



CabinetOffice

Strategic Framework and Policy Statement on Improving the Resilience of Critical Infrastructure to Disruption from Natural Hazards

October 2009

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Foreword

This Strategic Framework and Policy Statement (the Framework) sets out for consultation proposals for a cross-sector programme to improve the resilience of critical infrastructure and essential services to severe disruption by natural hazards (the Programme). It covers the proposed policy intent, scope, aims, timescales and workstreams.

The Framework also sets out a first proposed standard for resilience in relation to flooding. This is intended to facilitate discussion between central government departments, regulators, relevant public sector bodies and critical infrastructure owners on the impact of adopting that proposed standard. It will be the basis for developing the evidence base on the practicalities, costs and benefits of setting resilience standards for *all* natural hazards.

The Government believes that this approach will:

- a. Enable the gathering of the necessary evidence base to inform the setting of standards for the resilience of critical infrastructure and essential services to severe disruption by natural hazards. The initial focus of the Programme will be on flooding, to allow the determination of the scale of work and investment that will be needed to improve the resilience of relevant infrastructure to the proposed standards.
- b. Enable those standards to take into consideration the UK Climate Projections published in June 2009.
- c. Allow the development in parallel of supporting **Sector Resilience Plans** for critical infrastructure, thus ensuring consistency.
- d. Enable all of this work to be placed within a common, flexible, risk-based and proportionate framework for resilience-building that takes account of the differences between sectors and regulatory regimes.
- e. Ensure that dependencies and inter-dependencies within and between sectors are highlighted and targeted.

The work outlined above will include consideration of the need to issue further guidance for regulators to encourage the pursuit by owners of critical infrastructure of measures to improve the resilience of their assets.

The Government's expectations, defined standards and guidance on good practice will be set out in a **National Resilience Plan** for critical infrastructure to be published in late 2010.

Consultation Details

Purpose

The purpose of this consultation is to give government departments, regulators, industry groups and infrastructure owners the opportunity to comment on proposals for delivering Recommendations 50-54 in Sir Michael Pitt's review of the summer 2007 floods.

Consultation responses will be used to provide the evidence base for setting standards for the resilience of critical infrastructure and essential services to severe disruption by natural hazards, and to develop proposals for any necessary further guidance for regulators or changes to regulatory instruments. It may also inform changes to other non-statutory civil protection arrangements.

We welcome your comments on the outline proposals and submissions of evidence to support the development of the Programme.

There is no impact assessment associated with the Programme at this stage because this consultation does not impose or reduce costs on businesses. Rather, it seeks information on the costs of setting an initial interim standard for resilience. An impact assessment will be undertaken to accompany future decisions on resilience standards or changes in regulation, which will be set out in a National Resilience Plan in 2010.

Timetable

The consultation will run for a period of approximately 8 weeks. We will consider responses received by noon on **Monday 18 January 2010**.

How to respond

A list of consultation questions is included in Section 5 of this document to guide your responses. We invite responses to these questions and supporting contributions from stakeholders.

Please submit responses to the questions and other evidence to: naturalhazards@cabinet-office.x.gsi.gov.uk marking your response with 'Critical Infrastructure Framework Consultation' in the subject field of your email.

Should you require this document or the consultation response template in a different format, please advise us of your specific requirements:

- email: naturalhazards@cabinet-office.x.gsi.gov.uk
- telephone: 0207 276 0831.

Confidentiality

We may pass the information you send to us to colleagues within Cabinet Office and other Government departments. We may also publish your comments in a summary of responses to this consultation. We will assume you are content for us to do this and, when replying by email, your consent overrides any confidentiality disclaimer that is generated by your organisation's IT system unless you specifically include a request to the contrary in the main text of your response to us.

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SECTION 1: INTRODUCTION

Purpose

1.1 This Strategic Framework and Policy Statement sets out the policy intent, scope, aims, timescales and work streams proposed for the cross-sector programme to improve the resilience of critical infrastructure and essential services to severe disruption by natural hazards. Its purpose is to establish a shared, consistent, proportionate and risk-based approach to delivering reductions in vulnerability over a number of years, as envisaged by Sir Michael Pitt in his reports on the floods of summer 2007.

1.2 As Sir Michael recommended, the Framework is intended to encompass a co-ordinated approach to driving up the resilience of critical infrastructure. A key goal will be to identify and assess risks, and thereafter to develop a range of options to avoid, transfer, accept, reduce or share those risks. Options could vary from the provision of physical protection through the relocation of assets or the provision of alternative supplies to improved arrangements for emergency response.

1.3 This Framework is primarily directed at central government departments, regulators, relevant public sector bodies and critical infrastructure owners. It describes the policy intent, scope, aims, work streams and timescales of the proposed **Critical Infrastructure Resilience Programme**. The Programme seeks to:

- Embed a **co-ordinated approach** to the achievement of reductions in the vulnerability of key infrastructure and essential services to severe disruption arising from natural hazards (Section 2).
- Set out an **interim minimum standard for resilience** to flooding (Section 3).
- Describe the **roles and responsibilities** of the wide range of public and private sector bodies who will contribute to the delivery of the shared goals of the Programme (Section 4).
- Generate the **information and evidence** (Section 5) necessary to support the subsequent development of policy and standards, and the development of sector and national plans to improve the resilience of critical infrastructure and essential services to severe disruption by all types of natural hazards.

Background

1.4 Sir Michael Pitt identified in his report on the summer 2007 floods a gap in the Government's policy-making and delivery towards the protection of critical infrastructure from severe disruption caused by natural hazards. In his Interim Report, Sir Michael concluded: *"that the Government should establish a systematic, coordinated, cross-sector campaign to reduce the disruption caused by natural events to critical infrastructure and essential services."*

1.5 Sir Michael found that a number of factors appeared to work together to reduce the effectiveness of risk mitigation within critical infrastructure sectors:

- a. The Centre for the Protection of National Infrastructure (CPNI) provides protective security advice aimed at reducing the vulnerability of critical national infrastructure to national security threats but has no such role in relation to natural hazards.
- b. Although information is available on future changes in mean climate parameters, information on future extreme weather events is poorly understood.
- c. There is no systematic shared understanding of the scale of vulnerability in each sector or of critical infrastructure as a whole to natural hazards.
- d. Whilst a number of policies and programmes are in place which will help to drive risk mitigation in a number of infrastructure sectors, the framework is patchy and inconsistent. Much of what is presently being done is the product of ad hoc reactions to specific events or particular administrative processes.

1.6 Sir Michael, in his Final Report, set out five recommendations to guide the cross-sector campaign described above:

- Recommendation 50: The Government should urgently begin its systematic programme to reduce the disruption of essential services resulting from natural hazards by publishing a national framework and policy statement setting out the process, timescales and expectations.
- Recommendation 51: Relevant government departments and the Environment Agency should work with infrastructure operators to identify the vulnerability and risk of assets to flooding and a summary of the analysis should be published in Sector Resilience Plans.
- Recommendation 52: In the short-term, the Government and infrastructure operators should work together to build a level of resilience into critical infrastructure assets that ensures continuity during a worst case flood event.
- Recommendation 53: A specific duty should be placed on economic regulators to build resilience in the critical infrastructure.
- Recommendation 54: The Government should extend the duty to undertake business continuity planning to infrastructure operating Category 2 responders to a standard equivalent to BS 25999, and that accountability is ensured through an annual benchmarking exercise within each sector.

1.7 In its response, the Government supported Recommendations 50, 51, 52 and 54, and the aims of recommendation 53.

SECTION 2: THE CRITICAL INFRASTRUCTURE RESILIENCE PROGRAMME

Definitions

Resilience

2.1 In his report, Sir Michael Pitt defined resilience as “*the ability of a system or organisation to withstand and recover from adversity.*” As such, a resilient organisation is one that is still able to achieve its core objectives in the face of adversity through a combination of measures.

2.2 Sir Michael also noted that: “*protection may make up an important part of resilience, but it is not the only factor. Resilience is also underpinned by an effective emergency response to help reduce the impacts of failure.*”

2.3 In the Government’s view, resilience encompasses both preventative and emergency response activity. It is important to get the balance right between investment in critical infrastructure itself and investment in emergency response and recovery plans and capabilities. A programme to improve resilience within the UK’s critical infrastructure will need to encompass both elements. In an increasingly networked society, it will also need to cover dependencies and interdependencies within and between sectors.

2.4 Critical infrastructure operators and providers of essential services will need to consider a range of options for ensuring continuity of supply, including:

- Considering the threat from natural hazards (current and future) in the design of new assets, networks and systems to avoid disruption arising in the first place.
- Increasing the robustness and resilience of existing services or assets by building additional network connections, or by providing backup facilities to ensure continuity of services. Actions may include defensive measures (e.g. permanent or temporary flood defences).
- Identifying key components and moving them out of harm’s way (for example, by moving high-criticality assets that are vulnerable to flooding into a lower-risk area). For most infrastructure assets, relocation can only be a longer-term option, meaning that short-term measures will be needed to buy time to plan for the necessary change.
- Enhancing skills and capabilities to respond to emergencies arising from natural hazards.

Risk

2.5 In this Framework, risk is defined as a product of the *likelihood* of a disruptive event occurring and the disruptive *impact* that it would have. Criteria for assessing impact are

drawn from the Civil Contingencies Act, and consider impacts on human welfare (life and health), disruptions to essential services and other key social activities (work; schooling etc), the environment and damage through reduced economic output¹. The assessment of risk is used to identify the hazards that have the greatest likelihood of occurring with significant impact and the most critical elements of infrastructure (see Annex A, Table A2).

National Infrastructure and Critical Infrastructure

2.6 The UK's national infrastructure is defined by the Government as: *"those facilities, systems, sites and networks necessary for the functioning of the country and the delivery of the essential services upon which daily life in the UK depends"*.

2.7 There are certain 'critical' elements of national infrastructure, the loss or compromise of which would have a major impact on the availability or integrity of essential services leading to severe economic or social consequences or to loss of life in the UK. These critical elements make up the critical national infrastructure (CNI).

Critical National Infrastructure

The definition of CNI is: *"Those infrastructure assets (physical or electronic) that are vital to the continued delivery and integrity of the essential services upon which the UK relies, the loss or compromise of which would lead to severe economic or social consequences or to loss of life"*

2.8 The National Infrastructure is categorised into nine **sectors**: energy, food, water, transportation, communications, emergency services, health care, financial services and government. Activity may also be pursued on cross-sector themes (e.g. 'space') which are not recognised as national infrastructure sectors in their own right but which may draw on critical national infrastructure in the delivery of essential services. Annex A provides further information on the classification of the UK's national infrastructure sectors, sub-sectors and the system for categorising infrastructure.

2.9 The European Union defines critical infrastructure in a broadly similar way, as: *"A critical infrastructure (CI) consists of those physical and information technology facilities, networks, services and assets which, if disrupted or destroyed, have a serious impact on the health, safety, security or economic well-being of citizens or the effective functioning of governments"*.

2.10 These definitions are helpful in considering the criticality of a particular asset, measured by the importance of the services it provides and number of consumers it covers. Seen from the perspective of the consumer, however, what matters is the loss of an essential service, irrespective of whether it arises from the loss of a critical national

¹ Note that the value of the infrastructure asset is not weighed in this assessment; it is the loss of the service that determines the weight given to the risk.

infrastructure asset or local infrastructure (e.g. a local electricity sub-station). For the purposes of this Framework there are, therefore, two categories of critical infrastructure:

- (a) critical national infrastructure (that is, infrastructure which is deemed critical in the context of its importance to the whole of the UK), and
- (b) other critical infrastructure which may be critical within a local area.

Both of these categories of critical infrastructure will be used to develop the Critical Infrastructure Resilience Programme. This will enable any assets, systems or networks not otherwise deemed as critical national infrastructure to be evaluated and included within the Programme if doing so would be appropriate and proportionate. The risk-based approach that underpins the Programme means that initial vulnerability analysis will focus on the Critical National Infrastructure.

Aims

2.11 The aims of the Critical Infrastructure Resilience Programme are to:

- **Reduce the most substantial risks** to the continuity of critical infrastructure and essential services resulting from severe disruption caused by natural hazards, through the careful assessment of vulnerability and prudent and proportionate risk mitigation activity based on new, centrally-defined standards.
- **Provide a shared Framework** to support cross-sector activity to assess, enhance and sustain the resilience of critical infrastructure and essential services to disruption from natural hazards.
- **Enhance the collective capacity of infrastructure to absorb shock and act quickly** when faced with unexpected events.
- **Ensure an effective emergency response** at the local level through improved information sharing and engagement before, during and after emergencies.

2.12 The Programme will ensure that the Government, regulators, public sector bodies and owners of critical infrastructure are aware of the risks arising from natural hazards and take appropriate action. This includes understanding the potential impact on society, the economy and the environment. This information, alongside defined standards for resilience, will enable plans to be developed to manage the risks and improve the resilience of critical infrastructure and essential services.

Principles

2.13 The Programme will be based on the following principles:

- **Risk-based approach.** The standards adopted and measures proposed to enhance resilience will be proportionate to the risks posed by natural hazards. Assessments of the likelihood and the consequences of critical infrastructure and

essential services being severely disrupted by natural hazards will be used to define standards and set priorities.

- **Proportionality.** The scale and cost of proposed programmes of measures to enhance resilience within each sector should be proportionate to the risks they face. This means taking into account the likelihood of their being affected by a natural hazard, the 'criticality' of the infrastructure in question and its vulnerabilities, and the different options available to improve resilience.
- **Co-operation and co-ordination.** The Programme will encourage and facilitate co-ordination and integration within and between sectors and essential services to deliver the aims set out above. It will also be based on collaboration with similar programmes within the Devolved Administrations on matters that are devolved, and respect the proper roles of each Administration. Arrangements will be established with the Devolved Administrations to harmonise work programmes where possible to ensure appropriate standards for resilience are progressed across the UK.
- **Sector differences.** Sector Resilience Plans will clarify the differences between sectors that arise from their different needs, circumstances and regulations, which will be taken into account in the National Resilience Plan.
- **Sector sponsor department responsibility.** Lead Government Departments will continue to sponsor and take the lead for their sectors.
- **Coherence.** Proposed Sector Resilience Plans should be 'joined-up' as far as possible with other relevant Government programmes, especially the programme to reduce the vulnerability of national infrastructure to terrorist attacks.
- **Voluntary co-operation.** This will be the preferred means of achieving shared aims, although the use of regulatory or other legislative powers may be appropriate or necessary.
- **Tripartite relationship.** Where relevant, the Programme will seek to establish a tripartite relationship between the sector sponsoring department, the relevant regulator and infrastructure owners in taking activity forward.
- **Information sharing.** The Programme will promote information sharing to support resilience-building, especially on dependencies, interdependencies and arrangements for business continuity management across sectors.
- **Precautionary.** A precautionary approach will be taken to encompass inherent uncertainties in the estimation of the risks posed by natural hazards across the medium-term.
- **Sustainability.** Programmes of resilience-building will be scrutinised for their contribution towards the Government's aims for sustainable development, especially the creation of safe and sustainable communities. Individual resilience-building measures will need to support National Planning Statements, be consistent with spatial plans and comply with planning policies (e.g. PPS25).

Scope

2.14 The Programme will cover all nine sectors of national infrastructure. It will reflect the position that each sector is at a different starting point. As a result, expectations for each sector will be different in the early stages of the Programme.

2.15 Many critical infrastructure owners already have in place arrangements for improving and sustaining the resilience of their assets, networks and systems, and for risk assessment and business continuity management. The Programme will work in partnership with those owners, lead government departments and regulators to understand activity already under way, to assess the residual vulnerability of infrastructure assets to severe disruption caused by natural hazards and to determine if further measures are necessary to improve resilience.

2.16 Local authorities will be engaged in the programme through Regional and Local Resilience Forums established under the Civil Contingencies Act 2004.

2.17 The Government already has in place a comprehensive programme to protect the critical national infrastructure from terrorism as part of the UK's counter-terrorism strategy (CONTEST). The Critical Infrastructure Resilience Programme will be aligned to this strategy as far as possible. Established procedures will be adopted where possible to provide a coherent and consistent approach to building resilience across sectors to all risks, and especially to ensure coherent and consistent advice for operators at the asset level.

2.18 The Programme will work closely with the *Adapting to Climate Change Programme* to ensure consistency and pursue how best to align with the reporting obligations under the Climate Change Act. The Government's Climate Change Adaptation Programme² will also:

- a. publish the latest set of UK Climate Projections (June 2009);
- b. undertake the first national Climate Change Risk Assessment in 2012;
- c. establish a Reporting Power on adaptation for priority bodies (including infrastructure owners).

2.19 The Programme will assess and identify the activity and investment needed to improve resilience to defined standards and set this out in a formal impact assessment. This analysis will be developed, and the supporting evidence gathered, during the consultation on this document and through the development of Sector Resilience Plans. Ministers will make the final decision on resilience standards and delivery mechanisms for resilience programmes in each sector.

² The ACC Programme includes a two-year project (to March 2011) on Infrastructure and Adaptation, which will focus on how to increase the long-term resilience (i.e. a 20-90 year timeframe) of infrastructure in the energy, water and transport sectors.

Work Streams

2.20 The Programme will be pursued as two parallel workstreams (see figure 1 below). The first will focus on the short-term, and on flooding. It will ensure that flood risk assessments are prepared which assess the vulnerability of the most critical assets to severe disruption from flooding under current climate parameters. A summary of this analysis, and a programme of work to reduce vulnerabilities, will be published in Sector Resilience Plans.

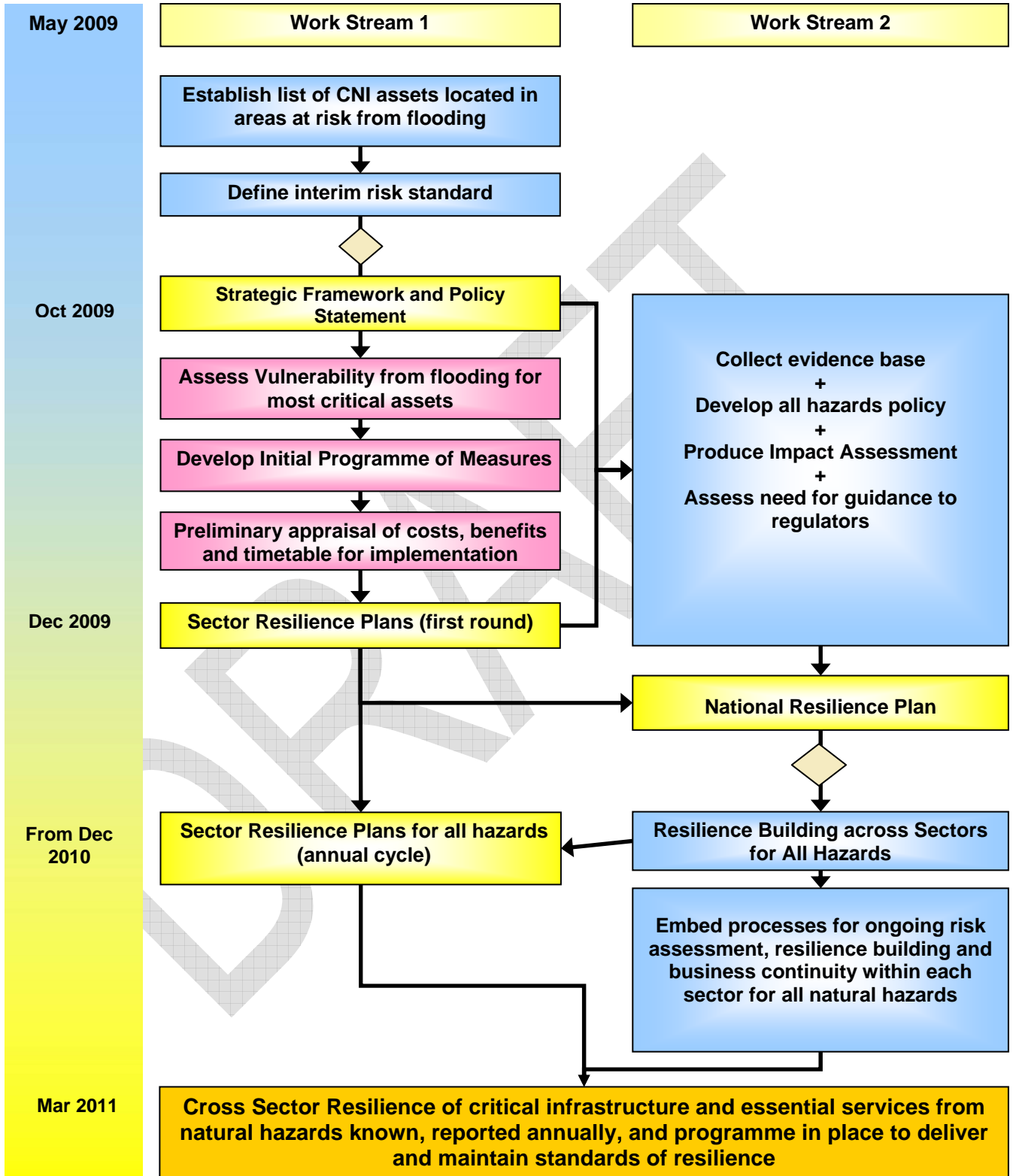
2.21 The second workstream is focused on the medium-term, and on the development of a sustained programme to address risks to the continued delivery and operation of critical infrastructure and essential services from all natural hazards. This work will include reviewing existing, and providing where necessary additional, guidance to regulators to encourage resilience-building by critical infrastructure owners. It will gather the evidence necessary to develop proportionate policies and standards, and thereafter resilience-building programmes. These will be set out together with the Government's expectations and guidance on good practice, in a **National Resilience Plan**. This workstream will also address cross-sectoral issues arising from the dependency and inter-connectivity of services, including the potential for, and likelihood of, chains of events that could lead to cascade failures, with a consequent greater impact on communities.

Vulnerability assessment

2.22 Flooding is the first hazard to be considered by the Programme as it is the highest climatic risk in the Government's National Risk Assessment. Information is already available on flood risk across the UK that can be used to assess the vulnerability of individual infrastructure assets to severe disruption from flooding and hence the need for activity and investment to reduce those vulnerabilities. Risks posed by other natural hazards are not currently as precisely defined. Where they are, however, they will be taken into account in the vulnerability analysis.

2.23 The Programme will analyse which critical national infrastructure assets are located in areas at risk from flooding, from rivers or the sea. Discussions with lead government departments and site owners will then take place to understand the current level of resilience of those assets from flooding. This initial vulnerability assessment will inform decisions on the need for activity and investment to mitigate risk further. It will be summarised in Sector Resilience Plans, and used to inform the setting of standards of resilience against flooding across all sectors.

Figure 1: Outline Project Plan



Setting standards

2.24 An interim minimum standard for flood resilience in critical national infrastructure is set out in section 3 of this Framework. Setting an interim standard at this early stage in the programme will allow:

- (a) a clear statement of expectation to be made while allowing a period of discussion and evidence-gathering;
- (b) the final standard to take into consideration the UKCIP Climate Predictions published in June 2009;
- (c) the Strategic Framework to be developed in parallel with the development of Sector Resilience Plans, thus ensuring consistency;
- (d) an assessment of the scale of activity needed to improve the resilience of relevant infrastructure to this standard;
- (e) determination of the costs of setting a particular standard, the investment needed over what timeframe; and hence what will be the impact on owners'/providers' business models and customers' bills.

2.25 The Programme will test a range of standards, as well as the merits of setting different standards for the most critical assets and within each sector, on economic, social and environmental grounds.

2.26 The National Resilience Plan to be published late 2010 (see below) will set out a risk-based approach for resilience-building and appropriate sector standards, based on the evidence obtained by testing this initial standard.

Sector Resilience Plans

2.27 The Programme will produce guidance to support, and oversee, the progressive development of **Sector Resilience Plans**. These will ultimately assess the resilience of critical infrastructure from all natural hazards in each sector, and describe the measures which will ensure that deficiencies in resilience for critical sites and essential services are addressed. Responsibility for producing the Plans will rest with the lead government department for each Sector.

2.28 Sector Resilience Plans will set out:

- an understanding of vulnerability and overall risk within the sector, developed by the bottom-up risk assessment and analysis on a periodic basis;
- the levels of ambition for resilience across the sector across a defined timeframe, based on existing standards of protection, economic factors and business continuity planning for all risks;
- a programme of measures for achieving the defined level of ambition, along with timescales for delivery;

- a mechanism for reporting progress on the implementation of the programme of measures, and for updating the plan on an annual basis to incorporate changes in the understanding of risks and actions taken; and
- a process for the benchmarking of business continuity plans.

2.29 It is envisaged that the first version of these plans will cover, as a minimum, risks to the most critical assets from flooding. The first plans should, at least, set out:

- (a) the lead government department's understanding of the risks from river and coastal flooding to critical infrastructure and essential services in their sector;
- (b) a clear picture of what is already being done directly and indirectly to address deficiencies in resilience to severe disruption from flooding; and
- (c) the further work that will be needed to improve resilience to disruption from flooding to the initial interim standard.

2.30 Initial versions of Sector Resilience Plans should analyse current fluvial and coastal flood risks under a range of scenarios using industry standards for flood estimation and the information available. Risks from surface water and groundwater flooding, as well as flooding from reservoirs, should also be considered if the necessary information and resources are available. Plans will need to demonstrate that the most critical assets have been identified, relevant flood risks assessed and that measures have been proposed to resolve any deficiencies in resilience. These Plans (or a summary of them) will be published, although the list of the most critical assets will not be made public.

2.31 Future Sector Resilience Plans will be progressively extended to cover all natural hazards and critical infrastructure, and to plan for future climate parameters. Future risks will be drawn from successive versions of the National Risk Assessment and UK Climate Projections. This work will be aligned with planning and reporting requirements under the Climate Change Act 2008.

2.32 In the longer-term, sector resilience planning should become part of normal business operating procedures for infrastructure owners. Each sector will require an infrastructure-wide iterative process to periodically assess the risk, then plan and deliver actions to improve resilience to achieve and maintain standards expected by communities, regulators (where appropriate) and the Government. It is intended that Sector Resilience Plans should be reviewed annually by lead government departments and updated to reflect progress within the sector. The Cabinet Office will establish arrangements for quality assurance of the Plans to ensure that they are fit for purpose.

National Resilience Plan

2.33 The development of the National Resilience Plan will be rooted in a partnership between the many public and private sector bodies involved and infrastructure owners/operators. It will bring together evidence from this Framework, Sector Resilience Plans and relevant analysis to set out a long-term, all-risks programme to reduce the

vulnerability of critical infrastructure and essential services to severe disruption from natural hazards. It will set out proportionate policies and standards, and the resilience-building programmes necessary to achieve them. In addition, it will set out the Government's expectations and guidance on good practice.

Guidance for Regulators

2.34 This Framework provides interim guidance for economic regulators on the Government's expectations for resilience of critical infrastructure from flooding, in line with Recommendation 53 of Sir Michael Pitt's Final Report. Further guidance will be produced for regulators to enable them to effectively support a national programme of cross-sector resilience-building from all natural hazards. This will address in particular the legal powers needed, and how such a programme can be funded. It will also consider the appraisal processes used by each sector to determine the affordability of different levels of resilience.

Timetable

2.35 The Government's response to the Pitt Recommendations set a target date for the development of the first Sector Resilience Plans of 31 December 2009. The National Resilience Plan will be published late 2010.

2.36 The delivery of measures to improve the resilience of critical infrastructure is partly dependent on regulatory review cycles (in the regulated sectors) and hence funding availability. Both Ofwat and Ofgem are currently considering proposals put forward by their sectors to improve the resilience of their most critical assets. It is anticipated that decisions will then be made on what measures should be taken and what funding is necessary. The Government expects the regulators to make some funding available during the current price reviews for these measures to improve resilience in the short term (2010-2011).

SECTION 3: POLICY AND STANDARDS

The Impact of Climate Change

3.1 The main types of flooding to be considered are:

- **Rain leading to fluvial (river) flooding.** This is mainly associated with prolonged and often widespread rainfall or from convective rainfall over a period of time. The chance of river flooding is higher where cells of heavy rain occur within a wider rain band, or if the ground is already saturated from earlier rain, or if combined with rapid snowmelt.
- **Rain leading to 'flash' flooding.** This often arises from heavy, localised thunderstorms, which are more likely to occur in the summer months due to the convective nature of the rainfall. The impacts can be serious localised flooding, particularly in urban areas.
- **Coastal and Tidal flooding.** Weather, principally wind, causes increased wave heights or a tidal surge which can result in the overtopping or breaching of sea defences.

Surface water and groundwater flooding are also important considerations and will be included within the resilience-building programme as fuller information on these risks becomes available from the agencies responsible for flooding.

3.2 The National Risk Assessment also identifies risks from other natural hazards relevant to the UK, including:

- **Strong winds.** Storm events (such as occurred in the UK in 1987, 1990, 1998, 2000, 2002, 2005 and 2007) bringing extreme winds are usually the greatest risk to life and property in this country and cause disruption to power, transport and communications.
- **Snow.** Most winters in the UK have at least one period of heavy snowfall bringing serious disruption to public services.
- **Extremes of heat and cold.** Increased mortality is a well-documented phenomenon when the temperature moves away from the optimum. 20,000 people in Europe died as a direct consequence of the heat wave in 2003. That said, the impact on critical infrastructure is less well understood.
- **Dry spells.** Long periods without significant rain lead not only to water resource problems but also forest fires, and building subsidence as clay soils dry out.

3.3 Most of the categories of severe weather described above can usually be forecast in the general sense, out to some days ahead. However, for many events, it is the fine detail of the forecast which is most vital. Thus, although heavy rain can be disruptive, it is the much smaller areas of extreme rainfall which are likely to generate the highest flood risk.

3.4 The levels of variability and uncertainty inherent in predicting the incidence and impact of natural hazards across the medium-term – and especially extreme and localised events - presents a key challenge to the development of suitable resilience standards. The UK Climate Projections will, however, provide a platform for analysing the incidence and impact of natural hazards, now and into the medium-term future. The Cabinet Office will work with Defra, the Met Office and others to understand the probability of certain climatic events, and the impacts that could be experienced by critical infrastructure, across the short- and medium-term. These scenarios will subsequently be compared with the events currently considered by the owners of critical infrastructure.

UK Climate Projections (UKCP09)

The UK Climate Projections (UKCP09), launched on 18 June 2009, describe how the climate of the UK might change during this century. UKCP09 attaches probabilities to different levels of future climate change, allowing users to consider the implications of uncertainties and risks.

UKCP09 provides projections of changes for a number of climate variables (such as average temperature and precipitation), for 25x25km grid squares and for administrative regions and river basins. There are also projections for marine regions around the UK and for different scenarios of greenhouse gas emissions.

Flood Resilience Standards

3.5 Flooding is the first hazard being covered by the Critical Infrastructure Resilience Programme as it is the highest climatic risk in the National Risk Assessment, and because information on flood risk is available in a form which is more readily usable. This is not intended, however, to exclude other natural hazards; where there are known and well-defined vulnerabilities to other natural hazards, these will be taken into account in initial resilience-building activity.

3.6 The standard – that is, the level of resilience of critical infrastructure - will ultimately be defined in terms of continuity of service. It will be governed by three risk factors:

- **Probability** of an event of a certain severity arising.
- **Vulnerability** of the infrastructure to harm from an event.
- **Impact** of the harm on the infrastructure as a result of the event, including the scale of the loss of service, the ability for the system to recover and the availability of alternative supplies. The impact of loss from CNI is categorised by the Criticality Scale.

3.7 The Pitt Review concluded that: “*for the purposes of building resilience in the critical infrastructure, a minimum standard of 1 in 200 annual probability would be a proportionate starting point [for all forms of flooding]*”.

3.8 It is proposed that the Pitt Recommendation be adopted as a minimum interim standard for critical national infrastructure across all sectors. This will enable discussion between government departments, regulators, other public bodies and critical infrastructure owners to gather the shared evidence base on:

- the scale of the activity necessary to improve the resilience of relevant infrastructure to this standard;
- the cost of doing so, and over what practical timeframe; and
- the impact on owners' business models and customers' bills.

3.9 The proposed minimum interim standard sets a level for the probability factor described above, in order that the vulnerability and impacts can be assessed for the most critical sites as follows:

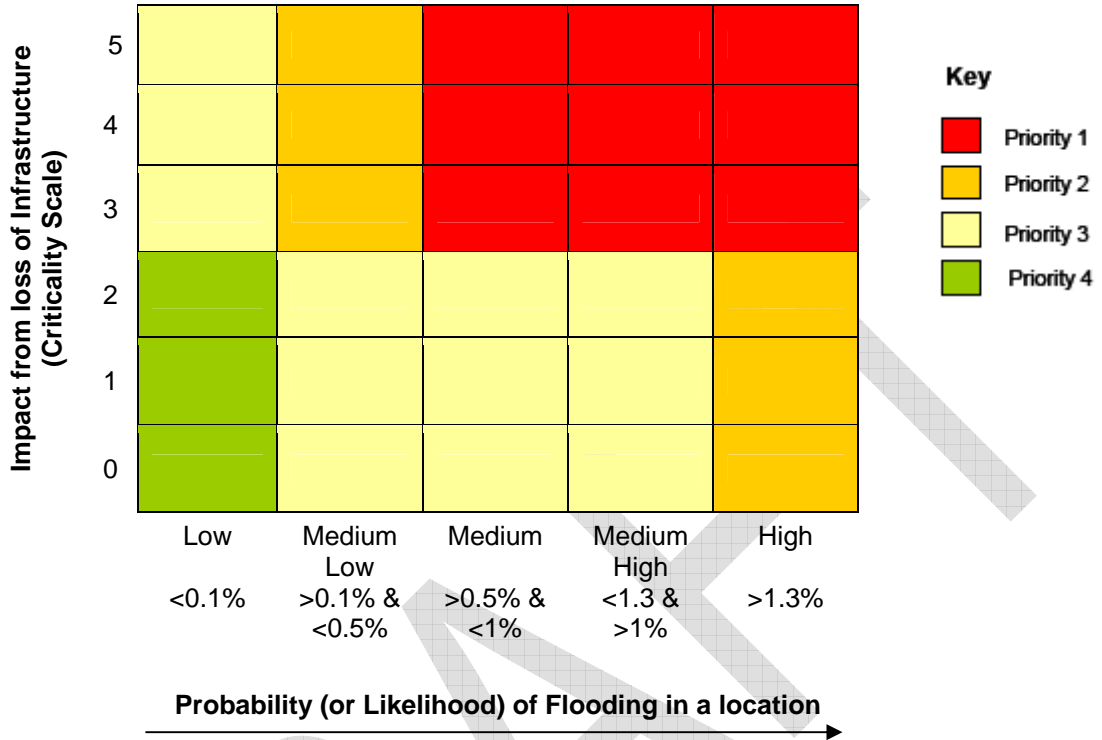
(i) Vulnerability. A 1-in-200 annual probability provides a proportionate starting point to ensure that the most critical assets are made resilient to flooding as soon as possible. Each sector will need to assess the existing vulnerability of critical assets against a 1-in-200 chance event to determine if there is any disruption or loss of service under those conditions. For some less vulnerable sites, a 1-in-200 chance flood event may flood the site but not cause any loss of service. Therefore, the site would meet the required standard for resilience, and no further measures would be required. However, if the site or service is unable to operate then additional measures may be required to ensure that resilience is sufficient. The cost of improving the resilience to the minimum standard and higher should be considered.

(ii) Impact. The highest priority for the Programme will be to improve the resilience of critical national infrastructure (i.e. Category 5, 4 and 3 assets) from flooding to manage major losses.

3.10 The Government is minded to introduce a sliding scale for resilience standards, with a higher standard (e.g. a 1-in-1000 chance flood event in any year) applying to the most critical national infrastructure. The feasibility and merits of doing so will be examined using the evidence submitted in response to the consultation on this Framework. Where infrastructure owners and regulators are already considering measures to improve the resilience of the most critical infrastructure, they are encouraged to adopt higher standards of protection in circumstances where the costs and benefits justify the additional investment.

3.11 It will remain for critical infrastructure owners and providers of essential services to assess the **vulnerability** and **impact** of flooding on their assets and services to severe flooding, drawing on information available from the Environment Agency. The grid below is offered as a simple model to assist in prioritising assets where resilience-building actions are required. As a minimum, priority 1 sites must be covered within the first Sector Resilience Plans, with other priority sites being included in annual plans as they develop.

Figure 2: Using a Risk-Based Approach to Prioritise Sector Resilience Planning



4. ROLES AND RESPONSIBILITIES

4.1 This section describes the roles and responsibilities of those organisations with the most significant potential contribution to the success of the Critical Infrastructure Resilience Programme. There are many other organisations that have a vital role in planning, preparing for, detecting, responding to and recovering from incidents associated with natural hazards. Their views and input to the programme will be sought through discussion on this Framework as the Programme proceeds.

Cabinet Office

4.2 The Cabinet Office is charged with developing the cross-sector resilience-building programme, with a clear remit to work across government departments and other public and private sector bodies to define and deliver shared goals.

4.3 The Cabinet Office also provides secretariat support to Cabinet Committees, including MISC36 to which this Programme will report.

4.4 The senior responsible owner (SRO) for this Programme within government is the Director of the Civil Contingencies Secretariat. The SRO is responsible for monitoring and managing the cross-sector effort to achieve the outcomes sought from the Programme.

Government Departments

4.5 Sponsoring government departments are responsible for working with regulators and relevant infrastructure operators and providers of essential services to determine the overall approach to be adopted within their sectors. Within this, key responsibilities include:

- Identifying what infrastructure within their sectors may be considered to be at risk of severe disruption from defined natural hazards, and the criticality of that infrastructure.
- Developing Sector Resilience Plans with the owners of critical infrastructure.
- Agreeing appropriate priorities and programmes of measures to improve resilience (as part of the Sector Resilience Plans) with critical infrastructure owners and regulators.
- Monitoring and reporting on activity and progress in their sector.
- Working with regulators (where they exist) to ensure the delivery of agreed programmes of resilience-building, including intervention in cases where infrastructure owners fail to implement agreed and funded programmes.
- Leading on any funding or regulatory issues that arise.

Devolved Administrations

4.6 The Devolved Administrations are the Welsh Assembly Government as the executive for the National Assembly for Wales, the Northern Ireland Executive for the NI Assembly and the Scottish Executive for the Scottish Parliament.

4.7 The National Assembly for Wales has powers to legislate on matters such as fire and rescue services, food, highways and transport, water, spatial planning and local government.

4.8 The Northern Ireland Assembly has legislative competence over transferred matters, defined as all those that are neither excepted nor reserved. Excepted issues include national security and nuclear energy. Reserved matters include policing and broadcasting. Transferred matters include social security, housing, economic development, local government, environmental issues, planning, and transport.

4.9 The Scottish Parliament has the power to pass primary legislation, but cannot legislate on reserved matters. Reserved matters include the Civil Service, aspects of energy regulation (e.g. electricity, coal, oil and gas and nuclear energy), aspects of transport (e.g. regulation of air services, rail and international shipping) and broadcasting. Devolved matters include education, Local Government, housing and policing. The Scottish Executive has established a Strategic CNI Group to address all issues impacting on the CNI in Scotland, from terrorism through to flooding. This work has been endorsed by the UK Government and seeks to adopt a holistic approach to the CNI, encompassing Reserved and Devolved issues.

Regulators

4.10 The Pitt Review considered that “*regulators should be given an explicit duty to take resilience into account, along with guidance to ensure clarity and that it is given appropriate regard.*”

4.11 The regulators are vital to the analysis of gaps in the current system of regulation, and on how the system may need to change to support increasing the reserve capacity of supply.

4.12 The health sector, as well as the emergency services sector and part of the transport sector, are not regulated in the same way as the water and energy sectors. A different approach will thus be needed with those sectors to deliver the aims of this Programme.

Infrastructure Owners and Operators

4.13 Infrastructure owners and operators are established businesses operating in very different markets, which are often highly competitive. These businesses have various

mechanisms and procedures to ensure the effective provision of their services to customers and to maintain (through market forces and regulation) a level of resilience within their infrastructure.

4.14 The Civil Contingencies Act 2004 provides the principal legislative framework for risk mitigation, preparedness and emergency planning. Many of the owners of critical infrastructure and providers of essential services are designated as either Category 1 or Category 2 responders under the Act. The utilities are Category 2 responders and the Act places general duties on them to co-operate and to share information with Category 1 responders (mainly the emergency services and local authorities). This enables Category 1 responders to undertake community risk assessments and local contingency planning duties.

4.15 Specific legislation for infrastructure sectors contains complementary provisions to plan for, prevent and respond to threats. However, there is not widespread consistency across sectors in the process or standards adopted for building resilience. In addition, Sir Michael Pitt's report described the way in which the priority given to the mitigation of natural hazards varies within and between sectors.

4.16 Through working in partnership with regulators and government departments within the context of this Programme, infrastructure owners and operators will be encouraged to take forward the building of greater and more consistent levels of resilience in critical infrastructure to severe disruption from natural hazards.

Centre for the Protection of National Infrastructure (CPNI)

4.17 CPNI is the Government authority for protective security advice to the national infrastructure relating to national security threats. It comprises teams of expert advisers who conduct security reviews and provides advice across the nine national infrastructure sectors aimed at reducing vulnerability to these threats. These advisers are supported by experts who undertake research and horizon scanning.

Environment Agency

4.18 The Environment Agency regulates air, land and water across England and Wales, and has responsibilities for flood and coastal erosion risk management.

4.19 The Environment Agency provides advice and information on flood risk and environmental matters, including publishing flood risk maps and data on the internet to raise public awareness and to support spatial planning. It also provides flood forecasting and warning services, maintains rivers and flood defences, and constructs new flood defences where necessary.

5. Questions

5.1. The Government would welcome contributions from stakeholders to assist in its development of policy and standards, in the preparation of Sector Resilience Plans and the National Resilience Plan. The questions below have been based on the material set out in this Framework.

Consultation Questions

About your organisation

Q1. Is your organisation:

- An operator (including government department or emergency service) of national infrastructure sites or assets as defined by the CPNI.
- An organisation that represents national infrastructure operators.
- A government department that sponsors a national infrastructure sector(s).
- A regulator.

Q2. Which of the nine national infrastructure sectors does your organisation fall into, represent or sponsor?

Developing a Resilience Programme

Q3: Is your organisation able to support the aims of the Programme to improve the resilience of critical infrastructure?

Q4. What action have you taken since the floods in 2007 to build a level of resilience into infrastructure assets to ensure continuity during a worse case flood event? (Pitt Recommendation 52).

Q5. If you own or operate infrastructure assets, how have you identified the vulnerability and risk of your assets to flooding? (Pitt Recommendation 51).

Q6. What further guidance do you think is needed from the Government to enable the regulator within your sector (or for others where there is no regulator) to support a programme of building improved resilience? (Pitt Recommendation 53). Would you support a voluntary approach? How could this work in your sector, or what other approaches could you suggest?

Definitions

Q7: What natural hazards are most likely to have an adverse impact on the supply of essential services by your organisation/sector?

Q8: The Government has defined “critical national infrastructure”. The Pitt Review talked more generally of “critical infrastructure and essential services”. How do you define what is “critical” for the infrastructure in your organisation / sector?

Standards

- Q9: The Government's view is that resilience should be built into critical infrastructure to meet a minimum standard or level of expectation. What level of risk to disruption of services are your customers or the public currently expected to tolerate? How was this level determined or established?
- Q10: Are you able to support the setting of the initial interim standard for resilience to flooding as proposed? What is the resilience of the existing infrastructure in your sector/organisation compared to this standard (if known)? What further work, time and investment is needed to understand the resilience of your critical infrastructure bring it up to these standards? Will the arrangements described in this document result in appropriate and proportionate action on the ground?
- Q11: Do you agree that Government 'standards of resilience' to natural hazards should be based upon continuity of service standards, should be risk-based, and should vary between and/or within sectors? How does your organisation (or sector) currently adopt risk-based approaches and decide upon the level of resilience within the infrastructure and corresponding level of emergency planning/response?

Dependency and Interconnectivity

- Q12: Do you agree that action is needed to improve the sharing of information to promote the understanding of resilience and dependencies across sectors? How does this currently work in practice and what further action is necessary?
- Q13: Would you support the local resilience community taking on the role of assessing dependencies and the interconnectivity of essential services in their local areas and using this to drive improvements within sectors? What arrangements would be needed to enable this to happen? Would a voluntary approach work or are changes needed to legislation or regulations (e.g. enhancements to the Civil Contingencies Act)?

Timetable

- Q14: Are the timescales for the programme realistic and achievable for infrastructure owners in your sector? How does the timetable fit with the investment and funding cycles in your organisation/sector?

Monitoring

- Q15: What measures would be necessary to determine whether the resilience standard has been achieved, and how can this be monitored, reported and enforced across sectors?
- Q16: What additional arrangements would ensure that there is an appropriate overview within government of the level of resilience of critical infrastructure in your sector?

Funding

- Q17: Can the Government adopt the "user pays" principle to fund the building of greater resilience in critical infrastructure? What alternative options are available to fund resilience-building in your organisation/sector? Which is your preferred solution and why?

Annex A

Categorising infrastructure and the criticality scale

A1.1 The nine national infrastructure sectors are further broken down into sub-sectors. These are set out below.

Table A1: National Infrastructure Sectors

National Infrastructure Sector	Infrastructure Sub-Sector	Sponsor Department in Whitehall
Communications	<ul style="list-style-type: none"> - Landline Telephones - Mobile Telecommunications - Postal Services - Broadcast Communications 	BIS BIS BIS DCMS
Emergency Services	<ul style="list-style-type: none"> - Ambulance - Fire & Rescue - Marine - Police 	DH CLG DfT HO
Energy	<ul style="list-style-type: none"> - Electricity - Gas - Oil - Fuel 	DECC DECC DECC DECC
Finance	<ul style="list-style-type: none"> - Payment, Clearing & Settlement Systems - Public Finances - Markets & Exchanges 	HMT HMT HMT
Food	<ul style="list-style-type: none"> - Production - Processing - Import - Distribution - Retail 	DEFRA & FSA
Government	<ul style="list-style-type: none"> - Central government - Parliament - Devolved Administrations - Regional & Local Authorities 	CO
Health	<ul style="list-style-type: none"> - Health & Social Care 	DH
Transport	<ul style="list-style-type: none"> - Maritime - Aviation - Land (Road and Rail) 	DfT
Water	<ul style="list-style-type: none"> - Potable Water Supply - Dams - Waste Water Services 	DEFRA

A1.2 Infrastructure is categorised according to its value or 'criticality' and the impact of its loss. This categorisation is done using the Government 'Criticality Scale', which assigns categories for different degrees of severity of impact. Table A2 below provides broad descriptions of the sorts of types of infrastructure that would be categorised at the different levels (more detailed and specific impact criteria for each sector is captured in the Scale). For example, Category 5 ('CAT 5') indicates infrastructure which would have the most severe impact when it is disrupted; CAT 0 indicates infrastructure whose loss would be minimal when considered in the national context.

Table A2: Criticality Scale for national infrastructure

Criticality Scale	Description
CAT 5	This is infrastructure the loss of which would have a catastrophic impact on the UK. These assets will be of unique national importance whose loss would have national long-term effects and may impact across a number of sectors. Relatively few are expected to meet the Cat 5 criteria
CAT 4	Infrastructure of the highest importance to the sectors should fall within this category. The impact of loss of these assets on essential services would be severe and may impact provision of essential services across the UK or to millions of citizens
CAT 3	Infrastructure of substantial importance to the sectors and the delivery of essential services, the loss of which could affect a large geographic region or many hundreds of thousands of people
CAT 2	Infrastructure whose loss would have a significant impact on the delivery of essential services leading to loss, or disruption, of service to tens of thousands of people or affecting whole counties or equivalents
CAT 1	Infrastructure whose loss could cause moderate disruption to service delivery, most likely on a localised basis and affecting thousands of citizens
CAT 0	Infrastructure the impact of the loss of which would be minor (on national scale).

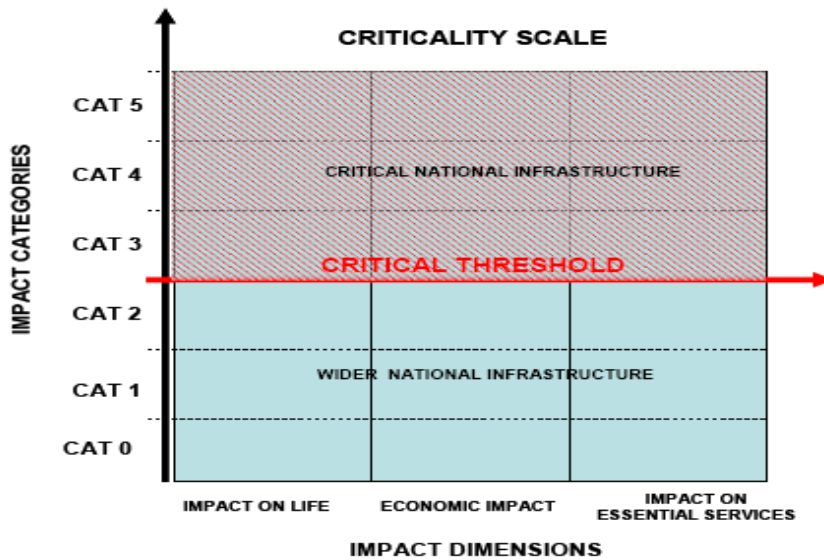
A1.3 Not everything within a national infrastructure sector is ‘critical’. Within the sectors there are certain ‘critical’ elements of infrastructure, the loss or compromise of which would have a major detrimental impact on the availability or integrity of essential services, leading to severe economic or social consequences or to loss of life. These ‘critical’ assets make up the nation’s *Critical National Infrastructure (CNI)* and are referred to individually as ‘infrastructure assets’. Infrastructure assets may be physical (e.g. sites, installations, pieces of equipment) or logical (e.g. information networks, systems).

A1.4 The Criticality Scale includes three impact dimensions: impact on delivery of the nation’s essential services; economic impact (arising from loss of essential service) and impact on life (arising from loss of essential service). These are illustrated in figure A1. Infrastructure may be classified using any one of these factors of impact. The designation should reflect the highest criticality category reached in either of the impact dimensions.

A1.5 The following three factors provide the means to distinguish between different degrees of severity of impact on essential services:

- The degree of disruption to an essential service
- The extent of the disruption, in terms of population impacted or geographical spread
- The length of time the disruption persists.

Figure A1: The three dimensions of the Criticality Scale



A1.6 A 'critical threshold' has been set on the scale and is the level above which the impacts of loss are considered so severe that infrastructure falling into these categories should be considered to form part of the *Critical National Infrastructure*. The threshold is currently set at CAT 3.

A1.7 Sponsor departments lead on identifying what infrastructure in their sector may be considered 'critical', in conjunction with sector experts at the Centre for the Protection of National Infrastructure (CPNI). Sponsor departments also lead on setting the essential service impact criteria ('criticality' criteria) for their sector. The Natural Hazards Team will work closely with sponsor departments and CPNI to ensure that the interconnectivity of essential services is considered to enable an assessment of the risks from natural hazards.