DMDU checklist committee

# Context

Many institutions (government or industry-related) worldwide are increasingly seeking guidance on how to build more robustness and resilience into investments and planning under changing risk conditions and uncertainty. There are a growing number of major guidance documents that draw on Decision Making under Deep Uncertainty (DMDU) principles, such as the New Zealand Coastal Hazards and Climate Change Guidance[[1]](#footnote-1), the State of California guidance for Safe Infrastructure[[2]](#footnote-2), and the work done by the International Hydropower Association and the American Society of Civil Engineers[[3]](#footnote-3) on how to incorporate non-stationary climate conditions in the design of hydropower dams. All of these documents seek to enable users to make decisions under conditions of uncertainty and change, but there is no generic document that explicitly describes the main steps that should be followed to properly apply DMDU methods to critically important policy or infrastructure decisions.

The growing demand for structured guidance poses an opportunity for the DMDU Society to make its mark explicitly and to influence others, as the guidance and systems that are being created now to guide investments will help create a needed shift in approach by private investors, public procurement, and project developers, with the aim of redirecting private and public decision making and investments toward more resilient decisions and projects.

# Objectives

The objective of this DMDU checklist committee is to provide guidance on the basic elements of the process and analyses that need to be followed while making an investment or planning decision in order to claim that future risks have been properly considered. The checklist also provides a list of “frequently made mistakes” to be avoided during the process leading to a decision.

Importantly, following the checklist does not guarantee that the decision will lead to a resilient plan or project, but it helps to guarantee that decision makers will have the best available information on the possible future outcomes of the decision in a changing world where change and surprise is endemic. For example, the consequences of risks from failure would have been considered transparently for all stakeholders, even if choices are taken that do not result in resilient and robust decisions. This objective – no guarantee of good outcomes but a guarantee that decisions makers have used the best available information and process – is the best one can expect.

# Process

This document was prepared by a team of DMDU experts composed of Geoff Darch, Alex Harvey, Judy Lawrence, Pedro Lima and Julie Rozenberg and was peer reviewed by Nidhi Kalra, Robert Lempert and Patrick Reed.

The team is now expecting comments from all DMDU members interested in contributing.

The checklist is a living document that will need to be updated as research advances in decision science and new methods are being tested and developed.

# Checklist audience

Many decisions made by decision makers across a wide range of interests face deep uncertainty about the future. The DMDU Society reflected those wide interests has developed the following DMDU checklist and associated guidance. Table 1 sets out some of the functional areas, organisations and uses for which the checklist can be applied.

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| **Function** | **Organisations** | **Potential checklist use** |
| Policy development (e.g. adaptive strategies and options elicitation | All levels of government (national, state/regional, local); infrastructure agencies | Managing deep uncertainty, building portfolios of options, charting strategic directions |
| Project developers (e.g. investment management; planning) | Infrastructure owners and operators; government departments | Follow checklist / implement guidance |
| Organisational risk management (e.g. Directors and corporate risk managers) | Any\* | Interested in significant or/and cumulative risks affecting bottom lines/ achievement of milestones and outputs contributing to outcomes  |
| Audit | Any\* | Regulatory compliance and achievement of milestones and outputs contributing to outcomes. |
| Project funders | Institutional investors; multi-lateral development banks; development agencies | Alignment with own approval processes and regulatory compliance in achieving objectives.  |
| Due diligence providers | Consultancies and professional institutions (e.g. ASCE) | Compliance with regulations and professional codes of practice; risk issues |
| Project beneficiaries | Country governments; stakeholder groups |  Fit for purpose projects that are sustainable as conditions and human populations change; Delivery on objectives; Capacity building |
| Financial sector oversight | Rating agencies, central banks and regulation authorities | Compliance; alignment with own risk management procedures; cumulative risks? |
| Research organizations | Universities, research institutes, think tanks | Building background evidence for research; testing guidance in field situations. |
| Standards organizations | General (e.g. ISO) or industry specific | Integrated with other risk assessment standards; codes of practice; Potential standardization of checklist |

**\* Distinct function in infrastructure owners; assume similar in MDBs etc**

# Checklist

This checklist is a set of steps that can be taken when planning and making decisions under changing and uncertain conditions. Each step can be revisited over time, including the decision framing, as conditions, stakeholders and preferences change. Participation of stakeholders in the DMDU process will provide buy-in to the decision outcomes and will provide more robust decision making at all stages of the process. When applied to problems that have deep uncertainty at many levels of decision making, about the system of concern and in the analysis process, the checklist provides a prompt for deep uncertainty to be explicitly considered, thus enabling adjustments to be made over time and avoid lock-in of decisions that can be more costly when they fail to deliver on objectives.

**Checklist**

**DECISION FRAMING**

1. IDENTIFY STAKES & STAKEHOLDERS / TO WHOM IS THE DECISION RELEVANT?
	1. Identify relevant stakeholders
	2. Map stakeholder relationships
2. DEFINE GOALS / WHAT DO STAKEHOLDERS ASPIRE TO?
	1. Identify broad goals
	2. Identify values and positions across stakeholders
	3. Define performance metrics and thresholds for failure
	4. Identify the most appropriate team and rules of engagement
3. BASELINE KNOWLEDGE AND ASSUMPTIONS / WHAT DO WE KNOW?
	1. Describe system and boundaries (when boundaries are known)
	2. Identify known and perceived issues
	3. Document uncertainties (including in system boundary)
	4. Engage a “devil’s advocate” reviewer pool across multiple interests
4. IDENTIFY A FIRST SET OF POLICY ALTERNATIVES/ACTIONS
	1. Stakeholder participation to reflect preferences
5. IDENTIFY ANALYTICAL METHODS / WHAT METHOD(S) SHOULD BE USED?
	1. Match method to decision context and uncertainties
	2. Select analytical method(s) and train / trial with stakeholders
	3. Define robustness criteria (e.g. range of scenarios; least regret; risk reduction; path dependency)

Agree on evaluation approaches (e.g. modelling; stakeholder trade-offs)

**SCENARIO AND VULNERABILITY ANALYSIS**

1. SCENARIO GENERATION/WHAT FUTURE STATES OF THE WORLD SHOULD BE EXPLORED?
	1. Create scenarios, futures, and narratives that explore uncertainties
	2. Screening: how do uncertainties affect performance objectives?
2. DEVELOP PORTFOLIOS OF ACTIONS/POLICIES
	1. Option development (through modelling or expert elicitation)
	2. Portfolio construction
	3. Search / long-list candidate portfolios
3. DEVELOP DECISION TRIGGERS AND CONTINGENCY ACTIONS
	1. Design indicators for decision triggers to change course ahead of failures
	2. Identify alternative actions and pathways when objectives cannot be met or they fail
4. PORTFOLIO VULNERABILITY ANALYSIS / HOW DO ACTIONS/POLICIES PERFORM?
	1. Model system vulnerability
	2. Model system with candidate portfolios
	3. Stress test the performance of portfolios/ pathways
	4. Identify failure causes
	5. Search / shortlist portfolios (e.g. Pareto-optimal)
	6. Iteration e.g. add options; edit portfolio

**STAKEHOLDER PREFERENCE EVALUATION**

1. PORTFOLIO / PATHWAYS EVALUATION/ WHICH PORTFOLIO(S)/ PATHWAYS ARE PREFERRED?
	1. Stakeholder participation to reflect/update preferences
	2. Evaluate options/portfolios/pathways e.g. Multi-criteria analysis to assess relative values

**IMPLEMENTATION**

1. IMPLEMENTATION PLAN
	1. Make short-term decisions and/or long-term options that can retain flexibility for shifting to other portfolio/ pathways if and when needed
	2. Use planning and regulatory responses to support adaptive /flexible implementation that fit the changing risk situation e.g. flexible measures compared with static measures
	3. Apply adaptive design (intra-option flexibility) criteria for buildings/ structures
	4. Develop project implementation plan that can be adjusted over time as conditions change.

**MONITORING**

1. MONITOR
	1. Secure adequate funding for monitoring system design and its execution
	2. Develop the monitoring plan using the decision triggers designed in 8b above
	3. Monitor trends, signals and triggers
	4. Assign responsibility for monitoring signals and triggers
	5. Create an accountability system (e.g. transparent performance indicators)
	6. Monitor portfolio/pathways performance
	7. When signals and triggers reached, responsible agency reviews adaptive plan
2. REVIEW & ADJUST
	1. Adopt contingency actions e.g. switch pathway, or adjust options
	2. Identify where trends / events might require new analysis and re iterate through ­­­­the checklist
	3. Revisit the decision framing and repeat all steps if necessary
	4. Share information with stakeholders
	5. Make decisions as to forward looking strategy

# Frequently made mistakes

1. Not considering broader values and diverse alternatives early on in framing
2. Limiting in advance the issues of concern
3. Insufficient consideration of a diversity of metrics that capture broader stakes and impacts in the system
4. Ignoring institutional instability and shocks
5. Not allowing dissenting critiques early and often
6. Using "best estimates" or averages for uncertainty
7. Using timeframes for planning, design and investment that are mismatched with the ‘real’ lifetime of the asset, which can be longer
8. Using economic assessment tools that are ill-suited to uncertain and changing risk situations i.e. rely upon pre-defined or static conditions based on historic or current conditions
9. Using high discount rates that discount the benefits from taking adaptive action **now** that is not realised until sometime in the future
10. Using static planning instruments spatially for managing changing risks
11. Using probabilistic methodologies where uncertainty is high [or where probabilities cannot be accurately defined because of deep uncertainty about the future]
12. Not providing initial and ongoing opportunities for participation of stakeholders in the decision process as conditions change over time
13. Not keeping the decision makers abreast of how uncertainty can be considered
14. Confusing normative and exploratory scenarios (what we’d like to happen is not the same as what could happen)
15. Optimism bias / not considering full range of scenarios (e.g. only considering / developing those which go in one direction)
16. Assuming linearity in systems / not incorporating feedback mechanisms
17. Using models that are ill-suited just because they are available/well known
1. https://www.mfe.govt.nz/publications/climate-change/coastal-hazards-and-climate-change-guidance-local-government [↑](#footnote-ref-1)
2. http://files.resources.ca.gov/docs/climate/ab2800/AB2800\_ES\_FINAL.pdf [↑](#footnote-ref-2)
3. https://www.hydropower.org/publications/hydropower-sector-climate-resilience-guide [↑](#footnote-ref-3)