westerly and West South Westerly direction. Pilotage is suspended at wind speeds greater than 40 knots, but can be lower for piloting some vessels.
Prevention of pollution and nature conservation.	Not impacted by weather.	No change is foreseeable.	

4.2 Stakeholders, Interdependencies and Community

The stakeholders of the Port of Dover can be categorised in the following way:

Transport Operators and Infrastructure Providers
The Port of Dover is a key part of the trans-European transport network (TEN-T). As a transport node, the Port is a core port connecting the UK and continental Europe. The transport connection between UK and Europe also relies heavily on the hinterland infrastructure, the vessels operating out of the Port and the sister ports on the continent and their hinterland infrastructure. There are therefore a number of key stakeholders which make up the transport network such as shipping operators, National Highways and other ports.

Statutory Bodies
There are a number of stakeholders operating within the Port who are required in order to maintain a legal operation such as UK Border Force and Police Aux Frontieres.

Customers
The customers of the Port of Dover include ships and shipping operators that use the Port and the Heavy Goods Vehicles (HGVs), cars and passengers that use the ships. In addition marina customers comprise berth holders and overnight visitors.

Tenants
The Port of Dover has over 300 tenanted spaces. These range from water sports providers to cold stores, food villages, shopping centres and workshops to office spaces.

Community
The close proximity of Dover town and environmentally designated areas to the Port of Dover (Figure 1) means that local people and many organisations have a strong interest in port operations and developments.

DHB organise many community events, such as beach cleans, to engage with the community and its stakeholders at various levels.

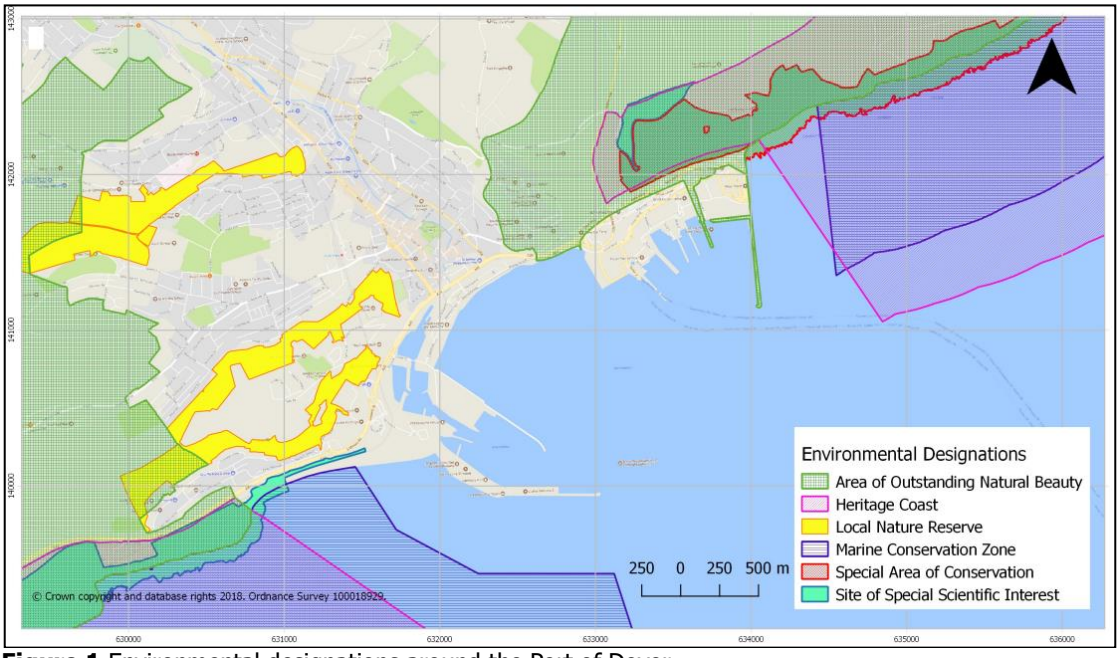

Figure 1 Environmental designations around the Port of Dover.

Table 3 outlines the extent to which weather affects the interaction between DHB and each stakeholder type in order to determine whether the impact of climate change on that stakeholder needs to be assessed.

Table 3: Stakeholder interaction impacts

Stakeholder	Impact of Climate Change
Transport Operators and Infrastructure Providers	There is an integral link between the successful operation of the Port of Dover as a transport node and the successful operation of other parts of the transport network. It was therefore important that the impacts of climate change on the rest of the transport network were assessed as part of this process.
Statutory Bodies	Weather does not currently inhibit the interaction of these statutory bodies with DHB operations and therefore it is not expected that the impacts of climate change will need to be assessed.
Customers	Weather may affect the preferences of customers and change market drivers. This has been explored as part of this assessment.
Tenants	Weather does not currently inhibit the interaction of these stakeholders with DHB and therefore it is not expected that the impacts of climate change will need to be assessed.
Community	Weather does not currently inhibit the interaction of the local community. However, it is recognised that weather can cause congestion in the local road networks. This relationship is therefore included in this process through the assessment of climate change impacts on the interaction between the Port and the transport operators and infrastructure providers.

Customers, transport operators and infrastructure providers are therefore the key stakeholders for consideration. They include the following:

- Ferry operators;
- National Highways;
- Kent Highways Services;
- Berth holders in the marina;
- Cargo customers;
- Cruise operators.

Although the impacts of climate change on the other stakeholders do not need to be assessed, it is recognised that the changes to port policies, operations or developments that arise from this assessment may have an impact on the interaction with that stakeholder. These changes will however be dealt with in the same way as any other change to port policy, operation or infrastructure and the affected stakeholders would be consulted through the normal channels.

5.0 Climate Change Assessment

5.1 Assessment Methodology

UKCP18 was used as the main source of data for predicted changes in climate that are expected to affect Dover in this report, as opposed to the 2011 and 2015 reports which used UKCP09. The User Interface Tool was used to produce a customised set of probabilistic projections for the Dover locality (see Appendix 1). This allowed the most local grid square (612500.00, 137500.00 Landside projections, 51.17N 1.42 E Marine projections) available to be used for each climate variable that was analysed, therefore providing the most detailed data possible for the assessment.

As identified in section 3.1 the operations of Port of Dover are weather sensitive. It was therefore decided that the high emissions scenario RCP 8.5 would be used to determine the impact of climate change on the Port as this presents the greatest change in climate. It is considered that if the greatest change in weather can be adapted to, through a managed adaptive approach, then a change of smaller magnitude would be accounted for within that approach.

The high emissions scenario data was collated using the 1981-2000 baseline for sea level rise, precipitation and temperature for the years 2025, 2050 and 2080. This allowed the risk assessments to take into account when each climate variable may start to have an impact on the operation so that risks that would take a long time to adapt to could be taken into account.

Where probabilistic projection for a climate variable was unavailable from UKCP18, information of general trends were obtained. As there is no probabilistic information of what those changes may be and the associated time frame, the risk assessment is more vague about the level of risk that will be experienced and when this risk will become an issue.

In round one of reporting (2011), the impacts of the predicted changes on the activities of the Port of Dover were assessed through a series of workshops with each key department: *Operations*, *Engineering Services* and *Commercial and Support Services*. Attendees at the workshop brought their own specific set of expertise allowing the assessment to take into account the effects of climate change on a variety of disciplines whilst using experts that had the best local knowledge of the operation of the Port of Dover. Attendees included: Harbour Masters; pilots; operational managers and directors; health, safety and environmental experts; mechanical, electrical and development engineers; buildings and estates managers; commercial managers; financial and insurance experts; and human resources managers.

A further series of workshops was undertaken in 2015 with the same key departments. The workshops covered the following topics;

Current effects of weather	Compare the view of the statutory functions and thresholds of 2011 to 2015.
Effect of Climate Change	Analyse the risks from 2011 to check their validity and more threats or opportunities if required.
Mitigation and Adaption	Analyse 2011 mitigation measures and possible adaption measures. Report on; • progress and changes • monitoring and evaluating • interdependencies • barriers, opportunities and benefits

In the current round of reporting all departments that had had risks identified in previous rounds were contacted to provide updates on the mitigation and adaptation measures that were raised in the pervious iterations of risk matrices (Appendix 2).

5.2 Quantifying Risk

The method used by DHB to quantify risk has changed since the first Climate Change Adaption report in 2011 and therefore both methods used have been outlined below in the following sections.

The level of risk resulting from climate change was assessed in 2011 using the same methodology that was used to assess all risks affecting the Port. This allowed the Climate Change Risk Register to feed directly into the Corporate Risk Register, incorporating it into the normal risk processes of DHB as outlined in section 8. It also allowed all risks affecting DHB to be comparable, thus ensuring that the correct risks are prioritised and the right investment decisions are made, see Appendix 2 for the full 2011 Climate Change Risk Matrix.

Each effect is assigned a quantitative value of gross risk and residual risk. Gross Risk is the unmitigated threat. It is a theoretical risk as it assumes that no mitigation is delivered which is a highly unlikely scenario but is useful in understanding the value of the mitigating activities. Residual risk is the risk that remains after mitigation measures are in place. It is this level of risk that is finally accepted by the organisation.

As the climate change risk register is not only dealing with the known impacts of current conditions but also the predicted impacts of future conditions, the risks have been separated out into 2 scenarios: "Present Day" and "Future."

In order to make this clear, the measures taken to reduce risk have also been separated out into these 2 scenarios and can be defined as follows:

- **Mitigation measures** are the measures that are already undertaken to reduce the threat of weather to the organisation.
- **Adaptation measures** are the measures that will need to be taken to reduce the threat of the changes to the weather systems in the future as a result of climate change.

Therefore within the Climate Change Risk Assessment, only mitigation measures are taken in to account when calculating the Present Day residual risk but mitigation and adaptation measures are taken in to account when calculating the Future residual risk.

Risk is calculated by considering:

- the *probability* of that effect occurring; and
- the *severity* of the effect.

5.2.1 Risk Method used in 2011

Using experience and knowledge of DHB and its operating environment, the categories financial, reputation, service and safety were used to quantify the severity and probability of each effect.

The following calculation was then used to determine an overall value of risk.

Risk = Severity x (Probability + 2)
Each risk was then prioritised and colour coded based on its overall quantitative value. Red and amber risks are the high priority risks. Yellow and green risks are much lower priority (see table 5.2).

Severity					
Major	*4*	12	16	20	24
Moderate	*3*	9	12	15	18
Minor	*2*	6	8	10	12
Insignificant	*1*	3	4	5	6
	Multiplier	*3*	*4*	*5*	*6*
Probability		Rare	Unlikely	Possible	Likely

Table 5.2: Calculation of risk 2011.

An assessment of risk was carried out for each weather effect in the "present day" scenario and the high emissions scenario at a date in the future at which it was determined that the change in risk would be significant.

5.2.2 Risk Method used in 2015

The risk methodology used for the Corporate Risk Register had changed since 2011, from a 4x4 risk matrix of probability and severity, shown above in section 5.2.1, to a 5x5 risk matrix (shown below) using the categories financial loss, service delivery, safety/injury, legality, reputation and environment to quantify the likelihood and severity of each event. As the 2011 Climate Risk Matrix was written to feed into the Corporate Risk Register the 2015 Adaptation Report needed to do the same, therefore the matrix was rescored using the 2015 methodology before it was reviewed in the workshops.

Horizon = 5 years		**Likelihood** ---------->				
Severity ^		L1 = (1 + 2) = 3	L2 = (2 + 2) = 4	L3 = (3 + 2) = 5	L4 = (4 + 2) = 6	L5 = (5 + 2) = 7
	S5 = 5	**15**	**20**	**25**	**30**	**35**
	S4 = 4	**12**	**16**	**20**	**24**	**28**
	S3 = 3	**9**	**12**	**15**	**18**	**21**
	S2 = 2	**6**	**8**	**10**	**12**	**14**
	S1 = 1	**3**	**4**	**5**	**6**	**7**

Low Risk	Moderate Risk	Substantial Risk	High Risk

5.2.3 Risk Method Used in 2021

The risk methodology used for the Corporate Risk Register hasn't been updated and so the same Risk method used in 2015 has been used in 2021.

5.3 Evaluating Our Adaptation Options

Adaptation to climate change could be approached in 2 different ways:

Managed adaptive approach – allows for adaption in the future and is appropriate where changes can be managed through multiple interventions.

Precautionary approach – necessary where future adaption may be technically unfeasible or too complex.

DHB took the view that managed adaptive was the appropriate approach in most cases to ensure that investment is not wasted on over-adaptation. Therefore the majority of adaptation measures that were identified follow this approach. A precautionary approach is useful, however, when developing large pieces of infrastructure as it is often more cost effective and produces a better outcome if the appropriated features are incorporated at the design stage instead of undertaking retrofitting at a later date. In this instance, climate change impacts are assessed as part of the environmental impact assessment or appraisal of any major project. As this Risk Assessment process is mainly associated with the current activities of DHB, the approach discussed, both in the 2011 and 2015 report, the approach is predominantly a managed adaptive one.
In 2015 the Climate Change workshops reviewed the progress on measures proposed in the 2011 report and reviewed them as per Defra guidance on effectiveness for;

- Achieving beneficial outcomes
- Mitigating climate change risks
- Increasing the organisation's readiness to respond and recover from impacts
- Contributing to sustainable development.

This 2021 edition of the report will update the climate predictions using CP18 and review the the mitigation measures laid out in 2015's Climate Change Risk Matrix.

In the case of measures that had not been implemented reasons for these were discussed and recorded. The following chapters explain the risks and adaptations that are the highest priorities for DHB.

6.0 Weather Effects

6.1 Storminess

6.1.1 The effects of storms

High winds and stormy seas are the most impacting weather parameters on the operation of the Port of Dover. Severe weather affects the safety of navigation and can lead to timetabling delays and in certain conditions port closures. The effect on the operation is mainly due to the sea state which is not only a function of wind speed but also wind direction. Winds of above 45 knots from a South South Westerly to West South Westerly direction have the worst effect on the Port. In swells of greater than 1.5m fender damage can be caused by berthing vessels and the ship to shore interface of cruise and cargo vessels can be compromised. Manoeuvering within the harbour becomes more difficult, traffic uplift is reduced and the potential for a marine incident increases.

This risk is mitigated by increased use of the tugs to aid vessel manoeuvering and to maintain the ship to shore interface. In extreme conditions, the Duty Harbour Master will close the marine side of the Port if he deems the conditions unsafe for operations. In section 8a of the Port's general directions it states that 'The Port shall close/suspend services to all shipping movements when the sustained wind speed within the Harbour exceeds 55 knots from the SSW through to WSW'.

Closing the marine side of the Port mitigates the risk of a marine incident but leads to a loss of revenue due to missed sailings. This effect is most pronounced in the cruise operation where port closures or severe weather could inhibit a cruise call altogether.

As a major transport node within a wider Trans European network, closing the Port in order to mitigate the risk of a navigational incident creates a number of knock-on consequences which in themselves create their own risks. Ships can anchor or lay by in safe areas to shelter from the weather. However, vehicles travelling to board the ferries will continue their journey to the Port and provisions need to be made to accommodate them in order to keep the local road network operational. The landside facilities of the Port will continue to fill up until capacity is reached at which point traffic will start to queue on the approach roads.

During times of prolonged delay, a proven contingency plan may be put in place. Operation Stack involves closing part of the M20 motorway to store Heavy Goods Vehicles (HGVs) heading to either Eurotunnel or the Port of Dover. This limits the congestion experienced on the local road network and allows traffic to be called forward as space becomes available. The manning required to achieve a successful Operation Stack requires the services of port staff and Kent police and has cost and resourcing implications for the organisations involved.

Storms and high winds can lead to berth damage from vessels as mentioned above but can also lead to flooding and damage to piers and buildings from wind and wave action. The Port closely monitors weather predictions as a normal part of operations and uses a storm warning system to ensure that weather sensitive assets are secured in time. A post storm inspection regime checks that any damage is picked up and dealt with appropriately. A good maintenance plan also helps to keep the effects to a minimum and insurance is used to share the liability. This problem could however be exacerbated as extreme weather can constrain maintenance and repair work. This in itself is overcome by good planning of maintenance and project work to reduce the risk of delays.

6.1.2 The potential effects of increased storminess

It is believed that the potential for increased storminess which is expected to be a result of climate change can continue to be mitigated through the proven management plans and programmes that are already in place at the Port. It is however recognised that increased resources will be needed to cope with any increase in regularity and intensity of storm events, which, would lead to an increase in costs. The St Jude's storm, 6th December 2013, caused flooding at Dover Cruise Port and evidenced the potential risks of storm events and subsequent insurance claims.

The increased pressure that may be experienced by certain key members of staff, such as tug crews and maintenance teams has been mitigated by modifying the working hours and contractual arrangements to meet the change in demand. These measures have been taken as a result of monitoring the working practices and recognizing when a change in process is needed.

If storm damages were increased for the UK as a whole this could lead to an increase in insurance premiums. These would be minimized as far as possible through our current processes of good risk management, negotiations and investigating the most cost effective insurance pathway, which could involve self insuring, although this is not required at present.

Previously, a detailed analysis of the effects of storm events on the Port of Dover was conducted. The conclusion that adaptation could be achieved through our current work practices and the proposals to increase capacity remains the Port's stance and the outbound controls and traffic management improvement projects highlight how the Port's natural development will aid in mitigating the effects of climate change.

6.1.3 Changes and Progress

DHB continually looks to improve and update facilities to increase the resilience of the Port to all factors which could cause operational delays. The Port development projects, detailed in section 3.0, will aid climate change adaptation as they are consistently aligned to meet demand under the circumstances experienced. Traffic management improvements have been completed in the Eastern Docks and the new outbound controls project will streamline the journey for vehicles travelling via ferry. By moving cargo operations out of the Eastern Docks ferry terminal more landside space has been created for the ferry operation. The cargo operation is now no longer space constrained allowing the business to develop. New longer berths will provide improvements in navigation and a better wave climate to ensure operations can be maintained for as long as possible in inclement conditions. As reported in 2011, a climate change assessment was carried out for this specific project as part of the Environmental Impact Assessment to improve future resilience against storm and flood risk.

Many of the Port buildings are old and some are listed buildings which have low levels of thermal efficiency. Increased wind speeds could lead to a reduction in the thermal efficiency of these buildings and require an increase in energy use. Following analysis of the key areas for improvements, Harbour House was identified. Improvements have already been implemented to this building such as secondary double glazing, improved insulation and installation of a zonal thermostatically controlled heating system. DHB has in place a number of programmes to reduce energy and has successfully reduced its carbon footprint since 2006 by 60% (2020 data). A Buildings Energy Management System (BEMS) is used to monitor the energy use of port buildings. Any improvements that were needed to combat the reduced thermal efficiency that might be experienced would be picked up by the monitoring programme and delivered through our energy saving initiatives.

The Port continues to work hard to reduce the impacts of queuing in Dover prior to the implementation of Operation Stack. The Traffic Management Improvement (TMI) project outlined in section 3.0, increased the vehicle capacity of the Port by 220 freight vehicles, reducing congestion on the external road network. The Dover Traffic Access Protocol (Dover TAP) on the A20, Dover approach road, by Highways England (in conjuction with the Port of Dover) continues to manage traffic and aid congestion through Dover town and with the outbound controls project now underway, futher improvements to reduce queueing and idling vehicles will be made.

A key area where the knowledge and preparation for risk has improved is that of flood resilience. At the Port of Dover digital terrain models have been created to allow production of updated inundation maps; using 8.0m, 8.5m and 9.5m (above chart datum) inundation events, these new models give an improved height accuracy from previous data allowing inundation events to be better forecast. The highest ever recorded tide is 7.49m. Flood resilience has been strongly incorporated into development plans outlined in section 3.0, Port Projects and Development Plans. Work was completed on topographic and bathymetric surveys showing further modelling of flood events using enhanced wave modelling data, tidal information and fluvial flows for the River Dour. This was completed in liaison with the Environment Agency and feeds into the East Coast Ramsgate and Hythe Coastal inundation model. The River Dour modelling and mapping report was completed in 2016 and the Coastal flood modelling report for the Kent coast was completed in 2020. These reports provide us with flood level estimates for various flood event predictions, allowing us to feed into projects

In collaboration with the cruise contractor, changes have been made to the parking arrangements for the Cruise Terminals to avoid the areas identified as potentially at risk of flooding. The Engineering Dept. has protected or raised electrical infrastructure where appropriate and the revised inundation maps have been consulted for any proposed installations.

Charging mechanisms, linked to increased costs associated with pressures on certain resources, were not considered of immediate concern in 2011 or 2015 as they had a relatively short implementation time for changes. They remain unchanged as the monitoring of resource cost and use has not indicated that charging changes are required at present, although if this situation changes the system is flexible enough to adapt quickly, in consultation with the relevant parties.

6.2 Snow events and precipitation

6.2.1 The current effects of snow events and precipitation

Severe snow events can have a serious effect on the resilience of the UK transport system. Within the Port of Dover the internal road network is kept passable and the risk of slips and trips is minimized through effective planning, a robust gritting policy and regular weather reports. Under ramp heating has been constructed in essential areas to help keep them snow and ice free.

Although port operations may be reduced so that effective snow clearance of essential infrastructure takes priority, it is extremely unlikely that the Port would ever have to close due to snow. Snow clearance and salting is now undertaken by one of the Port contractors, reducing the chance of disruption and the need for DHB staff involvement. This resilience to snow fall means that the Port of Dover can be expected to deal with significant numbers of additional passengers moving to the Port from other modes of transport that are less resilient. Airport and Eurostar closures lead to an influx of foot passengers. Under normal operational conditions the main ferry users are HGVs and tourist vehicles with relatively few foot passengers. Facilities therefore have to be realigned to cope with this change in user demand.

This is dealt with through detailed contingency plans, which involve on call staff, emergency supplies of heaters, blankets etc. and through strong relationships with other organizations that may be involved, such as bus and train companies. Weather alerts are shared at tactical meetings with local government agencies and other operators. Transport operators will also cascade information on potential transport network problems to the Port.

6.2.2 The potential effects of changes in snow events and precipitation

The expected increase in snow events has the potential to lead to stock shortages in certain supplies such as grit and heating/fuel oil and could lead to increased pressure on staff availability if the length of time that snow events have a serious effect is extended. Contingency plans are also regularly reviewed and revised and increases in their stock requirements, modifications to equipment and staff training would be delivered as part of this process.

Our charging system does not currently take into account emergency events which lead to a high influx of passengers. If these types of events were to increase, the charging system would have to be reviewed to ensure that the increase in cost was reflected.

The Port has never been heavily affected by flooding in the past because the essential infrastructure is mainly located on reclaimed land which has an extremely low potential for a fluvial flood event, although the flooding caused by the St Jude's storm in 2013 has increased awareness of flooding.

The drainage within the Port has been designed and constructed to the relevant drainage standards and until now has never been breached due to a rain event. However, within the high emissions scenario the increase in winter precipitation becomes significant by the year 2050. This significant increase, coupled with the long lifetimes associated with drainage infrastructure, makes this an area that may require further consideration. In the interests of developing a managed adaptive approach, investment in new infrastructure would not be made until it is considered necessary. It is expected that drainage design standards in the future would reflect this change in precipitation and a programme of retrofitting to meet this standard would be developed.

There is also a level of concern that increased flooding in other areas has the potential to contaminate the potable water supply to the Port, which in turn would affect the potable water which is supplied to the ships. A regular testing regime is undertaken by Affinity Water, the water supplier, and monitored by The Port Health Authority to ensure that potable water standards are being maintained. It is assumed that water providers would be adapting to meet the pressures of the changing climate in order to maintain their service level. DHB has the potential to develop its own resilience to this issue through water filtering systems if the potable water service was compromised. This would not be a carbon efficient option however, and would not be implemented unless absolutely necessary.

The expected decrease in summer precipitation becomes significant in the high emissions scenario by the year 2050 and this has the potential to affect water supplies. DHB does not consume large volumes of water for its own operations, it does however provide a significant amount of water to the vessels that visit the Port. In the future, if there is a shortage of supply, this service would put a greater demand on the Port's water supplier. Currently, cargo and cruise vessels are charged for their water usage based on the amount used but ferries and marina berth holders have water included as part of their berthing fees. The infrastructure is in place to monitor the water usage of these customers but is currently not used as part of the charging mechanism. If the price of water were to increase significantly the charging mechanism would be changed to pass this cost on to the customer. This would defer the risk from DHB and would lead to a change in attitude by the end user resulting in a reduction in

consumption of UK water resources – the ferries are the biggest water consumers in the Port and have the potential to bunker in our sister ports in France.

Within the Port there is potential to increase the use of grey water. These measures would always be considered when undertaking port projects to ensure they incorporate the principles of sustainability. As water becomes more scarce the cost effectiveness of these solutions may increase and a case would be made for implementation.

6.2.3 Changes and Progress

A new grit storage area has been constructed on the port. It has tripled the storage capacity to 90 tonnes, and a regular maintenance schedule is in place. Working partnerships are being utilized for snow clearance to reduce the reliance on DHB staff for snow clearing. Two road ramps are currently heated and this has been reviewed as sufficient.

As part of the development of the Western Docks, flood modelling and inundation maps have been carried out, as detailed in section 6.1.3, *Storminess, Changes and Progress* and these considered the flood risk from increased precipitation and sea level rise, including input from the River Dour which exits through the Wellington Dock.

After detailed analysis of the affects of precipitation on the Port of Dover it is concluded that some investment in adaptation measures is likely to be required but the need for this investment only becomes significant in 2050. As in the 2015 report, no immediate action is required other than the current activities outlined above. After analysing the affects of snow events, it is considered that the extra investment that is currently being made is appropriate.

6.3 Fog

6.3.1 The current effects of fog

Fog can affect the safety of navigation and as a result leads to delays in shipping. Where fog lasts for a long period of time the delay to the shipping timetable means that the shipping uptake may not meet the traffic demand resulting in other traffic management measures. Mitigations to reduce the risk of an incident help to maintain shipping operations at an appropriate volume. Measures include: high visibility lights, enhanced radar systems, the direction of the Port's Vessel Traffic Information Service and the Port Marine Safety Code and training for crew on how to deal with fog.

6.3.2 The potential effects of increased fog

If incidents of fog become more severe and longer lasting as a result of climate change there is little more that can be done to mitigate this problem and the delays caused by these types of events may get worse. These may be dealt with through Operation Stack and other traffic management and capacity measures.

6.3.3 Changes and Progress

Since 2015 an enhanced RADAR system has been installed in Port Control and on the Admirality Pier as well as on the new marina curve extension that was constructed as part of the Western Docks Revival Project. This, alongside the high visibility lighting mentioned in the previous report, has improved visibility and safety both on the land and marine operations. Mitigation and adaptation measures against traffic congestion that is associated with shipping timetable delays have been discussed earlier in section 6.1.3 *Storminess, Changes and Progress*.

6.4 Storm Surges and Sea Level

6.4.1 The current effects of storm surges and sea level

The Port infrastructure provides the facilities on the quayside for people and vehicles to board vessels. On the ferry berths, link-spans provide the ship to shore interface by connecting a ramp to a ship over which vehicles can travel. On the cruise berths and on some ferry berths, passenger access ramps are used to provide a walkway from the quayside to the vessel. Link spans and passenger access ramps are either free floating or can be moved up and down to meet the decks of different vessels at different states of the tide. Currently at extreme low and extreme high water some of the link spans and passenger access ramps cannot be used as they cannot be raised or lowered enough to provide a safe interface with the vessel. Some of the ferry berths are therefore closed over high and low water during extreme tides and loading operations cannot be undertaken at the cruise terminal. This is over such a short period of time that it is not an issue and the changes are accommodated into the timetable.

The flooding that occurs around the Wellington Dock has the potential to be worse during a storm surge event than it has been previously. From a tidal surge in 2013, flooding occurred to the Wellington Dock, marina, the inner harbours, Eastern Docks vehicle assembly lanes, car parks and closed the swing bridge beside the Marina which has raised the need for improved flood risk knowledge.

During storm surges, penstock valves are used to close the drainage in the Eastern Docks to prevent the system back filling. As storm surges are predictable events, notification of a storm surge leaves plenty of time for the penstock valves to be closed and for any areas at risk of flooding to be cleared.

6.4.2 The potential effects of rising sea level

As sea level is expected to rise, the duration of berth closures would increase over the high water but decrease over the low water. However, link spans and passenger access ramps only have a 30 year life span and so will be replaced with spans and ramps that could cope with the new tidal range as part of the normal replacement programme which is already underway.

6.4.3 Changes and Progress

Since the last report, quay walls have been heightened and dock gates that can help keep out storm surges have been implemented. These measures have been introduced as part of the Dover Western Docks Revival Project and aim to help prevent flooding in and around the

Wellington Dock. Improved understanding of our flood risk is part of this process and is outlined in section 6.1.3 *Storminess, Changes and Progress*.

Linkspans and berth improvements have been underway since 2004 and sensor activated self locking mechanisms on the free floating fingers, are reducing the amount of bridge movements to adjust to vessel height and provide energy savings and improved safety. Vertical ladders were used for crew access to vessels and these have been replaced by articulated walkways that go to an angle of 20° to improve safety. The berth refit programme concluded with the last berth in 2016. These improve the resilience to tidal height changes both for the long term and also during weather events.

6.5 High Summer Temperatures

6.5.1 The current effects of high summer temperatures

Cooling and refrigeration units are used to provide temperature control in the following areas:

- server rooms for the IT system;
- storage areas for temperature sensitive commodities, such as palletised fruit;
- comfort cooling in some of the office space.

The specification of the unit chosen is determined using a cost benefit analysis. A unit which remains efficient at higher temperatures costs more and that cost has to be balanced against the costs associated with the effects of the peak temperatures that may go above that efficiency threshold within the lifetime of that unit. Using this rationale, a unit that remains efficient during peak temperatures is more critical in temperature controlled stores or server rooms than in office space.

Temperature control in the Port is maintained using units which have a lifespan of approximately 15 years. The older units on site become less efficient above 28°C but the newer models now remain efficient up to 34°C, which is an increase from 30°C in 2011.

6.5.2 The potential effects of rising summer temperature

As summer maximum temperatures are expected to rise as a result of climate change this will need to be accounted for in the cost benefit analysis when procuring new cooling units. Units of higher specification may be required in the more critical areas such as the temperature controlled stores and the server rooms.

6.5.3 Changes and Progress

As the older air conditioning units come to the end of their lifespan they are replaced with modern units with the higher efficient operating threshold and the replacement programme is almost complete. This has benefits for energy consumption reduction. The Information Technology is continually upgrading equipment around the Port. Some of the newer equipment installed since 2015 is more tolerant of higher temperatures, this has allowed us to adjust the temperature of the rooms the equipment is housed in, putting less demand on air conditioning units. Since 2015 the Port has continued its commitment to upgrading to more efficient refrigeration units, with new more efficient units being installed across the Port.

7.0 Uncertainties and Assumptions

7.1 Uncertainties

Within this risk assessment there are different levels of uncertainty associated with different climatic factors.

This risk assessment for 2011 and 2015 reports are based on the UKCP09 projections which for some climatic factors provided probabilistic outcomes for the Dover area. The same can be said about the UKCP18 projections used in this report. Where this is the case, the outcomes are available for 3 different scenarios of high, medium and low emissions. The high emissions scenario is assessed within the report but the scenario that is realised will depend on population growth and future reliance on fossil fuels. For example, the Met Office state that they cannot rule out substantial additional sea level rise, specifically referencing the potential loss of ice in West Antartica.

However, there is uncertainty about the level of emissions and therefore the level of alignment with the high emissions scenario which has been assessed. There is uncertainty whether the climatic outcome associated with that emissions scenario will be within the "likely" ranges expressed. There is also an inherent uncertainty in using a model to replicate the Earth's systems as the model can only be based on the best current understanding of the system which is likely to improve over time.

There are some factors which are less understood and therefore their projections are associated with a greater level of uncertainty. The factors of greatest importance to the operation of the Port of Dover are the areas that have less detail within their projections, such as storminess (including the potential to be electrical), wind speed, and critically direction and fog. All of these have a bearing on DHB's operations and costs but probabilistic, time specific projections are unavailable so there is less certainty about when these factors may need to be taken into account in business planning.

There are some climatic factors that affect DHB operations for which there is little or no information such as wind direction, which affects sea conditions, and sunshine hours, which affects lighting requirements.

The time frames associated with climatic change are extremely long when compared with business models and decisions about commercial operations. Therefore the activities and commercial priorities of DHB are likely to change significantly and may not necessarily be affected by the climatic factors in the way that is currently predicted.

7.2 Assumptions

This adaptation programme is developed on the assumption that the climate projections produced by UKCP18 are correct. However, it is recognised that there are uncertainties within this postulation and a managed adaptive approach has been developed to provide the flexibility to overcome this and ensure that an appropriate level of investment is made into the Port's adaptation options.

There are also some key assumptions that reflect the Port's interdependencies with other parties. It is expected that the UK government will continue to prioritise its winter resilience programme in order to retain a functional transport system during snow events. It is presumed that Highways Authorities, Sewerage Undertakers and Utility providers will also be adapting to climate change in order to maintain their level of service delivery. It is also assumed that

building standards and regulatory requirements will be modified as necessary to align with the changing climate.

It is assumed that trade patterns and resource demand between UK and continental Europe that are the basis for DHB's operations will be unaffected by climate change.

8.0 Barriers to Adaptation

During the risk workshops conducted for previous rounds of reporting, barriers to suggested adaptation measures were identified. These can be found in the risk matrices for 2011 and 2015. (Appendices [Add Number When finalised]) The 2021 risk matrix includes any updates to these barriers, or new barriers that have been identified since the last round of reporting. This section provides a general overview of the barriers that were identified in 2015 and gives their current status where changes have been seen.

8.1 Staff Relations

Some adaptation measures involved modifying working processes and staffing levels to meet peak demand for certain types of services. These changes were implemented fairly smoothly with contractual changes providing greater flexibility in availability of staff. In 2021 a new and improved document management system has been developed, this helps to standardise and collate working processes at the Port.

8.2 Cost

Some adaptation measures require investment in infrastructure which must be justified. It is also recognised that adaptation through management processes could lead to an overall increase in costs, (e.g. due to increased maintenance or on call pay) which if not managed appropriately, could have some implications for cash flow. A managed adaptive approach remains and the requirement for a sound financial justification reduces the potential for over adaptation, keeping costs to a minimum and sound monitoring of expenses ensures that cash flow is maintained.

8.3 Control and Interdependencies

This risk assessment considered the interdependencies of DHB with its key stakeholders as identified in section 4.2; customers and transport providers. It also considered the dependency on suppliers. The risks that climate change poses to these interdependencies are detailed within the risk matrix and section 6 and form a considerable part of the risk that is posed to the organisation, as a transport node. It is key to this assessment and the future operations of the Port of Dover that the hinterland infrastructure and national utility providers are adapting to maintain their service delivery also. Delivery of these adaptions is not within DHB's control.

8.4 Knowledge

As discussed in section 7.0 there is a lack of knowledge surrounding some of the climate variables that are most significant to the Port operations. This affects the extent to which adaptation measures can be planned. Knowledge of flood risk has increased since 2015 with the publication of the River Dour Modelling and Mapping Study and the Kent Coast Whitstable to Hythe Coastal Modelling reports.

8.5 Technological/Managerial solutions

It is possible that further adaptive solutions will be found with technological advances and changes in organisational structure.

8.6 Carbon

DHB has reduced its carbon footprint of their operation by 60% since 2006 and it is expected that this reduction will continue as the Port continues it's drive to be more sustainable. This requirement constrains some adaptation options which have high energy requirements. The adaptation options with high energy demands are therefore the least favoured and will only be implemented if absolutely necessary and in the most energy efficient manner practicable.

9.0 Monitoring and Evaluation

DHB has a mature Risk Framework that has been developed to be consistent with the requirements of ISO31000: Risk Management Principles and Guidelines in order to integrate the process of managing risk into the organisation's overall governance, strategy and planning. The Risk Framework is broken down into varying levels in order to tailor it to the interest levels of all members of the organisation. High level corporate risks are broken down into more detailed risks which sit with different working areas. Each risk is assigned a leader who is empowered to review the level of that risk and the results of any mitigation actions and report back to management on any changes or effects. In this way the responsibility is put into the hands of the mitigators and mitigating actions can be undertaken at various levels within the organisation embedding risk management into all processes.

This is carried out in conjunction with DHB's Risk Management Plan as outlined in section 9.1.

9.1 DHB Risk Management Plan

The following Policy Statements are made available to all DHB staff via the intranet system and the staff handbook and outline the risk management responsibilities associated with all types of organisational risk, including climate change risk.

Policy

Dover Harbour Board will identify and manage its risks in order to maximise the opportunities for the Port and minimise risk to its employees, assets and business. The risk management discipline will form a fundamental part of all the activities of the organisation and the culture of effective risk management will be continuously developed and reviewed.

Risk Ownership

Every adverse risk has a risk leader identified on the Corporate Risk Register. The risk leader is the designated member of staff responsible for ensuring that the impact and likelihood of occurrence of any adverse risks are properly assessed after consulting with colleagues and specialist advisors as necessary. The risk leader is not responsible for the design or delivery of the associated controls or mitigations but has a duty to understand them, assess their adequacy and formulate recommendations on their development. Nevertheless as Risk Leaders are the people considered most able to undertake the above tasks for the various risks, they may have other responsibilities relating to risks which they lead on arising from their individual job descriptions.

Responsibility

Everyone is responsible for the effective management of risk. All employees are responsible for identifying potential risks within their area of activity and for notifying management of such risks. Management is responsible for developing and implementing plans to reduce the negative effect of risks. The Board is responsible for ensuring that appropriate resources, including those required for training and development, are available at each level of staff to ensure the successful implementation of this risk management policy. In particular:

Individuals should:

- understand their obligation to be aware of risk,
- know that they are accountable for risk that they control or influence,
- understand how they can play a part in the continuous improvement of risk management,
- understand that effective risk management is a key part of the organisation's culture and everyone's day-to-day work, and
- report systematically and promptly to management any perceived new risks or failures of existing control measures.

Heads of Department and Business Managers will:

- establish performance measures which allow them to monitor the key business activities in the context of progress towards their business and service objectives,
- identify risks, including new risks, which require control systems to be established,
- develop control measures to manage the risks which fall into their area of responsibility,
- develop mitigating or contingency plans to minimise or respond to risk events which occur notwithstanding the controls that may be in place,
- be aware of the possible effects that their risks may have on other business areas and the effects that risks in other areas may have on them,
- report promptly and directly to senior management any perceived new risks or failures of existing control measures. It should be noted that any sudden and significant deterioration in an adverse risk rating to a red net level requires immediate reporting to a director who may determine that the activity should be suspended temporarily pending further investigation,
- encourage a culture of risk awareness amongst their teams, and
- champion the embedment of risk management in all of their procedures and activities.

Risk Leaders will:

- carefully assess all risks assigned to them, consulting with colleagues and specialist advisors where appropriate,
- form a view as to the effectiveness of the associated control and mitigation measures and report systematically to the Risk Compliance Manager, and
- report promptly and directly to executive management and the Risk Compliance Manager any perceived new risks, failures of existing control measures or inadequacy of mitigating or contingency plans.

Directors and General Managers will:

- promote risk awareness within their areas of responsibility,
- develop risk management objectives in their areas of responsibility,
- champion the embedment of risk management into the day to day activities of their reporting teams,
- determine the organisation's appetite for risk at operational, technical, project and component business stream level,
- establish the assessment matrix and its gradation levels,
- advise the Board on strategic risk tolerance and risk management policies,
- report exposure to high-rated risks and all strategic risks to the Board, and
- ensure that risk management, in the sense of both the business case and the delivery plan, is incorporated at each stage of a project.

The Board (incorporating the responsibilities delegated to its Audit Committee)

- has responsibility for determining the strategic direction of the organisation by setting clear objectives for management,
- is ultimately responsible for Dover Harbour Board's systems of risk management and internal control,
- will set appropriate policies,
- will set the tone of risk appetite and determine the Board's tolerance for adverse strategic risk and limits of exposure,
- will seek regular assurance that the risk management system is working effectively as part of its evaluation of systems of internal control
- will report performance to stakeholders and regulators as required.

The Director of Corporate Assurance will:

- act as the primary champion of risk management at strategic level,
- set policy and strategy for risk management,
- co-ordinate the various functional activities which advise on risk management issues for DHB,
- chair the risk review panel, and
- prepare Board reports on risk and co-ordinate the strategic risk reporting to the Board and Audit Committee.

The Risk Compliance Manager will:

- maintain custody of the risk registers,
- understand and link all non-financial risk processes throughout the organisation,
- administer the risk management review process using ISO31000 and its associated guidance standards as the model of good practice,
- prepare monthly reports on risk,

- highlight weaknesses in risk management and control processes.

In addition to the above general responsibilities for certain groups or teams, there is a number of teams or individuals with specific risk management responsibilities:

Internal Audit will:

- provide robust independent assurance that the risks, key management objectives and core systems are being appropriately managed,
- understand and link all risk processes throughout the organisation,
- assess the efficiency and effectiveness of the assurance processes,
- identify gaps and possible overlaps in assurance provided,
- report significant issues related to the processes for controlling the activities of Dover Harbour Board, including potential improvements to those processes, and provide information concerning outstanding actions not completed within agreed timescales which arise from our internal audit reviews.

The Head of Corporate Administrationwill:

- ensure that contracts of employment/job descriptions contain appropriate risk management responsibilities as a core competence,
- ensure that risk management is emphasised in induction training, appraisals and the staff handbook,
- facilitate risk management training for staff at all levels, and
- ensure that risk management forms a part of the management training and development programme.

The Financial Controller will:

- ensure that risk management is embedded in the financial and budgeting processes, and
- understand and link all financial risk processes throughout the organization
- prepare monthly reports on risk and co-ordinate the risk reporting to the Risk Review Panel,
- identify new risks and highlight weaknesses in risk management and control processes, and
- highlight weaknesses or inefficiencies in risk response processes, including contingency, disaster recovery and business continuity programmes.

9.2 Embedding Climate Change Risks

The Climate Change Risk Framework feeds into DHB's Corporate Risk Register and will lie beneath the corporate risk:

"Major disruption to operations arising from bad weather, industrial action or other factors"

As with all other risks, each risk will be assigned an owner and a leader and a regular review of all risks will be carried out. This will include a review of any changes to projections, thresholds and interdependencies which may change as a result of mitigation, further monitoring, modification of equipment, assets or processes. The regularity of the review of each risk will depend on the level of residual risk.

Through the review and reporting process, DHB continues to look out for new risks associated with climate change and remove risks that no longer apply, continuously improving the Climate Change Risk Register within the context of the overall risk framework. Mitigation and adaptation

measures are assessed on their cost effectiveness and their ability to meet the criteria set out in section 5.3. Options that allow flexibility in meeting adaptation needs will be viewed preferably to allow for the uncertainties that are inherent to the climate change projections.

When the risk matrix was reviewed with the Risk Compliance Manager, against the corporate risk register, some risks that were no longer considered valid were removed; others were combined as they overlapped sufficiently to be assessed as the same risk. The subsequent risk review process, through communications with various departments around the Port has resulted in the updated 2021 risk matrix.

9.3 Evaluation of the Risk Matrix

UKCP18 was used to re-evaluate the timescales when changes become significant. Where mitigation and adaption measures have been introduced since 2015 the risk matrix has been updated to reflect these changes, the updated risk matrix will be communicated with the Port. This ensures staff see the positive impact their consideration for climate change has on the risk to the Port, hopefully encouraging them to strive to continue to improve the Port's resilience to climate change related risks.

As was the case in the previous round of reporting, some mitigation and adaptation measures have naturally occurred as an intrinsic part of the normal maintenance, renewal and upgrades to the infrastructure at the Port. The method for project approval and management remains the same, so proposed projects now have a sponsor, from a relevant department, who is driving projects. These go through a rigorous review process, by various parties including by the SHEQ Team, so questions will be raised to ensure resilience against climate change risk has been considered.

10.0 Summary

There have been some significant improvements made since the second round of reporting in 2015. Some specific adapations mentioned in the 2015 risk matrix have been undertaken and the continual dock improvement works such as DWDR and the outbound controls project continue to implement measures to help mitigate the future effects of climate change.

Brexit and the Coronavirus pandemic has proven, once again, the resilience of the Port and it's ability to adapt to an ever changing environment. This adaptability is ingrained in the Port and reports such as this are essential in ensuring we maintain a high level of awareness and adaptability to changes on the horizon. The potential effects of climate change are now well known across the Port. Environmental campaigns distrubted portwide inform and educate the business on envirionmentally friendly practices and encourage and inform new projects to implement mitigation measures for the future and environmentally friendly practices for the present.

Appendix 1: Climate Change Projections for Dover

Year	Temperature				Precipitation			Percentage Change in Specific Humidity				Sea Level Rise (95%ile)
	Increase in Winter Mean	Increase in Summer Mean	Increase in Summer Max	Increase in Summer Min	Change in Annual Mean	Change in Winter Mean	Change in Summer Mean	Dec Jan Feb	Mar Apr May	Jun Jul Aug	Sept Oct Nov	
2025	**0.7°C** (-1.0 - 2.4)	**1.2°C** (-0.4 - 2.9)	**1.3°C** (-0.9 - 3.5)	**1.1°C** (-0.1 - 2.4)	**2.2%** (-16.8 - 23.0)	**4.8%** (-28.7 - 42.7)	**-8.7%** (-65.1 - 56.1)	**4.4%** (-8.4 - 16.2)	**2.9%** (-6.5 - 12.6)	**5.7%** (-5.6 - 15.8)	**5.0%** (-6.0 - 16.5)	**0.164m**
2050	**1.7°C** (-0.2 - 3.5)	**2.3°C** (0.2 - 4.4)	**2.4°C** (-0.2 - 4.4)	**2.1°C** (0.5 - 3.8)	**-2.8%** (-18.8 - 18.3)	**11.6%** (-26.1 - 47.3)	**-30.0%** (-74.7 - 32.0)	**10.8%** (-5.1 - 25.7)	**7.2%** (-3.1 - 18.7)	**10.1%** (-3.6 - 24.6)	**11.2%** (-1.6 - 23.6)	**0.394m**
2080	**3.0°C** (0.6 - 5.4)	**4.4°C** (1.4 - 7.5)	**4.9°** (1.2 - 8.7)	**4.2°C** (1.7 - 6.8)	**-3.0%** (-21.8 - 19.4)	**18.9%** (-27.3 - 70.3)	**-37.0%** (-88.3 - 16.8)	**20.5%** (0.9 - 40.7)	**15.0%** (0 - 40.7)	**17.9%** (-0.6 - 37.2)	**24.0%** (6.9 - 42.2)	**0.803m**

Appendix 2: Climate Change Risk Matrix 2021

Risk Number	Climate Projection	Risk Description	Details of Risk Including Any Thresholds	Risk Identified in 2015	Gross - Present Day			Gross - Future (Based on the timescale when the change becomes significant)				Current Mitigation Measures	New Measures taken since 2015	Adaptation Measures	Barriers to Adaptation	Net - Present Day			Net - Future (Based on the timescale highlighted)		
					Severity	Probability	Risk Overall	Timescale	Severity	Probability	Risk Overall					Severity	Probability	Overall	Severity	Probability	Overall
1	Storm surge.	Flooding around the Wellington Dock.	A storm surge greater than 8m would cause the Wellington Dock to over spill and flood the surrounding area. No current operational risk but precludes development in this area which reduces the opportunity for making a profit from this asset.	Y	4	2	16	now	4	3	20		Heightened quay walls and dock gates that can keep out storm surges to prevent flooding have been implemented as part of DWDR.			4	1	12	1	4	6
3	Increase in daily mean summer time maximum temperature.	Increase pressure on cooling in temperature sensitive areas. Higher utility costs for cooling	Refrigerant units become less efficient above 28°C for older units and 32°C for newer units. Cooling to a specified temperature is important in the temperature controlled stores, computer server rooms and in the berth pump houses. Hotter days could cause more money to be spent on cooling.	Y	1	4	6	2080	1	4	6	Energy saving initiatives to improve efficiency and investigate the potential for renewables. Maintain a suite of refrigerant units that can meet the majority of circumstances.	New more efficient fridge and freezer units continue to be installed as part of general upgrades around the Port. New IT equipment installed around the Port is more tolerant of higher temperatures, putting less demand on air conditioning units.	Increase the specification of refrigeration units to meet the temperature demands and maintain the required temperatures. Upgrade equipment to less temperature sensitive solutions as technology improves. This can be done through the normal upgrade programme due to the lifespan of the equipment in relation to the temperature changes expected. As costs increase more measures become cost effective.	Availability of technological solutions. Increased cost of improved specification systems. High energy requirements of cooling. Costs of investment in new technology/solutions.	1	3	5	2	2	8
4	Increase in summer max temperature	Staff welfare in uncomfortably warm offices.	Temperatures above 28°C in un-air-conditioned offices causes complaints and decreasing productivity. Offices without any air-conditioning may not be rented off the organisation.	Y	1	4	6	2080	1	4	6	Air conditioning is currently placed in areas of significant solar gain and where other options are less feasible.	Current Mitigation Measures are still deemed as adequate.	Awareness training on keeping cool without the need for air con. Significant justification for installing air conditioning in new areas would be needed. Potential to investigate external blinds/reflective glass, and changing the occupancy of building to move people to cooler areas.	Awareness training maybe ignored. Cost of introducing external blinds/reflective glass. Negotiations about moving office spaces.	1	3	5	2	1	6
5	Increase in summer max temperature	Sunburn to staff.	Increased temperatures could cause more cases of sunburn during the summer.	Y	1	4	6	2080	3	4	18	Personal Protective Equipment (PPE) is available, offering protection from sunburn. Occupational Health department assists with any health issues. During summer months education on preventing sun burn is sent out. Risk assessment in place concerning working in the sun.	Current Mitigation Measures are still deemed as adequate.	Increase current mitigation measures.		1	2	4	2	4	12
6	Change in mean precipitation in summer time.	A shortage of water supply.	Large amounts of water are required for vessels. This puts greater demands on our supplier.	Y	1	1	3	2050	4	3	20	DHB monitor the water usage of all vessels. DHB have an Energy and Water Policy in place and run and associated initiatives to reduce water consumption.	Pressure and leakage management options are being investigated.	DHB would pass on increasing water charges to the tenants and vessels and change the charging mechanism to reflect water use. Investigate the potential for vessels to obtain their water supply in France to reduce the pressure on UK resources. Increase the use of grey water within the port. Investigate the potential for a desalination plant.	The dispersed nature of buildings does not lend itself to cost effective implementation of a greywater systems A desalination plant would require a large capital expenditure and would use large amounts of electricity. Nord pas de Calais has suffered a number of droughts and water restrictions in the last few year and is more water stressed than the south east of England. In general use the existing berths in Calais already suffer from low pressure hence the vessels do most bunkering in UK.	1	1	3	2	4	12

7	Change in winter mean precipitation.	Contamination of potable water service caused by flooding	Risk controlled by service provider.	Y	3	1	9	2080	3	3	15	DHB currently have a testing regime in place and are notified through Kent area health authority. There is also a regime for sanitizing any new modifications that are put in place. Ferries have sterilisation systems on board.		Apply pressure to the water provider to maintain service levels. Protect our own supply via filtration.	Our water supply is not fully under our control, as it is provided to us by the supplier. The cost of infrastructure for filtration can be very high and has the potential to use large amounts of energy.	2	1	6	2	4	12
8	Change in winter mean precipitation.	Flooding of the port due to inadequate draining facilities	Increased precipitation could potentially flood drains causing pollution and lack of access. Service ducts and tunnels would also become flooded.	Y	3	1	9	2050	3	3	15	DHB presently use the correct design standards for drains to mitigate for any potential flooding due to precipitation.		Increase the drainage capacity inline with future design standards. Ensure new buildings or critical equipment is built on plinths above the appropriate flood return period flood level Consider installation of backflow prevention devices in in drains to buildings to prevent internal flooding via the drainage/sewage system. Assess flood levels at the appropriate return period at critical assests and if required install permanent or temporary flood defences around critical infrastructure such as substations, switch rooms, telecom cabinets etc .	Infrastructure can be very costly, however this can be reduced via a manage adaptive strategy that would bring drainage up to new design standards incrementally.	0	0	0	2	3	10
9	Increased storminess/wind speed	Loss of function of Port Control due to damage to marine navigational equipment and/or inaccessibility	Marine navigational equipment such as (HADCP/VTMS/Tide Gauge) can be damaged due to large wind and wave action.	Y	1	3	5	?	2	3	10	Maintain a stock of spare parts for maintenance of equipment. Back up systems on certain areas.	Current Mitigation Measures are still deemed as adequate.	Continue with the same.		1	2	4	1	4	6
10	Increased storminess/wind speed	Disruption to hydrographic surveying regime and dredging regime. Restricted work and work opportunities and maintenance etc. delays project	Disrupted hydrographic regime would cause a delay in information to the dredger reducing the accuracy of dredging operations. Dredging cannot be carried out in high swells as the dredger has difficulty accessing the disposal site. This leads to siltation of the harbour.	Y	1	1	3	?	2	3	10	Monitor the weather and arrange dredging and hydrographic operations around inclement weather. Prioritise dredging and hydrographic operations in good weather where possible. Prioritise to ensure key areas are surveyed and dredged. DHB ensure good planning is conducted to avoid bad weather when programming works.	Current Mitigation Measures are still deemed as adequate.	Continue with the same. Potentially increase resource to allow hydrographic and dredging operations to be prioritised further. DHB would increase current measures, and look into introducing more flexible hours, such as annualised hours. With more outdoor work taking place in the summer months.	Cost of additional staffing.	1	1	3	3	2	12
12	Increased storminess/wind speed	Increased storm damage and corrosion	Increased winds brings more storminess causing damage to buildings and marine structures. Increased costs to fix damages and cover overtime.	Y	2	3	10	?	2	4	12	DHB have in place a storm warning system. Prior to a storm vulnerable structures are fixed down. There is a post storm inspection and regime, to check on all structures. The organisation is heavily insured towards this risk. Hydraulics research with HR Wallingford. means there is a catalogue of information available on how storms can affect the port.	Additional storm protection has been installed for the Cruise Terminal 1 building.	Upgrade buildings and structures to meet design standards.	Assuming design standards are modified to adapt to climate change. Increased demand on maintenance staff.	2	3	10	2	2	8
13	Increased storminess/wind speed	Beach erosion. Scouring action will undermine marine structures	Heavy winds creating large swell could lead to an increase in beach erosion. Which has the potential to undermine marine structures such as the Admiralty Pier.	Y	1	1	3	?	2	2	8	Regular surveys and maintenance of marine structures.	Current Mitigation Measures are still deemed as adequate.	Continue with the same. Apply additional sea defence measures if necessary.	Capital investment unlikely to be justified on grounds of preservation of amenity alone.	1	1	3	2	2	8
14	Change in winter mean precipitation.	Cliff erosion.	More precipitation causing freeze-thaw erosion may lead to increased cliff erosion. A big potential for danger and disruption.	Y	1	3	5	2025	2	3	10	Regular surveys and cliff protection and descaling works.	Current Mitigation Measures are still deemed as adequate.	Continue with the same.		1	3	5	2	3	10
15	Increased storminess/wind speed	Reduced thermal efficiency of buildings	Increased winds can cause drafts in poorly insulated buildings reducing the thermal efficiency of the building and costing more to heat it.	Y	1	4	6	?	2	4	12	DHB carry out general maintenance and monitor the energy use of buildings. We also have in place an Energy Monitoring scheme across the port, to continuously identify areas for improvement and investments are made annually to deliver improvement projects.		The implement of improvement projects would be carried out when they become cost effective through energy savings, backed by enhanced capital allowances.	Many of the old buildings that have a poor thermal efficiency are also listed buildings, which can limit the types of works that can be carried out.	1	3	5	1	2	4
16	Increased wind speed.	Disrupted electricity supply due to weather damage. Power cuts	Stormy conditions causing damage could lead to a loss in power from the grid supply.	Y	3	4	18	?	3	5	21	System of generators to allow key operations to continue.	Current Mitigation Measures are still deemed as adequate.	Generator upgrade currently in planning to improve resilience further.		1	4	6	1	4	6

17	Sea level rise/storm surge.	Failure of ramps and berths in the marina.	A severe storm surge coupled with a significant rise in sea level could cause the ramps and berths in the marinas to fail.	Y	2	2	8	2050	2	2	8		Ramps and berth in new marina designed to cope with expected storm surges as part of DWDR.			2	1	6	2	1	6
18	Sea level rise.	Low and high tide affecting passenger access operations at the cruise terminal and span operations at the ferry berths.	The passenger access walkways and the link spans on some berths cannot be operated safely at all states of the tide. Operations are therefore not carried out on these berths over extreme low and extreme high waters.	Y	2	2	8	2050	2	3	12	Close the berth until the tide turns. Manage the operation through other berths during this time.	Current Mitigation Measures are still deemed as adequate.	Engineer the problem out as part of the general upgrade of equipment. The lifespan of berths being 25 years.	Cost of infrastructure potentially including the vessels.	1	3	5	1	3	5
19	Increase in daily mean summer time maximum temperature.	Tarmac broken through heat softening		Y	1	2	4	2080	1	2	4	Concrete used on areas where vehicles are turning. Asphalt only used on low impact areas. Regular resurfacing programme to maintain road surfaces in good condition.	Resurfacing works continue around the port and will be a major part of the outbound controls project.	Continue with the same.		1	1	3	1	2	4
20	Change in winter mean precipitation.	Snow and icy conditions creating costs to cover labour, plant and grit.	Snow clearing operations require on call staff and can lead to overtime and associated costs.	Y	2	4	12	2080	2	4	12	The cleaning contractor is used to carry out gritting functions in place of sweeping which cannot be done in snow conditions. This utilises staff who are already being paid. Staff and tenants responsible for clearing their own areas.	Current Mitigation Measures are still deemed as adequate.	Update contractual arrangements to define responsibilities and reduce the burden on DHB.	Contractual negotiations.	1	4	6	1	4	6
21	Increase in snow events	Bad weather, snow and ice causing traffic disruptions within the port.	Internal roads, lanes and ramps become impassable and unusable.	Y	3	3	15	2025	3	4	18	Gritting and snow clearance. Bad weather planning. Gritting policy. Weather reports direct from met office.	Grit store size has been increased to hold more salt and grit in reserve. Store has regular maintenance and stock checks.	Bring in outside help from local service providers for snow clearance. Plan to maintain the heating system in the ramps and investigate the potential to install more.	Heating system infrastructure has to be cost effective.	2	2	8	1	3	5
22	Increase in snow events	Severe weather closing other modes of transport creating extra pressure and costs to the port operation	Airports, Eurotunnel being closed due to weather conditions. The port has to modify operations to account for the resultant change in transport modes and travel patterns.	Y	2	3	10	2025	3	4	18	Contingency plans. Extra staff on-call. Relationships with bus and train companies. Emergency supplies (blankets, heaters).	Current Mitigation Measures are still deemed as adequate.	Modify charging mechanisms to reflect costs. Overflow space made available for foot passengers.	Cost of on call staff. Cost of emergency supplies.	2	3	10	1	4	6
23	Snow events/Change in winter mean precipitation.	Snow and ice affecting approach routes.	Halts/reduces traffic flow to the port.	Y	1	3	5	2080	2	3	10	Outside of DHB control. Liaison with Highways Agency		Government winter resilience programme.	Outside of DHB control.	1	3	5	1	3	5
24	Change in winter mean precipitation.	Snow and ice preventing employees getting to work.	Lack of staff for operational roles. Increased pressure on staff in attendance.	Y	1	2	4	2080	2	3	10	Contingency planning to bring staff in. On call staff to provide cover. Business continuity planning.	Current Mitigation Measures are still deemed as adequate.	Continue with the same.		1	1	3	1	1	3
25	Increase in snow events/Change in winter mean precipitation.	Severe weather causes stock shortages in key supplies.	e.g. salt, grit, fuel oil.	Y	2	3	10	2025	3	3	15	Hold a stock of grit and fuel oil.	Grit store size has been increased to hold more salt and grit in reserve. Store has regular maintenance and stock checks.	Source fuel oil by sea.		1	2	4	1	2	4
26	Increased fog	Delays in the ferry timetable due to poor visibility.	Leads to delays and operation stack. Currently affects operations 2-3 weeks per annum.	Y	2	4	12	?	3	4	18	High visibility lights, enhanced radar systems. Port control measures. Training for ship staff to work in the fog. Port marine safety code.	Traffic Management Improvement project has increased capacity within the Eastern Docks. New RADAR on new marina curve extension and Port Control and Admirality Pier systems enhanced.	Outbound controls project will improve efficiency and reduces queueing.		1	3	5	2	2	8
27	Increased storminess/wind speed.	Loss of reputation as the last mode of transport standing.	Increased port closures due to storminess undermine the ability to handle £100 billion of UK/European trade and influxes of passengers from elsewhere.	Y	1	2	4	?	1	2	4	Maintain operations in as many conditions as possible. Provide good customer service in times of delay.	Current Mitigation Measures are still deemed as adequate.	Continue with the same. Studies to improve the resilience of berths.	Fragility of regional infrastructure - road and rail.	1	1	3	1	3	5
28	Increased storminess/wind speed	Service delivery ro-ro. Severe weather leading to port closure/operation stack. Berths untenable traffic queuing. Uplift capacity reduces	Police manning roundabouts/operation stack. Traffic disruption and air quality decreases.	Y	3	3	15	?	3	4	18	Port marine safety code. Dover Traffic Access Protocol (TAP). Operation stack procedures. Good relations with Kent police/Highways Agency. Tug assistance to vessels.	Buffer zone introduced at entrance of Port to hold waiting traffic.	Outbound controls project will improve efficiency and reduce queueing.		3	2	12	1	1	3
30	Increased wind speed.	Parting of vessel from ship-shore interface. Health and safety risk	Safety risk in gale force 7-8 and/or 2m swell.	Y	1	3	5	?	2	4	12	Put out extra moorings. Use alternative berths which are more sheltered. Vessels use engines to stay in berth. Retro-fitting ro-ro berths with self-supporting fingers.	Current Mitigation Measures are still deemed as adequate.	Planned berths are aligned to give the best wave climate possible for the local conditions.		1	3	5	1	2	4

31	Increased wind speed.	Enhanced operational commitments affects crewing arrangements.	Long continuous use of the tugs leads to problems with the crewing arrangements. The Maritime Working Directive limits work to 14 hours. The problem is exacerbated when two tugs are required simultaneously.	Y	1	4	6	?	2	4	12	Use on-call tug crew to provide break. Flexible working hours		Consider recruiting additional staff.	Significant difficulty in recruiting specialist skills.	1	4	6	1	1	3
32	Increased storminess/wind speed.	Damage to customers property, flooding on the admiralty pier.	Vehicles stored in the port. Waves overtopping the Admiralty Pier can occur during high water, with gale force 8 and above winds.	Y	2	3	10	?	2	3	10	Insurance. Prepare for the weather through monitoring and storm warning systems. Flood defences are fitted on the Admiralty Pier in winter season. Flood plan updated. Use alternative storage areas.	Storm defences installed in Cruise terminal 1 and storm surge flood defences implemented in Wellington Dock as part of DWDR	Continue with the same. Inundation maps completed to 8.5-9m above high tide. There is potential to continue to improve the flood defences that are currently in place. This will only be taken forward if it becomes cost effective.	Cost of infrastructure.	1	2	4	1	1	3
33	Increased storminess/wind speed.	Customer service risk. Damage to floating craft/ equipment.		Y	3	2	12	?	1	2	4	Insurance. Prepare for the weather through monitoring and storm warning systems.		Continue with the same.		3	1	9	2	1	6
34	Snow events/Change in winter mean precipitation.	Ice causing slips/trips	Health and safety concern.	Y	2	4	12	2080	2	4	12	Gritting and snow clearance. Bad weather planning. Gritting policy. Weather reports direct from met office.	Grit store size has been increased to hold more salt and grit in reserve. Store has regular maintenance and stock checks.	Bring in outside help from local service providers for snow clearance. Plan to maintain the heating system in the ramps and investigate the potential to install more.	Costs of investment in ramp heating and high energy use.	2	3	10	1	3	5
36	Snow events/Change in mean precipitation in winter time.	Extreme conditions leading to staff absence, extra work and excess passengers causes staff to take time away from their core roles.	Potential to miss an important deadlines, commercial opportunity.	Y	2	2	8	2080	2	2	8	Business continuity planning.		Continue with the same.		1	2	4	1	3	5
37	Increased storminess/wind speed	More insurance claims to cover effects. Higher insurance premiums	Property, employer liability and public liability insurance could be affected. As more claims are processed UK wide the cost of insurance will increase as will the excess	Y	1	4	6	?	2	4	12	Good risk management practices. Negotiate suitable excess. Liability limitations.		Continue with the same.		1	4	6	1	1	3
40	Increased storminess/wind speed	Service delivery cruise and cargo. Vessels unable to call due to conditions or delayed in departure.	Loss of call revenue, disruption of service to customer, increased costs. Perception by vessel owners that Dover is comparatively more exposed.	Y	3	3	15	?	3	4	18	Tug assistance makes operations possible in difficult conditions to an extent. Flexible working hours. Liaise with the cruise customer to deliver the best service and issue weather warnings.	New Tugs have been budgeted in for 2026 and 2027		Cost of purchasing tugs. Significant difficulty in recruiting specialist skills	2	3	10	3	1	9
41	Increased storminess/wind speed	Financial results affected by more costs and less revenue	More costs due to increased expenditure on overtime and maintenance and lower revenue due to fewer sailings.	Y	2	1	6	?	3	3	15	Take account in forecasting and managing costs. Includes eastern docks not cruise terminals.		Modify charging mechanisms to reflect costs.	Customer objections.	1	1	3	1	2	4

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