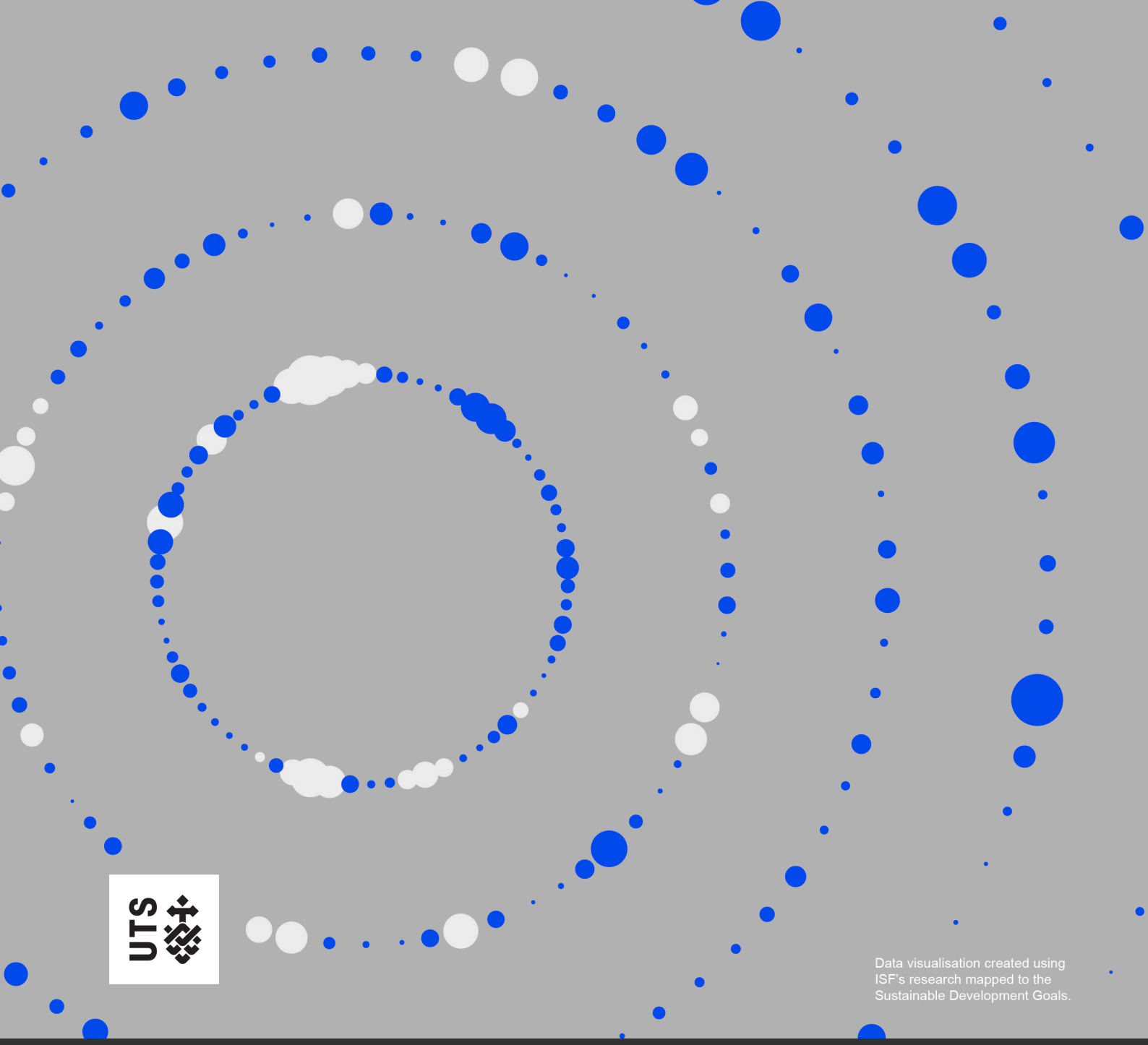

Data visualisation created using ISF's research mapped to the Sustainable Development Goals.

Institute for
Sustainable Futures

lsf.uts.edu.au

Review of decision making framework for allocating water during extreme water shortages

DRAFT

PREPARED FOR:
NSW Department of Industry

About the authors

The Institute for Sustainable Futures (ISF) is an interdisciplinary research and consulting organisation at the University of Technology Sydney. ISF has been setting global benchmarks since 1997 in helping governments, organisations, businesses and communities achieve change towards sustainable futures.
We utilise a unique combination of skills and perspectives to offer long term sustainable solutions that protect and enhance the environment, human wellbeing and social equity.

For further information visit: www.isf.uts.edu.au

Research team

Prof Pierre Mukheibir

A/Prof Simon Fane

Citation

Please cite as: Mukheibir P & Fane S 2019 Review of the decision making framework for allocating water during extreme water shortages, prepared for the Department of Industry (NSW) by the Institute for Sustainable Futures, University of technology Sydney

February 2019

Institute for Sustainable Futures
University of Technology Sydney
PO Box 123 Broadway, NSW, 2007
www.isf.edu.au

Contents

1 Introduction

The NSW Department of Industry has developed a decision making framework for allocating water during extreme water shortages, based on the principles and priorities as set out in the Water Management Act (2000) and the NSW Extreme Events Policy[1].

The Institute for Sustainable Futures (UTS) has been tasked with reviewing this decision making process outlined in Attachment A of the RFQ against the principles for good decision making based on our practical experience in collaboratively developing such frameworks with industry decision makers. We have found that the following overarching principles below have proven useful for guiding both the design and implementation of decision making processes. In this review, we have sought to ensure that these principles are applied and hold true.

Table 1: Principles for a good decision making process framework

A process that:	Outcomes that are:
Provides a clear map, with tools and methods that will inform the decision	**Practicable** and viable in the decision making context
Collaborates between and across agencies and divisions	**Aligned** with the vision, strategy, objectives, and risk appetite (of the Act and Extreme Events Policy)
Accommodates opposing views and objectives between stakeholders and allows trade-offs	Inclusive of **both Qualitative and Quantitative** (where the information is at hand) considerations
Clarifies the roles and responsibilities between and across organisations for decision making at specific steps in the process	Based on the **best available and relevant information** (both qualitative and quantitative) with an appropriate level of accuracy at the time, and avoids biases and assumptions
Is transparent in the objectives to be met, and the analysis processes to arrive at the decision	**Robust and repeatable,** regardless of who does the assessment
Fit-for-purpose and adaptive to make the appropriate decision at the time it is needed	**Easily communicated** to stakeholders
Delivers the decision/s needed	**Documented** for later reference and accountability

To undertake this review we have reviewed the decision making process (RFQ Appendix A), the Water Management Act (2000)and the NSW Extreme Events Policy. The research team were invited to sit in as observers at the two CWAP meetings (18 and 21 February) and have consulted closely with DoI Land and Water and WaterNSW to understand how the water allocation decisions are currently being made, and how the process has evolved to date.

Our review revealed that the decision making process appears to be facilitating reasonable and timely decisions under difficult circumstances. The application of the current criteria has allowed for the prioritisation of response options and allocation of water to priority critical demands.

However, at a high level, we would suggest that process could be more structured with discrete steps). In this report, we have proposed a framework diagram to aid the understanding of the discrete decision steps, and outlined the sub-processes and assessments to be undertaken for each step of the decision framework.

We have also made specific suggestion for improvements in the short and long term (based on the timing, and level of effort and information required).

This report is structured in three sections that firstly provides specific considerations as they pertain to the DoI decision making framework, secondly outlines the proposed structure of the framework in discrete steps, and finally makes specific recommendations for further improvements to the decision making process.

[1] NSW DoI 2018 NSW Extreme Events Policy: Policy framework for the management of NSW Murray–Darling Basin water resources during extreme events, POL18/41, NSW Department of Industry.

2 Framework considerations

In reviewing the decision making framework, key considerations included:

- The critical timing of the decisions and therefore the need for flexibility in the framework
- The criteria to be used for firstly ranking the critical demands, and secondly for prioritising the options (and packages of options)
- Quantifying the critical demands to be considered in the decision process
- The adaptability of the framework to learn

2.1 Timing

A decision making framework needs to be fit-for-purpose in that it should facilitate a decision based on the available information. Currently information is being surfaced on an needs-based manner. We propose that over time that this approach be modified to allow for changes in conditions to be considered (such as a rainfall event) and for a proactive definition of the critical demands and transparent process for options development and assessments.

We suggest that the evolution of the decision making framework be considered across three time horizons:

a) ***Now*** – How to make allocation decisions under the current drought

b) ***Near term*** – How to allocate any systems flows that provide interim relief

c) ***Long term*** – How to allocate water resources under a future extreme drought with improved information at hand (e.g. based on drought scenario modelling and improved ecosystem needs)

2.1.1 Now

This review focuses primarily on how best to make water allocation decisions under the current extreme water shortage in the NSW Murray-Darling systems. It makes recommendations on improvements to the current process in the short term.

2.1.2 Near term

In the near term there will possibly be a rainfall event that will allow a release of water for allocation to critical demands. It is our view that the framework should be suitable for such allocations should they arise. It is likely that critical environmental needs and the risks to the environment may be more significant under these conditions, and consideration of how to assess these is recommended before such an event occurs.

2.1.3 Long term

For drought events that follow this one, this framework should be robust enough to provide the necessary rigour for sound decision making. Assessing the critical demands earlier and testing various packages of options under drought scenarios is strongly advised (this may have resourcing implications). It is likely that additional steps may be needed in order to adapt the decision making framework to accommodate the scenario testing assessments.

2.2 Assessment criteria

Using a set of multiple criteria is especially useful in the public sector because of the need to be responsive to broader (and often conflicting) objectives/demands. In any form of systems planning, multi-criteria decision analysis (MCDA) provides a structured means for ***integrating quantitative and qualitative goals*** and weighing up the performances of a set of options against

these goals. The criteria should therefore, be assessed against the following principles to ensure a robust assessment process (Mukheibir & Abeysuriya 2014, Mukheibir & Mitchell 2011).

Table 2: Principles good decision making criteria

Principle	Each criterion must
Contextual	be relevant to the context of the problem and agreed objectives.
Discerning	distinguish between all the options. If all the options score the same then the criteria are not meaningful for the analysis.
Assessable	be assessable against the criteria, either quantitatively through physical measures or qualitatively through judgement.
Consequential	focus on the consequences of/for each option.
Independent	avoid double counting, e.g. loss of jobs as a consideration under both social and economic impacts.
Life Cycle oriented	consider the whole timeframe for the decision-making within consistent boundaries across all of the options.

The objectives, and hence related key performance criteria, for this decision should be drawn from the Water Management Act (2000) (the Act) and the NSW Extreme Events Policy (the Policy). The key objective of the Policy is stated as improving resilience and providing certainty for communities during periods of drought and water shortage (NSW DoI 2018):

- *during drought and periods of water shortage*
- *in the event of a water quality event of an intensity, magnitude and duration that is sufficient to render water acutely toxic or unusable for established local uses and values.*

The Act sets out the priorities for allocating water when an order is made to suspend water sharing plans (either in part or in whole) under the extreme events described above. The ranked order of these priorities are as follows:

Priority 1: *Critical human and non-human needs*
Priority 2: *Needs of the environment*
Priority 3: *Other Basic Landholder Rights, Native Title and harvesting rights, high security access licences, supply of commercial and industrial activities, electricity generation.*
Priority 4: *All other licences*

The Policy establishes the principles by which all water resources within the NSW Murray-Darling Basin will be managed during an extreme water shortage (NSW DoI 2018):

Principle 1 — *Every attempt will be made to maintain the operation of the statutory water sharing plans;*
Principle 2 — *The local requirements for critical human water needs will be recognised and prioritised;*
Principle 3 — *The market will continue to operate for as long as possible during extreme events;*
Principle 4 — *Licence holders within licence categories should be treated equally;*
Principle 5 — *Certainty should be maximised;*
Principle 6 — *Management strategies will be fit for purpose;*
Principle 7 — *Local stakeholder consultation should inform management responses so that they are fair;*
Principle 8 — *Learnings from previous extreme events will inform the development and implementation of IRGs;*
Principle 9 — *Connectivity of systems should be considered.*

These Policy principles appear to be a combination of process and outcome principles and therefore are not that useful in defining assessment criteria. They make no direct mention of social, environmental and economic impacts for example. The three assessment criteria listed in the decision making framework can be best matched to the principles as follows:

Practicality – ability to deliver the water efficiently (possibly Principle 6)

Equity – consistency in approach to other equivalent water users in NSW (Principle 4 and 7)

Risk – the potential social, economic or environmental impacts if no water is supplied (possibly Principle 2)

The assessment criteria have been assessed against the principles for good criteria (provided in Table 2), and are discussed further below. On the whole the criteria are sound, but there is potential for some double counting.

Table 3: Assessment of criteria against the principles

Principles	Practicality	Equity	Risk due to no water
Contextual	Yes	Yes	Yes
Discerning	Yes – only between those at the top and bottom of the system	Yes	Yes – but does not have weighting between Social, Economic and Environment
Assessable	Yes	Yes	Yes
Consequential	Yes	Yes	Yes
Independent	Yes	Yes – but sometimes linked to practicality	Yes – but possible to have double counting between risk criteria - potentially both social and economic risk due to loss of jobs for example
Life Cycle oriented	Yes – through regular reviews of the situation	Yes	Yes

3.3.1 Practicality

This criteria is well defined and has been relatively well applied. Information at hand makes it easy to assess the transmission losses for a specific option designed to meet specified critical demands.

When assessing the packages of options, the combination of options in the package may change the practicality rating where co-benefits are apparent.

3.3.2 Equity

This criteria is well defined in the RFQ Appendix A, which will lead to an improved application of this criteria going forward. Understanding the trade-offs between critical users between and within priority demand groups is always going to be difficult. In such instances tools such as pair-wise comparison[2] may be useful.

3.3.3 Risk due to no water

The current approach to assessing the risk of no water being supplied to a specific critical demand is outlined in item 5 of the RFQ Appendix A. It suggests using a risk matrix of likelihood and consequence. However, this is not appropriate in this instance, since the likelihood is not a consideration. The assessment of risk is based on when no water being provided, not if no water was supplied. So the focus is solely on the consequence / impact on the social sector (public and animal welfare), economy and environment.

The timing and duration of the impacts should be a consideration: firstly, the rate of recovery (ability to bounce back) might be worth including in this consideration – i.e. how permanent will the damage be?. Secondly the effect of the negative impacts can sometimes be felt long after the event – a shop owner may be able to keep their shop open through the no flow period, but slow declines in business may render the business bankrupt some time after the event.

The current approach is to score the impact of response option against social, economic and environmental risks using a simple qualitative rating score:

0. High costs (negative)
1. Minimal net change (neutral)
2. Benefits (Positive)

[2] Pair-wise comparison is where the criteria (in this case) would be compared individually with each of the other criteria. On a five point scale the relative importance between them is determined. Using simple statistical analysis, the collective ranking (and therefore weighting) of the criteria relative to each other is established.

Given that this assessment is based on qualitative information, we suggest that ***+, 0, -*** be used instead of numbers to avoid the illusion of a quantitative assessment and the adding up of the scores.

As will be explained in the decision making framework section, we have proposed that the risk assessment be undertaken in three discrete steps:

> Firstly, ***determine the risk*** of receiving no water early on for each critical demand under the relevant headings of social, economic and environment.
>
> Secondly, for each viable response option, ***assess the mitigated negative impacts*** on the critical demands due to the implementation of the option, by drawing on the risks identified in the earlier step, and
>
> Finally, when packaging up the options, ***assess the residual risks/negative impacts*** on the critical demands that will not be receiving water under the package.

The risk assessment criteria (social, economic and environmental) are drawn from traditional approaches and are suitable for this decision process. However, the trade-offs between the risks due to not getting any water are complex, partly due to qualitative nature of the information, and the interpretation by the decision maker of the severity of the impact. These is also the potential for double counting - for example the loss of jobs could lead to metal health issues making it both a social and economic impact.

The challenge here is how these various impacts are measured and compared with one another. the prioritisation process is subjective and will depend on who is making the decision. How would having enough water to avoid sewer blockages rank against sufficient water for stock watering or electricity generation? There are numerous methods for undertaking a ranking process for prioritising the critical demands and hence the hierarchy of negative impacts (such as *pair-wise comparison*).

Further work is needed to sharpen these risk criteria and how ranking within and between risk types can be done simply (***long term recommendation***).

Risks from a low flow event:
In the medium term it is possible that a rainfall event may trigger a small release flow through the system. This may have unintended negative outcomes for the environment where poor quality water is partially distributed through the system contaminating a larger area and negatively affecting the ecological health of the river. Technical advice should be sought on the impact of a small release event in the system ***(Long recommendation***).

3.3.4 Assessing the options against the criteria

The current practice is to consider all the criteria alongside each other and determine on qualitative basis which option or package of options is preferred. Using the example below, option 3 would be the likely recommendation due to its high positive scores for the five assessment criteria.

Options for Current Available Stored Water	Legislation/Policy	Practicality	Equity	Social	Economic	Environment
Release all the water now in Keepit Dam for Walgett	2	0	2	1	0	2
Release all the water now in Keepit Dam for Pian Creek Replenishment	2	0	2	1	0	2
Release all from Keepit +2-3GL Split Rock to provide flow through to Walgett and if sufficient account orders determined through EOI	2	2	2	2	2	2
Reserve water to release with later Peel e-release	2	1	1	1	2	1

Figure 1: Example Option assessment against criteria

As was discussed above, we suggest that ***+, 0, -*** be used instead of numbers to avoid the illusion of a quantitative assessment and decision makings adding up of the scores.

Further, it would appear that the criteria have all been given equal weighting, whereas in practice it is likely that the people making the final assessment would have their own sense whether social impacts were more important than economic impacts for example. There is potential to consider an approach for collective "agreement" on the weighting or emphasis of the criteria, without making the process overly complex and time consuming (***Long term recommendation***).

2.3 Quantifying the critical demands

In the decision making framework, the user demands are considered under items 1 and 2. This includes determining the minimum volumes for the user demands under each of the priority groups (as set out on the Act). High priority needs in the downstream valley are also taken into consideration.

Currently these critical demands are determine on a need-to-assess basis, together with the assessment of viable options. This is efficient and dynamic in the current circumstances, however, we would recommend for the long term (before the next drought) to develop a **register of critical demands** (including key environmental assets) for each system, so that all the demand information is at hand when considering potential supply options (***long term recommendation***).

A further challenge is that of demining the **minimum demand to ensure general ecosystem health** in specific parts of the river system i.e. through refuge pools. The duration of the required supply to meet that need and over which seasons may also be considerations. Studies should be commissioned to determine the minimum environmental water requirements (***long term recommendation***).

Associated with the determining the critical demand definition, is a need to consider the **time horizon for the decision**. Some consideration is needed on how much water to hold back for critical human and ecosystem needs. Should this be secured for the next 6 months, 2 years etc.? What are the medium to long term risks to critical human needs if all available water is allocated now? What other critical needs can to be foregone by holding water back to ensure critical human and ecosystem needs are met if the drought continues? The level of water security should be described early on the process (see Step B of the proposed Framework structure - Demand definition) (***long term recommendation***)

2.4 Adaptability

Given that the decisions in relation to resource allocation under severe drought conditions are likely to evolve, as suggested in 3.1. above, the framework needs to have a mechanism to allow learning and reflection to inform improvements in the process and information at hand. This consideration is consistent with Principle 8 of the Extreme Events Policy (Learnings from previous extreme events will inform the development and implementation of incident response guides). (***long term recommendation***)

3 Proposed framework structure and steps

The proposed structure and steps outlined here attempt to tease apart the key components of the decision making process for allocating water during extreme water shortages in NSW. The decision making framework builds on the process described in RFQ Appendix A, by adding a series of proposed steps.

Currently these proposed steps are being considered together – namely the assessment of critical demands, the assessment of critical supply shortfalls, the identification and assessment of possible options and the development and assessment of packages of options. This has some advantages in terms of bringing information together in a timely manner to make decisions, but it also carries some risks of missing vital information and potential solutions.

The nature of the decisions being made about water allocation in extreme drought are such that significant iteration back and forward between steps will be inevitable. However, we suggest that defining the various different steps in the decision framework would have value for all parties involved in the decision process and will support all options being considered.

We also suggest that separating out the demand and supply assessments (See Figure 2 and Appendix 1) would be useful. Further, some demand assessments many be able to occur earlier in the process as they do not generally require regular revision as might be the case for the supply assessments.

Defining the specific steps also has an advantage in relation to clarifying roles and responsibilities. Since multiple government agencies and authorities are involved in providing information for and/or making the decision about water allocation during an extreme shortage, being clear on the roles and responsibilities is important (***short term recommendation***).

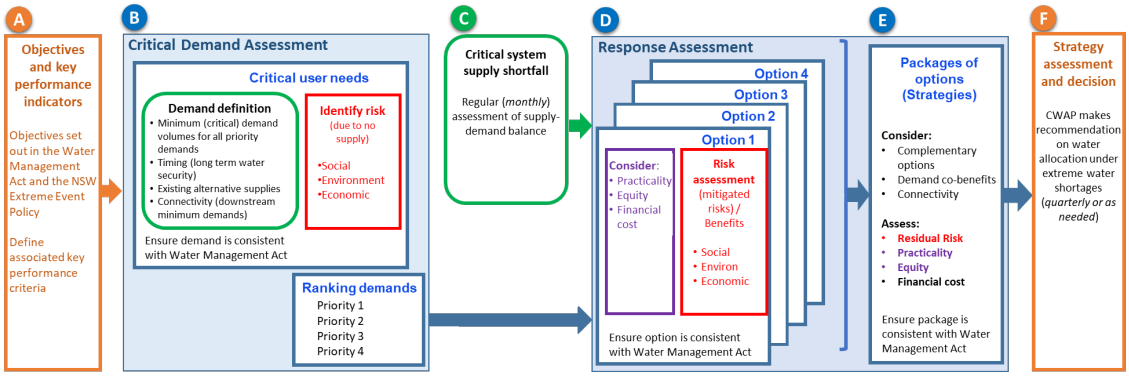

Figure 2: Decision making framework

3.1 The Framework Steps

Using the diagram in Figure 2 as a guide, six distinct steps in the decision making process have been described below, along with the need for feedback and review as a final step.

A) Objectives and key performance Indicators

The objectives for the decision on allocating water under extreme water shortages should be aligned with the aims and objectives of the Water Management Act and the NSW Extreme Events Policy. The objectives should then in turn inform the key performance indicators for assessing the viable options and packages of options, as was discussed in section 2.2.

Since the objectives in the NSW Extreme Events Policy make mention of water quality issues also affecting the available water for useful supplies, this should also be a consideration in this decision making framework.

Recommendations:

- The decision process should include consideration of water quality as it pertains to restricting local uses and values (L).
- Align the assessment criteria with the objectives and principles of the Act and Policy (L).

B) Critical Demand Assessment

This step considers the critical demands that should be met, the associated risk if they were not to receive any (or less than minimum) water, and whether the demand being requested is consistent with the Water Management Act. Based on the social, economic or environmental risks, the demands should then be ranked within their specific priority groups (as set out in the Water Management Act (2000).

Currently the practice is to determine the critical demands at the onset of an extreme water shortage either formally, or to surface the critical information during the Critical Water Advisory Panel (CWAP) deliberations. If this information was assessed before such an extreme shortage event and tabled at a CWAP meeting for consideration, the discussions on the response strategy might more efficiently focus on the options and the associated trade-offs. The potential for CWAP deliberations to surface changes to critical demands is likely to remain as a factor and the decision making framework will need to be flexible to this. However, the majority of critical demand can be defined and assessed in advance.

Demand definition: This step requires information to be provided by various government agencies on:

- The minimum critical demand volumes for all priority demands within the system
- Existing alternative supplies that could meet some of these minimum demand needs
- The connectivity of downstream minimum demands that are reliant on the system

Identify risk: For each critical demand, the consequence of running out of water should be defined according to social, economic and environmental risk criteria (the application of these criteria have been discussed in Section 2.2). The combination of timing and severity of the impact is an important consideration.

The application of the social, economic and environmental risk lenses and the limits to using a conventional risk matrix have been discussed in section 2.2.

Some agreement will be needed to set the risk level (level of water security) by determining what length of time critical water supplies will be held in storage for, particularly for critical human needs.

Ranking demands: Once the critical demands have been established and their associated risks identified, they should be ranked within their relevant priority groups. This will assist later when deciding which critical demands to service first.

Recommendations:

- Define which agencies provide which critical demand information, and which agencies assess the risk due to not having water (S).
- The risk appetite for holding water back for certain critical demands needs to be agreed upon (L).
- Assess the critical water demands and their associated risks due to receiving no water at an earlier stage taking into consideration existing alternative supplies and downstream connected demands. Consider the combination of timing and impacts in the risk assessment (L).

C) Critical System Supply Shortfall

The shortfall between supply and demand is currently assessed on a monthly basis by WaterNSW. This information is used to determine what water is available in the system for potential use to meet critical demands. It is also used to inform triggers for suspending components of the water sharing plans due to an extreme water shortage.

D) Response Assessment

If the whole or component of a water sharing plan is suspended, then according to the NSW Extreme Events Policy, an assessment of the viable options for allocating water to the critical demand users is undertaken. This step should involve consideration of the various response options in terms of:

- The practicality of delivering the water to the destined user without unrealistic loses along the way (as discussed in section 2.2).
- Ensuring that types of users are treated as fairly as possible (taking into consideration the issue of practicality) (as discussed section 2.2)
- The financial cost to the NSW Government of implementing the option e.g. the cost of building block banks or providing carted water.
- Undertake an assessment of the mitigated risks (Social, Economic and Environmental) due this option. Which critical demands would benefit from this option?

Finally, screen out those that are inconsistent with the Act and Policy Principles

Recommendations:

- Incorporate the assessment of the financial cost to the NSW Government of implementing an option into the options assessment process (L)

E) Packages of Options

In the framework diagram, the packaging up of the options is seen as a discrete task. However, in practice this may be an iterative and intuitive process of considering viable options or groups of options.

Based on the options determined in Step D, and the cohort of critical demands (Step B), package up combinations of options that deliver water to as many critical users as possible, and as efficiently as possible.

In packaging up the options, the following should be considered:

- Are any options complementary or better suited to being deployed together, for example piggy-backing a human demand on top of an environmental flow release?
- Can one option satisfy more than one critical demand?
- Are there any connected valleys that are better placed to provide a critical downstream demand?

For each package of options, assess the:

- Residual risk/loss – determine the combined residual risk of the package of optiuons by reviewing the Social, Economic and Environmental risks for the individual options.
- Practicality - check the level of water loss due to the combination of options.
- Equity – check that no unforeseen equity issues have arisen through the packaging process.
- Financial cost – sum the financial costs associated with individual options that make up the package

Undertake a qualitative comparison of the packages based on these three criteria.

Ensure that the packages are consistent with the Water Management Act.

A shortlist of viable packages should be tabled to the CWAP, clearly outlining how the assessments were undertaken. The potential for CWAP deliberations to surface potential additions and alterations to actions or packages is likely to remain as an important factor in the decision making as no one party has all the available information. The framework will need to be flexible to this drawing on new information from the CWAP and developing improved packages with meetings.

Recommendations:

- Incorporate the assessment of the financial cost to the NSW Government of implementing the package of options into the package shortlisting process (L)
- Focus CWAP on the packages of options, and considering specific options themselves (L)

F) The decision – the Preferred strategy

The shortlist of packages (along with their assumptions and assessments) should be deliberated on by the CWAP. The CWAP should bring current knowledge to the discussion within an understood framework for the decision-making. Ideally the CWAP will base their decision on the level of residual risk, equitable allocation, and financial cost of each package, and arrive at a recommended package (strategy) for allocating the available water during the extreme water shortage.

The outcome and reasons for the decision should be captured in the meeting minutes and communicated to the relevant stakeholders and affected critical users.

G) Review / iteration

While the framework diagram may give the impression that the decision making process is linear, there are indeed a number of feedback loops and iterations:

- Steps D and E may have a number of iterations before landing a shortlisted set of packages. Further, as the drought progresses, new options may come to light or other may become longer viable, requiring a review of the packages.
- As the drought worsens, or demands change, the critical demands may need updating (Step B), which will in turn affect the how the options are considered (Step D).
- If a rain event produces a new source of water, the allocation of that volume of water will need to be considered through Steps D and E.

Finally, lessons learnt during the decision making process should be documented and any agreed adjustments to the process should be made and followed during the next implementation of the decision making framework.

Recommendations:

- Ensure that a reflection process is included in the CWAP agenda, to review the decision making process on an ongoing basis and implement the agreed actions (S).

4 Summary of Recommendations

Our review has revealed that the decision making process appears to be facilitating reasonable and timely decisions under difficult circumstances. The current criteria and their application have allowed for the prioritisation of the response options and allocation of water to priority critical demands. However, at a high level, we would suggest that process could be more structured with discrete steps, as suggested by the framework diagram (Figure 2 and Appendix 1).

Institute for Sustainable Futures (UTS) recommends that DoI Land and Water continue with their current decision process and develop it over time. The following recommendations have been made, and have been sorted into short, medium and longer term actions:

Short term:

- Clearly define the roles and responsibilities of the various agencies involved in the decision making process.
- Define which agencies provide which critical demand information, and which agencies assess the risk due to not having water.
- Ensure that a reflection process is included in the CWAP agenda, to review the decision making process on an ongoing basis and implement the agreed actions.

Longer Term:

- Check alignment of the assessment criteria with the objectives and principles of the Act and Policy.
- Consider an approach for collective “agreement” on the weighting or emphasis of the criteria, without making the process overly complex and time consuming.
- Seek technical advice on the impact of a small flow release in the environment in the coming months.
- Incorporate the assessment of the financial cost to the NSW Government of implementing a response option into the decision process.
- Define the critical environmental water requirements.
- Further work on the assessment criteria is needed to sharpen their application and remove unintended double counting when comparing the impacts, in line with best practice.
- Seek agreement early on the process on the level of water security and risk appetite for holding water back for certain critical demands.
- Include the consideration of water quality as it pertains to restricting local uses and values in the decision process.
- Treat demand and supply separately - Assess the critical water demands and their associated risks due to receiving no water at an earlier stage taking into consideration existing alternative supplies and downstream connected demands. Consider the combination of timing and impacts in the risk assessment.
- Focus CWAP on considering specific options and the packages of options, including the refinement of the packages of options.

Appendix 1: Decision making framework for allocating water during extreme water shortages