Infrastructure and Projects Authority

UK Government

Project Development Routemap

for Infrastructure Projects

International Module

Interactive document

Risk Management

International version of UK Government's Project Routemap

Rationale Ra 01 | Governance Gv 02 | Systems Integration SI 03 | Execution Strategy ES 04 | Organisational Design & Development OD 05 | Procurement Pr 06 | Risk Management RM 07 | Asset Management AM 08 | Handbook Hb 00

Any enquiries regarding this publication may be sent to us by email at ipa@ipa.gov.uk.

Contents

Preface

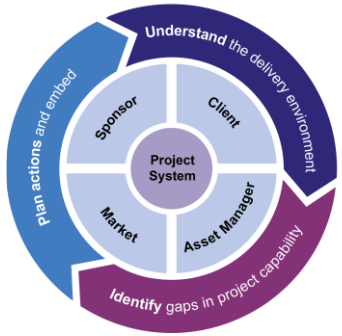
The UK Infrastructure and Projects Authority (IPA)[1] is proud to present this international module on the Project Development Routemap for Infrastructure Projects.

Projects that enhance and expand access to infrastructure are critical to achieving inclusive, sustainable growth and reducing poverty. However, infrastructure projects often encounter problems in their early stages. Poor project development constrains project delivery and limits the benefits it can drive from investment.

The Project Development Routemap (Routemap) is a structured and tested methodology used to set up projects for success. It ensures best practice and learning about the most common causes of project failure are considered at crucial early stages of development. In this module, we use the term 'project' to encompass projects, programmes and portfolios.

Routemap principles are core to any infrastructure project, and especially helpful where project teams undertake complex projects that test the limits of their organisational capability. It is a structured approach that brings project stakeholders together, to improve project-specific capabilities, enable governments and supply chains to maximise value for money and, where appropriate, increase opportunities for international investment. It gives confidence to people developing projects, those approving them, and those investing in them.

Since 2012, Routemap has been applied in the UK to projects totalling over £300bn, with significant and sustained impact on public policy, professional practice and economic benefit.[2]



Routemap aligns with the G20 Principles for the Infrastructure Project Preparation Phase (the G20 Principles), the United Nations Sustainable Development Goals (in particular, supporting environmental and social sustainability) and was identified by the Global Infrastructure Hub as a leading practice in good project preparation.

This international module was produced as part of the Global Infrastructure Programme[3], sponsored by the UK's Prosperity Fund[4] to provide practical instruction on the Routemap. It builds on both UK and international experience and is tailored to the needs of audiences in a broad range of countries. The IPA would like to thank the United Kingdom's Foreign, Commonwealth and Development Office and embassies, and the governments of Colombia and Indonesia who have provided invaluable assistance in the development of the Routemap for international use.

We hope this guidance is useful, practical and will improve the quality of infrastructure development in your country.

[1] 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.

[2] The Project Development Routemap has been adapted from the UK Project Initiation Routemap, 2016, now replaced by Project Routemap, 2021: https://www.gov.uk/government/publications/improving-infrastructure-delivery-project-initiation-routemap.

[3] This was a UK cross-government programme delivered by the FCDO, the IPA and the Department for Business Energy and Industrial Strategy. It aimed to enable the provision of sustainable and resilient infrastructure, as a critical enabler for economic development in middle-income countries.

[4] The Prosperity Fund supported the UN Sustainable Development Goals and the 2015 UK Aid Strategy by promoting growth and prosperity in developing countries.

Introduction: Routemap Modules

The Routemap modules (modules) help you to identify and address gaps in capability across seven commonly challenging areas of project development. You should use these modules alongside the *Project Development Routemap for Infrastructure Projects: International Handbook*.[5]

The Handbook explains the Routemap methodology and describes the 10-step process for its application to projects, which results in a detailed action plan to close the gaps in project capability.

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

- Rationale
- Governance
- Execution Strategy
- Organisational Design & Development
- Procurement
- Risk Management
- Asset Management
- Systems Integration (UK module, included due to relevance for international audiences)

The module content applies to all types of infrastructure projects, including PPP and publicly funded projects. It supports project teams to identify risks to project outputs, and wider economic, environmental and social outcomes. It helps align projects to the G20 principles of 'quality infrastructure',[6] internationally recognised standards like the International Finance Corporation Performance Standards,[7] and the United Nations Sustainable Development Goals.

There are also examples of good practice to help project teams plan and improve project development. They come from the experience of UK public sector-driven infrastructure projects and from international authorities. Examples have been specifically selected for relevance to international audiences.

Routemap modules can be:

- useful when applying the Routemap 10-step process which is described in the Routemap handbook (the following diagram shows how the sections of the module support different steps in the process)
- a stand-alone resource 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.[8] They are based on real-world experience from large infrastructure projects and complement best practice found elsewhere. You need to consider each project's individual characteristics and context and then you can identify what will be most helpful to the project.

[5] Infrastructure and Projects Authority's Project Development Routemap for Infrastructure Projects: International Handbook, 2023: https://www.gov.uk/government/publications/project-development-routemap

[6] These non-binding principles reflect the G20's common strategic direction and aspiration for quality infrastructure investment: https://www.g20-insights.org/related_literature/g20-japan-principles-quality-infrastructure-investment/

[7] See Section 1 and Appendix E of the Routemap Handbook for further detail on the importance of sustainability.

[8] For detailed guidance on infrastructure business cases and their development process, see: Infrastructure and Projects Authority's Infrastructure Business Case: International Guidance, 2022.

The Routemap modules are useful when applying the Routemap 10-step process which is described in the Handbook. The diagram below shows how the different sections of the modules (listed in the left column) can support the different steps in the process.

Module sections	Setup				Diagnosis			Action planning		
	Whether to apply the Routemap 01	When to apply the Routemap 02	Routemap strategy 03	Planning the application 04	Information gathering 05	Conducting a gap analysis 06	Agreeing the findings 07	Developing recommen -dations 08	Action planning 09	Integrate and capture benefits 10
Characteristics of good practice			Comparing your project information with these **characteristics of good practice** may help you to identify areas of interest in the Routemap scope			Comparing your project with these **characteristics of good practice** may help you identify areas for improvement.				
Useful documents			You may find it helpful to review these types of project **documents**, to define the areas of interest in the Routemap scope.		You may find these **documents** helpful to develop interview questions.	You may find it helpful to cross-check this **document** list against existing project documents, to help identify capability gaps.				
Typical findings						You may find helpful to review these when identifying issues and articulating your **findings**		If your **findings** contain statements like these, this Module could help strengthen capability.		
Considerations					This section lists a series of questions or **considerations** that can help you to validate the effectiveness of existing arrangements.			Working through these questions or **considerations** can help you understand the root causes of the findings and develop solutions.		
Good practice examples and suggested reading									You may find these **good practice examples and suggested reading** useful in developing actions to address capability gaps..	

Risk management, and why it is important

Effective risk management is critical to project success. Risk is defined as the uncertainty of outcome, whether the positive opportunity or negative threat, of actions and events. The identification, assessment, mitigation and monitoring of risk are core activities of risk management. Risk management increases the likelihood of meeting the project's objectives, saves time, improves the quality of results and value for money. It constantly looks towards uncertainties and managing change.

The process of considering risks brings the sponsor, client, asset manager and market closer together in understanding the activities required to deliver the programme. The risk management arrangements you adopt will depend upon the risk appetite and risk tolerance of these organisations. Cross-project input and collaboration is especially important for long-term, multi-organisation and complex project arrangements, such as PPP, public funded, and consortium-led projects. Such programmes often come with complex risk allocation and management strategies.

Infrastructure risks

International infrastructure project risks can be many and varied. They include:

- political
- currency exchange
- expropriation of assets
- repatriation of profits
- lack of internationally recognised dispute resolution channels
- non-transparency
- joint venture obligations with local companies
- unfamiliar business and labour laws and regulations
- economic changes relating to Environmental, Social and Governance (ESG) criteria and/or regulatory requirements, e.g. increasing prices of carbon offsetting

Environmental and social risks

Infrastructure projects also can lead to a number of environmental and social risks due to the often large scale, and labour and resource intensive nature of the projects. There is a broad range of environmental and social risks with varying levels of likelihood and severity. Some examples of environmental and social risks are listed below:

- impacts on biodiversity and ecosystems
- increased greenhouse gas emissions, pollution and unsustainable use of natural resources
- destruction and degradation of natural habitats
- public mistrust of the project and/or active protest
- unclear land ownership rights and potential displacement of communities
- health and safety risks
- sexual exploitation or abuse of vulnerable project affected persons
- illegal labour practices, such as child labour and modern slavery, or off-site construction practices

Public health emergency risks

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.

This is notably important for infrastructure projects that involve public services (which will include many PPPs). In particular, 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 change management plan for any such emergency.

Internationally recognised standards such as the IFC Performance Standards[9] provide useful frameworks to help you to identify potential environmental and social risks. As with all types of risk, identifying and responding to these risks early, will help you to avoid future negative impacts, e.g. operational/construction delays; compensation payments to project affected persons; reputational damage from protests; lack of public support for the project etc. 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.

[9] IFC Performance Standards, 2012, https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards

Effective risk management requires that:

- Project leadership recognise how important risk management is, and actively promote its use throughout the project.
- The sponsor, client, asset manager and market share an understanding of the project's objectives and the allocation of risks between them.
- Decisions are made, taking into account qualitative and quantitative assessments of risk and the project's risk appetite.
- A formal risk process exists, including for environmental and social risks. It is used by the project to support design and delivery activities and apportion accountability for risk mitigation, management, and reporting.
- Senior managers have a thorough understanding of its assumptions, uncertainties and risks, and can make a reasonable quantitative assessment of their impacts on cost and schedule forecasts.
- The socio-economic context of the project's area of influence is comprehensively assessed to identify risks, e.g. prevalence of gender-based violence, labour force participation rates, land use, livelihood patterns of populations neighbouring the project, relevant legislation, vulnerable and/or marginalised groups etc.
- Specialist input is sought for sensitive or high-risk environmental and social issues, e.g. resettlement and land acquisition, use and disposal of hazardous materials, sexual exploitation and abuse, and on the appropriate standards for their management, e.g. IFC Standards, Equator Principles.
- Risk management is recognised as an effective component of the assurance framework.
- Inputs and outputs of quantitative risk assessments are shared with sponsors and funders to provide confidence on delivery commitments.
- Risks within the wider delivery environment of the project are understood and considered. These may be external to the project team's control. The Complexity Assessment in the Routemap Handbook can help you to identify these.

The *IPA's Infrastructure Business Cases: International Guidance*[10] provides additional guidance – largely within the Management Case – on project risk identification, assessment and management through the business case stages. It also includes guidance on commissioning and overseeing in-depth environmental and social impact assessments (ESIAs) across the early and intermediate stage business cases.

Citation

'Risk management involves understanding, analysing and addressing risk to make sure organisations achieve their objectives. So, it must be proportionate to the complexity and type of organisation involved. Enterprise Risk Management (ERM) is an integrated and joined up approach to managing risk across an organisation and its extended networks.'

Institute for Risk Management[11].

[10] Infrastructure and Projects Authority's Infrastructure Business Case: International Guidance, 2022

[11] Institute for Risk Management: https://www.theirm.org/the-risk-profession/risk-management.aspx

Characteristics of good risk management

Risk Management can save time, improve quality and reduce the cost of achieving an agreed outcome. The following four pillars together characterise an effective risk management framework.

Pillars of effective risk management

Pillar 1: Defining the boundaries

- You need to understand the project's current and future socio-economic and environmental context and outcomes, to fully identify the strategic risks to the project's success
- Being clear on the project's key dependencies and underlying assumptions is also part of this.

Pillar 2: Informed decision-making

- You will need to make important decisions during the project's early stages when levels of uncertainty are high
- It is really important to reflect that uncertainty in the decision-making process, so that you understand the impact of decisions on the project's overall risk exposure

Pillar 3: Building Confidence

- Risk management should give confidence to internal and external project stakeholders.
- During early project development, risk management gives the sponsor confidence that the parties delivering the project are able to deal with uncertainty and mitigate risk, including risks to vulnerable people and places of high environmental and social value.

Pillar 4: Projecting Value

- Success depends on understanding, managing and mitigating the impacts of uncertainty and risk from the earliest stage.
- Appropriate risk allocation, effective control mechanisms and pre-emptive, quick-response actions will significantly protect project value. They minimise negative impacts to project-affected persons and maximise environmental and social benefits.

If one of the above pillars is missing or insufficiently addressed, the risk management arrangements will likely be ineffective or inefficient. Reviewing your risk management arrangements against these pillars can help to identify potential areas for improvement. The pillars are expanded in the *Considerations* section of this module.

In Routemap, these pillars support **(Step 6)** - *Gap analysis*. Considering them in the context of your current risk management arrangements can help you to identify areas for improvement.

Useful documents

These documents and reports usually contain information on risk management. They may be helpful when reviewing and developing the risk management arrangements for your project.

- Risk management plan
- Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis
- Political, Economic, Sociological, Technological, Legal and Environmental (PESTLE) analysis
- Stakeholder risk appetite assessment
- Due diligence material (including any environmental and social studies)
- Environmental and social impact assessment (ESIA)
- Environmental and social management plan (ESMP)
- Energy and carbon reporting
- Stakeholder management plan
- Early business case
- Governance arrangements
- Public announcements about the project
- Lessons learned reports from other relevant projects

You may find it useful to review these documents to identify the 'areas of interest' when scoping a Routemap **(Step 3)** – *Routemap strategy*.

These documents may also be helpful in **(Step 6)** - *Gap analysis*. When cross-checked against existing project documentation, they may help to identify capability gaps.

Typical findings related to risk management

This list describes typical issues that might arise during project development and would indicate that the approach to risk management needs improvement.

- ❑ Decisions are made without an appreciation of the change in risk exposure
- ❑ There are complex industry and stakeholder relationships that could cause confusion about the project purpose and influence public perception of the project
- ❑ Weak assessment of the socio-economic context of the project means key social risks and impacts to project affected persons are overlooked
- ❑ Environmental and social risk management is not integrated into the broader risk management process and/or insufficient budget and personnel have been allocated to this element of the risk management process
- ❑ There are externally driven funding, market and economic factors that need to be managed
- ❑ There is a lack of engagement and consultation with communities in the project's area of influence, to inform the overall risk assessment
- ❑ Through the life of the project there is little provision for, or anticipation of, potential scope changes caused by changes to external factors
- ❑ The required environmental and social safeguards/standards are not agreed or clearly understood by all project stakeholders
- ❑ Environmental and social risks are considered to be secondary to the main project priorities, and/or approached as a 'box-ticking' exercise
- ❑ Accountability for risk does not match the organisation's capability or appetite to manage it
- ❑ Contract terms and incentives are misaligned with the sponsor's requirements or the client model, which may mean the supply chain does not meet expectations
- ❑ It is not clear how the deliverables align or contribute to the expected benefits specified in the project rationale, and so whether the benefits will be fully realised by the project
- ❑ Senior management have inconsistent views on the top risks facing the programme
- ❑ Cost plans and schedules do not adequately factor in the possible impact of risks
- ❑ The financial and/or reputational risks associated with failing to address ESG criteria are not understood or addressed, particularly in the context of changing markets, e.g. increases to carbon offsetting prices, or changing legislation

During Routemap, these example findings may be helpful when identifying issues and articulating your own findings **(Step 6)** – *Gap analysis.*

If your findings contain statements like these, this module could help you to develop recommendations to strengthen capability **(Step 8)** – *Developing recommendations*.

Considerations for effective risk management

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.

These questions will help you

- to review and validate the effectiveness of your existing risk management arrangements
- to ensure risk is considered adequately in decision making
- to target areas for improvement
- to design and test new or improved risk management arrangements

The questions are grouped under the four pillars of effective risk management: defining the boundaries, informed decision making, building confidence, and protecting value.

The risk management arrangements may need to evolve during the project, so you should revisit the considerations at major transition points or approval points.

During Routemap, working through these considerations can help you to validate the effectiveness of existing arrangements **(Step 5)** – *Information gathering***.**

They can also help you identify reasons for the findings and ways to address them in **(Step 8)** – *Developing recommendations.*

Pillar 1: Defining the boundaries

Key areas/considerations

Stakeholders

- Who are the significant stakeholders in the project? These will include the parties directly involved in project development and delivery, politicians, local residents and communities in the project's area of influence, vulnerable project affected persons, community and representative groups, and businesses.
- What are their vested interests in the project, e.g. do they support the project, are they against it, or are they neutral?
- Are there any political/national/regional risks in addition to the project-specific risk?
- Has a communications and stakeholder engagement plan been developed and communicated to the relevant parties?

Dependencies

- What dependencies exist that are important to the project's success (including environmental and social dependencies)?
- Are there other projects/operations on which this project is dependent?
- Are other projects/operations dependent on this project?
- Is the project dependent on the provision of certain ecosystems services?[12]
- Is the project dependent on any socio-political factors, such as support from elected officials?

Commitments

- What early public commitments and announcements have been made?
- Have these been informed by an assessment of risk?
- What commitments to social and environmental standards have been made?

[12] Ecosystems services are the benefits humans receive from the natural environment and healthy ecosystems. This includes: provisioning services such as the provision of food and water; regulating services such as climate control and flood risk reductions; supporting services such as nutrient cycles and soil formation; and cultural services such as recreational activities.

Key areas/considerations

- At what 'level' have these been made, e.g. local, national, public, internal, stock market, and is there a mechanism to ensure these have been well communicated to affected stakeholders, including communities in the project's area of influence and vulnerable project affected persons?
- Have these been clearly communicated to all relevant stakeholders in a method that is accessible and understandable?

Assumptions

- What are the projects significant assumptions? (cost, benefit)
- 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?
- Have these been tested?

Objectives

- Have the project's objectives been articulated by the sponsors and client?
- Have these been tested and/or validated?
- How sensitive are the objectives to changes in the external environment?
- Is there awareness of potential changes that may influence the project's objectives during its lifecycle? e.g. legislation linked to net zero, ESG
- Do they take account of strategic risks (including environmental and social risks) and are they understood?

Aligned and linked

- Are the objectives aligned across sponsors, client and stakeholders? Do all the actors agree on applicable environmental and social standards?
- Are the requirements and scope linked to the sponsors objectives?
- Have the risks to the project objectives been considered in the broadest terms (political, environmental, social, technological, legislative, economic)

Key areas/considerations

Benefits

- Have the objectives for the operating phase been defined?
- Is there a clear understanding of the intended benefits, including environmental and social, and the intended beneficiaries?
- Is there a clear link through the project inputs, outputs, and operational performance to the delivery of benefits?
- Is there an understanding of how project risks might interfere with the intended benefits?
- Are there procedures in place to ensure that risks will be managed in a timely and effective manner to prevent impact on intended benefits?

Impacts

- Is there a clear plan, linking the project inputs, outputs, outcomes and socio economic and environmental impacts, e.g. theory of change (where impacts are socio-economic and environmental, rather than the benefits to the party delivering the project)?
- Has a robust environmental and social impact assessment (ESIA) been conducted to identify relevant opportunities and risks? Has a related social and environment management plan (ESMP) been developed to establish mitigation and monitoring measures in response to the findings of the ESIA? What safeguards standards have been used to undertake the ESIA?
- Does the environmental and social risk management process (including the ESIA and ESMP) conform to the IFC performance standards or follow the Equator Principles? (Note that an assessment of compliance with these standards is likely mandatory for accessing international commercial financing or international private sector investment.)
- 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, e.g., any impacts on climate risk?

Pillar 2: Informed decision making

Key areas/considerations

Decisions

- Is uncertainty considered as part of the decision-making process? Does the business case make adequate provision for uncertainty?
- Is scenario planning used as an aid to decision-making, e.g. have different climate scenarios been considered?
- 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 projects overall objectives considered when making decisions? Are early decisions informed by an assessment of the risk to the operating phase and the delivery of benefits?
- Is decision-making informed by consultation with key stakeholders (including project affected communities)?
- Are decisions related to high level environmental and social risks escalated to the relevant authority?

Governance

- Does the project governance establish accountability for the management of risk between sponsor, client and the market? Are there clear accountabilities set out for the management of environmental and social risks?
- Has the project governance been designed proportionately to the level of risk being managed at each level of the project governance structure, e.g. independent attendees at board meetings, additional resources and specialist skills applied?
- Is the delegation of authority clear and sufficient to enable the management of risk, including environmental and social, by those accountable?
- Do governance processes require that risk exposure be considered when making decisions?
- Does the project governance require the reporting of risk exposure, including environmental and social risk exposure, to the governing bodies?
- Is the project management team/executive held to account for the management of risk by the project sponsor?
- How are the change management mechanisms designed to update the risks? Are environmental and social risks updated as part of this process?

Key areas/considerations

- Are the necessary risks disclosed to the relevant stakeholders, including communities in the project's area of influence and vulnerable project affected persons?
- Is there a publicly advertised complaints and grievance redress procedure or mechanism, e.g. for land acquisition and displacement? Can it be accessed easily and anonymously? Is there a clear process for handling complaints, including those that involve sensitive personal data, e.g. complaints relating to sexual exploitation, abuse or harassment?

Pillar 3: Building confidence

Key areas/considerations

Capability

- Are sponsors risk-aware and comfortable dealing with uncertainty?
- Is there a common level of awareness and understanding of risk (including environmental and social risk) between sponsors and client?
- Is risk management an inherent part of project planning, monitoring and evaluation? Are environmental and social specialists and/or safeguarding advisors involved in all stages of planning and evaluation?
- Does the project leadership promote the open and honest discussion of risk and view risk management as core business?
- Does the project board or executive committee routinely discuss risk exposure? Are environmental and social risks discussed routinely as part of this?
- Do the cultures of the involved organisations support active risk management?
- Have all the parties with responsibility for risk management been identified? These include sponsors, clients, developers, contractors, operators, maintainers, funders and financiers.
- Do the organisations involved have in-house expertise in risk management (including for environmental and social risk management), or is this outsourced? If outsourced, how is risk management overseen, and related incentives linked back to the organisation?
- Have the organisations involved assessed their own risk management and risk valuation capabilities using a maturity model, e.g. P3M3 or RM3?
- Do the organisations have access to required skillsets for specialist risk areas, e.g. addressing sexual exploitation and abuse, resettlement planning etc.?
- Is the team responsible for the communication of risks to stakeholders, including project affected persons, adequately resourced and skilled? Is this team able to communicate with stakeholders in a meaningful and effective way?
- Are the risk behaviours required by the supply chain understood? Is this reflected within the procurement strategy?
- Does the supply chain demonstrate that it understands the allocation of risk in the contract and exhibit the necessary behaviours to manage that risk?

Key areas/considerations

- Do contractual incentives align supply chain behaviours with the project objectives, including the upholding of environmental and social safeguards?
- Are there inappropriate incentives in the contract that could discourage active risk management by the supply chain?

Assessment

- Do cost and schedule forecasts contain realistic assessments of risk and uncertainty?
- Has a formal assessment of risk been carried out, including a robust environmental and social impact assessment (ESIA)? Is this assessment both qualitative and quantitative? Will follow up assessments be carried out to monitor the evolution of risks over the project life cycle?
- 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?
  - Consider all assumptions and exclusions?
  - Consider interdependencies that lead to systemic risk?
  - Take into account the perspectives of all the stakeholders, including vulnerable project affected persons? Is it based on engagement and consultation with communities in the project area of influence and with representative groups for vulnerable and/or marginalised groups?
- Has a comprehensive environmental and social management plan been developed, based on this assessment? Does it include clear and measurable indicators and baseline data? Is it regularly updated?

Pillar 4: Protecting value

Key areas/considerations

Risk allocation and appetite

- Is the level of risk associated with the project understood by all parties involved in delivering it?
- Do all parties understand the potential impact of environmental and social risks on the value that the project is expected to deliver?
- Does the sponsor understand the ability and desire of the other organisations involved, to manage and bear risk?
- Is there the potential for misalignment between risk appetite and capability, between sponsors, funders, the client and the market?
- Has the allocation of risk been properly considered?
    - Is it understood which risks would be uneconomical to allocate to a particular party? (e.g. risks associated with operational assets might reside best with the asset owner)
    - Is it understood which risks the sponsor might retain to stabilise the project and improve value for money?
- Does the procurement and contracting strategy clearly allocate the risk to the parties best placed to manage it?
    - Inappropriate risk transfer may result in a risk premium being paid – there may be options that are more efficient.
    - Does the risk allocation in the procurement strategy create sufficient appetite and competition in the market?
- Do reputational and commercial incentives align with the allocation of risk?

Processes

- Is there a project board or executive member accountable for the effectiveness of the risk management process? Is there clear accountability at this level for environmental and social risks?
- Is a recognised risk management methodology being used? Does this include a robust methodology for managing environmental and social risks?
- Are internationally recognised environmental and social standards being used, e.g. IFC Performance Standards or Equator Principles?
- 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?

Key areas/considerations

- Is contingency budget allocated with reference to risk exposure?
- Is there a robust contingency management process linked to the control of change?
- Is the risk mitigation programme adequately budgeted and resourced?
- Do approval points challenge the management of risk (threats and opportunities)?
- Are suitable KPIs in place to measure the risk management process and changes in risk exposure?
- Is there a transparent complaints and grievance redress procedure or mechanism in place and accessible to all project affected persons including vulnerable persons? Does it allow for anonymous reporting and handling of sensitive case material, e.g. personal data protection for sexual exploitation, abuse and harassment cases? Is a separate worker grievance mechanism in place?

Good practice examples

This section offers supporting materials to help you to develop your risk management approach.

We give examples of good practice to help you understand:

1. The sources of strategic risk arising from key project relationships
2. The relationship between risk and the decision-making process
3. The use of gateways to confirm uncertainty is 'locked down' at each stage of a project life cycle

4/5. How and when different techniques can be used to quantify the project's risk exposure

6. The importance of allocating a contingency budget to guard against the impact of risks
7. Alternative models for allocating contingency
8. How accountability for managing risk informs the allocation of contingency
9. How incentives can be used to align behaviours and manage risk
10. How to embed climate risk into asset management

These examples will not be relevant to every project. They are a collection of good practice that may be helpful, in specific circumstances. It is important to assess and tailor any good practice to your project and its wider context.

Likewise, the *suggested reading* is a starting point for further research. You should look for other sources relevant for your project, to support capability strengthening.

Within Routemap, the examples of good practice support capability strengthening in **(Step 9)** – *Action planning*.

1. Good practice: Understanding the sources of strategic risk arising from key project relationships

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

Tip: The '4Ts' (Terminate, Transfer, Treat, Tolerate) provide a useful model for designing risk mitigation plans.

Note: At each interface in the list above, there is a risk that requirements (including the standard expected) are not cascaded appropriately. There needs to be clear articulation and agreement of requirements to prevent misunderstanding.

Where the risk may sit	Sponsor/client relationship	Client/market relationship
Source of strategic risk	• Defining the investment need and business case • Responding to government and external environment • Developing policies and strategic plans • Securing financing and funding • Managing results and out turn confidence • Obtaining permissions and powers to construct and operate • Managing results and confidence in cost forecasts • Managing corporate affairs and public relations • Complying with legal, regulatory and tax frameworks • Managing insurance warranties and third party compensation • Providing leadership and motivational alignment • Managing risk, governance and assurance • Managing resources and collaborative partnerships • Specifying the sponsors requirements • Realising the benefits • Defining the function specification • Specifying the engineering requirements and standards • Developing estimates that support the investment and business case • Managing project controls and core processes • Managing business continuity, force majeure and catastrophic events • Operating the infrastructure and delivering the service • Integrating systems and commissioning the works • Responding to incidents and service disruptions (construction and operation) • Engineering the scheme and reference design	• Planning and commercial proposition • Establishing the procurement strategy and commercial arrangements • Obtaining permissions and powers to construct and operate • Managing corporate affairs and public relations • Managing contracts and work authorisations • Confirming operational viability • Engineering the scheme and reference design • Developing estimates that support the investment and business case • Building high performing teams • Managing resources and collaborative partnerships • Providing leadership and motivational alignment • Managing results and confidence in cost forecasts • Managing business continuity, force majeure and catastrophic events • Achieving operational readiness • Managing insurance warranties and third party compensation • Establishing the safety duty holders and safety management systems • Investigating the site and data gathering • Specifying the engineering requirements and standards • Managing contracts and work authorisations • Implementing the works

2. Good practice: Understanding the relationship between risk and the decision-making process

Here, we demonstrate the relationship between risk and the decision-making process, which is a key aspect of effective risk management.

It is useful to visualise the spine (the left column) of a project around which risks, uncertainties and assumptions typically exist:

Benefits	Projects exist to deliver a vision and a set of objectives and benefits
User requirements	The benefiting body or end user defines the outcomes that will achieve this vision in a set of user requirements
Scope	In response to which is developed the project scope
Methodology	Which will be designed and delivered according to a particular methodology
Cost/time	Which will consume resources to pursue: cost / time

Examples of some crucial early decisions are:

- Setting budgets
- Setting benefit expectations
- Committing to schedule milestones
- Making commitments to stakeholders
- Designing the organisation structure of the project team
- Designing project governance regime

It is only possible to move down this spine, and progress the project by taking decisions (see the right column), making assumptions, or accepting ranges of uncertainty. Any estimate of cost or time will be based on assumptions about all the uncertainties throughout the spine.

The higher up the spine an uncertainty is, the more significant its potential impact on the cost and time estimates will be. So, it is crucial that you accurately identify where the project requirements and scoping assumptions lack certainty. This should be detailed in the risk analysis.

A typical project progressively locks down uncertainty at each stage. Where early stage uncertainty is not sufficiently locked, e.g. because of poorly defined benefits or user requirements, significant unexpected variation can remain (see 3. Good Practice).

3. Good practice: Confirming uncertainties are locked down through the project lifecycle

The illustration on the next page shows a project's journey through its lifecycle, using the gateways between stages to confirm uncertainties have been locked down.

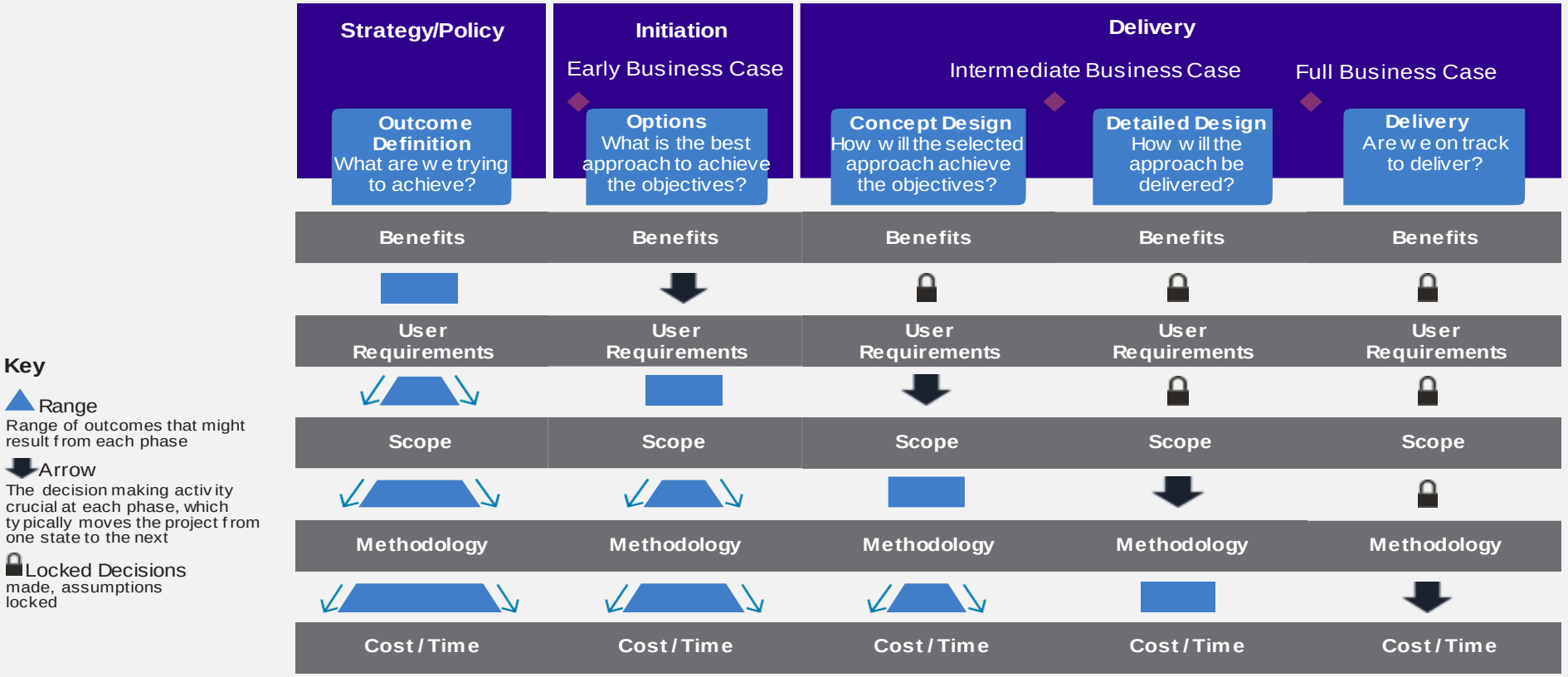
A project aims to lock down levels of uncertainty at each stage of its lifecycle. This is most difficult on novel or highly complex schemes, where there is a lack of benchmarking or reference class data.

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 unlocked (because of poorly defined benefits or user requirements), significant and unexpected variation can remain into the delivery stage.

Once locked down, change control should be employed if iteration is required.

Confirming uncertainties are locked down through the project lifecycle:



Quantitative risk assessments typically model the risks and uncertainties existing between the scope, methodology and cost/time. You can apply top down techniques, such as optimism bias (where a percentage uplift is applied to cost and/or schedule) to ensure you have considered the difficulty in accurately assessing the impact of risk at higher levels of the spine. In this case, you would need to conduct a quantitative risk assessment at the end of concept design. After this has given you further certainty, you can set the final estimates at the end of the detailed design.

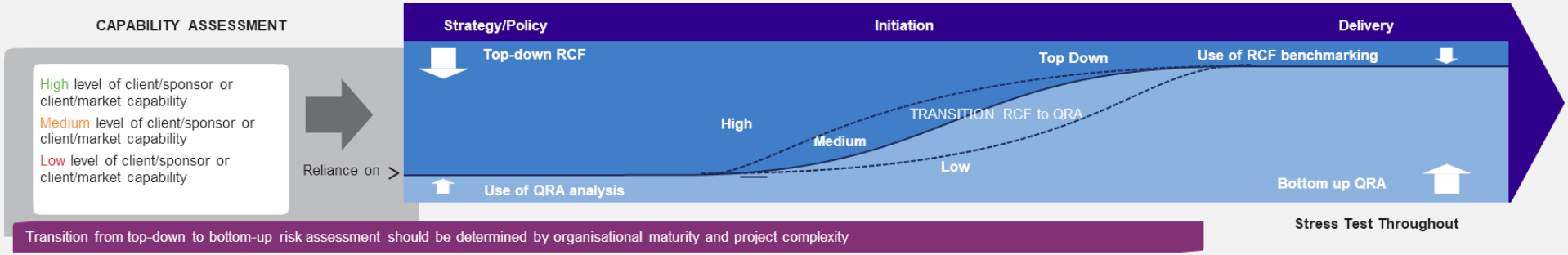
4. Good practice: Applying different techniques to calculate the project's risk exposure (i)

The next two examples detail how Reference Class Forecasting and Quantitative Risk Assessment can be used to quantify risk exposure and to inform the level of project contingency required. Risk exposure is a measure of potential future loss, resulting from an activity or event occurring.

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 ways to develop an understanding of the risk exposure. The reliability of this 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.

Even though one approach may be more appropriate at a given point in the project lifecycle, it is still important to understand how to use both. 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. The more mature an organisation is, the earlier the transition point. 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. A project with a high level of capability will begin to rely more on QRA than RCF earlier in the project lifecycle than a project with lower capability.

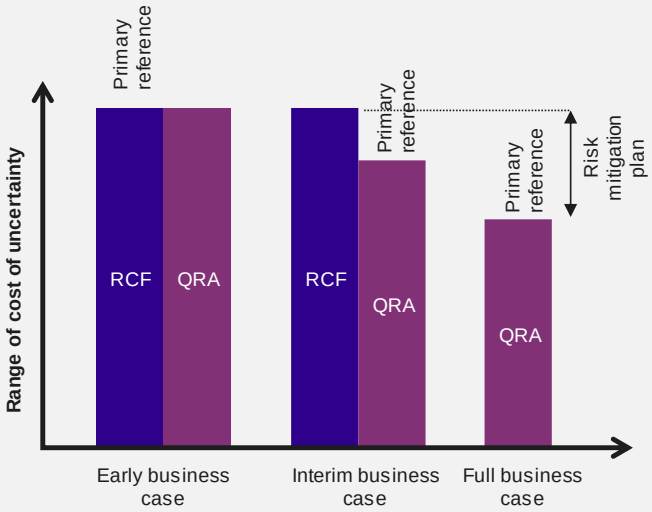


5. Good practice: Applying different techniques to calculate the project's risk exposure (ii)

As described in the previous example, top-down Reference Class Forecasting (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 Quantified Risk Assessment (QRA) approach will be more applicable, as there will be detailed information available about most aspects of the project and fewer remaining uncertainties.

The illustrations below demonstrate that the ability to switch from RCF to QRA also depends on the project team having the necessary capabilities:

Example 1: High level of client/sponsor or client/market capability

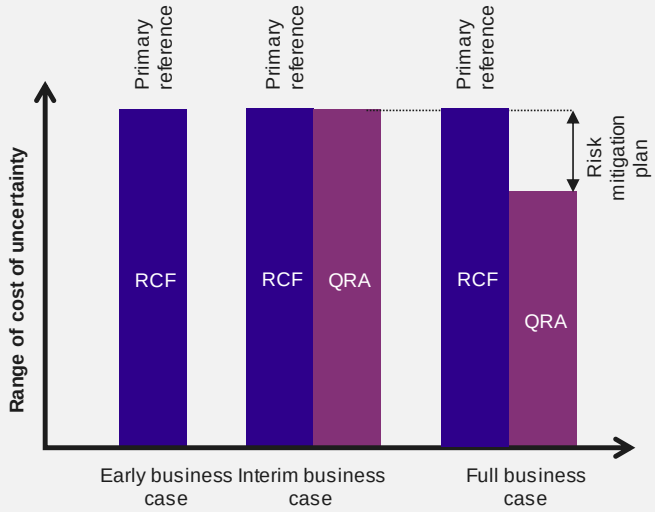


Key points

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

Example 2: Low level of client/sponsor or client/market capability



Key points

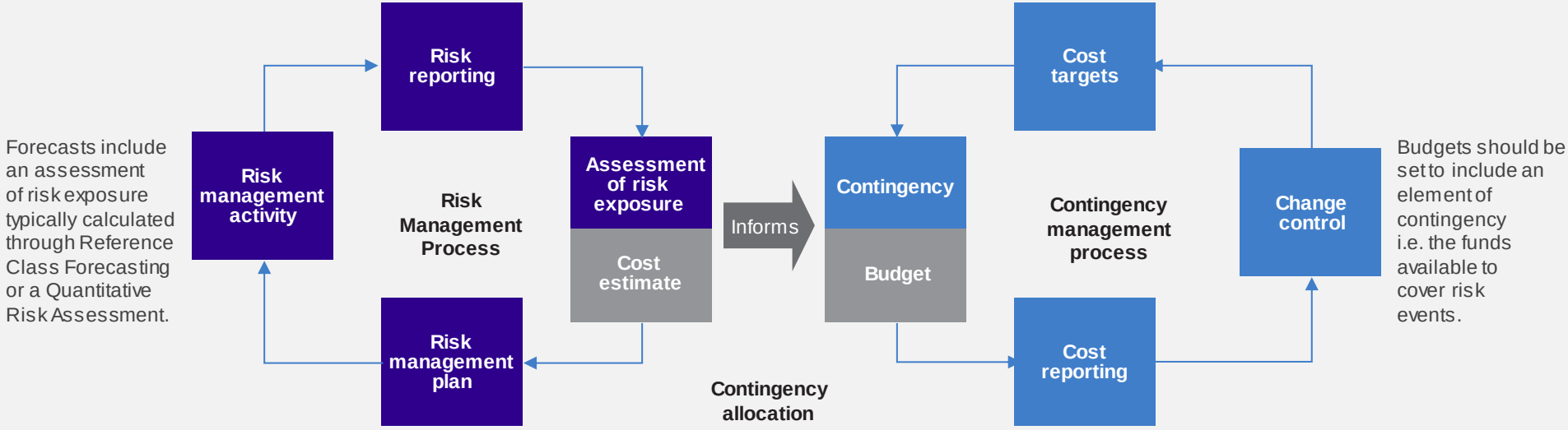
The low combined capability of the organisations involved meant that:

- 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

6. Good practice: A risk-based approach to establishing a 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 lifecycle.

Once you have determined, allocated and mitigated your risk exposure, you should establish a specific budget – known as a 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.



Budget and forecast
It is important to draw a fundamental distinction 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, e.g. emerging issues, changing delivery performance and risk.

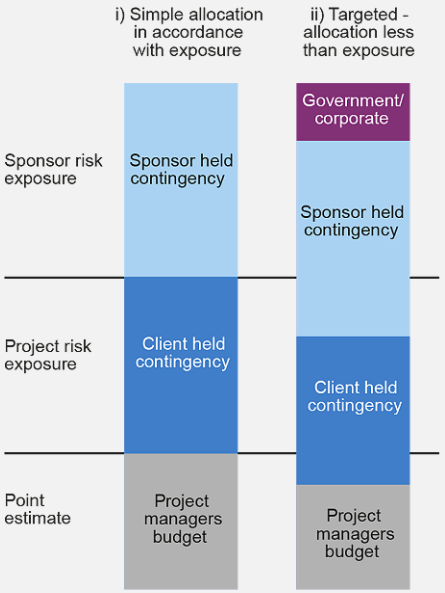
7. Good practice: Alternative models for allocating contingency

Here are three examples of contingency management models, which can help you to allocate project contingency in accordance with the owner and size of the risk exposure, or overall confidence in capability.

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, as some of the next examples consider.

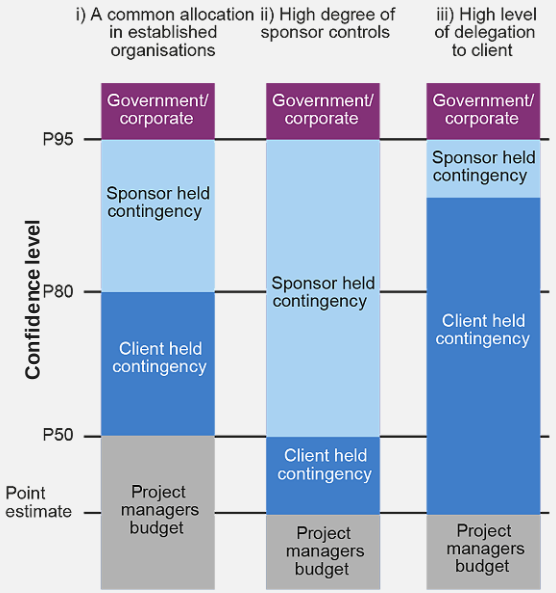
Example 1: Contingency allocated in accordance with exposure

- 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.
- ii) Targeted allocation creates stretch target for risk reduction, by allocating contingency less than assessed exposure.



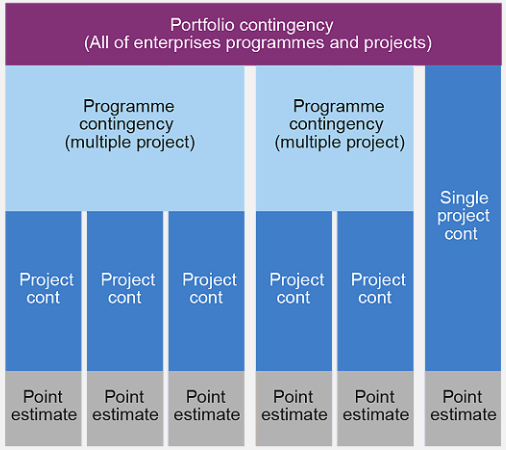
Example 2: Contingency allocated to overall project confidence levels

- 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 extra-ordinary 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.



8. Good practice: Allocating contingency based on accountability for managing risk

This example shows specific project resources that may be responsible for areas of the risk-based contingency budget.

It is important that accountability for managing risk is clear at each level of the project governance structure (see Routemap Governance module). This will make it easier to allocate contingency budgets which are 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 (see Routemap Procurement module).

Risk example	Informs	Contingency example

Project risks
• 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
• Local interfaces with third parties
		Project
		• Budgets at project level:
		  • Delivery budgets for known cost items
		  • Contingency budgets for risk events, e.g. including those related to environmental and social risks
		• Set as stretch target (typical e.g. 90% of remaining forecast)
		• Project managers responsible for managing forecast down to budget
		• Project managers have authority to spend subject to scheme of authorities

Programme risks • Requirements, specifications, scope changes • Employers design • Interface between projects (scope, design, schedule, logistics) • Failure to provide timely decisions or assurance • Systems integration • General interface with third parties • Political, economic, social, technological, legal and environmental • Catastrophic risks • Extraordinary delivery risks with significant impacts		**Programme** • Budgets at programme level include: • Contingency for programme risks • Programme budget set as stretch target • Project directors objective to manage risk to within budget • Accessed by application to programme change
Board risks • 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		**Board** • Budget at board level includes: • Remaining contingency available within overall control budget • Board budgets set as stretch target • Programme directors objective to manage risk to within budget • Accessed by application to board.

9. Good practice: 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 subject to different incentives – 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. Sponsor, client and market capability (see Routemap handbook) and risk appetite are important considerations when designing incentives. Each needs to be clear about the value of the incentive, as a means of risk mitigation.

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 (see below the size of the circles representing influence on cost and benefit in the short and long term). In response, changes to the execution strategy (see Routemap Execution Strategy module) 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 in how to manage programme-wide 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. There are four steps to completing this risk mapping exercise:

1 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.

2 The business case is delivered through cooperation between the sponsor, client, operator and supply chain. Each party has an influence over the risk to its benefit cost ratio – indicated by the area of each circle

3 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.

4 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 arrow [Figure 2].

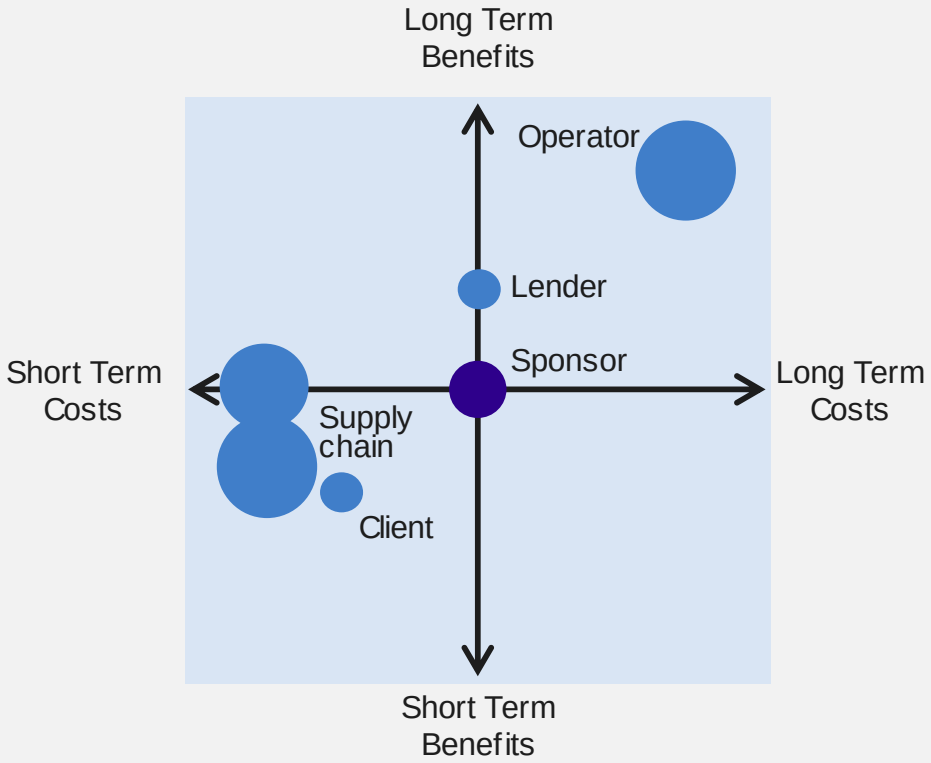


Figure 1

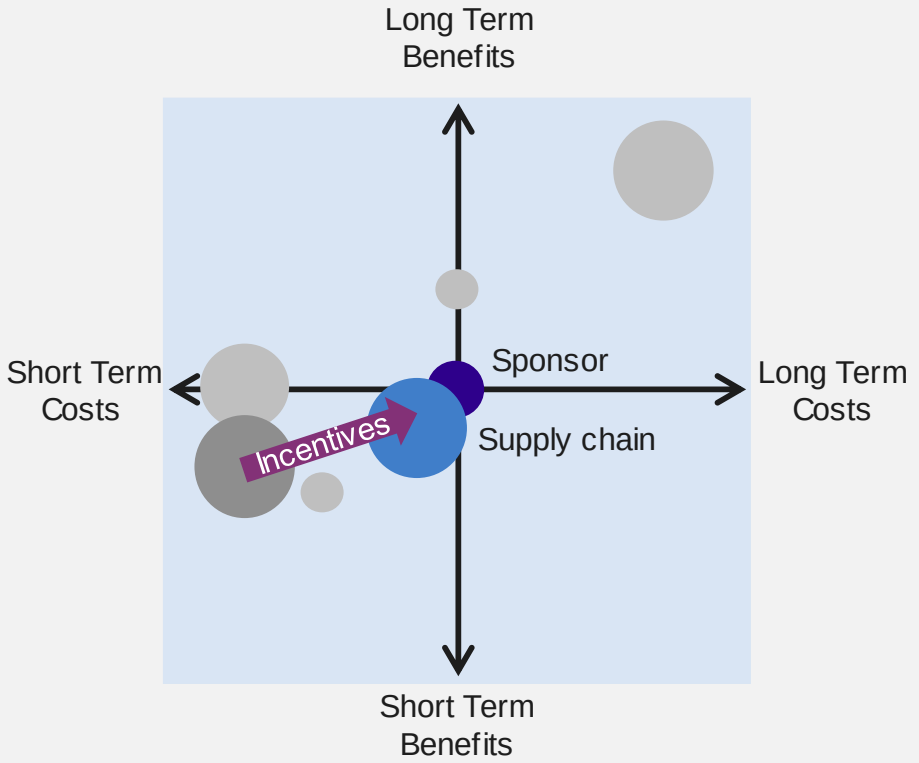


Figure 2

10. Good practice: Embedding climate risk assessment into asset management

Climate risk is a function of the likelihood of a climatic event, the magnitude of the associated impacts, and assessment of resilience/ adaptation measures. A risk analysis must consider a wide range of possible climatic scenarios and their outcomes, both positive and negative. Moreover, such assessments should be specific to the project and/or asset. Organisational climate risk assessments can then be aggregated from asset-level assessments (and other factors). Project/asset-specific climate risks assessments should consider:

(i) Analysis of climate variables - future (e.g. 30/50/100 years) projections of temperature, rainfall, storm surges, wind speed - if the asset is based in a particular location, then projections should be localised

(ii) Characterisation of each infrastructure asset - fragility (against different risks -heat, cold, wind), capacity (impact if it fails)

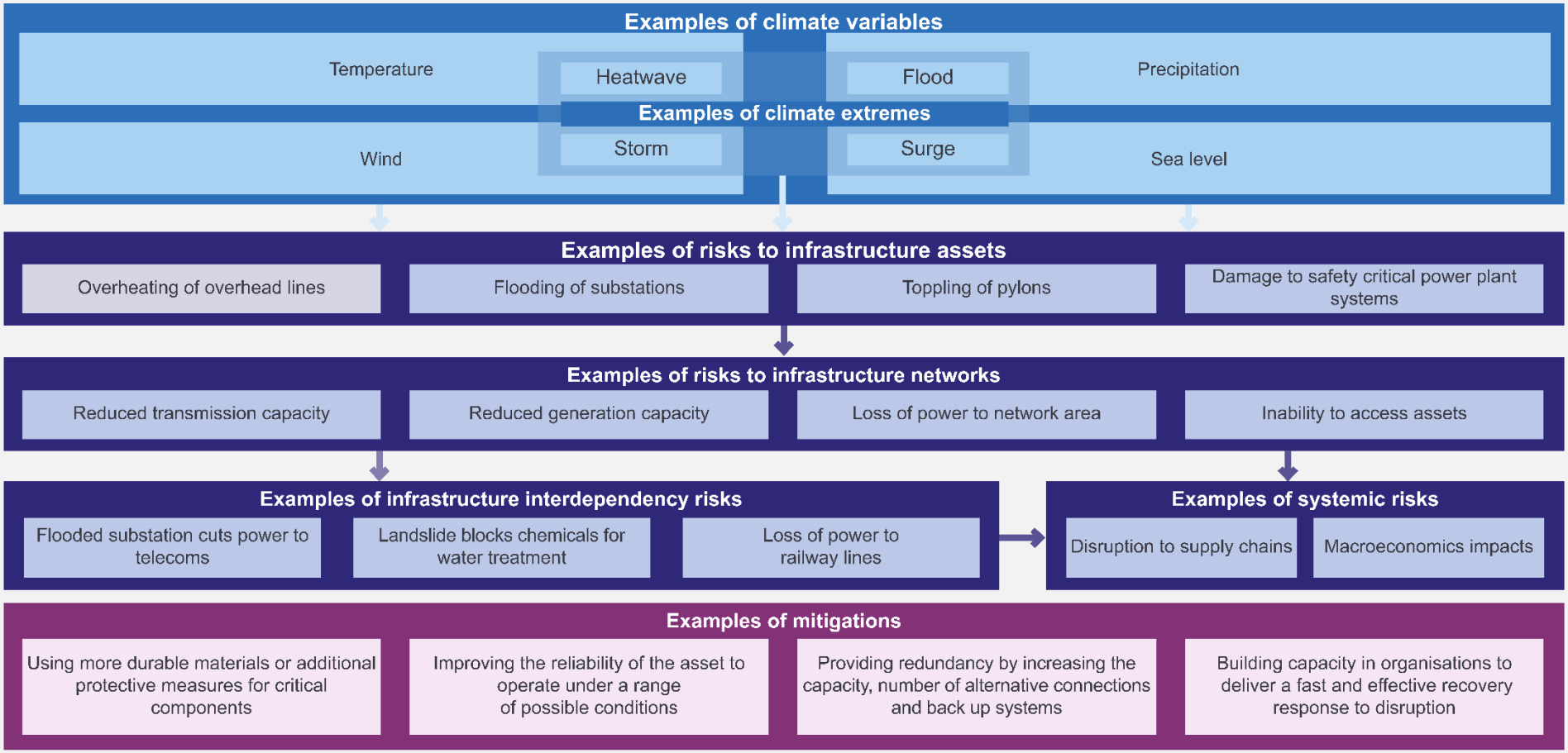
(iii) Network-wide effects - impacts on multiple components and/or system functions and existing mitigations (backup, redundancies)

(iv) Analysis of interactions and interdependencies between infrastructure networks - to understand 'cascading impacts', e.g. an electricity outage shutting down a water treatment plant

(v) Assessment of systemic risks - loss of infrastructure services that lead to indirect impacts on economic growth, social wellbeing and environmental protection

(vi) Assessment of adaptations/resilience measures - existing or planned including society-wide policies, e.g. national water usage restrictions would increase the resilience of the water supply network

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.



Source: Committee for Climate Change, UK Climate Change Risk Assessment 2017 Evidence Report / Technical chapters / 4. Infrastructure, 2017

Suggested reading

Within Routemap, the suggested reading supports **(Step 9)** – *Action planning.*

Here are some sources of good practice information and guidance on risk management:

Project Development Routemap for Infrastructure Projects: International Handbook, Infrastructure and Projects Authority, 2020

https://www.gov.uk/government/publications/project-development-routemap

Business Case Development for Infrastructure Projects: International Guidance, Infrastructure and Projects Authority, 2020

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1062669/Infrastructure_Business_Case_International_Guidance.pdf

Management of Risk (M_o_R), Axelos

https://www.axelos.com/best-practice-solutions/mor

The Green Book – The 5 Case Model, HM Treasury, 2013-2020

https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

Crossrail Learning Legacy, Infrastructure Risk Group, 2013

https://learninglegacy.crossrail.co.uk/documents/managing-cost-risk-and-uncertainty-in-infrastructure-projects/

Strategic Risk Management, Major Projects Association Knowledge Hub, 2018

https://www.majorprojectsknowledgehub.net/resources/strategic-risk-management/

IFC Performance Standards, International Finance Corporation, 2012

https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards

Good Practice: Note Managing Contractors' Environmental and Social Performance, IFC Performance Standards, International Finance Corporation, 2017
https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_escontractormanagement

World Bank Environmental and Social Framework, 2018
https://www.worldbank.org/en/projects-operations/environmental-and-social-framework

Equator Principles
https://equator-principles.com/

Infrastructure Tool: Sexual Exploitation, Abuse and Harassment (SEAH), DFID, 2019
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/855899/ICED-Safeguarding-Infrastructure-Tool2.pdf

IPCC Emissions Scenarios Report
https://www.ipcc.ch/report/emissions-scenarios/

ISO31000: 2018
https://www.iso.org/iso-31000-risk-management.html

PESTLE analysis, Chartered Institute of Personnel and Development, 2020
https://www.cipd.co.uk/knowledge/strategy/organisational-development/pestle-analysis-factsheet

Task Force for Climate-Related Financial Disclosures
https://www.fsb-tcfd.org

The Institute of Risk Management
https://www.theirm.org

Taskforce of Climate-Related Financial Disclosures
https://www.fsb-tcfd.org/

Glossary

This glossary identifies key terms for the Risk Management Routemap Module. The *Project Development Routemap for Infrastructure Projects: International Guidance* contains a comprehensive glossary of terms related to the Project Development Routemap generally.

Asset manager: Asset management is the coordinated activity within and between organisations, to realise value from their assets.

Capability: Routemap uses capability to describe the ability of the sponsor, client, asset manager and market to organise for effective and efficient delivery. It refers to a part of the business and not the individual, as most barriers to best practice are institutional and not individual actions. Stakeholder perception of capability is assessed by capability assessments.

Capability gap: The difference between the existing organisational capability and the capabilities required to successfully deliver the proposed project or programme.

Client: The client is the organisation that is responsible for undertaking the work to fulfil the sponsor's requirements and deliver the benefits. The client translates the requirements from the sponsor and manages the delivery outcomes. The client selects, procures and manages supplier(s) to meet project objectives. The client organisation may be referred to as the implementing agency or the government contracting agency. The client may be internal or external to the department or line ministry.

Client model: The client model refers to how the client organisation structures and resources the project execution activities between the client, advisors/partners and supply chain (e.g. in-house vs. external). This is a key consideration in determining organisational design and procurement strategies.

Complexity: 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.

Equator Principles: A risk management framework for environmental and social risk management in project finance that has been adopted which was developed by a number of financial institutions to focus on environmental and social risk management in project finance.

Economic, environmental 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 (e.g. improved transport link) and from by-products of delivery (e.g. 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, e.g. delivering economic development, but at significant cost to local biodiversity.

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.

Environmental and Social Impact Assessment (ESIA): An environmental and social impact assessment is conducted to identify and evaluate environmental and social risks in projects.

Environmental and Social Management Plan (ESMP): An environmental and social management plan contains mitigation measures and actions in order to mitigate environmental and social risks and to maximise potential environmental and social benefits over the life of a project.

Grievance Mechanism: Processes that can be used by workers, community members and services users to make complaints or report concerns relating to any aspect of the project development process.

Market: A market is a group of organisations that integrates and competes to provide goods or services to one or more clients.

Optimism bias: The demonstrated and systematic tendency to overemphasise positive benefits and opportunities and undervalue the costs and negative risks of projects.

P3M3: The portfolio, programme, and project management maturity model (P3M3) provides a framework within which organisations can assess their current performance and plan for improvement when managing and delivering change.

PPP: Public Private Partnerships (PPP) is a form of contract between public and private sector whereby, characteristically, the private sector design, build, finance and operate a publicly provided service against payment by the Sponsor (for an Availability based PPP) or by users (for a Concession based PPP). There are many different possible definitions.

Project: Throughout this document, the term *project* means project, programme or portfolio.

Project Affected Person: A person who has been affected by the project due to loss of land, housing, other immovable assets, livelihood or a combination of these due to project activities. These include protected and/or marginalised groups such as indigenous peoples, women, children, persons with disabilities and informal sector workers.

Project's area of influence: This is not only the immediate footprint of the project and facilities, but also the surrounding land use and livelihood patterns of the men, women and youth neighbouring the project.

QRA: Quantified risk assessment is a formal and systematic risk analysis approach to quantifying risk.

Reference class data/forecasting: Analysis of data from previous comparable projects to help predict the costs, duration, or benefits of a new project.

Risk: The uncertainty of outcome, whether positive opportunity or negative threat, of actions and events.

Risk and reward: Risk and reward refer to an organisation's strategy, appetite and capability to balance expected returns against the risk that is linked to it. It is often expected that higher potential reward is associated with a linked increase in risk.

Risk appetite: The amount and type of risk that an organisation is willing to take in order to meet their strategic objectives.

Risk crystallisation: The occurrence of a risk becoming an actual event.

Risk exposure: The measure of potential future loss that may occur as a result of certain activity.

Risk management: The process for identifying and assessing risks, responding to them and then monitoring their resolution.

Risk tolerance: The maximum level of risk that an organisation is willing to take for each individual risk and also collectively.

RM3: Risk management maturity model (RM3) is as a tool for assessing an organisation's ability to successfully manage health and safety risks, to help identify areas for improvement and provide a benchmark for year-on-year comparison, developed by the Office of Road and Rail and the rail industry.

Safeguarding: The organisational system in place to prevent harm or unethical behaviour being perpetrated by individuals [engaged in project development and delivery].

Sexual Exploitation and Abuse (SEA): Sexual exploitation is any actual or attempted abuse of a position of vulnerability, differential power or trust for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another (UN Glossary on Sexual Exploitation and Abuse 2017, World Bank 2019). Sexual abuse is the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions (UN Glossary on Sexual Exploitation and Abuse 2017, World Bank 2019).

Sexual Harassment: Any unwelcome sexual advances, request for sexual favours, and other verbal or physical conduct of a sexual nature.

Sponsor: The sponsor organisation secures the funding, owns the business case and is responsible for specifying the requirements to the client. In some contexts, the sponsor and client could be from the same organisation.

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.

Value for Money: (VfM) The optimum combination of whole-of-life costs and quality, or fitness for purpose, of a good or service that meets the user's requirements (though there are many different possible definitions).

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 recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

Infrastructure and Projects Authority

UK Government