Infrastructure and Projects Authority

Project Routemap

Setting up projects for success

Risk Management

UK Module

Interactive document

Contents

Cover image
The £1.5bn A14 Cambridge to Huntingdon improvement scheme includes a major new bypass to the south of Huntingdon and upgrades to 21 miles of the A14. The upgrade will cut up to 20 minutes off journeys enhancing national economic growth, provide better connection to communities and improve the local natural environment.

Acknowledgements
Highways England

Preface

Project Routemap is the Infrastructure and Projects Authority's (IPA) support tool for novel or complex major projects. It helps sponsors and clients understand the capabilities needed to set projects up for success, incorporating learning from other major projects and programmes.

The IPA is the centre of expertise for infrastructure and major projects, sitting at the heart of government and reporting to the Cabinet Office and HM Treasury in the UK.

Over the coming years there will be more investment in infrastructure and major projects than ever before, backed by both public and private sectors. This investment will be a catalyst to building back better and stronger. Infrastructure and major projects will play a critical role in fuelling economic growth and improving the lives of people right across the country.

With greater investment comes greater responsibility and we must ensure we have a strong delivery record that demonstrates real value. This means setting projects up for success from the very start, so that they come in on time and budget, and deliver on their promises - to the benefit of the citizens of the UK.

Although setting up projects for success can take more time at the start, this will be repaid many times over in the delivery phase. Projects that focus enough attention on the early stages are much more likely to achieve their intended outcomes later on and display world-class delivery standards.

That's why the IPA developed the Project Routemap ("Routemap") - a support tool that provides practical advice based on learning from other major projects and programmes.

There is no doubt that complex projects can test the limits of organisational capability, but if applied in the most crucial early stages of project development, Routemap will ensure that best practice and learning about the most common causes of project failure and principles for project success are incorporated. This will result in benefits ranging from selection of the most appropriate delivery model, to clearer governance arrangements, proper risk allocation and accelerated decision-making.

Routemap has been used by many of the UK's biggest, most complex and high-profile projects since its first publication in 2014 and more recently it has also been applied to projects internationally. However, the project delivery system and the way projects are delivered has evolved. That is why the UK Routemap handbook and accompanying modules have been updated to incorporate new and emerging best practice in project delivery and to align with standards, including the Government Functional Standard for Project Delivery and the UN Sustainable Development Goals.
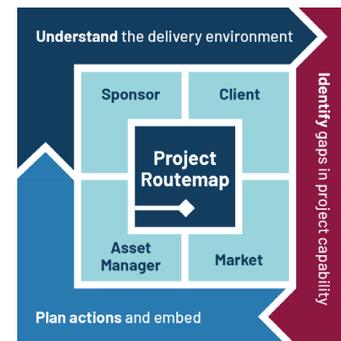
Building on its success with economic infrastructure, Routemap has also been expanded to cover social and defence-related infrastructure projects and includes guidance for application to other types of projects.

Applying Routemap to more of our projects will be another step towards realising our ambition of world-class delivery standards. Whatever the project, applying Routemap will give confidence to the people delivering them, those approving them, and those investing in them.

The IPA would like to thank all those organisations and individuals who have contributed to the development, of both the original, and the updated UK Routemap handbook and accompanying modules.

Nick Smallwood
Chief Executive Officer of the Infrastructure and Projects Authority and Head of Government's Project Delivery Function

Introduction: What are the Routemap modules?

The Routemap modules provide practical advice to help set up projects for success. The modules have been developed by the UK government in collaboration with industry and academia. They capture best practice and learning from common causes of project failure and success over the past decade from £300bn of capital programmes.

These modules sit alongside the Routemap handbook. The handbook explains how Routemap can be applied to identify gaps in project capability and build an action plan to close those gaps.

There are eight modules, one covering each of the following areas:

The best practice and learning contained in the modules reflect the collective experience of public and privately funded projects from the infrastructure and defence sectors. However, most of the principles apply to all projects, including digital and transformation projects.

These modules are aligned with the government's Project Delivery Capability Framework and help projects comply with the Government Functional Standard for Project Delivery. They also help projects to align with other recognised standards and guidance, including the United Nations Sustainable Development Goals.

They are useful whether you are using the Routemap to undertake a Full Project Review or a Modular Deep Dive, as detailed in the Routemap handbook. They can also be a useful standalone reference to identify potential risks and improvements in project capability development, and relevant good practice from other projects.

The modules are not a complete guide to project development, nor a substitute for business case development. Instead, they provide considerations to challenge your thinking and to launch your project on the path to success. The project team will need to consider their project's individual characteristics and context and identify what will be most helpful to them.

Requirements
Delivering strategic project outcomes and realising the benefits.

Procurement
Understanding how the project will buy goods and services.

Governance
Establishing clear accountability and empowering effective decision-making.

Risk Management
Managing uncertainties and opportunities.

Systems Integration
Making multiple systems work as one.

Asset Management
Balancing costs and risks to maximise whole life benefits.

Organisational Design & Development
Organising the project team to deliver successfully.

Delivery Planning
Readying the project for transition into delivery.

Introduction: How do you use the Routemap modules?

This table summarises how different module sections support the three key stages of the Routemap methodology.
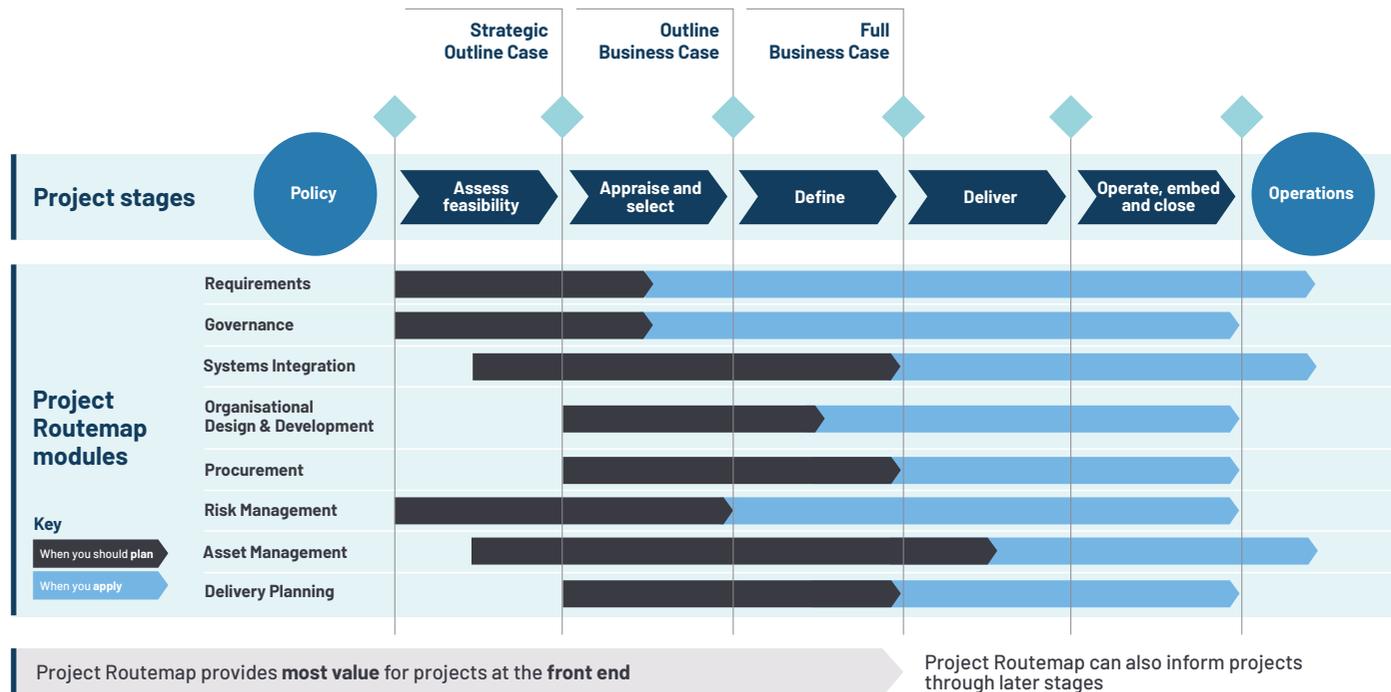
The modules are useful when applying the Full Project Review and Modular Deep Dive approaches, which are described in the Routemap handbook.

	Setup Determine the scope and timing of the Routemap, which can be project-wide or targeted to specific areas of capability	**Diagnosis** Gather information and identify where capabilities need to be enhanced	**Action planning** Collaborative development of practical solutions to enhance capability
Routemap approach			
Full Project Review	Determine if there is value in using Routemap to support project-wide capability development.	Determine which modules may help.	Apply best practice and learning from the modules and any other major project examples.
Modular Deep Dive	Determine if there is value in using specific Routemap modules to support development of a specific area of capability.	There is likely to be one module in particular that focusses on your selected area of capability. However, there may be value in consulting other interfacing modules too.	Apply best practice and learning from the modules and any other major project examples in the selected area of capability.
Module section			
Key project documents Documents that will help you understand the risk management arrangements for your project.	You may find it helpful to review these types of project documents, to define the areas of interest in the Routemap scope.	Cross-checking this document list against existing project documents may also help you to identify capability gaps.	You may find that developing or enhancing these types of documents will help to close capability gaps.
Typical findings Indicators that issues might arise during delivery.	If these indicators are apparent even before you start applying Routemap, this should inform the areas of interest in the Routemap scope.	You may find it helpful to review these when identifying issues and articulating your findings.	If your findings contain statements like these, this module could help strengthen capability.
Pillars of effective risk management Hallmarks of successful project set up.	Comparing your project with these characteristics of good practice may help you to identify areas of interest in the Routemap scope.	*Not applicable to this stage*	Comparing your project with these characteristics of good practice may help you set goals for your action plan.
Considerations Detailed list of questions to understand root causes and suggest improvements.	*Not applicable to this stage*	This section lists a series of questions that can help you to test the effectiveness of existing arrangements.	Working through these questions can help you understand the root causes of the findings and develop solutions.
Good practice examples and suggested reading Context to support your wider understanding.	*Not applicable to this stage*	*Not applicable to this stage*	You may find these good practice examples and suggested reading useful in developing actions to address capability gaps.

Introduction: How do the modules map to the project life cycle?

This diagram maps the Routemap modules to the stages of a project life cycle.

It shows when each of the modules should be used to support planning during project set up. It also suggests the stages when the modules' principles are expected to have been applied.

	Strategic Outline Case	Outline Business Case	Full Business Case

Project stages

Policy → Assess feasibility → Appraise and select → Define → Deliver → Operate, embed and close → Operations

Project Routemap modules

- Requirements
- Governance
- Systems Integration
- Organisational Design & Development
- Procurement
- Risk Management
- Asset Management
- Delivery Planning

Key

When you should **plan**

When you **apply**

Project Routemap provides **most value** for projects at the **front end**

Project Routemap can also inform projects through later stages

Cross-cutting themes projects can't ignore

Six cross-cutting themes emerged from our engagement with major projects and industry, which have informed the updated Routemap modules. These place complex demands on project teams, and if overlooked during set up, can create issues during the later stages of the project life cycle.

These themes include the need for focus on behaviours and culture, consideration of wider economic, environmental, and social value and the increasing use of digital systems and tools to enable a systems-focused approach.

Planning ahead for the right skills, experience and capacity to address these themes is key to success.

To help you navigate these themes, we have developed a series of prompts. You can use these prompts to check whether your project is set up to meet the challenges ahead.

Benefits and outcomes focus
adopting a whole life perspective whilst managing the project

- Have you got a clear vision of the target outcomes, which is aligned across the sponsor, client, asset manager and market?
- Have the project outcomes been effectively communicated to key stakeholders and the supply chain?
- Has the project set realistic and transparent targets?
- Are you able to measure the realisation of benefits throughout the whole life cycle? Including any potential early releases?
- Have you considered the disbenefits and how to minimise them?

People and skills
planning ahead for the right skills, experience and capacity to deliver the project

- Have you undertaken activity-based resource planning to ensure you have the people with the right skills, knowledge, experience and behaviours at the right time to deliver the project?
- Are these plans reviewed on an ongoing basis? And do they incorporate skills development and succession planning to ensure continuity in key roles and to meet evolving needs?
- Have you considered the time commitment of your project leaders to ensure they have the right capacity to deliver the project?
- If using delivery partners or third parties, do they have the capacity and expertise to support the project as required?

Behaviour and culture
realising project success with a capable, diverse and integrated team

- Is there a plan for how desired behaviours and values will be cascaded and embedded through the sponsor, client, asset manager organisations and the supply chain?
- How are the desired behaviours and culture promoted in the project?
- Does the project have a culture that empowers constructive challenge and diversity of thought?
- How is the project planning to build relationships and invest in creating the right environment to realise project outcomes?

Economic, environmental and social value
taking in a wider view of the project's impact

- Have you considered how the project will generate economic, environmental, and social value, both through its intended outcomes and/or as a by-product of delivery? Has this been hardwired into the business case, with a clear link to the UN Sustainable Development Goals?
- Is your project aspiring to leave a "net positive" and climate resilient impact on the natural environment?
- How are you maximising benefits and minimising risk and disbenefits for project affected communities and contributing to levelling up?
- Is there clear accountability for the economic, environmental, and social benefits and outcomes?

Digital and technology
embedding systems and approaches at the front end to maximise project productivity

- Have digital and modern methods been considered at the earliest point in the life cycle to maximise their impact on benefits?
- How has the project assessed and addressed digital capability within the sponsor, client, asset manager and market?
- Has the project considered how information, data and knowledge will be shared across the project, including with the supply chain?
- What consideration has been given to potential changes in technology that may influence benefits realisation?

Transitions
planning for change and developing the required capability before progressing to the next life cycle stage

- Does the project have a clear plan for how they will transition from one life cycle stage to the next?
- Does the plan set out the changes needed to organisational and governance arrangements?
- Does the project have the necessary capability to transition to the new organisational and governance arrangements for the next life cycle stage? Including the change management capability required to embed the changes?
- Is the project clear on how the relevant documents and people will carry knowledge and learning across life cycle stage boundaries?

Risk management, and why it's important

"If we are serious about meeting objectives successfully, improving service delivery and achieving value for money, risk management must be an essential and integral part of planning and decision-making."

The orange book: management of risk – HM Treasury and Government Finance Function 2020

"In many programmes we have reviewed, governments have not sufficiently recognised the inherent uncertainties and risks in early estimates..."

Lessons learned from major programmes – National Audit Office 2020

Risk
Management

RM
06

Why risk management matters

Risk is defined as the uncertainty of outcome, whether the positive opportunity or negative threat, of actions and events that may be within or outside the control of a project. The identification, assessment, and management of such factors are core activities of risk management. Effective risk management is a fundamental part of successful project management. It is critical to project success, not only increasing the likelihood of meeting the project's objectives, but also generating efficiencies in delivery, improving the quality of results, maximising value for money and optimising societal value.

The risk appetite and tolerance of the sponsor, client, asset manager and market organisations will inform the risk management arrangements you adopt. Early engagement across these organisations and with other stakeholders is critical to understand the project risk profile and to make sure everyone is aligned on the project's intended outcomes and benefits. To realise value for money, risks should be allocated to the party best placed to manage them. Major project learning has continually demonstrated that trying to maximise risk transfer generally leads to outcomes that result in poor value for money. A full understanding of the risk profile informs both early-stage cost estimates and procurement costs. It is important to consider not only specific delivery risks but also the wider macro-economic implications associated with finance, credit risk and the status of the insurance market, as well as public health, climate risk and evolving societal trends. This will also support the development of the economic and commercial components of the business case.

Creating the right organisational culture is key to the management of risk. Transparency, honesty, and open discussion will ensure that uncertainty is acknowledged and the response is fair and objective. Project leaders should actively promote these behaviours, supported by robust processes. Governance structures need to clearly identify roles and responsibilities for the management of risk. This will ensure the project has a comprehensive understanding of its assumptions and risks and can make realistic assessments of the impact on cost and schedule forecasts as well as the project's wider outputs, outcomes and benefits.

This module can help to assess whether existing or proposed risk management arrangements are suitable for the scale or the complexity of your project.

What are the key project documents?

If you are seeking to find out more or to review the existing risk management arrangements on your project, the typical documents and reports set out below may contain information that will help.

- Project delivery plan
- Risk management plan, including the risk register
- Benefits realisation plan, including the benefits register
- Business case, in particular the strategic , commercial, and economic cases
- Change control procedure
- Terms of reference for decision bodies, including role descriptions
- Corporate charters or codes of conduct
- Contracts, third-party agreements (including any guarantees) and insurance documentation
- Cost management plan
- Environmental impact assessments (EIA)(including climate risk assessments)
- Equality impact assessments (EqIA)
- Health and safety plan
- Procurement strategy
- Sustainability strategy
- Stakeholder map and engagement plan
- Political, economic, sociological, technological, legal and environmental (PESTLE) analysis
- Strengths, weaknesses, opportunities, threats (SWOT) analysis.

Not all projects will have all of these documents, particularly in the earliest stages of development.

Typical findings

● Primary module
◑ Other relevant modules

Typical findings relating to risk management

This list describes situations that might arise and would indicate that the approach to developing project risk management needs improvement. Other relevant modules may also help you close identified capability gaps

Relevant modules

Typical finding	Requirements	Governance	Systems Integration	Organisational Design & Development	Procurement	Risk Management	Asset Management	Delivery Planning
Sponsor and client organisations attempt to transfer maximum risk as opposed to placing risks where they are best able to be managed.		◑		◑	●	●		◑
Management time is not focused on identifying and clearly allocating key risks, resulting in uncertainty about where residual unallocated risks may lie.		◑			◑	●		
The desired project culture is not being role-modelled in leaders' behaviours. For example, instead of collaborating on risk management, a more silo-based approach is evident.		●		●		●		◑
Senior management have inconsistent views on the top risks facing the project.		◑	◑		●	●		◑
There is no clear understanding of sustainability-related risks, such as reputational damage or non-compliance with legal requirements	◑	●			●	●		
Accountability for risk does not match the organisation's capability or appetite to manage it.		◑	◑	●	●	●		
Decisions are made without an appreciation of the change in risk exposure.		●		◑		●	◑	
There is no clear understanding of risk allocation, nor collaboration between organisations to assist each other in risk mitigation.		●		◑	●	◑	◑	◑
Cost plans and schedules do not adequately factor in the possible impact of risks.		◑			●	●		
Through the life of the project there is little provision for, or anticipation of, potential scope changes caused by external factors.	●		◑		◑	●		
Assurance activities, reporting and actions are duplicative, lack objectivity or are not focused on the areas of greatest risk.		●		◑		●		
Outcomes from assurance activities are not followed up with appropriate rigour and discipline to ensure they have been effectively addressed and closed out.		●				●		◑

Pillars of effective risk management

The four pillars below summarise the characteristics of effective risk management.

Pillar 1: Defining the boundaries | 1

- Understanding the project's current and future economic, environmental and social context is critical to identifying fully the strategic risks to the project's success.
- Early stakeholder engagement will help you to build the risk profile to inform early estimates.
- Be clear on the project's key dependencies, interfaces, underpinning assumptions and commitments (including public commitments).

Pillar 2: Making risk-based decisions | 2

- It is important to have an honest dialogue around risk and reflect that uncertainty in the decision-making process.
- There should be defined accountabilities and authorities for the management of risks across the sponsor, client, market and asset manager organisations.
- There should be clear criteria and routes for the timely escalation of risks.
- It is also critical to ensure that the right behaviours (such as collaborative problem solving) are embedded to manage project risks effectively.

Pillar 3: Building risk capability and confidence | 3

- Risk management should be viewed as a core discipline and all parties must have the necessary capabilities to fulfil their risk management responsibilities, drawing upon specialist advice as appropriate.
- It is important to develop a common understanding of the risk profile.
- Early-stage risk should be assessed utilising industry recognised quantification methods to inform estimates of cost and schedule, factoring in optimism bias as appropriate. This will provide internal and external stakeholder confidence.

Pillar 4: Maximising value | 4

- Success depends on understanding and managing the impacts of uncertainty and risk from the earliest stage.
- Appropriate risk allocation must be aligned to risk appetite, ability to influence and capability. These factors will help to identify the best party to manage each type of risk.
- Embedding effective controls and pre-emptive, quick-response mechanisms will maximise opportunities to realise benefits and value, including to the wider economy, environment and society.

These four pillars underpin an effective risk management framework for infrastructure projects. If one pillar is missing or out of balance, the risk management arrangements will likely be ineffective or inefficient. The pillars are expanded in the considerations section of this module.

The arrangements for managing risk might need to evolve during the project, so you should revisit the considerations at major transition points or approval points, or as plans change.

Risk managements arrangements should evolve as:

- more information becomes available, the sponsor increases their understanding of risk and the effectiveness of the project's risk management arrangements is demonstrated
- the project team and their processes develop and embed
- the project progresses through its life cycle, from design and planning through implementation to operation

Considerations

Module Pillars

The considerations questions help you understand the root causes of the capability gaps and suggest improvements. You may not need to review all the considerations, just use the most relevant ones for your project.

Considerations

Each pillar is expanded into a number of consideration questions. These questions will help you:

- to review and validate existing risk management arrangements
- to target areas for improvement
- to test the design of new risk management arrangements

What may help

Signposts other related material which you might find helpful. These include other relevant modules with related content, key project documents, good practice examples and suggested further reading.

Routemap uses four primary roles to describe the key areas of responsibility in the early stages of project development. These are sponsor, client, asset manager and market. Before reading through the detailed considerations, you should familiarise yourself with these definitions in the glossary and consider which organisation is fulfilling which role for your project. Sometimes an organisation can fulfil more than one of these roles, for example both the sponsor and client roles. Also, where a project is still at an early stage, a role might not yet be filled by any organisation, for example the market role.

Considerations:

Pillar 1 Defining the boundaries

Considerations	What may help

Objectives
- Have the project's objectives been agreed, articulated and communicated by the sponsor and client?
- Have these been tested and/or validated?
- Do they take account of strategic risks? For example, changes in supply markets.
- Have the risks to the project objectives been considered in the broadest terms? Including political, force majeure (for example pandemic related risk), environmental, social, technological, legislative, economic or financial (for example credit risk)?
- How sensitive are the objectives to changes in the external environment? Is there an awareness of potential changes that may influence the project's objectives during its life cycle? For example, legislation linked to net zero and ESG.

Rq 01 **AM** 07

Business case (strategic), PESTLE analysis and risk register

Example 1 and 3

Aligned and linked
- Are the project's outcomes aligned across the sponsor, client, market and asset manager?
- Are the project requirements and scope linked to the sponsor's objectives?

Rq 01

Benefits
- Have the objectives and target operating model for the operating phase been defined?
- Is there a clear understanding of the intended benefits, including wider economic, environmental and social benefits, and the intended beneficiaries?
- Is there a clear link through the project's inputs, outputs, and operational performance to the delivery of benefits?
- Is there an understanding of how the project's risks may impact the project's intended benefits?

Rq 01 **AM** 07

Stakeholder map and engagement plan

Example 1

Considerations:

Pillar 1 Defining the boundaries

Considerations	What may help

Stakeholders
- Who are the significant stakeholders in the project?
- What are their vested interests in the project? For example, do they support the project, are they against it, or are they neutral?
- Are there any political, national or regional risks in addition to the project's specific risks?
- Has a stakeholder engagement plan been developed?
- Does the plan identify the significance of the interfaces and the potential implications on the project's risk profile?
- Is it clear how the findings from stakeholder engagement inform the identification of project risks?

Rq 01 **DP** 08

Stakeholder map and engagement plan

Example 1

Commitments
- What early public commitments and announcements have been made about the project? Do these include any commitments to economic, social and environmental standards or initiatives?
- Have these been informed by an assessment of risk?
- At what level have these commitments been made? For example, local and national, internal or public?
- Have these been clearly communicated to all relevant stakeholders, including project affected communities, in a method that is accessible and understandable?

Rq 01

Contracts and third-party agreements

Assumptions
- What are the project's significant assumptions? For example, costs, environmental targets, benefits and schedule. How have they been documented and communicated?
- How significant will the impact be if they are not true?
- How likely are they to be true?
- What degree of control does the project have on these significant assumptions?
- How and with whom have these been tested?

Business case (strategic) and cost management plan

Suggested reading 1 and 2

Considerations:

Pillar 1 Defining the boundaries

Considerations	What may help

Dependencies
- What dependencies exist that are of significant importance to the project's success?
- Are there other projects or operations on which this project is dependent?
- Are other projects or operations dependent on this project?
- Is the project dependent on any social or political factors, such as support from elected officials?

What may help

SI 03
Systems Integration

Business case (strategic) and contracts and third-party agreements

Example 3

Impacts
- Are the project's inputs, outputs and outcomes mapped to wider economic, social and environmental impacts? Including those impacts which extend beyond the party delivering the project.
- Has a robust environmental impact assessment (EIA) and equality impact assessment (EqIA) been conducted to identify relevant opportunities and risks? Have mitigation and monitoring measures been implemented in response to the findings of the EIA and EqIA?
- Does the project have access to specialists to support the identification, quantification, allocation and management of risks? Including specialists on economic, environmental and social risk?
- Have the risks of climate change on the successful delivery of benefits been considered? These may include:
  - physical - acute risks, including droughts, floods, extreme precipitation and wildfires; or chronic risks, including rising temperatures, the expansion of tropical pests and diseases into temperate zones, and an accelerating loss of biodiversity
  - policy - changes in regulation/policy towards a low carbon economy
  - technological - changes in technology away from fossil fuel reliance leading to the risk of stranded assets
  - markets - changes in consumer behaviour
  - legal - the legal risk of non-compliance with climate legislation or sustainability-related regulation
- Are risks profiled over time and the impact on future generations and specific populations understood (for example, any impacts on climate risk)?

Rq 01
Requirements

EIA and EqIA

Examples 1, 2 and 3

Suggested Reading 18 and 19

Considerations:

Pillar 2 Making risk-based decisions

Considerations	What may help

Decisions

■ Is uncertainty considered as part of the decision-making process? Does the business case make adequate provision for uncertainty?

■ When options are compared, is relative uncertainty recognised? (Less mature options will be less well defined and will naturally have higher levels of uncertainty, as less research and analysis has been undertaken on them).

■ Are the risks to achieving the project's objectives considered when making decisions? Are early decisions informed by an assessment of the risk to the operating phase and the realisation of benefits?

■ Is the decision-making approach holistic, including consideration of the impact of risks on the economy, environment and society?

■ Is decision-making informed through consultation with key stakeholders (including project affected communities)?

■ Is scenario planning used as an aid to decision-making (for example, have different climate scenarios been considered)?

Rq 01 Requirements

Terms of reference for decision bodies, including role descriptions, change control procedure, business case (economic) and stakeholder map and engagement plan

Examples 1, 5 and 6

Governance

■ Does the governance framework establish accountability for the management of risk between sponsor, client and the market?

■ Has the governance framework been designed proportionately to the level of risk being managed at each level of the project's governance structure? For example, independent attendees at board meetings, additional resources and specialist skills.

■ Is the delegation of authority clear and sufficient to enable the effective and efficient management of risk?

■ Are the catastrophic risks (low probability/high impact risks) that could affect the project understood by the sponsor, client, market and the asset manager and are they being monitored?

■ Does the governance framework require that risk exposure is considered when making decisions?

■ Is the process for reporting of risk exposure to the governing bodies clear?

■ Is the project management team/executive held to account for the management of risk by the sponsor?

■ Is the project's change control process integrated with risk and contingency management activities? Is there clarity on risk ownership that aligns with the levels of delegated authority linked to change management?

■ Is there a mechanism to report concerns and complaints, available to all stakeholders including the project team? Can it be accessed easily and anonymously? For example, concerns relating to health and safety, discrimination, harassment or bullying, bribery, corruption or modern slavery.

■ Are the criteria for risk escalation clear? Do the escalation criteria include cost, time, quality, safety as well as wider economic, environmental and social matters? Do they describe which risks should be held or dealt with at project, programme and portfolio level?

■ Are the escalation routes through projects and programmes to portfolio level clear?

■ Are there mechanisms for analysing and aggregating risks at portfolio level? Have possible efficiencies been considered? For example, grouping of risks by root cause to determine a suitable level of contingency.

Gv 02 Governance

Terms of reference for decision bodies, including role descriptions, change control procedure and project delivery plan

Examples 2 and 11

Suggested reading 3 and 4

Considerations:

Pillar 2 Making risk-based decisions

Considerations	What may help

Behaviour

- Are the desired risk behaviours and culture understood, defined, communicated, and promoted?
- Are arrangements in place to encourage and support desired risk-taking behaviours and discourage inappropriate risk behaviours? For example, rewards for successful mitigations or conversion of opportunities.
- Are there awareness training activities around new types of risk that need to be considered? For example, those linked to cyber security, economic, environmental and social risks.
- Does the project's leadership seek assurance that the desired risk culture and behaviours are being adopted? Do they direct and manage any corrective action required?
- Does the project's leadership promote transparency throughout the project through the open and honest discussion of risk?
- Are project team members encouraged to escalate risks and opportunities? Do they feel safe to raise concerns? Are there appropriate processes or forums in place to enable this?
- Is the project team applying consistent behaviours as part of the risk management process?
- Is experience and learning valued in the project team? Has all prior project experience been effectively tapped into at the outset? Are arrangements in place to gain insights from external perspectives of the project throughout its life cycle?

What may help

Governance **Gv** 02   Organisational Design & Development **OD** 04

Corporate charters or codes of conduct and contracts and third-party agreements

Examples 5, 7 and 12

Suggested reading 5 and 6

Considerations:

Pillar 3 Building risk capability and confidence

Considerations	What may help

Capability

- Are sponsors risk-aware and comfortable dealing with uncertainty?
- Is there a common level of awareness and understanding of risk between sponsors and client?
- Is risk management an inherent part of project planning and evaluation?
- Does the project's leadership view risk management as a core business process? For example, the management of economic, environmental and social risks.
- Does the project's board or executive committee routinely and proactively discuss risk exposure?
- Have all the parties with responsibility for risk management been identified? These include sponsors, clients, developers, contractors, operators, maintainers, funders and financiers.
- Are their responsibilities for risk management clear and understood?
- Are they suitably capable and empowered to manage the risks and opportunities that they have been allocated?
- Do the organisations involved have in-house expertise in risk management (including for economic, environmental and social risk management), or is this outsourced? If outsourced, how is risk management overseen, and related incentives linked back to the organisation?
- Do the organisations have access to required skillsets for specialist risk areas? For example, addressing modern slavery, bribery or corruption.
- Has a maturity assessment taken place to evaluate the organisations' risk capability?
- How has the market demonstrated that it understands the allocation of risk in the contract? Do they exhibit the necessary behaviours to manage that risk?
- Do contractual incentives align supply chain behaviours with the project's objectives and outcomes? For example, wider economic, environmental and social targets.
- Are there inappropriate incentives in the contract that could discourage active risk management by the supply chain?
- Is the team responsible for the communication of risks to stakeholders, including project affected communities, adequately resourced and skilled? Is this team able to communicate with stakeholders in a meaningful and effective way?

Pr 05   Procurement

OD 04   Organisational Design & Development

Terms of reference for decision bodies, including role descriptions and contracts and third-party agreements

Examples 1 and 11

Considerations:

Pillar 3 Building risk capability and confidence

Considerations	What may help

Assessment of risk

- Do cost and schedule estimates include realistic assessments for risk and uncertainty? In particular:
  - Have recognised estimation techniques been used? Are they appropriate for this stage of the project's life cycle? For example, quantified risk analysis or reference class forecasting.
  - Are forecasts given with accuracy ranges? For example, ranges as outlined in the IPA's cost estimating guidance document?
  - What was the rationale for any contingency levels or application of optimism bias techniques?
- Is the risk assessment trusted? Have sponsors and other stakeholders been involved? Has the assessment been independently reviewed and verified?
- Is the risk assessment comprehensive? Does it consider:
  - the full range of uncertainty, taking into account the nature and scale of the risks across the whole life of the asset?
  - catastrophic risks (low probability, high impact)?
  - wider macro-economic implications associated with finance and credit risk?
  - potential emergent risks? For example, risk of non-compliance with likely future legislation around net zero targets or social value.
  - which risks will be covered by insurance, those that insurance will not cover and will have to be retained by the client or sponsor organisations? For example, terrorism risk.
  - all assumptions and exclusions?
  - interdependencies that lead to systemic risk?
  - the perspectives of all key stakeholders, including project affected communities?
- Will follow up assessments be carried out to monitor the evolution of these risks over the project's life cycle?
- Has a formal qualitative and quantitative assessment of risk been carried out within the environmental (EIA) and equality impact (EqIA) assessments?

Risk management plan, including the risk register, EIA, EqIA, PESTLE analysis and SWOT analysis

Examples 2, 3, 5 and 8

Suggested reading 2, 6 and 7

Considerations:

Pillar 4 Maximising value

Considerations	What may help

Risk allocation and appetite

- Is the level of risk associated with the project understood by all parties involved in delivering it?
- Does the sponsor understand the ability and desire of the other organisations involved to manage risk, and their financial capacity to absorb risk should it occur?
- Is there a common understanding of risk ownership and respective roles and responsibilities? In particular, prior to contract award.
- Has the allocation of risk been properly considered? In particular:
    - Is it understood which risks would be uneconomical to allocate to a particular party? For example, risks associated with operational assets might reside best with the asset manager.
    - Is it understood which risks the sponsor might retain to stabilise the project and improve value for money?
- Are risks appropriately allocated to parties best placed to manage them? Is this reflected in the procurement strategy? Has specialist legal advice been sought in the drafting of documentation relating to risk allocation? For example, conditions of contract or indemnities.
- Has the potential for misalignment between risk appetite and capability, between sponsors, funders, the client and the market been tested? In particular with the market, to ensure there is sufficient risk appetite.
- Is there transparent communication on risk allocation with prospective suppliers and the supply chain? Does this lead to a joint risk register to promote a collaborative and proactive approach to risk management?
- Do reputational and commercial incentives align with the allocation of risk?
- Do all parties understand the potential impact of economic, environmental and social risks or opportunities on the value that the project is expected to deliver?

What may help

Procurement

Pr 05

Risk management plan, procurement strategy, business case (commercial) and contracts and third-party agreements

Examples 5, 7, 10 and 11

Suggested reading 8, 9 and 10

Considerations:

Pillar 4 Maximising value

Considerations	What may help

Processes

- Is there a project board or executive member accountable for the effectiveness of the risk management process?
- Is a recognised risk management methodology being used? Does it include clear and measurable indicators and baseline data? Does it include a robust methodology for capturing and managing economic, environmental and social risks? How do these inform the quantification and prioritisation of risk?
- Is risk management a part of a comprehensive and robust set of control processes?
- Does routine reporting include the extent, nature and changes in risk profile?
- Are there procedures in place to ensure that risks will be managed in a timely and effective manner?
- Are suitable indicators in place to measure the effectiveness of the risk management process and changes in risk exposure?
- Does the risk management process capture opportunities for enhancing positive economic, environmental and social impact?
- Is contingency budget allocated with reference to risk exposure?
- Is there a robust contingency management process linked to the control of change? For example, are the root causes of change clearly linked to appropriate contingency funds?
- Are there appropriate resources and budget provisioned to effectively implement identified risk mitigations?
- Do project stage gates challenge the management of risk, in terms of both threats and opportunities?

Gv Governance 02 **DP** Delivery Planning 08

Risk management plan, change control procedure, business case (management) and cost management plan

Examples 6, 7 and 10

Good practice examples

Good practice examples	Pillar			
	Pillar 1: **Defining the boundaries** 1	Pillar 2: **Making risk-based decisions** 2	Pillar 3: **Building risk capability and confidence** 3	Pillar 4: **Maximising value** 4

It is important to assess how applicable each example is to your specific project, and tailor it as appropriate. This table shows which of the four pillars of good practice are characterised by each example.

	Pillar 1	Pillar 2	Pillar 3	Pillar 4
Example 1 Understanding strategic risk and the complexities of the delivery environment: A Highways England case study	●	●	●	
Example 2 An indicative risk matrix	●	●	●	
Example 3 Examples of project risks	●		●	
Example 4 Embedding climate risk assessment into asset management	●	●		
Example 5 Understanding the sources of strategic risk arising from key project relationships		●	●	●
Example 6 Confirming uncertainties are locked down through the project life cycle		●		●
Example 7 Using incentives to align behaviours and manage risk		●		●
Example 8 Applying different techniques to calculate the project's risk exposure			●	
Example 9 A risk-based approach to establishing contingency				●
Example 10 Alternative models for allocating contingency				●
Example 11 Allocating contingency based on accountability for managing risk		●	●	●
Example 12 An approach to behaviour risk management		●		

Good practice examples

Example 1

Understanding strategic risk and the complexities of the delivery environment: A Highways England case study

This example demonstrates how a consistent approach to risk management at project and programme level can inform strategic risk management and enhance decision-making at portfolio level. Highways England uses the principles of the Infrastructure and Projects Authority's risk potential assessment form (Suggested Reading 11) as a basis for their portfolio risk management approach. The form is designed to provide a standard set of high-level criteria for assessing the strategic risk potential of programmes and projects.

Consistent application of the risk potential assessment form by Highways England projects provides a cross-portfolio view of their outcomes and associated strategic risks and complexities. This understanding is used to make systemic changes to protect and enhance value across the whole portfolio, not just single projects. For example, where specific skillsets or resources are needed.

The use of the project complexity data in this way promotes integrated working, efficiency and increases collaboration across disciplines. This contributes to the maturity of Highways England's strategic decision-making during early stages by increasing the alignment between project and programme complexities and the necessary capabilities and other enhancements to ensure more successful portfolio outcomes.

Pillar 1: **Defining accountability**
1

Pillar 2: **Making risk-based decisions**
2

Pillar 3: **Building risk capability and confidence**
3

Pillar 4: Maximising value
4

Risk potential assessment at project level

Table A Consequential impact assessment A strategic assessment of the consequential impact should the project/programme fail to deliver its objectives to time, cost or quality.

Political	Public	Financial
Operational business and commercial change	Dependencies	

Table B Programme/project complexity assessment An assessment of the complexity factors that may affect the achievement of the programme/project objectives.
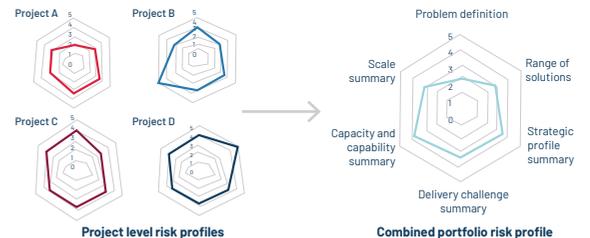
Problem definition	Strategic profile	Delivery challenge	
■ How well is the problem understood? ■ Is the problem statement clearly articulated?	■ Political ■ Public ■ Business performance ■ Organisational objectives	■ Policy/legal ■ Security ■ Requirements for business change ■ Technology ■ Supplier delivery	■ Financial provision ■ Governance ■ Stakeholders ■ Dependences ■ Change and implementation

Range of solutions	Capacity and capability	Scale
■ Number of solutions ■ Validity and feasibility ■ Link to original issue	■ Programme or project team ■ Stakeholders and organisation ■ Suppliers ■ Strategic leadership	■ Time ■ Budget ■ Benefits ■ Quality

Table C Risk potential assessment Plot overall assessments from Table A and Table B onto Table C, mark with a X to represent the overall risk potential assessment of the programme or project.

Table C			
Risk potential assessment			

Overall consequential impact assessment summary (Table A): High / Medium / Low

Overall complexity assessment (Table B): Low / Medium / High

(X marked at Medium/Medium)

Risk potential assessment at portfolio level

Each project/programme completes Table A – Consequential impact assessment and **Table B Programme/project complexity assessment** within the Highways England digital tool. Visual representations of risk profiles are then combined at a portfolio level to provide a strategic perspective of overall performance.

Project level risk profiles — Project A, Project B, Project C, Project D

Combined portfolio risk profile — Problem definition, Range of solutions, Strategic profile summary, Delivery challenge summary, Capacity and capability summary, Scale summary

Portfolio risk management is supported by the Benefits and Value team who:

■ facilitate workshops with project teams, sponsors and specialists to aim for consistency
■ inform portfolio risk management activities through the identification of systemic issues linked to project complexity.
■ assist in project action planning to mitigate risks and enhance opportunities
■ report data and plans to project and programme committees

Complexity factor: capacity and capability

Programme or project team / Stakeholder and organisations / Strategic leadership and business culture / Suppliers

Complexity factor: scale

Benefits / Budget / Quality / Timescales

At portfolio level, the ability to drill down to particular complexity factors allows:

■ identification of common issues and challenges
■ systemic and targeted enhancements across the whole portfolio
■ informed dialogue with the supply chain on common issues
■ highlighting areas for lessons learned on effective risk mitigation plans

Good practice examples

Example 2
An indicative risk matrix

Some types of risk lend themselves to a numerical quantification – particularly financial risk. For other risks – for example reputational risk – a much more subjective view is all that is possible. It will be necessary, however, to develop a framework for assessing all your project's risks. This assessment needs to be done by evaluating both the likelihood of the risk being realised, and of the impact if the risk is realised.

A categorisation of high/medium/low in respect of each may be sufficient and should be the minimum level of categorisation. This results in a "3x3" risk matrix.

A more detailed analytical scale may be appropriate, especially if clear quantitative evaluation can be applied to the particular risk. "5x5" matrices are often used as shown in this example.

There is no absolute standard for the scale of risk matrices (the scales in the example are indicative only and will need to be tailored to your project and its context). The organisation should reach a judgement about the level of analysis that is most practicable in the circumstances. You should pay particular attention to risks that are low probability but will have a major impact; whether or not suitable insurance can be procured, as well as continuity planning should they occur. For example, a major tunnel collapse or public health emergency.

A risk matrix like this can be used to track the effectiveness of risk mitigations and residual risk. It will also focus senior management attention on "top" or new risks as they are identified.

Pillar 1: **Defining accountability**	Pillar 2: **Making risk-based decisions**	Pillar 3: **Building risk capability and confidence**	Pillar 4: Maximising value
1	**2**	**3**	**4**

The table below is indicative of a £500m project.

Impact / Likelihood	1 – Very low	2 – Low	3 – Medium	4 – High	5 – Very high
5 – Very high	5	10	15	20	25
4 – High	4	8	12	16	20
3 – Medium	3	6	9	12	15
2 – Low	2	4	6	8	10
1 – Very low	1	2	3	4	5

Example risks:

Economic uncertainty

Design development delay

Condition of existing assets

Impact	Likelihood	Commercial impact	Schedule impact	Health and safety impact	Reputational impact	Economic, environmental and social impact	Benefits impact
1 – Very Low	1 – Very low (0–20%)	Minimal cost impact (£10,000)	Minimal schedule impact (<1 day)	No safety impact	Minimal reputational damage	No or limited impacts	No benefits impact
2 – Low	2 – Low (20–40%)	£100,000	1 week	Minor reportable health and safety incident	Some press impacting reputation	Minor negative impacts on economic and social value	Minor delays or reduction to benefits realisation
3 – Medium	3 – Medium (40–60%)	£1m	1 month	Multiple reportable health and safety incidents	Reporting in trade press impacting reputation	Specific measurable impact that will require investment or change to address	The benefits realised will be reduced or significantly delayed
4 – High	4 – High (60–80%)	£10m	1 year	Life changing injury	Significant reputational damage from local/regional press	Regulatory non compliance issues	The benefits realised will be significantly reduced
5 – Very High	5 – Very High (80%+)	Significant commercial impact (£100m)	Significant schedule impact (many years)	Death	Significant reputational damage from global press	Major contravention of statutory policy	Unable to deliver 'most' of the benefits or many 'key' benefits

Good practice examples

Example 3
Examples of project risks

Effective risk management requires that project leadership recognises the importance of risk management, and actively promote its use throughout the project. The sponsor, client, asset manager and market must share an understanding of the project's objectives, the risks to achieving those objectives and who owns them.

Risks arising from the wider delivery environment of the project must be understood and considered. Some of these may be external to the project team's control. The complexity assessment in the Routemap handbook can help you to identify these. You may also wish to seek specialist advice to identify certain types of risk for example, wider economic, environmental and social risks.

Identifying and responding to these risks early will help you to avoid future negative impacts, for example, operational/construction delays, compensation payments to project affected persons, reputational damage from protests or lack of public support for the project. It is also particularly important to be aware that there is often limited capability, amongst those affected by these risks to mitigate them by themselves.

Infrastructure delivery risks	Environmental and social risks	Public health emergency risks
Infrastructure project risks can be many and varied. When identifying risks, it is essential to remember that not all risks are negative. In addition to considering where there are threats to the project, it is beneficial to look for potential opportunities that can be captured to enhance the delivery and/or outcomes.	Infrastructure projects also can lead to a number of environmental and social risks due to their often large-scale, and labour and resource intensive nature. There is a broad range of environmental and social risks with varying levels of likelihood and severity.	The risk of a public health emergency, such as that caused by Covid-19 (Coronavirus), should also be assessed. You should consider the impact of a public health emergency (and the associated changes to work practices) and how the proposed design could be adapted accordingly. In addition, the potential impact this may have on the cost, time and quality of outputs, and subsequent impact on the expected project outcomes.

Some examples of infrastructure risks are listed below, but these are not exhaustive:

- funding availability
- economic uncertainty - inflation, exchange rates, commodity prices and availability of labour
- lack of clear functional requirements
- design development
- estimating uncertainty
- delay to obtaining consents and approvals
- access
- existing asset conditions
- interfaces between delivery entities or contracts
- delivery risks (quality, productivity, environmental incidents)
- commercial and supply chain management (insolvency risks, performance issues)
- systems integration
- technical assurance
- operational readiness
- health and safety

Some examples of environmental and social risks are listed below, but these are not exhaustive:

- impacts on biodiversity and ecosystems
- increased greenhouse gas emissions, pollution and unsustainable use of natural resources
- achieving policy and regulatory targets. For example, net zero and Paris Agreement.
- destruction and degradation of natural habitats
- public mistrust of the project and/or active protest
- unclear land ownership rights
- illegal labour practices, such as modern slavery
- failure to deliver social value outcomes, such as local jobs and training
- failure to establish expected environmental and social standards could impact stakeholder, public and political support
- coordination of the environmental and social policies of the broader enterprise and supply chain
- business case implications of environmental and social policies

This is notably important for infrastructure projects that involve public services. Contracts for such projects should deal with:

- how the service may be affected in such an emergency
- how the impact of any such emergency should be reflected in the payment flows
- how the infrastructure may need to be requisitioned or adapted
- whether the service should continue to be provided in a different way
- whether the force majeure provisions should or should not apply

You should develop a detailed plan for any such emergency.

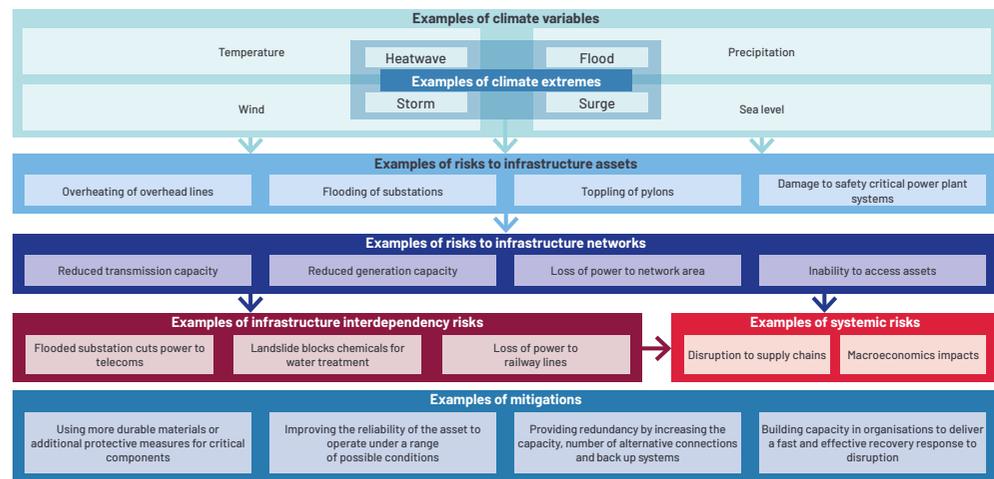| Pillar 1: **Defining accountability**	Pillar 2: Making risk-based decisions	Pillar 3: **Building risk capability and confidence**	Pillar 4: Maximising value
1	2	**3**	4

Good practice examples

Example 4
Embedding climate risk assessment into asset management

This example, based on the UK climate change risk assessment 2017 evidence report (Suggested Reading 17), presents a useful framework for assessing climate change risk for infrastructure assets. To ensure that assets have long-term resilience, it is essential that future infrastructure investment, including the adaptation of existing infrastructure, is considered in the context of the potential climate risks. A more recent appraisal of climate risks is available in the 2021 evidence report (Suggested Reading 18).

Climate risk is a function of the likelihood of a climatic event, and the magnitude of the associated impacts, both positive and negative. A risk assessment must consider a wide range of possible climatic conditions and should be specific to the project. A consistent methodology should be used to ensure that an organisation-wide climate risk profile is available to inform strategic decision-making on long-term investment.

It is recommended that climate risk assessments should consider:

- analysis of climate variables – lifetime future projections of temperature, rainfall, storm surges, wind speed - if the asset is based in a particular location, then projections should be localised
- characterisation of each infrastructure asset - fragility (against different risks - heat, cold, wind) and capacity (impact on the wider network if it fails)
- network-wide effects caused by asset failures - impacts on multiple components and/or system functions (electricity distribution, rail network transit) and existing mitigations (back up, redundancies)
- analysis of interactions and interdependencies between infrastructure networks to understand cascading impacts. For example, an electricity outage shutting down a water treatment plant
- assessment of systemic risks caused by network-level failures and exacerbated by cascading impacts. For example, loss of infrastructure services that lead to indirect impacts on economic growth, social wellbeing and environmental protection
- assessment of existing or planned adaptations/resilience measures and mitigations, including society-wide policies. For example, national water usage restrictions increasing the resilience of the water supply

Climate risk mitigations might address risks at the asset level (such as the installation of fire suppression systems) or at higher levels (such as back up assets to improve network resilience). These mitigations should be considered in the context of the economic, environmental and social benefits that the project or portfolio is seeking to realise.
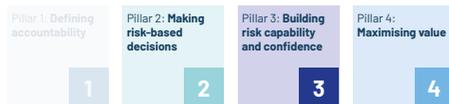
Good practice examples

Example 5
Understanding the sources of strategic risk arising from key project relationships

This is a useful table of common sources of strategic risk arising from the sponsor and client relationship and from the client and market relationship. You can cross check this list against the project's strategic risk register. The sponsor, client and market should work together to reduce (mitigate) the risk exposure.

A particularly key risk at these two interfaces is that project requirements (including the standards expected) are not cascaded appropriately. There needs to be clear articulation and agreement of requirements to prevent misunderstanding.

Sponsor and client relationship	Client and market relationship
■ defining the investment need and business case	■ establishing the procurement strategy, commercial model and incentivisation
■ responding to government priorities and the external environment	■ building high performing teams with appropriate level of integration
■ managing corporate affairs and public relations	■ developing capability by managing resources and creating collaborative partnerships
■ complying with legal, regulatory and tax frameworks	■ providing leadership and motivational alignment
■ developing policies and strategic plans	■ establishing the safety duty holders and safety management systems
■ securing financing and funding	■ investigating the site and data gathering
■ obtaining powers to construct and operate	■ managing contracts and work authorisations
■ specifying the sponsor's requirements and the targeted benefits	■ implementing the works, including the management and coordination of interfaces
■ defining the engineering requirements, standards and developing the reference design	■ managing insurance warranties and third-party compensation
■ developing estimates and schedules that support the investment and business case	■ managing results and confidence in cost forecasts
■ providing leadership and maintaining alignment	■ confirming operational viability
■ managing risk, governance and assurance	■ achieving operational readiness
■ managing results and outturn confidence	
■ addressing third-party compensation	
■ maintaining business continuity during force majeure and catastrophic events	
■ integrating systems and commissioning the works	
■ progressive benefits realisation	

Pillar 1: Defining accountability — 1
Pillar 2: **Making risk-based decisions** — 2
Pillar 3: **Building risk capability and confidence** — 3
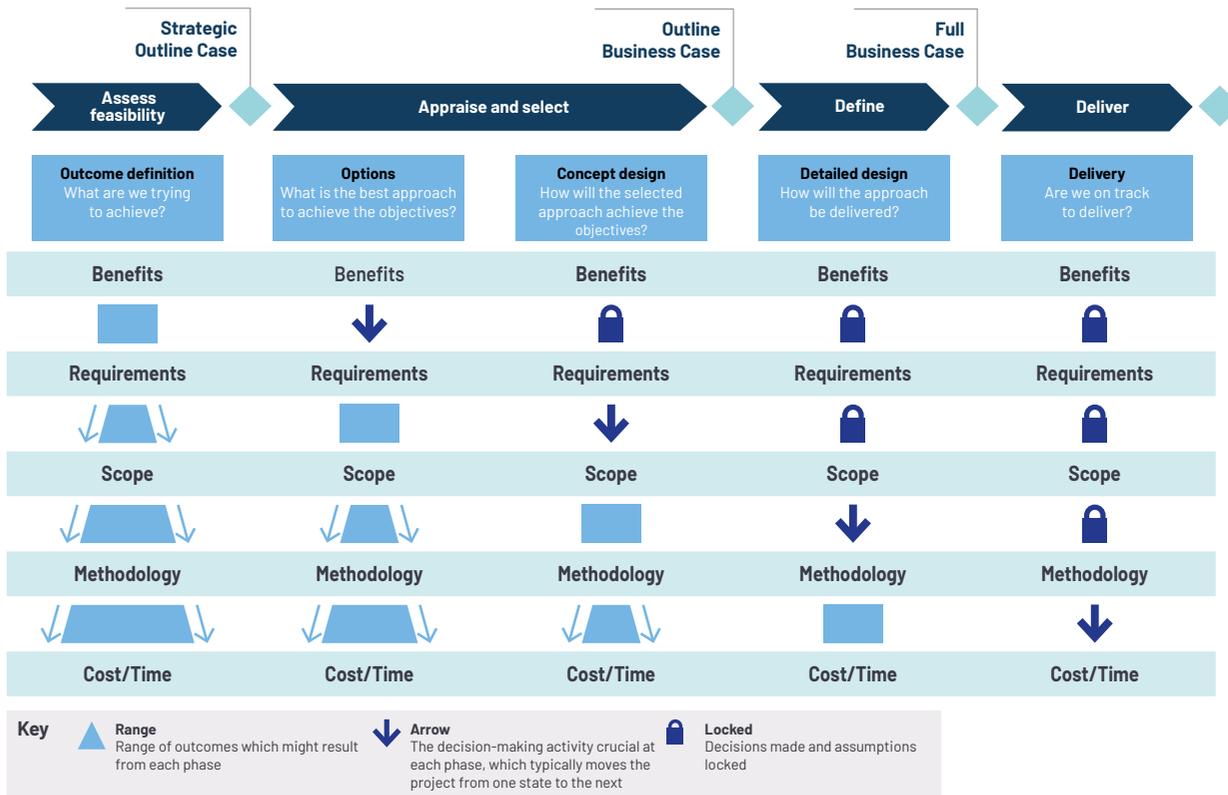Pillar 4: **Maximising value** — 4

Good practice examples

Example 6

Confirming uncertainties are locked down through the project life cycle

It is only possible to progress a project by taking decisions, making assumptions or accepting ranges of uncertainty. This illustration shows a project's journey through its life cycle, using the gates between stages to confirm sources of uncertainty have been locked down. Once locked down, change control should be employed if iteration is required. This is most difficult on novel or highly complex schemes, where there is a lack of benchmarking or reference class data.

It is crucial the estimates for cost and time are prepared with a clear strategy for dealing with all residual uncertainties, otherwise the actual cost and time might vary significantly from the estimates. Where early-stage uncertainties are not locked (because of poorly defined benefits or user requirements), significant and unexpected variation can remain into the delivery stage.

For further information, please refer to Suggested Reading 2.

Pillar 1: Defining accountability **1**

Pillar 2: **Making risk-based decisions** **2**

Pillar 3: Building risk capability and confidence **3**

Pillar 4: **Maximising value** **4**

	Strategic Outline Case		Outline Business Case	Full Business Case	
	Assess feasibility	**Appraise and select**		**Define**	**Deliver**

Outcome definition	Options	Concept design	Detailed design	Delivery
What are we trying to achieve?	What is the best approach to achieve the objectives?	How will the selected approach achieve the objectives?	How will the approach be delivered?	Are we on track to deliver?

Benefits / Requirements / Scope / Methodology / Cost/Time

Key

Range — Range of outcomes which might result from each phase

Arrow — The decision-making activity crucial at each phase, which typically moves the project from one state to the next

Locked — Decisions made and assumptions locked

Good practice examples

Example 7
Using incentives to align behaviours and manage risk

Incentives drive behaviours and can be an effective form of risk management. However, the organisations delivering a project are often incentivised differently and misaligned incentives create a significant source of risk. Here, we show how incentives can align organisations to protect the benefits and costs of a business case.

Incentives do not need to just be hard financial ones – often politics or risk to reputation provide equally strong incentives. They might be used to align parties around strategic objectives or to focus effort on completing a specific task. You can test the value of an incentive by considering the relationship between objectives, risk and the behaviours encouraged by the incentive. Capability and risk appetite are important considerations when designing incentives.
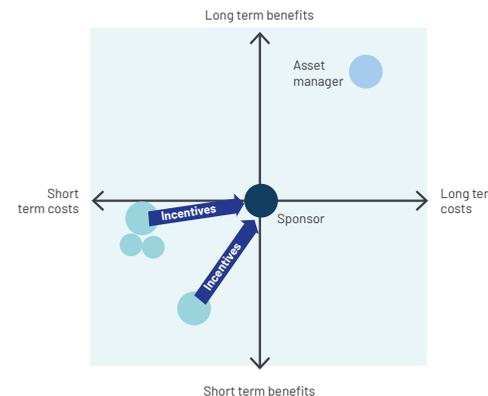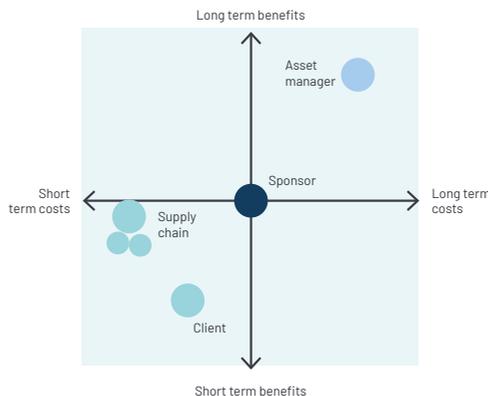
The importance of understanding incentives is widely recognised and is a powerful means of promoting collaboration by aligning behaviours. By mapping incentives to the delivery of a project business case, potential conflicts can be identified. In response, changes to the delivery plan can be made to promote greater alignment. Keeping the incentive map under review as the project progresses, and relationships change, is vital to managing risk exposure.

Collective programme level incentives can align different stakeholders' objectives and promote collaboration on the management of project risks. The figures below show how a project could plan incentives to align stakeholders more closely to the optimum balance of long-term and short-term benefits.

Pillar 1: Defining accountability	Pillar 2: Making risk-based decisions	Pillar 3: Building risk capability and confidence	Pillar 4: Maximising value
1	2	3	4

There are four steps to this mapping exercise:

Step 1	Step 2	Step 3	Step 4
The sponsor describes the optimum balance between long-term and short-term benefits, and long-term and short-term costs in the business case (often expressed as a benefit cost ratio). This is represented as the centre of the axes in the figures below.	The business case is delivered through cooperation between the sponsor, client, asset manager and supply chain. Each party has an influence over the risk to its benefit cost ratio – indicated by the area of each circle.	Competing priorities and commercial pressures often shift individual attention on to either short-term or long-term gain, and away from the optimum benefit cost ratio – shown by the divergent points on the graph (left). The asset manager's primary focus will generally be the long-term benefits and operating costs.	An incentive provides a means to align behaviour around the collective management of risk to the benefit cost ratio in the business case – indicated by the arrows (right).

Good practice examples

Example 8
Applying different techniques to calculate the project's risk exposure

This example explains how reference class forecasting (RCF) and quantitative risk assessment (QRA) can be used to quantify risk exposure and to inform the level of project contingency required.
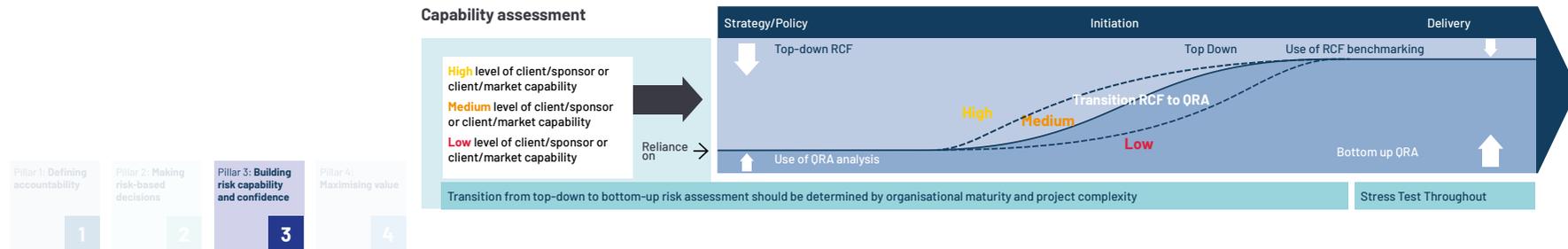
Having defined the project complexity, capability and assumptions, you need to quantify the risk exposure, to inform the level of project contingency required. There are a number of approaches to risk quantification and their reliability will depend on the maturity and depth of knowledge on the project.

Reference class forecasting (RCF) is a top-down approach that uses past project results and relates them to the project in question. Statistical methods are used to analyse large samples of projects, to provide a reliable reference class, which is relevant to the new project's circumstances. Often, different reference classes are used in relation to different parts of the project scope

Quantitative risk assessment (QRA) is generated bottom-up by identifying specific risks, costing their impacts (if they were to occur) and building them into a model of how you perceive the project might work out.

One or other of these approaches may be more appropriate at a given point in the project life cycle. Top-down RCF is more appropriate at the beginning of a project, as there will be many uncertainties and opportunities for the project to evolve along different routes. As the project nears completion, a bottom-up QRA approach will be more applicable, as there will be detailed information available about most aspects of the project and fewer remaining uncertainties.

The degree of project definition and organisational maturity (in terms of both capability and processes), will determine at what point the risk model will change from a top-down RCF to a bottom-up QRA. A more mature project, with a high level of capability will begin to rely more on QRA than RCF earlier in the project life cycle than a project with lower capability. However, this should occur when there are still significant options open for a meaningful bottom-up risk model. The figure below shows how the project may change its approach to calculating risk exposure over the course of project development.

Capability assessment

High level of client/sponsor or client/market capability

Medium level of client/sponsor or client/market capability

Low level of client/sponsor or client/market capability

Reliance on →

Strategy/Policy | Initiation | Delivery

Top-down RCF | Top Down | Use of RCF benchmarking

High

Medium | Transition RCF to QRA

Low

Use of QRA analysis | Bottom up QRA

Transition from top-down to bottom-up risk assessment should be determined by organisational maturity and project complexity

Stress Test Throughout

Pillar 1: **Defining accountability** — 1

Pillar 2: **Making risk-based decisions** — 2

Pillar 3: **Building risk capability and confidence** — 3
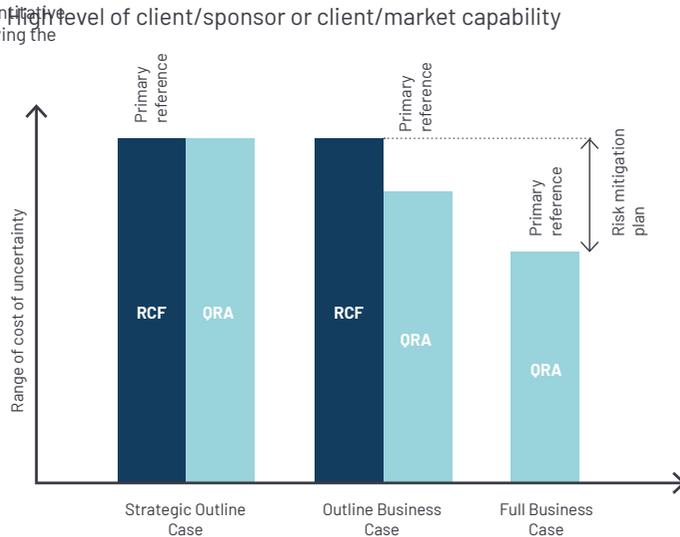
Pillar 4: **Maximising value** — 4

Good practice examples

Example 8
Applying different techniques to calculate the project's risk exposure

These illustrations below also demonstrate that the ability to switch from reference class forecasting to quantitative risk assessment depends on the project team having the necessary capabilities.

High level of client/sponsor or client/market capability

Low level of client/sponsor or client/market capability

Key points
The high combined capability of the organisations involved meant that:
- The switch from RCF to QRA could happen sooner
- The estimated cost range reduced more quickly as a result of improved accuracy from QRA

Key points
The low combined capability of the organisations involved meant that:
- The switch from RCF to QRA was unable to take place
- The estimated cost range did not reduce and therefore the business case was not sufficiently robust as more accurate QRA was not undertaken

Pillar 1: **Defining accountability** 1

Pillar 2: **Making risk-based decisions** 2

Pillar 3: **Building risk capability and confidence** 3

Pillar 4: **Maximising value** 4

Good practice examples

Example 9
A risk-based approach to establishing contingency

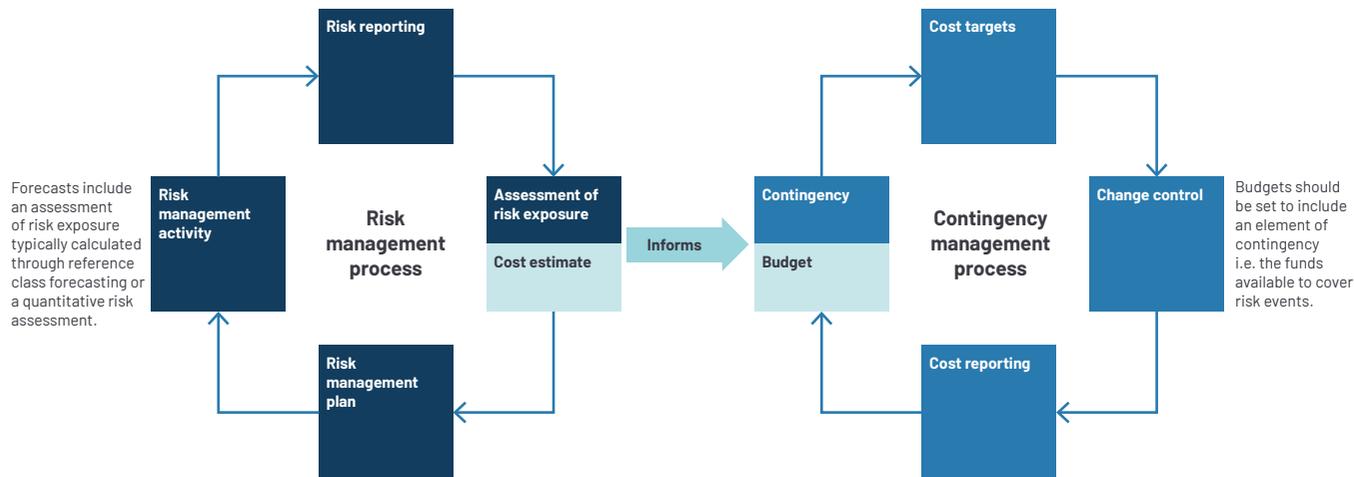This example illustrates how the risk management process informs the level of project contingency required. This will help to protect your project from the financial impact of risks if they occur during its life cycle.

Once you have determined, allocated and mitigated your risks, you should establish a specific budget – known as contingency – to guard against the impact of the risk. The contingency should be held by the appropriate organisation, but all the organisations involved in the project should agree how it will be managed throughout the project's life.

The contingency will need to be reviewed and, if required, adjusted over the course of the project's life, to reflect any changes in circumstance or context.

Forecasts include an assessment of risk exposure typically calculated through reference class forecasting or a quantitative risk assessment.

Risk reporting

Risk management activity

Risk management process

Assessment of risk exposure

Cost estimate

Informs

Risk management plan

Cost targets

Contingency

Budget

Contingency management process

Change control

Cost reporting

Budgets should be set to include an element of contingency i.e. the funds available to cover risk events.

It is important to understand the difference between budget and forecast. While projects typically have limited funds with which to deliver their objectives (the budget), the genuine assessment of the anticipated final cost (the forecast) will vary over the life of the works. Controls should be set up to maintain fixed budgets, but allow forecasts to properly reflect changing circumstances, for example, emerging issues, changing delivery performance and risk.

Pillar 1: Defining accountability

1

Pillar 2: Making risk-based decisions

2

Pillar 3: Building risk capability and confidence

3

Pillar 4:
Maximising value

4

Good practice examples

Example 10
Alternative models for allocating contingency

Here are three alternative models for allocating contingency:

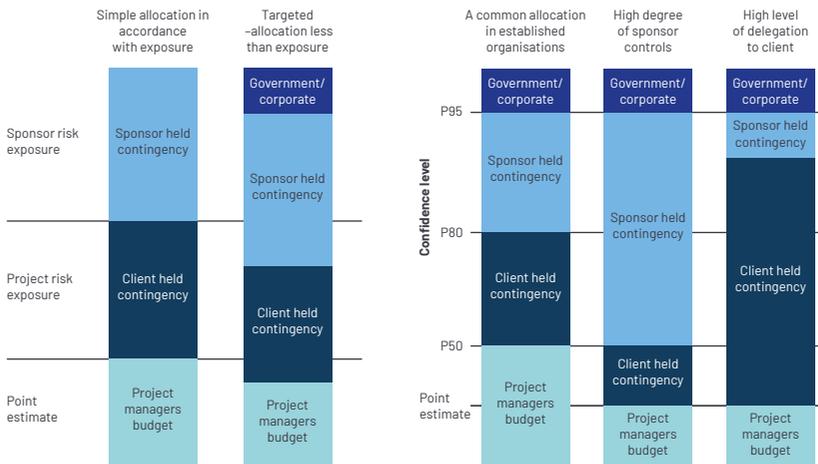**Example 1: Contingency allocated in accordance with exposure**
- Budget led contingency allocation based on categories of risk owned by sponsor and client.
- Contingency allocation sized according to the risk exposure of each party.
- Targeted allocation creates stretch target for risk reduction, by allocating contingency less than assessed exposure.

Example 2: Contingency allocated according to overall project confidence levels
- Forecast led contingency allocation based on risk assessed levels of confidence.
- Likely to be adopted where sponsor and/or client are risk mature (or plans are in place to become so), risk allocation is clear and a well-developed quantified risk assessment is available.

Example 3: Contingency held at portfolio, programme and project levels
- An organisation may benefit from maintaining a 'portfolio' contingency to cover extraordinary risks.
- This approach can accommodate a range of different project models within an overarching framework.
- Managing risk and holding contingency at the portfolio level can be more efficient than providing each project with contingency to cover common risks.

Note
In each example, the 'point estimate' is the estimated cost impact should the risk crystallise calculated through reference class forecasting (RCF) or quantitative risk assessment (QRA). This is a point estimate only, as it does not account for the distribution of risk outcomes.

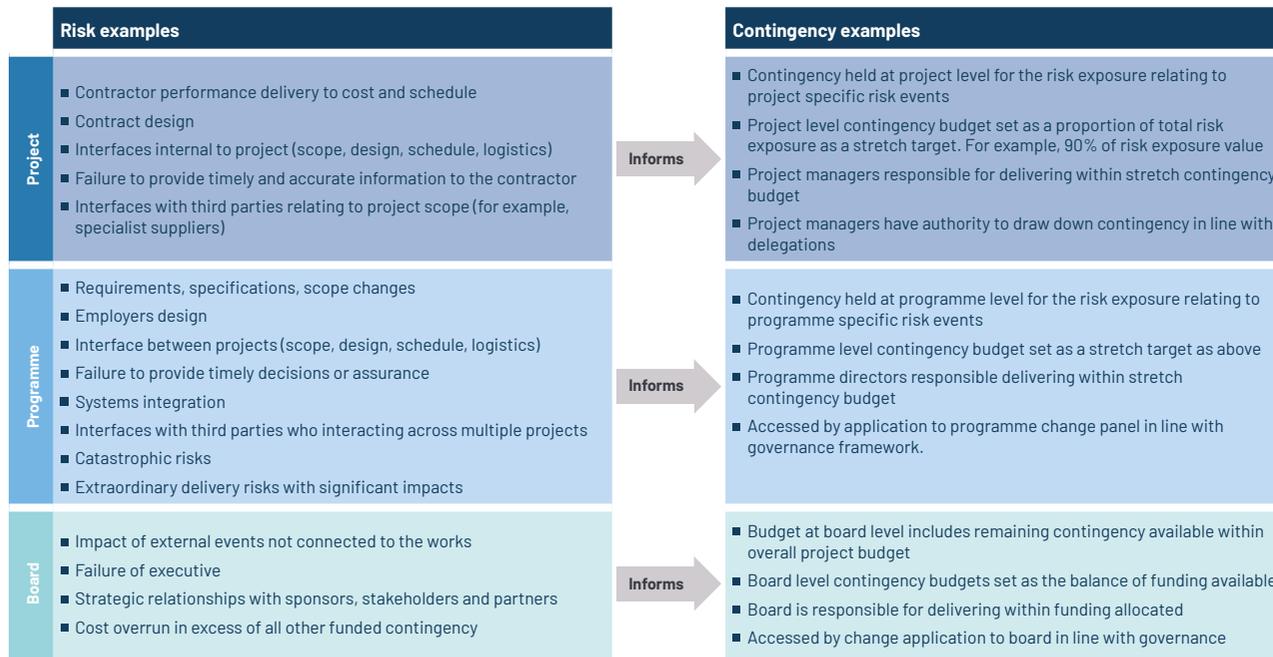| Pillar 1: Defining accountability	Pillar 2: Making risk-based decisions	Pillar 3: Building risk capability and confidence	Pillar 4: Maximising value
1	2	3	4

Good practice examples

Example 11
Allocating contingency based on accountability for managing risk

This example presents an indicative example of how risks and the associated contingencies are held and managed at various levels of the governance structure.

It is important that accountability for managing risk is clear at each level. This will make it easier to allocate ownership of contingency budgets and to set them at a level which is proportionate to the risk exposure that is being managed.

Accountability for managing risk is also important when defining the procurement strategy. It will inform the debate on which risks the supply chain should manage. Explicitly describing these risks in the contract has proved valuable to projects.

Risk examples	Contingency examples
Project ■ Contractor performance delivery to cost and schedule ■ Contract design ■ Interfaces internal to project (scope, design, schedule, logistics) ■ Failure to provide timely and accurate information to the contractor ■ Interfaces with third parties relating to project scope (for example, specialist suppliers)	■ Contingency held at project level for the risk exposure relating to project specific risk events ■ Project level contingency budget set as a proportion of total risk exposure as a stretch target. For example, 90% of risk exposure value ■ Project managers responsible for delivering within stretch contingency budget ■ Project managers have authority to draw down contingency in line with delegations
Programme ■ Requirements, specifications, scope changes ■ Employers design ■ Interface between projects (scope, design, schedule, logistics) ■ Failure to provide timely decisions or assurance ■ Systems integration ■ Interfaces with third parties who interacting across multiple projects ■ Catastrophic risks ■ Extraordinary delivery risks with significant impacts	■ Contingency held at programme level for the risk exposure relating to programme specific risk events ■ Programme level contingency budget set as a stretch target as above ■ Programme directors responsible delivering within stretch contingency budget ■ Accessed by application to programme change panel in line with governance framework.
Board ■ Impact of external events not connected to the works ■ Failure of executive ■ Strategic relationships with sponsors, stakeholders and partners ■ Cost overrun in excess of all other funded contingency	■ Budget at board level includes remaining contingency available within overall project budget ■ Board level contingency budgets set as the balance of funding available ■ Board is responsible for delivering within funding allocated ■ Accessed by change application to board in line with governance

Informs (between Project and Contingency)
Informs (between Programme and Contingency)
Informs (between Board and Contingency)

Pillar 1: Defining accountability — **1**

Pillar 2: **Making risk-based decisions** — **2**

Pillar 3: **Building risk capability and confidence** — **3**

Pillar 4: **Maximising value** — **4**

Good practice examples

Example 12
An approach to behaviour risk management

This example details how a project organisation within the aviation sector enhanced the effectiveness of its risk management by promoting the right culture and behaviours.

The client's objective was to provide uninterrupted digital infrastructure to Europe's largest hub airport through a multi-million-pound capital upgrade. Given the level of complexity and high stakes, the client needed to have full visibility of all threats that could prevent them from operating the current infrastructure uninterrupted whilst the upgrade was delivered.

To establish the desired risk management culture, the risk management team worked with change experts to understand the behaviours, knowledge, skills and capabilities required for the desired culture and mapped them against the existing "as is" state.

Next, they prepared a detailed gap analysis together with recommendations on the people, process, governance and system changes required to embed the new culture. The recommendations were implemented through a 12 week change programme.

Key components of the new active risk management approach	Key success criteria and actions taken
Project leadership set the 'tone from the top'	■ An organisation's risk culture and associated behaviours are driven by its leadership. The enterprise risk management strategy contained a vision statement written by the project director which described the desired risk culture and the required behaviours including transparency and ongoing open and honest discussion. ■ Behaviours were role modelled by the project director and other project board members to set the 'tone from the top'. For example, by chairing joint risk workshops to which all members of the supply chain were invited.
Client and supply chain organisations agree a common approach to collaborative working	■ To support the enterprise risk management strategy and vision, the client and supply chain partners co-developed a practical approach to collaborative working based on the ISO 44001 Collaborative Working industry standard (Suggested Reading 12). ■ This was captured in the form of a charter which explained how the required behaviours, such as supporting others, no 'blame' and speaking out, would support successful delivery. The charter was signed by the client organisation and all supply chain partners and communicated widely. Compliance with the charter was self-assured though all parties were encouraged to actively challenge each other in month end reviews, particularly if commercial needs were being placed ahead of the needs of the project.
Continuous and ongoing dialogue to manage operational risk	■ The client and supply chain partners had identified the potential conflict between reducing operational risks and abortive capital spend. In addition to continuous informal dialogue, the regular joint risk workshops provided a forum for open discussion and timely resolution of these issues resulting in reduced abortive costs of unnecessary maintenance works on assets due for replacement. ■ Stakeholders were also consulted regularly including the ultimate operators, to ensure risks were raised and dealt with in a timely manner.
Clear and regular communications about risk	■ The importance of identifying and escalating risks was promoted through all divisional communications. Strong and explicit communication about risk was a core departmental objective. The risk escalation hierarchy was a clear part of all communications.
Embed the changes to drive long term success	■ The risk management culture and expected behaviours were detailed in the induction packs for all new starters and integrated into project and operations handbooks. Real project examples were used to reinforce the effectiveness of positive risk management behaviours. The culture and behaviours became recognised as "business as usual" ways of working to both new and long-term project staff.

Pillar 1: Defining accountability **1**

Pillar 2: **Making risk-based decisions** **2**

Pillar 3: Building risk capability and confidence **3**

Pillar 4: Maximising value **4**

This behaviour-based approach had a direct impact on capital delivery performance. Lower contingency levels were needed due to the higher confidence in the operational interfaces and reduced need to manage defects. This enabled the supply chain to transition from delivering projects with contingency of 15% to contingency of 5%, this released budget for other capital programmes. The enhanced approach was also recognised by the organisation's external auditors as good practice.

Suggested further reading

Reference	Use
1 **Guidance** [The green book: appraisal and evaluation in central government - HM Treasury 2020](#)	This guidance issued by HM Treasury outlines how to appraise policies, programmes and projects. It also provides advice on the design and use of monitoring and evaluation before, during and after implementation.
2 **Guidance** [Cost estimating guidance: a best practice approach for infrastructure projects and projects – Infrastructure and Projects Authority - 2021](#)	This document sets out a best practice approach to cost estimating which should be used by all major infrastructure projects and programmes in the UK.
3 **Standard** [The orange book: management of risk – HM Treasury and Government Finance Function 2020](#)	This guidance establishes the concept of risk management and provides a basic introduction to its concepts, development and implementation of risk management processes in government organisations.
4 **Guidance** [Management of risk in government: framework – Cabinet Office 2017](#)	Provides a new model for risk management in government. It is intended as useful guidance for board members and risk practitioners.
5 **Guidance** [Principles for project success – Infrastructure and Projects Authority 2020](#)	A quick guide for practitioners on things to get right for any project to succeed.
6 **Study** [Optimism bias study: recommended adjustments to optimism bias uplifts - Department for Transport 2017](#)	A study on optimism bias in the context of rail infrastructure projects.
7 **Guidance** Project risk analysis and management mini-guide - Association for Project management 2018	Outlines processes involved in project risk management to help new practitioners get started.
8 **Policy** [The construction playbook – Cabinet Office 2020](#)	Sets out key policies and guidance for how public works projects and programmes are assessed, procured and delivered.
9 **Guidance** Control of risk: a guide to the systematic management of risk from construction (SP125) and Engaging with risk in construction (RP995) – Construction Industry Research and Information Association 2021	Introduces the processes of systematic risk management to clients.

Suggested further reading

Reference	Use
10 **Guidance** PPP risk allocation tool 2019 edition – Global Infrastructure Hub 2020	A tool designed to assist both the public and private sector in appropriately allocating risks across a variety of infrastructure projects.
11 **Guidance** Risk potential assessment form – Infrastructure and Projects Authority 2018	The risk potential assessment form is used to assess the strategic risk potential of programmes and projects. The form should be completed as early in the life of a change initiative as possible, for example, when policy is being formulated.
12 **Standard** ISO 44001 Collaborative business relationships management system - International Organization for Standardization 2017	Identifies requirements for the effective identification, development and management of collaborative business relationships within or between organisations.
13 **Report** Lessons learned from major programmes - National Audit Office 2020	An insight to the most recent National Audit Office reports on major programmes, including Crossrail, Carrier Strike and Universal Credit.
14 **Guidance** Risk analysis and management for projects – Institution of Civil Engineers 2014	A framework for analysing and managing the risks involved in projects.
15 **Standard** ISO 31000 - Risk management - International Organization for Standardization 2018	Sets out standards to help organisations increase the likelihood of achieving objectives, identifying opportunities and threats and effectively allocating resources for risk treatment.
16 **Research and analysis** Updating the evidence behind the optimism bias uplifts for transport appraisals- Department for Transport 2021	Provides updated evidence for optimism bias uplift use in Reference Class Forecasting (RCF) for transport appraisals.
17 **Guidance** Futures toolkit: tools for strategic futures for policy-makers and analysts – Cabinet Office and Government Office for Science 2018	Summarises what futures thinking is, how it can be used in policy making and describes a series of tools that can be used by policy makers to manage in uncertainty and identify future actions.
18 **Research and analysis** Climate Change Risk Assessment - Department for Environment, Food & Rural Affairs - 2017	Information on the UK's climate change risk assessment, which details climate risks and opportunities in the UK and advice on national adaptations.

Suggested further reading

Reference		Use
19	**Website** Taskforce of Climate-Related Financial Disclosures	Website of the Taskforce on Climate-Related Financial Disclosures, set up to improve and increase reporting on climate matters. The Taskforce makes recommendations on climate-related financial disclosures which are widely adoptable and applicable to organisations across sectors and jurisdictions.

Glossary

Accountability
The accountable person is the individual who is ultimately answerable for an activity or decision. This includes 'yes' or 'no' authority and veto power. Only one accountable person can be held to account. An accountable person has to be accountable to someone for something. Accountability cannot be delegated or shared.

The responsible person is the individual who actually undertakes the task: in other words, they manage the action/implementation. Responsibility can be shared. The degree of responsibility is determined by the individual with the accountability.

Asset
Anything tangible or intangible that is owned or controlled with the expectation of present or future benefit.

Asset manager
In the context of Routemap, the asset manager is the organisation (or parts of) responsible for day-to-day operations and maintenance of the asset. The asset manager may be a part of the sponsor or client organisations, or a separate entity. Similarly, the operator and maintainer of the assets may be separate entities.

Assurance
A general term for the confidence that can be derived from objective information over the successful conduct of activities, the efficient and effective design and operation of internal control, compliance with internal and external requirements, and the production of insightful and credible information to support decision-making.

Benefits
In the context of project delivery, benefit is the measurable value or other positive impact resulting from an outcome perceived as an advantage by one or more stakeholders, and which contributes towards one or more objectives.

Capability
In the context of Routemap, capability describes the ability of the sponsor, client, asset manager and market to organise for effective and efficient delivery. It refers to all or part of an organisation, and not the individual.

Client
In the context of Routemap, the client is the organisation that is responsible for undertaking the work to fulfil the sponsor's requirements. The client translates the requirements from the sponsor and manages the delivery. The client selects the most appropriate suppliers. In some contexts, the sponsor and client could be from the same organisation.

Client model
The client model refers to how the client structures and resources the project. The model will set out how delivery, transition and operational activities will be split between the client, advisors/partners and supply chain (in-house versus external) to ensure a successful outcome and realisation of the sponsor's goals.

Complexity
In the context of Routemap, project complexity is a measure of the inherent difficulty of delivering a project. This is assessed on factors such as the stability of the wider delivery environment, the level of innovation required, and the number of stakeholders involved.

Delivery model
The delivery model is the form of structural and commercial arrangements to be deployed to meet the sponsors requirements. The selected model should be the best option from those available, taking into account the capabilities and constraints of the project. For example, the creation of an arm's-length body like High Speed 2 or the formation of a special purpose vehicle as has been used to deliver Thames Tideway Tunnel.

Delivery strategy
The delivery strategy describes how the selected delivery model will be implemented and how it will need to change over time.

Environmental, economic and social value
The impact a project has on the environment, economy, and society. This may be global or localised, and may result both from meeting the project's objectives (for example, improved transport links) and from by-products of delivery (for example, job creation). It relates to reducing negative impacts as well as increasing positive impacts, and it is important that value delivered against one category is not at the expense of another (for example, delivering economic development but at significant cost to local biodiversity).

Glossary

Environmental, social and governance (ESG) criteria
These are key criteria for sustainability reporting, in response to widespread investor and consumer demand. They are also increasingly used to inform investment decision making.

Governance
Governance defines relationships and the distribution of rights and responsibilities among those who work with and in the organisation. It determines the rules and procedures through which the organisation's objectives are set and provides the means of attaining those objectives and monitoring performance.

Market
In the context of Routemap, the market comprises organisations which integrate and compete to deliver goods or services to one or more clients. This includes

- the players, for example, sellers/buyers/partner
- the rules, for example, regulation, legislation
- processes, for example, procurement, delivery
- structure, for example, relationships between buyers, sellers, partners

Optimism bias
The demonstrated and systematic tendency to overemphasise positive benefits and opportunities and undervalue the costs and negative risks of projects. This bias should be quantified when developing cost plans and schedules.

Outcomes
The result of change, normally affecting real-world behaviour or circumstances. Outcomes are desired when a change is conceived. Outcomes are achieved as a result of the activities undertaken to effect the change; they are the manifestation of part or all of the new state conceived in the target operating model.

Outputs
A specialist product (the tangible or intangible artefact) that is produced, constructed or created as a result of a planned activity and handed over to users.

Requirements
Requirements are the project stakeholders' wants and needs, clearly defined and with acceptance criteria.

Risk
The effect of uncertainty on objectives. Risk is usually expressed in terms of causes, potential events, and their consequences.

- a cause is an element which alone or in combination has the potential to give rise to risk
- an event is an occurrence or change of a set of circumstances and can be something that is expected which does not happen or something that is not expected which does happen.
- the consequences are the outcomes of an event affecting objectives, which can be certain or uncertain, can have positive or negative direct or indirect effects on objectives, can be expressed qualitatively or quantitatively.

Risk appetite
The nature and extent of risks that an organisation is willing to take.

Risk tolerance
The threshold levels of risk exposure that, with appropriate approvals, can be exceeded, but which when exceeded will trigger some form of response

Senior Responsible Owner (SRO)
All UK government projects will have a senior responsible owner. They are accountable to the sponsor organisation for a programme or project meeting its objectives, delivering the projected outcomes and realising the required benefits. The senior responsible owner is the owner of the business case and accountable for governance. The senior responsible owner of a government major project is ultimately accountable to Parliament.

Sponsor
In the context of Routemap, the sponsor is an organisation that secures the funding, oversees the business case and is responsible for specifying the requirements to the client. In some contexts, the sponsor and client could be the same organisations.

Stakeholders
Any individual, group or organisation that can affect or be affected by or perceive itself to be affected by an initiative (programme, project, activity or risk).

Glossary

Sustainability
This means making the necessary decisions now to stimulate economic growth, maximise wellbeing and protect the environment, without affecting the ability of future generations to do the same.

Target operating model
The target operating model refers to how the asset or change will be funded, owned, operated and maintained once the project has closed.

Transition points
Points at which a project moves from one stage to another. For example, delivery to operations.

UN Sustainable Development Goals (SDGs):
Adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated and recognise that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

Acknowledgements

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