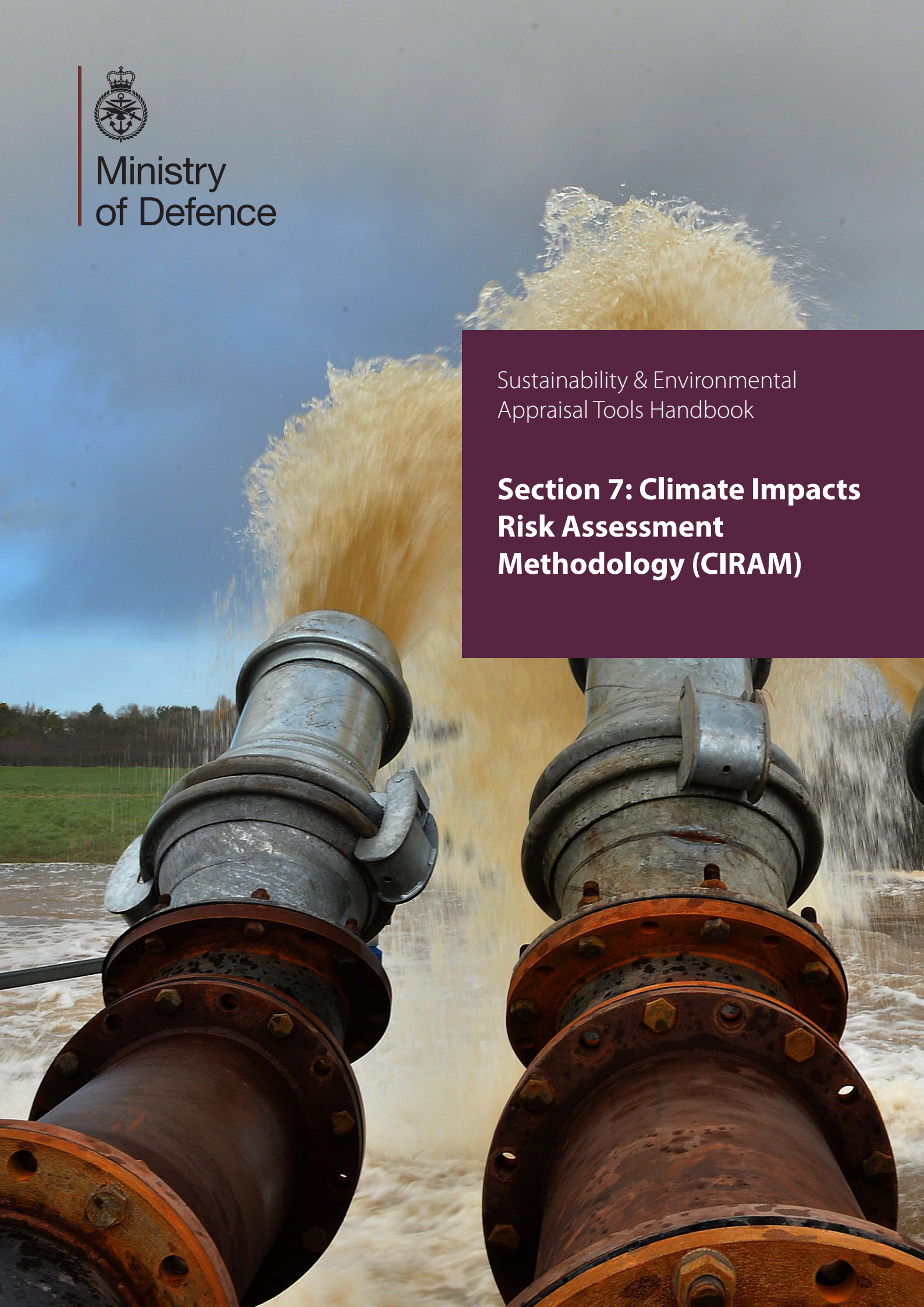




Ministry
of Defence

Sustainability & Environmental
Appraisal Tools Handbook

**Section 7: Climate Impacts
Risk Assessment
Methodology (CIRAM)**



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Appendix 7I. GEOViewer Guidance

How to use this Guidance

This guidance forms Section 7 of the MOD Sustainability and Environmental Appraisal Tool Handbook ('the Handbook'). It provides guidance on undertaking a Climate Impacts Risk Assessment.

[Section 7.1:](#) What is CIRAM?

[Section 7.2:](#) Why is CIRAM important?

[Section 7.3:](#) When is CIRAM required?

[Section 7.4:](#) How to undertake CIRAM

Who is the guidance aimed at?

This guidance provides advice on how and when to complete a Climate Risk Impact Assessment.

Box 7.1 – CIRAM Guidance & Policy

CIRAM Guidance and Implementation:

DIO Sustainable Development Support: DIOSDEUS-SusDevSpt@mod.gov.uk

CIRAM Policy

[JSP 850 – Infrastructure and Estate Policy](#)

Infrastructure Climate Resilience Delivery Plan 2017 - 2022

[Infrastructure System Handbook, Leaflet 3.2.2 – Risk Management](#)

[Infrastructure System Handbook, Leaflet 5.2 – Stewardship](#)

MOD is always seeking to learn from good practice to improve the ways that guidance is provided. Please email any **suggestions or feedback** to DIOSDEUS-SusDevSpt@mod.uk

What is CIRAM?

- 7.1.1 Climate Impacts Risk Assessment Methodology (CIRAM) is a risk assessment tool, based on MOD's own risk management methodology ([JSP 892 MOD Risk Management Policy](#)), designed to improve the resilience of MOD establishments to climate related hazards and ensure the continuity of defence outputs. It has been developed to meet MOD's business and statutory commitments.
- 7.1.2 CIRAM identifies the risks posed by current and projected impacts of climate or extreme weather events on the outputs of MOD establishments and identifies actions required to maintain and optimise operational capability. It identifies:
- Existing vulnerabilities to weather related hazards;
 - Whether existing vulnerabilities are likely to change over time;
 - Any additional vulnerability likely to arise in the future;
 - The likely direct and indirect impacts on defence output;
 - Actions and measures to build resilience into the defence function of the establishment;
 - Any opportunities created by changes in climate.

Why is CIRAM important?

- 7.2.1 CIRAM helps enhance MOD Business Resilience proportionate to the risks posed by weather and climate related hazards. It can enhance the performance of the MOD estate, by identifying improved efficiencies, better targeting of resources, adopting flexible solutions and managing social impacts.
- 7.2.2 CIRAM helps MOD establish an understanding of the estate's ability to anticipate, absorb, accommodate and recover from the effects of climate driven challenges, and implement resilience and adaptation actions where necessary.
- 7.2.3 Climate resilience is a UK Government and Defence priority. The [UK National Security Strategy \(NSS\) 2010 A Strong Britain in an Age of Uncertainty](#) highlighted natural hazards such as floods as one of the national security highest priorities (Tier 1 risks), together with terrorism, cyber-attack and international military crises. This priority status was maintained in the [National Security Strategy Review 2015](#). The NSS emphasises the need to predict, prevent and build resilience to these risks and remain adaptable for the future. Weather events can compromise the delivery of defence outputs on MOD establishments. Existing vulnerabilities are likely to become more challenging with changes in climate.
- 7.2.4 CIRAM also supports the [UK Climate Change Act 2008](#), [UK Government Greening Government Commitments](#), [UK National Adaptation Programme](#), [Cabinet Office Critical Infrastructure Resilience Programme](#) and [MOD resilience policy](#).

- 7.2.5 Climate resilience threats, impacts and opportunities shall be fully appraised and taken into account in all strategies, policies, decision-making processes and associated programmes, projects, activities and behaviours.
- 7.2.6 Climate change is likely to exacerbate existing risks as well as create additional risks and opportunities for MOD establishments. There will be implications for the way the estate is managed and developed; Major projects and refurbishments will need to reflect future climatic conditions; business continuity processes may need to be revised; new ways of working introduced and there may be issues for establishment security.

When is CIRAM required?

- 7.3.1 As indicated in [JSP 850 Estate Infrastructure & Policy](#), MOD shall continue to assess and manage climate resilience risks to meet current and future infrastructure capability requirements. The application of the CIRAM tool shall be prioritised and triggered by:

- Estate initiatives such as: plans, programs or projects with wider implications for the MOD estate;
- The development or update of long-term development plans of an establishment e.g. Establishment Development Study;
- Strategic initiatives e.g. Estate Optimisation; or
- Strategic Environmental Assessments and Sustainability Appraisals.

- 7.3.1 In absence of the above triggers, CIRAM may be required if MOD activities:

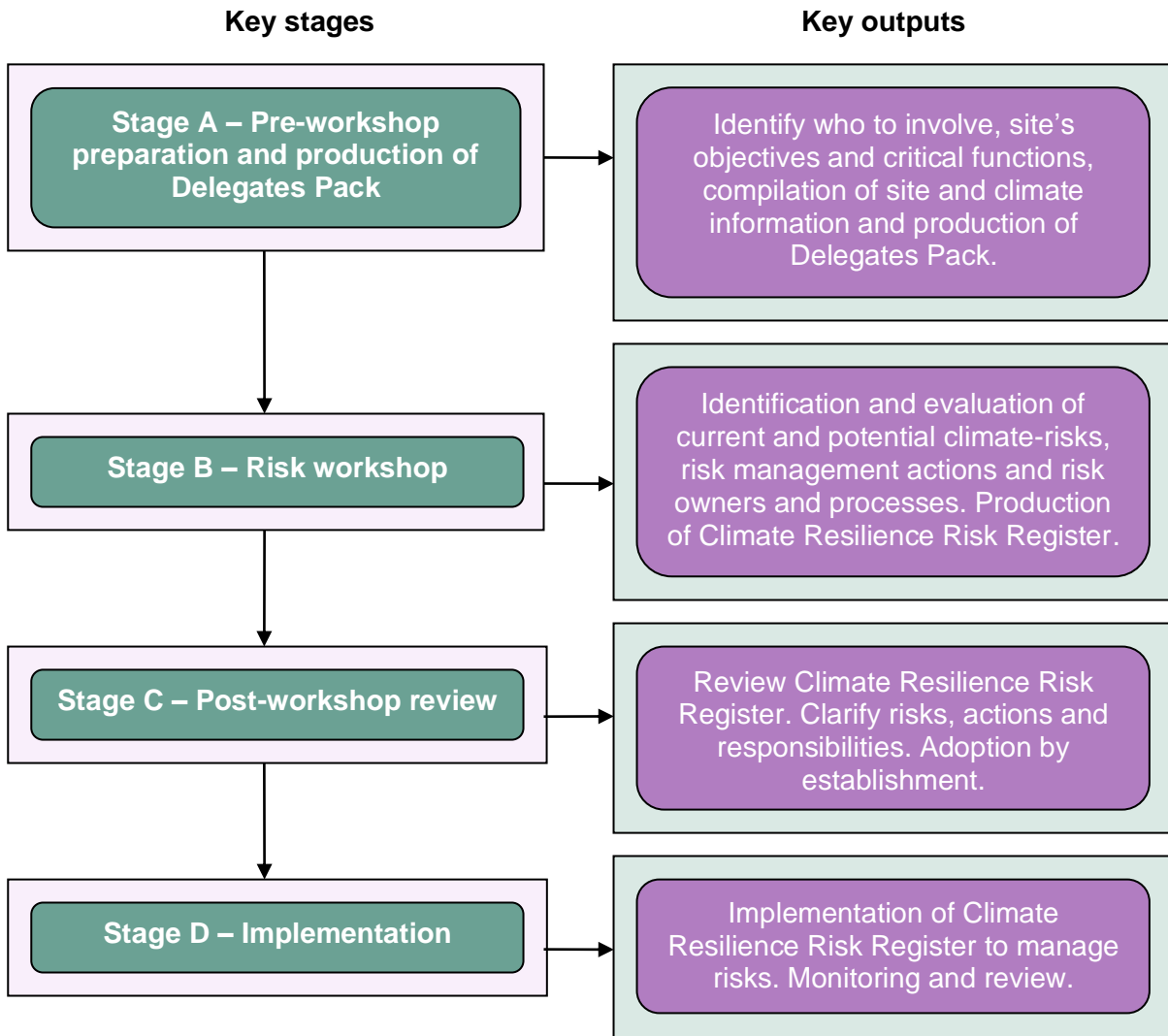
- Provide or support critical national infrastructure;
- Have already been impacted by severe weather;
- Involve significant investment;
- Involve decisions with significant irreversible impacts;
- Have significant interdependencies with other government activities or the wider economy; or
- Address contingency planning or business continuity needs.

How to undertake CIRAM

- 7.4.1 This chapter provides practical guidance on how to prepare and undertake a CIRAM assessment. The initial CIRAM assessment has 4 key stages (Fig. 7.1) which are:

- [Stage A](#) – Pre-workshop preparation and production of Delegates Pack
- [Stage B](#) – Risk workshop and production of a Climate Resilience Risk Register (CRRR)
- [Stage C](#) – Post-workshop review
- [Stage D](#) – Implementation

Figure 7.1 Key stages and outputs of the CIRAM assessment



Resources available for undertaking CIRAM

- 7.4.2 Stage A is the most resource intensive as it involves the collation and interpretation of climate and site data in order to produce a site specific climate report (Appendix 7A). The Sustainability team within DIO SEE has been allocated resources to undertake Stage A of CIRAM for defence priority/ strategic sites/ overseas sites that are undergoing their initial assessment. The team will also provide support in facilitating the workshops (Stage B) for these establishments. For less sensitive establishments and those undergoing their CIRAM review, the following guidance and appendices will enable non-specialists to undertake a CIRAM assessment independently. DIO Sustainability can provide advice and training on completing the CIRAM process, and provide SME (Subject Matter Expert) advice on all stages of the process.
- 7.4.3 Stage B should be allocated half a day and be attended by relevant internal and external staff, including military and contractors, who are responsible for the management of the establishment.
- 7.4.4 It is advisable to allow up to four weeks for Stage C. This provides an opportunity for the Head of Establishment (HoE) and/ or nominated representative and workshop participants to review and

further understand the risks and actions identified in the workshop, and also to consult with any stakeholders identified as risk owners.

7.4.5 The CRRR and its associated actions are to be managed by site risk management processes including risk registers, resilience plans and Infrastructure Community Monthly Meetings. See the [Infrastructure System Handbook Leaflet 3.2.2 Risk Management](#) for further detail. The CRRR is to be updated annually. Reviews and updates can be supported and completed in combination with other existing processes e.g. review of establishment IIG, SHEP committee meetings etc. The entire CIRAM process is to be repeated every 5 years. In most cases, the site will be responsible for carrying out these updates and repeating the CIRAM process. See Stage D and [Practitioner Guidance 01/12 Building a Climate Resilient Estate](#) for further guidance on how to integrate the risk register into existing site practices.

Table 7.1 Indicative resource requirements for undertaking a CIRAM assessment

CIRAM stage	TLB Staff Resource	DIO Staff Resource
A. Pre-workshop preparation (2-4 days)	<ul style="list-style-type: none"> •Support DIO Sustainability in provision of information and critical objectives for site •Organise workshop and attendees in conjunction with Sustainability team 	<ul style="list-style-type: none"> •Collate and interpret climate data* •Support establishment in organisation of workshop*
B. Risk workshop (1/2 day)	<ul style="list-style-type: none"> •Facilities for workshop •Attendance by relevant TLB and establishment staff including military 	<ul style="list-style-type: none"> •Facilitate workshop* •Attendance by relevant DIO and contractor staff e.g. SEFM, LMS etc. • Provide training on CIRAM process
C. Post workshop review (4 weeks)	<ul style="list-style-type: none"> •HoE nominated representative to agree sign off of CRRR 	<ul style="list-style-type: none"> •Provide support in agreement of CRRR where required
D. Implementation	<ul style="list-style-type: none"> •Ensure CRRR action delivery, conduct annual review & update •Conduct CIRAM on 5 year basis •Integrate CRRR actions into current practices 	<ul style="list-style-type: none"> •Support review process •Provide training on review process

* For CIRAM reviews and less sensitive sites, this will be the responsibility of the site

Climate Resilience Roles and Responsibilities

Table 7.2 Roles and Responsibilities for Infrastructure and Estate climate resilience

<p>Head Office Strategic Direction and System Authority (FMC Cap Infra).</p> <ul style="list-style-type: none"> • Set strategy and policy for estate climate resilience. • Act as sponsor for CIRAM, reviewing the effectiveness of arrangements in line with changes to regulation or strategic direction. • Ensure climate resilience policy requirements and responsibilities are reflected in ISOM and SAMP, iaw JSP 892 and JSP 850.
<p>SME Technical Authority (DIO).</p> <ul style="list-style-type: none"> • Act as the Department's climate, centre of excellence, providing advice on climate infrastructure mitigation and adaptation to TLBs/ALBs and Delivery Agents. • To work with TLBs/ALBs to determined annual CIRAM assessment programme (including 5 yearly reviews) to reflect TLB/ALB strategic asset management and wider Defence priorities. • Maintain the CIRAM tool ensuring it remains fit for purpose against Defence needs and be responsible for updating the CIRAM section of the SEAT handbook. • Create and deliver CIRAM training to ensure climate resilience management skills are maintained across the infrastructure system. • Maintain a master dataset of CIRAM assessments and related climate data to support the delivery of sustainable, resilient infrastructure solutions. • Undertake CIRAM assurance to ensure the tool is applied: correctly; consistently; robustly, and that identified risks are included in relevant risk registers and being actively managed.
<p>Delivery Agent (DIO, ALBs, etc).</p> <ul style="list-style-type: none"> • Ensure that climate resilience risks are identified and incorporated into infrastructure strategic plans, programmes, and projects iaw JSP 892, JSP 850 and ISOM and SAMP. • Escalate climate risks through existing chain of command risk processes as necessary. • Support the HoEs in the management and mitigation of site level risks identified in the CRRR and included within ICMM risks discussions (& ALB equivalent) and within infrastructure development meetings, including the formation of future site plans. • Ensure that climate resilience management requirements are identified and incorporated in Industry Partner contractual arrangements.
<p>Customer (TLB/ALB Climate Resilience Infrastructure Focal Point).</p> <ul style="list-style-type: none"> • To ensure that a TLB/ALB level infrastructure focal point is appointed to ensure that climate risks are

incorporated into AMP and CIDP risk registers, iaw JSP 892, JSP 850, and ISOM.

- Escalate climate risks through existing chain of command risk processes as necessary.
- To work with Technical Authority to determined annual CIRAM assessment programme (including 5 yearly reviews) to reflect TLB/ALB strategic asset management and wider Defence priorities.
- Ensure that CRRR findings are reflected within establishment risk management processes and planning ie business continuity, resilience plans, EMS, site plans, SONs, business cases, etc.
- Conduct strategic analysis of identified site climate risks informing long-term investment and basing decisions and capability development.

Customer (Head of Establishment).

- As primary owner of the CRRR, ensure that risks arising from the assessment are incorporated into the establishment's plans and management processes iaw JSP 892, JSP 850.
- Escalate through existing chain of command risk processes as necessary.
- That climate risks and mitigation plans are included within ICMM risks discussions (& ALB equivalent) and within infrastructure development meetings, including the formation of future site plans.

Delivery Agent (Industry Partners).

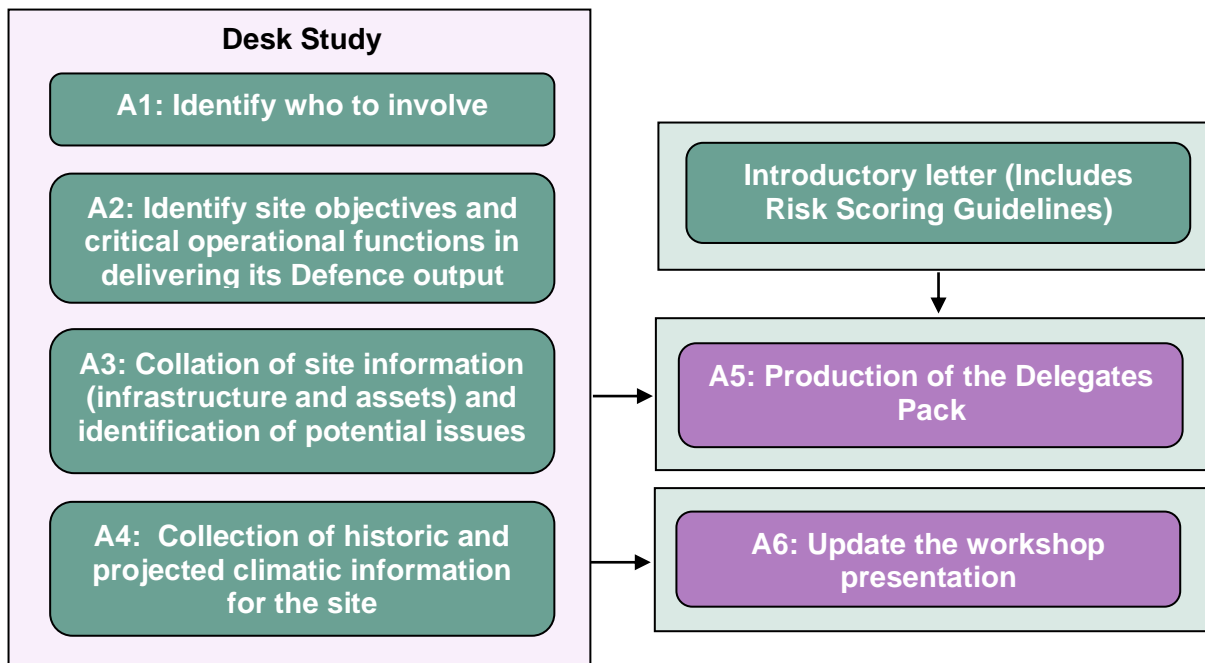
- To deliver agreed climate resilience mitigation/adaptation actions.
- Ensure, in cooperation with HoE, CRRRs incorporated into the relevant establishment's plans and management processes iaw JSP 892, JSP 850.
- Support the HOE in ensuring that climate risks and mitigation/adaptation plans are included within ICMM risks discussions (& ALB equivalent) and within infrastructure development meetings, including the formation of future site plans.

STAGE A – PRE-WORKSHOP PREPARATION AND PRODUCTION OF DELEGATES PACK

Introduction

- 7.5.1 Stage A involves a desk study to collate the climate and site information, to update the delegates pack and accompanying workshop presentation. The aim of the delegates pack is to provide participants and facilitators at the workshop ([Stage B](#)) with the relevant information to allow them to effectively contribute and identify risks.
- 7.5.2 Appendix 7A provides a clear template for undertaking the CIRAM desk study in order to produce the Estate and Climatic Information Report. Appendix 7I provides additional support to produce this document, with walk through directions for using GEOViewer.

Figure 7.2: Stage A Tasks



A1: Identifying who to involve in the desk study

- 7.5.3 Appendix 7A details a number of functional areas that can provide guidance, support and key information for each section of the report, including;
 - [DIO Sustainability team and MOD Climate Resilience Focal Point](#) should be informed that a CIRAM is being completed for the site and can advise throughout the process.
 - Senior Estate Facilities Manager (SEFM), Estate Manager, site Business Continuity (BC) and Resilience, and the site Safety, Health, Environment and Fire Officer, or equivalent, should all be contacted for information when compiling the report.

- Staff with good site knowledge and long experience of the establishment should also be consulted, as they are likely to have a detailed knowledge of the impacts of previous weather-related events.

7.5.4 The above roles should also be represented at the workshop.

A2: Identifying site objectives and critical operational functions

7.5.5 It is essential to identify the establishment's key objectives and critical operational functions that are fundamental to delivering operational capability on the establishment and if compromised would have a negative impact on operational output (Box 7.1). This includes any dependant or sister sites.

7.5.6 Wider sustainable development and environmental issues should also be considered where there is a legal obligation or a significant reputational impact e.g. if flooding of interceptors causes contaminated waters to migrate outside the wire.

Box 7.1 Identifying Objectives and Critical Operational Functions at Thorney Island

The critical operational functions identified for the establishment are:

- Operating Station infrastructure;
- Delivery of training;
- Essential services/utilities (water supply, power);
- Security of personnel;
- Provision of Support Services (food supply, messes);
- Provision of Service Family Accommodation (SFA).

The wider SD/ Environmental legislative and policy obligations that could impact on the establishment's reputation are:

- Minimal impact to the environmentally and ecologically sensitive Chichester Harbour and surrounding Site of Special Scientific Interest (SSSI) areas;
- Contamination avoidance;
- Compliance with all legislative requirements;
- Provide buildings with comfortable interior environment/temperatures;
- Minimise disruption and nuisance to the local community;
- Maximise opportunities for partnership working and community engagement activities;
- Maximise opportunities for the use of local suppliers.

Resource performance

- Value for money;
- Low maintenance costs;
- Avoidance of damage costs from flooding event.

A3: Collating site information and identifying potential issues

7.5.7 Information about the establishment and surrounding area should be collated to identify the key assets and dependencies (e.g. transport routes) in delivering the establishment's operational output. Identification of potential risks to the site will require use of a variety of external sources e.g.

data from the Environment Agency and British Geological Survey. A list of recommended sources of information can be found in Appendix 7A.

A4: Compiling historic and projected climatic information for the site

- 7.5.8 Information on observed and projected climate change needs to be collated in order to understand the current and future impact of climate related hazards on the establishment.
- 7.5.9 This information is freely available from the UK Climate Projections 2009 (UKCP09) which provides data on observed changes and future projections under different emissions scenarios on how the UK climate is likely to change up to the end of the century (Box 7.2). The procedure for compiling the establishment's observed and projected climate change is contained in Appendix 7A. Appendix 7H offers a template to more easily store and review the data.

Box 7.2 UK Climate Projections (UKCP09)

What are the UK Climate Projections (UKCP09)?

In June 2009, the UK Climate Impact programme (UKCIP), leading source of climate change information for the UK, released the latest and most detailed probabilistic projections on climate in the UK for the coming decades – the UK Climate Projections 2009 (UKCP09).

The projections consist of numerous freely available datasets at the UKCP09 [User Interface](#). There are a number of prepared reports, including regional maps and graphs but the data can also be interrogated at establishment level. To find out more see <http://ukclimateprojections.metoffice.gov.uk>.

New projections are currently in development by the Met Office and are due to be published in 2018. It is advised that due to substantial changes in the science behind sea level projections since the original projections were released in 2009, users should await the UKCP18 sea level projections. Therefore MOD coastal sites should await the release of the new figures before implementing CIRAM.

For advice on how to compile UKCP09 data contact [DIO Sustainability](#) team.

- 7.5.10 Observed climate change data available on the UKCP09 website is provided regionally, identifying the changes in daily mean temperature, precipitation and humidity experienced between 1961-2006.
- 7.5.11 In order to ensure consistency, projected climate change data is compiled using:
- a. **A 2050 timescale** - This is the projected changes averaged for the period 2040–2069 relative to the 1961–1990 baseline, and the 1980-1999 baseline for sea level rise and storm surge. It should be noted that not all UKCP09 outputs are provided for all timescales e.g. data for the number of hot days (annually) is only available for the 2080s period. If a business benefit is identified then different timescales may be considered.
 - b. **High emissions scenario** – UKCP09 provides projections for three emissions scenarios; low, medium and high. The high scenario is used for all MOD establishments and describes very rapid economic growth, continuing population growth that peaks around mid-century, and fossil fuel intensive technology. By applying these projections, the MOD estate is prepared for the worst case scenario and maximises its resilience to climate change. The 10th and the 90th percentiles give the range of the change likely to occur, so decisions can

be made whether there is a need to adapt a particular asset, depending on asset type and capability to undertake the risk.

7.5.12 Completion of steps A1 - A4 forms the main document for the delegates pack; an Estate and Climatic Information Report (Appendix 7A). A worked example can be requested from DIO SEE Sustainability team.

A5: Distribution of the Delegates Pack

7.5.13 The Delegates Pack is designed to provide the workshop participants with an awareness of climate change issues, the CIRAM process, establishment-related issues and key projected climate change issues prior to attending the workshop (Stage B). Participants are expected to review the information beforehand to enable them to effectively contribute.

7.5.14 The Delegates Pack should include:

- **Introductory letter (Appendix 7C)** - This provides an overview of the CIRAM process, the importance of undertaking the assessment and instructions for workshop participants;
- **Agenda for workshop (Appendix 7D);**
- **Completed Estate and Climatic Information Report (Appendix 7A), and;**
- **Climate Risk Scoring Guidelines (Appendix 7E)** – Guidance for scoring the impacts from each risk identified during the workshop, in line with JSP 892: Risk Management.

7.5.15 The Delegates Pack should be sent out in sufficient time to allow participants to complete their pre-workshop preparation. Participants should read through the material and consider the potential climate risks in advance of the workshop. Participants may have other relevant data or information and should be encouraged to highlight it at the workshop.

A6: Updating the workshop presentation

7.5.16 The PowerPoint template to present at the workshop, and associated speakers notes, can be found at Appendix 7F. It will be necessary to populate the presentation with information relevant to the establishment, instructions for which are contained in Appendix 7F. The presentation provides an opportunity to explain and discuss the detail of the climate change projections.

STAGE B – RISK ASSESSMENT WORKSHOP

Introduction

- 7.6.1 Stage B concerns the organising and delivering of a half day risk assessment workshop. The key aims of the workshop are:
- a. To identify current and future risks to the operational capability of the site as a result of climate related hazards, and;
 - b. To identify adaptation actions that would allow the site to become resilient to the effects of climatic events and therefore maintain operational capability, as well as identifying processes and risk action owners for delivery of these actions.
- 7.6.2 The main output of the workshop is a completed Climate Resilience Risk Register (CRRR), found at Appendix 7B.

B1: Organising the risk workshop

- 7.6.3 **Participants:** It is important to invite participants with long experience of working on the site who have knowledge of historical management issues and can provide an insight into the impacts of past extreme weather events on the establishment.
- 7.6.4 It is also important to invite participants who are responsible for the management of the relevant functional areas on the establishment and may be aware of any potential risks. The following functions should be represented:
- Representative familiar with site and military operations on site;
 - Business continuity and resilience planning;
 - Property/facility management (FM) e.g. Hard FM and Soft FM teams;
 - Land Management Services;
 - Site Health & Safety and Fire management;
 - Housing manager;
 - Site Environmental management;
 - Area Utility Manager (AUM);
 - Contract management team (e.g. Landmarc, Aquatrine);
 - DIO SEE Sustainability team representative;
 - Emergency planning; and
 - A site user.

- 7.6.5 Different sites will have different contract arrangements in place and responsibilities may come under different organisational roles. All relevant functional roles should be consulted and represented at the workshop.

B2: Delivering the workshop

- 7.6.6 The structure for the workshop follows the agenda outlined in Appendix 7D. The workshop facilitator is responsible for the following:
- a. Welcome and introduction to the workshop
 - b. Presentation - Starting with a brief overview of climate change science, observed trends, and risk scoring; followed by a presentation on each climatic variable (temperature, precipitation, storminess and sea level rise¹) including observed and projected information relevant to the site. Speaker notes are provided within the presentation at Appendix 7F.
 - c. Facilitated Working Session - This provides an opportunity to review the key objectives and critical operational functions contained in the Delegates Pack. The session should be used to populate the CRRR, identifying and recording the risks to the site, adaptation actions, and risk action owners. An Aide Memoire to guide the facilitation of this session can be found at Appendix 7G, and a more detailed description can be found in section B3 below.
 - d. Summary - Review the proceedings of the day and agree next steps.

B3: Facilitating the working session and completing the CRRR

- 7.6.7 Completion of the CRRR (Appendix 7B) is the main objective of the workshop. The working session should use the format of the Aide Memoire (Appendix 7G) to:
- Review existing and future climatic conditions (using information presented in Appendices 7A and 7F);
 - Identify the risks to the operational performance of the site (see B4 below for further guidance);
 - Score each risks using Appendix 7E, and;
 - Identify and make a record of existing risk management actions, future actions required, processes of the actions, and owners against each risk identified. A member of the establishment staff should be available to record the risks in the CRRR template as they arise during the discussions and to annotate actions and process owners.

¹ In November 2016, the Met Office released a report on the relevance of the UKCP09 figures. It advised that due to substantial changes in the science behind sea level projections since the original projections were released in 2009, users should await the UKCP18 sea level projections. Therefore MOD coastal sites should await the release of the new figures before implementing CIRAM. The new updated set of UKCP is expected to be published May 2018.

- 7.6.8 The Aide Memoire (Appendix 7G) details potential risks and can be used to guide discussion in the working session. It should be noted that this list of risks is not exhaustive. The facilitated session provides an opportunity for workshop participants to contribute their own experience.
- 7.6.9 The facilitator should go through each climate variable listed in Appendix 7G and question if a site is already experiencing impacts from each, and whether this would be exacerbated by climate change, considering the projections in Appendix 7A. The attendees should also consider the interactions between the different potential risks, e.g. the loss of biodiversity due to higher temperatures could allow erosion of peat land surfaces on training areas, which in turn could increase the flood risk.
- 7.6.10 A worked example of a CRRR can be requested from DIO SEE Sustainability.

B4: Risk identification

- 7.6.11 The identification of risks involves the identification of direct and indirect impacts, and an assessment of the “critical thresholds” if known, of those risks to operational capability. This process involves:
- The identification of existing climate risks, by considering how weather events and changes in climate have historically impacted the establishment. This will enable an assessment of how climate may impact on the establishment in future.
 - Assessment of whether past weather events have caused critical thresholds or sensitivities to be breached and therefore impacting on the operational output of the establishment. A critical threshold is the boundary between ‘tolerable’ and ‘intolerable’ levels of risk e.g. the amount of precipitation required to cause a flood that disrupts operations. Climate risks or thresholds may already be reflected within existing risk management processes. However, climate change is likely to alter the current thresholds and this will be a gradual process over time.
 - Quantitative values for critical thresholds should, where possible be recorded on the risk register e.g. IT performance sub-optimal at ambient temperatures above 32°C. If this information is not available, then further exploration and monitoring may be required to identify the thresholds.

B5: Risk scoring

- 7.6.12 Once risks from the climatic variables are identified, these should be scored and be assigned actions to mitigate them. Appendix 7E includes a detailed guide on how to apply the scoring methodology contained within the MOD risk assessment model (JSP 892).

B6: Identifying actions, processes and owners

- 7.6.13 Having evaluated and scored the key risks, adaptation actions need to be identified and the process and risk action owner need to be assigned.

- 7.6.14 It should be noted that infrastructure was constructed on the basis of historic climate information and may not necessarily be adapted to changing climatic conditions and increases in frequency of extreme climatic events.
- 7.6.15 Existing risk controls and processes already in place should be assessed for fitness of purpose in a changing climate. If not, actions need to be identified to manage this risk. Any existing management actions in place that reduces the risk should be noted in the risk register.
- 7.6.16 In completing the above, it is also important to consider the following:
- Any interactions between the proposed adaptation actions. There may be ‘quick wins’, cumulative or compounding effects;
 - Any knock-on/ chain effects on other areas if adaptation actions were implemented, and;
 - Any wider, strategic or institutional risks e.g. budgetary constraints.
- 7.6.17 Different risks will require different management strategies. The impacts of all of the climate risks facing the site may not be fully understood at this stage. In these cases the adaptation action could include monitoring the effects of climate on performance of the asset. The information gained can better inform the decision making at a later date as part of the future review of the risk register. There may be opportunities to enhance the resilience of infrastructure to climate as part of routine refurbishment or facility upgrades. JSP 892 details how to respond to identified risks, and details the 5 main risk management strategies; Terminate, Treat, Transfer, Tolerate, and Take the Opportunity. More detail on these management strategies can be found in Appendix 7E. [Practitioner Guidance 01/12 Building a Climate Resilient Estate](#) Annex A, provides examples of adaptation strategies against each of the JSP892 risk management strategies.
- 7.6.18 Assigning an action owner is critical to managing climate risks. The CIRAM will remain incomplete until all the actions have been allocated an owner. The owner may be an individual, a team, a working group, or other. Once assigned, the owner is responsible for delivering the action to the specified timeframe and feeding updates back to the HoE who will be responsible for managing the CRRR. It is the responsibility of the HoE to maintain, or delegate the maintenance of the CRRR and keep this up to date. It is also the responsibility of the HoE to escalate through the existing chain of command risks that require a TLB response in line with JSP 892 and JSP 850. On an annual basis, the CRRR will need to be reviewed and sent to DIO SEE Sustainability.

Box 7.3 Confidence Levels of Climate Change Projections

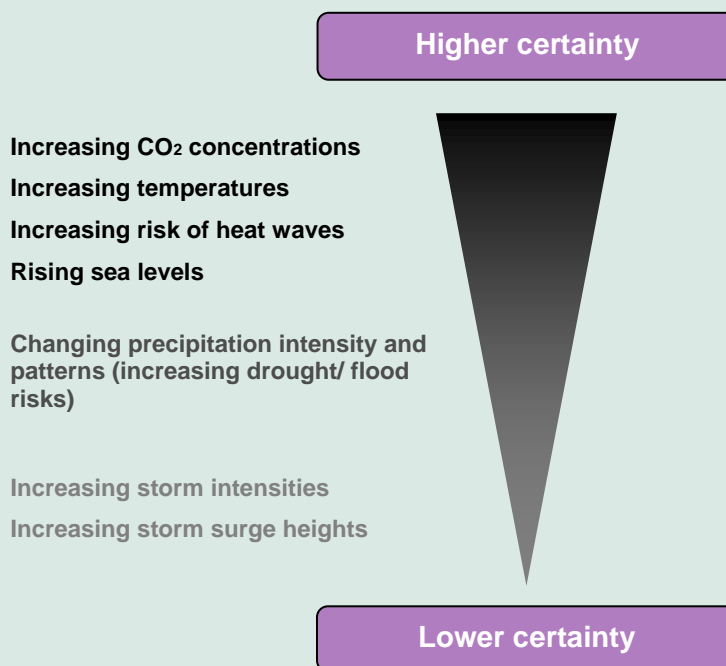
Different climate change variables have differing levels of certainty. The IPCC 5th Assessment Report identifies the confidence levels behind each changing climate variable using a scale from *very low* confidence to *very high*. The assessed likelihood of an outcome are also ranked from *extremely unlikely* (between 0% and 1% probability), to *virtually certain* (above 99% probability).

Global mean surface temperature is projected to rise over the 21st century under all emission scenarios (*high confidence*). It is *virtually certain* that during this period, there will be more frequent heat waves and fewer cold temperature extremes.

Global mean sea level is also projected to continue to rise during the 21st century under all emissions scenarios (*high confidence*), and it is *very likely* (90-100% probability) that this will be at a faster rate than observed changes between 1971-2010. This will not be uniform across regions, and some coastlines will experience a more extreme sea level rise. Updated data on sea level projections for the UK is due May 2018.

Future changes in precipitation (rain, snow, sleet, hail) will not be uniform; It is *likely* (66-100% probability) that high latitudes will experience an increase in annual precipitation and many mid-latitudes and dry regions will experience a reduction. It is *very likely* that extreme precipitation events over mid-latitude land masses and wet tropical regions will become more intense and more frequent.

Climate variables should be treated differently and establishments should **plan and design for** those variables projected with high certainty (rising temperatures, heat waves and sea levels). For those variables where there is lower certainty, we should **test the sensitivity and robustness** of our assets and activities against the projected change.



STAGE C – POST WORKSHOP REVIEW

- 7.7.1 Following the workshop it is necessary to review the completed CRRR. This provides an opportunity to:
- a. Review, explore further and clarify the risks (and their scores) identified in the workshop;
 - b. Identify any new risks;
 - c. Review and clarify any adaptation action identified;
 - d. Clarify process, timeframes for action delivery, and risk action owners; and
 - e. Obtain any further information that may inform the risks or adaptation, including advice from subject matter experts in climate resilience within DIO Sustainability team;
- 7.7.2 The key stakeholders should be engaged in the review. Any subsequent stakeholders identified within the risk workshop should also be engaged.
- 7.7.3 A maximum of 4 weeks should be given to review the CRRR. At the end of this period stakeholders should have agreed to formally adopt the risk register and deliver the risk actions within the specified timeframes. At this point all stakeholders should be clear on their role going forward in action delivery, monitoring, providing updates, and the annual CRRR review.
- 7.7.4
- 7.7.5 [PG 01/12 Building a Climate Resilient Estate](#) contains a detailed breakdown of how the CRRR should be integrated into existing processes and advices on how to complete monitoring. This document should be referred to during the post workshop review process.

STAGE D – IMPLEMENTATION

Incorporate into action plans, monitoring and assurance

- 7.8.1 Once the CRRR has been formally adopted by the establishment, the risks and actions identified should be embedded within the establishment's own management processes e.g. management plans and structures. [PG 01/12 Building a Climate Resilient Estate](#) contains a detailed breakdown of how the CRRR should be integrated into existing processes. This document should be referred to during the post workshop review process ([Stage C](#)).
- 7.8.2 There are a number of key roles responsible for managing climate risks for an establishment. The MOD Infrastructure Climate Resilience Delivery Plan 2017-2022 (awaiting publication), a subset to the [Sustainable MOD Strategy 2015-2025](#), outlines for all TLBs to identify a single point of contact (SPoC) for climate resilience at establishment level, normally the HoE. The SPoC will be responsible for identifying significant climate risks from the CRRR that will need to be escalated in accordance with JSP 892, MOD Infrastructure Climate Resilience Delivery Plan and Infrastructure System Handbook Leaflet 3.2.2 Risk Management, and for reflecting outputs from the CIRAM process within site processes. Examples of site processes that should incorporate CIRAM are illustrated in Box 7.4. In particular, the CRRR must inform the site risk management processes including risk registers, resilience plans and Infrastructure Community Monthly Meetings (ICMM).
- 7.8.3 TLBs will also appoint Infra Risk Management Leads to keep an overarching view of the climate risks within their TLB, and incorporate key risks in to TLB-wide risk registers and risk governance structures and plans e.g. the Command Plan and the Infrastructure Management Plan. The establishment SPoC should escalate risk to the Infra Risk Management Lead, Unit Management Board or relevant duty holder via their the ICMM.
- 7.8.4 The Climate Resilience Risk Register should inform short, medium and long-term resilience actions and allocation of funding balanced against affordability and risk appetite by the TLB. The impacts and risks identified by the assessment will directly affect the ability to operate and deliver defence capability and should be weighted on that basis.
- 7.8.5 Funding for further research, adaptation measures etc. lies with the relevant budget owner. Funding issues should be flagged up to the Infra Risk Management Lead at the earliest opportunity.
- 7.8.6 The HoE should ensure any life-cycle replacement is climate proofed based on the risk level (some may be linked to a statutory requirement). This should be reflected within any Statement of Need and User Requirement Documents for the Industry Partner to deliver.
- 7.8.7 Not all adaptation measures will require injected funding to build in resilience, instead it may require increased liaison, cooperation with service providers or adopting new procedures and new ways of working. Examples of mitigation measures can be found in Appendix 7G.
- 7.8.8 The owner for some risks and adaptation measures will not lie with the establishment but will require a response from another department within the MOD. These areas include:
- Strategic Estate Planning;
 - Equipment as specification and location of equipment may need to change;
 - Partnering arrangements may need to be improved in order to facilitate adaptation;

- Health and Safety Policy - Department's central H&S policy may need to be reviewed;
- Personnel Policy - Departmental personnel policy and working practices may need to be reviewed;
- Infrastructure Design and Construction - Major projects specifications may need to be future climate proofed; and
- TLB Command Plans - Operational activities of site may need to be revised in a changing climate e.g. increased civil assistance.

7.8.9 It is important that these issues are flagged up to the Infra Risk Management Lead and DIO Sustainability for these issues to be raised and taken forward to be addressed by the relevant owners. Copies of the endorsed CRRR should be sent to DIO Sustainability and the TLB Infra Risk Management Lead.

7.8.10 Guidance on adaptation measures and how to efficiently embed adaptation in to existing processes is available in the [PG 01/12 Building a Climate Resilient Estate](#), [PG 03/12 Embedding Climate Resilience in Land Use & Management](#) and [IN Embedding Climate Resilience in H&S Management](#)

Monitoring and Review

7.8.11 Each risk action owner at the establishment is responsible for monitoring the delivery of their own actions. The full range of infrastructure risk, including climatic risk, should be discussed and managed through the ICMM. The establishment SPoC will be required to report annually to the TLB Infra Risk Management Lead and DIO Sustainability on progress in adaptation action delivery. DIO Sustainability is responsible for maintaining a master dataset of all CIRAMs and undertaking assurance that actions are being monitored and delivered across TLBs. DIO Sustainability will also produce metrics on CIRAM delivery and implementation for MOD outfacing reports. A reporting requirement may also be required from the individual process chains e.g. Business Continuity to assure climate change adaptation has been considered.

7.8.12 Provisions should be made by the TLBs to ensure that the establishment reviews and revises the risk register on an annual basis, in the same way as EMS or Business Continuity. Reviews can be undertaken alongside existing monitoring mechanisms e.g. CESO monitoring activities. Revision and monitoring of the risks and the delivery of actions allows for flexibility and the provision of new information to inform and understand the risks, risk thresholds and their scores. Any monitoring actions should be updated during this process, and adaptation measures may also need to be reviewed accordingly. This also allows for continuity given changes in personnel and contractual arrangements at site level.

7.8.13 A full establishment CIRAM assessment should be repeated on a five year basis, however as this will be built on an existing assessment should involve less resources. DIO Sustainability can be contacted for support throughout this process, can peer review updated site reports and CRRRs and provide wider climate resilience support.

Box 7.4 Examples of Risk Adaptation Processes

MOD ESTATE PROCESS	Risk Action Owner's Responsibilities
Business Continuity & Resilience Plan	The Business Continuity (BC) owner should ensure the relevant BC risks identified e.g. Heat wave disrupting IT, are reflected in the establishment BC Plan and cascaded down into team plans etc.
Health & Safety	H&S owners should ensure any SHEF risks identified are reflected within their standard risk assessments and provide assurance that Health, Safety and Environmental legislation, Codes of Practice and MOD/TLB Policies will be compiled with.
Site Security Risk Management	The owner needs to ensure that any security related risks are reflected within the establishment security risk management plan.
Strategic Development Plan (SDP)	The strategic development of a cluster of establishments should consider any climate risks when planning for operational needs, rationalisation and co-operation between sites. The SDP should examine how climate risks will impact on maintenance and through life costs of the establishments. The financial plan, supporting the SDP should forecast any adaptation costs required to maintain resilience in the short, medium and long term.
Establishment Development Study (EDS)	The EDS should also reflect any relevant climate risks. The Climate Resilience Risk Register (Appendix 7B) should inform the identification of the establishment's current threats and constraints, and any issues relating to the future use of land and infrastructure.
Infrastructure Information Gateway (IIG)	The estate manager should ensure any relevant CIRAM outcomes are embedded within the IIG, formerly known as the Integrated Estate Management Plan (IEMP). CIRAM should inform the prioritisation of condition improvement actions.
Major Projects and Works	Works classified as Maintain, Sustain and Change should take into account climate projections and if a CIRAM assessment has been undertaken, then the outcomes should inform the location, design, construction etc. of the asset.
Environmental Management System (EMS)	EMS should embed any relevant climate risks and ensure any actions are implemented and monitored accordingly. A key aim of an establishment's Environmental Management System (EMS) is to mitigate the adverse effect of climate and environmental conditions on the estate. Therefore illustrating progress with the CRRR will demonstrate compliance with the EMS.
Establishment Risk Register	Climatic risks need to be managed in accordance with the direction contained in JSP 892 Risk Management and the Infrastructure System Handbook Leaflet 3.2.2 Risk Management. CIRAM must inform the wider establishment risk assessment