Harvey Water Supply System: Cost Sharing Issues

Paper 2 of 4 relating to aspects of dam safety and cost allocation, provided as input to the Inquiry into Harvey Water Bulk Water Pricing

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Economics Policy Strategy

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Executive Summary & Conclusions

This is the second of a series of four papers prepared by ACIL Tasman and commissioned by the Economic Regulation Authority of Western Australia – in relation to the current Inquiry into Harvey Water Pricing. The first paper dealt with the requirements for the regional dams in respect of dam safety – what might be required under current institutional and legal requirements, how this might alter if there were some form of formal regulation of dam safety, and the implications of looking more closely at efficient costs of investment in dam safety.

This paper addresses the question of how the costs of delivering dam safety should be allocated across stakeholders. A critical point is that how the costs are spread depend heavily on how the costs are generated. Some of the options considered in Paper 1 could result in a substantial reduction in costs relative to the current proposed program of investments. To a large extent, this reduction could be expected to arise from deciding not to do, or to defer for a long time, investments in safety improvement that appear to offer benefits that are disproportionately low relative to costs – assessed against willingness to invest in safety and public health elsewhere in our system. Essentially thus is an opportunity cost argument that recognises that better community safety outcomes might be achievable at even lower cost through redirection of resources.

Where the investments in dam safety appear efficient in the sense of offering safety improvements and wider community risk reduction at costs competitive with alternative opportunities, the case for these costs being rolled into the regulatory asset base – especially if these costs were not grossly out of proportion to the cost figure indicated at the time the BWSA was struck – seems reasonably strong on equity grounds. A level of scope and costing risk was almost certainly assumed at the time, and expectations of these costs arising were built into the agreement and, importantly into the value of associated assets – not just the Water Corporation dams but also the water rights of irrigators holding these rights and the farms with sunk irrigation infrastructure. Balancing equity concerns involves recognising all these interrelated effects; any increase in bulk water prices would in turn claw back some of the value of the water rights and of farms with sunk irrigation infrastructure.

Equity concerns have arisen mainly with the dramatic upwards adjustment (by a factor of 6-7 times) to the estimated cost of these works, with the potential, if passed through, for very large impacts on bulk water prices. This escalation appears attributable to the availability of better and longer time series of data,

including climate modelling, and to more sophisticated hydrology modelling, that has amplified the assessed risks of floods that may cause dam failure. These estimates remain subject to high levels of uncertainty with scope for implying large variations in costs. Revision to the ANCOLD default 'standard' for dam risk planning has also had an impact. Predominantly though, there appears to have been a *reassessment of the risks* faced, rather than an *adjustment to the level of acceptable risk*, underpinning the cost escalation.

Neither economics nor public policy precedent offers a clear and unambiguously correct way forward. Important considerations in weighing alternatives are:

- What is assumed about the 1996 starting position – what was the intent and where were residual risks intended to fall?
- Are there any questions of whether the costs of delivering satisfactory risk management will depend heavily on how the dams and water are used ;
  - For example, the extent to which it remains in irrigation versus further transfers into the IWSS system where there may be opportunities for pre-emptive transfers 'effectively' into other storage, providing the ability to operate these dams with more headroom and greater ability for flood control.
    - ⋯ It these circumstances, it would be dangerous to treat the dam safety costs as legacy costs.
  - More fundamentally, but much less likely, is the question of whether the dams should remain in service given the costs now being suggested;
    - ⋯ It seems likely that urban demand and some irrigation demand could justify even these costs, though these questions have not been resolved here.
  - If the costs are related to plausible variations in usage patterns, then questions of efficiency figure prominently and it would seem appropriate to be cautious in limiting efficient price signals.
    - ⋯ Conversely, if a block of costs will be incurred under all plausible scenarios, then there is much more scope for focusing on equity and even for treating the safety costs as legacy costs – though this does not necessarily imply that they be fully excluded from the regulatory asset value.

Two intuitively appealing approaches to allocation costs seek to do so either:

- on a basis reflective of the level of benefit obtained from the investment so that those benefiting most pay most – *beneficiary pays*; or
- on the basis of the importance of the demands for services in driving the need for the investment – *impacter pays*.

Unfortunately, in respect of retrofitting investment to adjust for revised assessments of risk, especially if these retrofits involve costs well in excess of the likely value of the benefits, it is not at all clear how either of these principles should be applied.

At least in respect of costs over and above a reasonable assessment of efficient costs, it is arguable that the beneficiary and the impacter are the government, institutional and community processes that are driving the decision to incur these higher than cost-justifiable investments. This is especially true where delivery of these safety levels is not required by WA regulation.

A preferred resolution of this would be to challenge the need for these costs, and seek mechanisms to allow these resources to be redirected in more valuable ways. Options here are discussed in paper 1. Failing this – if the costs are to be incurred because of the nature of these processes – it might be argued that these costs (over and above efficient costs) fall most naturally to the broader community than to the users of the dam assets. This might, in fact, post the most efficient price signals to review these incentive structures.

An exception to this, noted above, would be if the proposal to incur these costs and roll them forward into the regulatory asset base and user (notably irrigator) prices would result in incentives sufficient to allow some or all of these costs to be avoided.

The complex and important interactions between equity and efficiency objectives are addressed further in Paper 3.

1 Purpose

This is the second of four short and inter-related papers prepared by ACIL Tasman at the request of ERA, to provide input to its Inquiry in Harvey Water Bulk Water Pricing. The papers are concerned with different, but interrelated, aspects of the appropriate form, timing and pricing of investment in improved dam safety for purposes of assessing supply costs, and of the appropriate basis for allocating such costs across stakeholders.

More specifically, the four papers cover:

1. Issues that arise in considering whether it appropriate for the full costs of complying with the ANCOLD dam safety requirements should be assumed, for price determination purposes; and
   - if alternative approaches to safety might be considered, what form these might take.
2. The basis on which the costs of meeting dam safety targets should be shared across stakeholders – the subject of this paper;
3. Whether the current arrangements, including the approach taken in striking the Bulk Water Service Agreement (BWSA) entail a subsidy for Harvey Water and the possible relevance of this for cost allocation.
4. Review of the value of benefits recreational users derive from the dams, as possible input to the cost sharing arrangements.

These four papers are not independent of each other. Decisions taken on which costs to take into account in price determination, and why, have implications for both equitable and efficient cost sharing. Whether there is a subsidy depends heavily on the regulatory pricing framework used, and the attitude taken to restrictions on uses of the water beyond the current user base. The questions addressed in each paper do not lend themselves to the provision of a uniquely 'correct' answer – scope for substantial discretion exists and it is important that the different choices add up to a package of decisions that is sensible.

These papers are being prepared in parallel with work being undertaken by Marden Jacob Associates (MJA), focusing on specific aspects of the dams being considered. A balanced strategy will need to take into account both the issues and principles set out in the three papers, and the specific empirical insights to emerge from the MJA work. We have coordinated our work with MJA – who have previously undertaken significant relevant work[1].

[1] Marsden Jacob Associates (2003) and Marsden, Jabob *et al* (2005)

2 Issues in cost sharing

2.1 What costs?

The question of how costs might sensibly be shared across stakeholders would be a lot easier if there were a clear-cut value of costs to be allocated. This is not the case. Paper 1 draws a distinction between:

- The level of safety costs that might be necessary for Water Corporation, acting on its own, to clearly demonstrate compliance with established safety costs which, in the absence of regulation, it interprets as ANCOLD compliance;
- The level of costs that might arise, within an ANCOLD compliance setting, where the Government is prepared to be a party to the assessment and to exercise the exceptional circumstances provisions of ANCOLD – to deliver comparable or greater reductions in risk at potentially lower cost;
- The level of costs that might arise through a more generalised approach to safety management across a wider portfolio of infrastructure assets – with the likelihood that this could deliver comparable or greater safety outcomes for the community at a very much lower cost; and
- Extension of this last approach to include only those investments that can be justified as offering community benefits (including benefits in the form of risk reductions) in excess of costs.

From a traditional economic perspective, it is hard to see how these would not be seen as being ranked in increasing order of efficiency – but there may well be institutional impediments to Water Corporation moving away from the first without active support from government processes. The result might be ensuring greater minimum levels of safety for each asset, as opposed to delivering greater safety spread across a range of assets.

It is quite conceivable that different sharing of costs should be applicable to these different determinations of the level of costs. This argument might be further strengthened were it established that some of the budgeted costs for dam safety are attributable to special operating requirements for the dams to best meet the demands of current users, especially irrigators – costs that might be avoided if, for example, the water were traded into the IWSS/Perth supply system and alternative dam operation were feasible.

All these considerations strongly suggest that a *joint decision* will need to be made as to which costs are likely to be incurred and how these will be spread. Certainly, if the costs to be incurred could not be justified as either 'efficient' or required by a safety regulation process, then this will raise questions as to where any surplus over efficient costs is logically allocated,

2.2 Beneficiary/impacter pays

These same complications make particularly muddy the traditional split between two broad approaches to allocation of costs:

- The **beneficiary pays** principle, in which incremental costs (such as dam safety upgrade costs) would be spread across stakeholders broadly in proportion to the spread of incremental benefits.
  - Benefits to the broad community, including but not restricted to direct consumptive users of the water (irrigators, town supply etc), in the former of reduced risks of death and injury, mainly downstream of the dam.
  - Benefits to irrigation users of the water in the form of greater security of supplies and insurance against extended loss of supply capacity and associated production capability;
  - Analogous supply security benefits to other users, including town and industrial supply – and Water Corporation end use customers, including customers within the IWSS system given that water has been traded through to that system.
  - Analogous *reliability of facility access* benefits to recreational users of the dams – boating etc.
- The **impacter pays** principle, when the use or demand that triggers the need to incur the costs is confronted with the costs.
  - In relation to the possible building of a *new dam* to supply *irrigation* water, identifying the primary impacters is reasonably straightforward.
    - ⋯ The irrigators would expect to pay, and if the commercial case would not add up, either the dam would not proceed or another group (eg, possible recreational users) would be identified as a source of demand and willingness to pay and a joint case developed etc.
    - ⋯ Downstream residents and other interests would not be expected to pay for the costs of making the dam safe if this was doing no more than limiting the extra risk created by the building of the dam in the first place.
    - ⋯ However, if building the dam would deliver safety and damage reduction benefits through better flood management, and especially if meeting these demands implied a different design or operating regime, it is possible that these values could become part of the case for the dam and this group might then be seen as part of the impacters.
  - In relation to institutional demands to deliver a particular set of dam safety improvements to an established dam within a non-regulated but governance-driven setting – where the dam safety improvements would

fail a conventional net benefits or cost effectiveness test – it is harder to say who the impacter is:

- Is it a sate or Commonwealth community that, through its government and institutional arrangements, has created governance pressures that make support for such investments in safety, even when the programs and their costs appear to be far from efficient, *necessary for asset owners*.
- Is it Water Corporation for holding assets that, because of its corporate structure, may require higher costs to be incurred than would emerge naturally in a competitive market setting where dams and other assets could be traded, were this possible.

There is no automatically 'best' choice to be made between these principles, or any of a range of hybrids. Two *different philosophies* and associated value systems are involved – different ways of looking at fairness. There is no guarantee that either approach will deliver efficient price signals.

Economics has relatively little guidance to offer in the allocation of costs for equity reasons except where these allocations start to impact on investment and usage incentives – to have impacts on the efficiency of investment and resource use. The specifics of the economic guidance provided to guard against poor efficiency – including the so-called Baumol-Willig pricing band that sets the efficiency boundaries for allocating specific costs – are addressed in Paper 3 in this series. For the moment we focus on more on the equity dimension of which costs might reasonably be considered for allocation to particular stakeholders – subject to further probing for implications in this efficiency framework. The separation between the papers is not entirely clean – in this paper the question of how to allocate costs that are in excess of 'efficient costs' is addressed, but whether the costs are efficient or not still leaves some discretion as to how these costs can be allocated across stakeholders without compounding any inefficiencies in investment and usage signals.

Possibly the most constructive approach to weighing these alternatives for cost allocation is to recognise that a lot, especially in relation to the equity of the arrangements, depends on starting positions and views of these positions.

Suppose for the moment that a dam had been built that complied with *then relevant* safety standards – and these standards were well-defined and specified a maximum risk to life and property etc, and these risks had been correctly assessed at the time. Community consultation and formal approvals processes needed to be satisfied and, in a sense, a property right was created in the form of the right to build and operate a dam consistent with these safety outcomes. The approval process presumably entailed a form of judgment that included recognising benefits to the wider community, and that there would be net

benefits from the investment. In a sense, the community (through the combination of consultation and government approval) would then have been party to a contract that included accepting an identified level of risk after judging it acceptable, given offsetting benefits.

If a later decision were taken by the community to raise safety standards above historical levels, and this would requires expenditure on the dam, it would seem reasonable to judge the community demanding these additional 'safety services' as the impacter. This is a decision essentially to enter a political marketplace to acquire services *not already available*, possibly because these services had been 'sold' in the course of the earlier approval process or possibly because they had never been available[2].

While there is room for differing views, it would not be altogether unreasonable to argue that this new cost should not fall mainly to the dam owners and their customers. What if the risk related instead to a natural cliff face, or a naturally flood-prone undimmed river course, rather than a built and privately owned dam? There would then be little dispute about who pays – the value of safety works would need to be weighed but one way or another, if the works proceed, the community would expect to pay. What is fundamentally different about an item of privately owned capital investment that had been justified on the basis that the original costs delivered then acceptable safety, if the dam is continuing to deliver that agreed level of safety?

From a beneficiary pays point of view, are the consumptive users of the dam services going to be attributed only incremental benefits from the proposed greater safety – or the full benefits of being allowed to continue operating, with a threat of removal of service if the upgrades are not made. These two approaches imply very different cost allocations, the latter probably allocating most costs to the dam users. This could be viewed as moving from beneficiary pays to impacter pays, but in fact the two very different outcomes could be justified within a beneficiary pays framework – depending on your starting perspective. Is the dam that is now deemed to pose an unacceptable risk the source of impact to which costs should be attributed or is the community seeking to acquire higher safety standards the impacter? Either perspective is tenable – which is not in itself particularly helpful, other than in illustrating the complex value base, and associated room for discretion and even semantic debate, involved in allocating costs.

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[2] This last point is potentially important and is discussed in Paper 1. Building a dam can deliver safety services – through better management of 'normal floods, for example, as well as creating elevated risks in the event of extreme floods, where failure is a risk. Setting requirements on risk in the event of failure, without recognising also these other safety services may not result in the best outcome for the community.

There is some analogy, in the above example, with the current changes in dam safety requirements, but the analogy is in fact weak. While there have been changes in ANCOLD standards since 1996, these appear[3] not to be the main reason why very high compliance costs are now being proposed. What has changed is the science underpinning the assessment of risks and the engineering design and estimation for compliance. The changes have been big – because the assessment of the character and frequency of extreme flood events is suggesting a greater threat than had been previously assumed. Fundamentally, we are now aware that the actual risks are greater than was understood at the time because of this modelling and specific engineering assessments.

Focusing just on equity raises interesting questions:

- Was the agreement to allow the dam to be built and to accept a level of risk one in which the dam builders/owners guaranteed to deliver a minimum level of safety,
  - or one in which the community accepted the residual risk that building the dam on the basis of best information then available included a chance that it would subsequently prove to have a greater risk?
  - It seems likely the question was not formally addressed at the time of construction and was not explicitly addressed at the time the bulk water service agreement (BWSA) was negotiated in 1996.
- At the time of the BWSA, there was an acceptance that the dam would be upgraded to meet then current default standards for retrofit for dam safety, but the indicative budget was about $20m – in contrast to the current estimate of over $100m.
  - Was any consideration given to the allocation of the risk that the costs could be very much higher than the indicated figure?
  - Was this perhaps part of the reason why a Ministerial discretion was included in the cost sharing arrangements, even though an indicative basis for allocation was agreed?

Practice in other areas of the economy in relation to changes in safety and public health requirements in respect of existing assets have been mixed:

- Progressive requirements to retrofit seat belts have been introduced in many jurisdictions; but

[3] The 1994 guidelines that applied in 1996 have since been superseded by 2002 guidelines. These do alter the guidance provided in respect of tolerable risks but not the fact that exceptional circumstances may justify a departure from these limits. The evidence outlined in Paper 1 does suggest that even modest tightening of tolerable risk limits could imply a significant change in necessary costs to comply, so these changes may be an important part of the shift. However, better flood risk modelling and assessment of populations and assets at risk is, we believe, the dominant driver. The parallel empirical work being done by Marsden Jacob Associates may provide better information on these matters.

  - Requirements to upgrade existing cars to comply with latest design standards has generally not been a requirement.
- Lead has been removed from new paints, but retrospective removal from all surfaces has not generally been required – though OH&S requirements in respect of working with established buildings have been introduced.
- New pollution standards have commonly been applied as retrofit requirements for major industrial facilities, although sometimes with phase in times that allow reasonable amortisation of existing investment.

For dam safety there is a complex mix of factors. The latest standards have required a shift in the design level of safety – by creating new standards for tolerability of risk. At the same time, the assessment of the level of risk has changed, often dramatically, as a result of better methodologies and progressive accounting for climate change effects. The implied contracts in the earlier approvals processes are at best vague in their allocation of what have emerged as the dominant risks.

This means that an uncontroversial assessment of who is the impacter is far from straightforward – and is further complicated by institutional impediments to the development of a response based on some form of net benefit test.

This strongly suggests that these cost allocation principles offer only limited insights into a sensible way forward, even before considering the efficiency dimensions.

Paper 4 in this series deals with approaches to sharing costs (primarily within a beneficiary pays paradigm) between extractive and recreational uses of the water supply system – principally through a review of what can be said about the value of recreational benefits.

2.3 Treatment of 'inefficient costs'

Paper 1 deals with the special complexities that arise in relation to dam safety in the SW region as a result of uncertainty about the relevant application of ANCOLD Guidelines, especially in the absence of any formal regulatory base for their application. Aspects of the Guidelines are seen as potentially triggering costs well in excess of costs that could be justified on conventional net benefit grounds. While there is scope within the Guidelines for avoiding some extremes – situations where the costs are demonstrably 'disproportionate to the benefits' – accessing this capability while complying with ANCOLD appears to require active engagement by the Government. WA is one jurisdiction where the basis for this ahs not been established.

Water Corporation recognise aspects of this in their submission in response to the Issues Paper. That response states a clear position that they feel compelled

to comply with the nominal guidance provided, for reasons of good governance. Paper 1, and earlier work by Marsden Jacob *et al* (2004), identify potential additional difficulties with Water Corporation being fully responsible for dam safety implementation under wider institutional arrangements. This could have resulted in incentives to err on the side of caution – 'over-complying' in preference to the risk of being found to have 'under-complied'. It further suggests the potential for even a modest incentive in this direction to translate into much higher compliance costs than might emerge where there are clearer competitive pressures to strike a balance across competing concerns.

Other specific aspects of the ANCOLD Guidelines, including its requirements to achieve tolerable risk levels on a dam-by-dam basis, rather than across a portfolio of assets, could be expected to have further encouraged costs that are excessive in relation to the level of community safety delivered – by-passing feasible wider portfolio approaches to achieving the same level of safety. Again, if government were a participant in the compliance process, the exceptional circumstances provisions might be invoked to limit these 'excess costs'. However, there are understandable difficulties in Water Corporation achieving this outcome on its own.

All of these points suggest a high risk that the current processes for addressing dam safety could result in the roll-out of a program of works that involves costs that are high in relation to the level of safety delivered – measured indicatively by expected number of fatalities avoided. These costs are likely to be:

- high relative to least cost ways of delivering the same number of fatalities avoided across the set of dams;
- even higher relative to the costs of delivering the same number of fatalities avoided across a wider portfolio of government- or government agency-owned infrastructure assets; and
- extremely high relative to alternative opportunities for investment in saving lives through, for example, targeted investment in reducing road accident risks or the public health system.

This does not mean these costs would not be prudent for Water Corporation.

However, it does make sense to recognise different components of the possible costs, even while recognising that great precision in splitting the costs up may be difficult:

- The efficient costs involved in moving dams to a cost effective level of safety – the cost of the package of measures for which incremental costs do not exceed incremental benefits, taking into account community attitudes to risk and the opportunity cost of resources used.

- Any additional costs that would arise if 'least cost' ANCOLD compliance were feasible in conjunction with reasonable application of the extreme circumstances provisions to limit costs that are disproportionate to benefits, but consistent with the underlying philosophy of ANCOLD, applied dam-by-dam.
- Any additional costs that arise because Water Corporation is limited in its access to the extreme circumstances provisions and may face incentives towards over- rather than under-compliance that arises from the wider institutional arrangements that apply to the water supply system.

The second of these two items is open to wide interpretation. Other Australian jurisdictions that have implemented dam safety regulation arrangements, in all cases based on ANCOLD, do not appear to have formally exercised the exceptional circumstances provisions to target long-term levels of risk outside the ANCOLD guidance provided as to tolerable risk – though they have developed implementation strategies likely to delay implementation of the least cost effective elements. Deferral can have large implications for effective discounted cost, as might, for example, be passed through to the level of a renewals annuity or other smoothed funding instrument.

It is relevant to ask what the beneficiary and impacter pays principles might suggest for each of these classes of costs:

- For the 'efficient' costs, once a landing is reached in what these are, there would appear to be a reasonably clear-cut case for these costs being incurred.
  - The beneficiary pays principle would tend to suggest that most benefits would accrue to those stakeholders at direct risk from failure.
  - The impacter pays principle would suggest as the major impacter the owner of the dam and the clients for the dam services that involve the risk to be mitigated.
    - However, the earlier starting point issues are relevant – if the reason the upgrade is needed is because of change in safety standards demanded, relative to the safety levels originally agreed, then the impacter might be viewed as the wider community.
    - If the need arises from improved data and modelling and better climate science and engineering knowledge reassessing actual risks, then the impacter might more naturally be seen as the dam owner and clients for the dam services – though this might be affected by the nature of the original understanding with the community as to how the risks were being allocated at the time.
- For any additional costs as a result of 'least cost' ANCOLD compliance, these appear to be a creation of the particular regulatory framework chosen – assuming that ANCOLD compliance is set as an objective – that is encouraging additional costs.

  - Almost by definition, the beneficiaries value the benefits at less than the costs.
  - If these costs are unavoidable for reasons other than cost effectiveness, it may be appropriate to probe these other reasons.
    - ⋯ Community attitudes to perceptions of risk, and political responses to these perceptions or likely responses to an actual failure, that make it politically prudent to require higher cost strategies. In this case, the beneficiaries may be the politicians and the impacters the broader community.
  - Where compliance with these demands entails costs far in excess of those that might reasonably have been expected back in 1996, and much of these costs would fail to deliver matching benefits, it seems harder to argue that these should be attributed retrospectively to existing asset owners. However, the same test applied to numerous other regulatory requirements that are just treated as costs of doing business could result in some striking anomalies.
    - ⋯ Application of such standards to new assets, where the costs are more naturally avoidable without serious equity consequences, would seem to make more sense than retrospective application.

- For costs attributable to the lack of formal dam safety regulation and to wider institutional arrangements that may encourage overinvestment by Water Corporation, the case for pass through to users of the services seems even weaker.
  - A competitive market in asset ownership as well as operation could be expected to abate some or all of these extra costs.
  - Unfortunately this does not deal with Water Corporation's problem in the event that the arrangements do not change.
    - ⋯ This might be interpreted as a block of inefficient costs attributable to broader regulatory and institutional arrangements that have emerged from wider policy planning processes.
    - ⋯ In the absence of a mechanism for avoiding the need for these costs (that would seem a preferable solution), both impacter and beneficiary pays arguments might suggest that the costs be more naturally passed back through the system as a community impost – possibly addressed through the CSO arrangements.

2.4 Residual uncertainty – Options strategy

The data, science and engineering on which the risk assessments are being based may have come a long way – but very large uncertainty remains. Estimating the nature of extreme events with the limited available data, and the ranges that still apply to the climate change modelling, is subject to very large uncertainty. Given the evidence in Paper 1 of rapidly diminishing returns to

investment in dam safety, this strongly suggests that the efficient costs, and the other components of incremental cost, are likely to be highly susceptible to deeper probing and the progressive accumulation of better data – especially if active investment is made in these processes.

Modern methods for managing risks under uncertainty would favour exploring these sensitivities, and the scope for developing an adaptive strategy better able to manage the risks of over-, under- and inappropriate investment as a result of these uncertainties.

These issues are discussed in Paper 1, but are not explicitly allowed for within the ANCOLD Guidelines – though it might be possible to use the exceptional circumstances provisions to justify such a strategy.

A sound adaptive strategy commonly involves active investments in better information, alongside the deferral where possible of large commitments that might be challenged by emerging information. Assessing efficient costs might sensibly need to factor in such a strategy. Broadly the costs of investment in better information and flexibility – if done to reduce the expected cost of delivering adequate safety – would seem likely to be best allocated in the same way that the costs of actual safety upgrades are allocated.

However, the level of costs for delivering appropriate and efficient safety then becomes inherently a probabilistic concept. Any process designed to recover expected costs could well substantially over- or under-recover. This strongly favours an adaptive cost recovery mechanism.

2.5 Legacy arguments

The concept of pricing based on an established 'line in the sand' is discussed further in Paper 3. As the Issues Paper recognises, the BWSA effectively drew a line in the sand but with some uncertainty remaining. A regulatory asset value of zero was agreed for the dam assets, with expectations of recovering forward costs, including dam safety upgrade costs implied by the then (1994) ANCOLD Guidelines, and notionally estimated at about $20m. The uncertainty in the respect of the line lies in the Ministerial discretion allowed in respect of the costs of dam safety compliance.

At the time this line in the sand was drawn, appreciation of the future value that might accrue to these assets as a result of the opening up of water trading opportunities was, we believe, not a serious consideration. It seems likely that the subsequent development of these markets has delivered much greater value to the assets – a mix of real and option value in relation to the supply of water to the IWSS and Perth and surrounds. While, at the time, there might have been little difference implied by whether the dam assets were owned by Water

Corporation or by Harvey Water, subsequent developments have meant that ownership now confers significant benefits that were unforeseen then.

The then estimate of $20m for dam safety compliance rapidly proved to be a gross underestimate, having risen past $100m by the time of the 2000 Bowles portfolio assessment for Water Corporation.

In relation to legacy costs, the IPART concept could be seen to include in its definition of legacy costs the minimum costs needed to bring the infrastructure 1994 ANCOLD standards[4]. The 2003 Marsden Jacob reports notes that by 2002 compliance with those 1994 standards (as opposed to the new 2003 standards) had been costed at $102m, "and could be up to 50 per cent higher" – largely consistent with current figures. These figures also correspond closely with the aggregate works budget that underpinned the Bowles (2000) portfolio assessment done for Waster Corporation.

This strongly suggests that the core cost of works issue relates to inadequate costing as at 1996, within the 1994 Guidelines, not to any subsequent change in the standards.

Indeed, changes to ANCOLD guidelines since 1996 seem likely to have delivered significantly greater flexibility in respect of small dams where few lives are at risk, including allowance for limit of tolerability on risk to a single life dropping as low as 1:1,000 per annum, compared to the earlier 1:1,000,000.

Our impression is that implementation principles developed by the NSW Dam Safety Committee, and now being considered by the NSW Government, could deliver even greater flexibility and may become a better implementation model for dam safety than relying just on the ANCOLD guidelines. This does not eliminate the concerns with specific aspects of the Guidelines, as set out in Paper 1.

Viewed in these terms, it would seem reasonable to view most of the cost of the proposed works to upgrade the dams as legacy costs, if it was accepted then that compliance with ANCOLD guidelines was necessary. Based on Water Corporation response strategies in 2000, presumably reflecting 1994 Guidelines, and now reflecting 2003 Guidelines, the true cost of complying appears not to have changed dramatically since 1996. The fact that significant investment has already been made is relevant to this assessment, but the broad

[4] Our understanding of the IPART definition differs a little from that stated in the issues paper, in that the IPART definition would, in principle, still allow for a decision to allocate a share of legacy costs to a current user, though this would be seen a deviation from the 'line in the sand' principle. There is no need to get bogged down in a semantic discussion. We assume that Harvey Water would have believed that, with a payment of the order of (and realistically probably somewhat more than) $20m, it would gaining access to 'ANCOLD compliant assets'.

picture seems likely. We do note that Harvey Water, in its submission, appears to place significance on the extent to which we are now discussing changes in community standards as the drivers of cost increases. There may be an element of this, but it does not seem to be the dominant factor.

It does not follow that none of these costs should be paid by Harvey Water – the allocation of legacy costs (in an IPART/ACIL sense) is a separate issue – but it is relevant to recognise these as legacy costs.

A difficulty is that these costs were grossly underestimated at the time that the BWSA was struck. The BSWA incorporated a basis for funding the safety costs, using a fairly pragmatic approach to dealing with legacy issues, but that approach night not have been acceptable had better cost estimates been available at the time.

The legacy argument was developed for IPART to correct for 'irregularities' at the time of transfer that might have the effect of cutting across the intent of the line in the sand principle – with non-compliance with environmental or other regulatory requirements being a case in point. It was an element in implementing a clean line in the sand principle where there were large uncertainties at the time.

Nominally, the decision to recognise dam safety costs, to incorporate and estimate and an indicate basis for cost allocation would seem to render the rationale for using the legacy argument void. In practice, the inclusion of Ministerial discretion and the fact of both gross underestimation of actual costs and probably large asymmetry in the relative abilities of Water Corporation and Harvey Water to weigh the estimation risks for the dam safety program, suggest this is not so clear cut. It seems possible to argue that at least some of the 'overrun might usefully be viewed as a legacy cost, interpreted as being covered approximately by the BWSA deal interpreted at then face value, inclusive of the indication of likely cost.

In reality, all parties have been caught out by the escalation of the cost estimates and it is not clear that there is much to be gained from trying to force a legacy argument, developed for one purpose, to be used in this rather different setting. A more constructive approach seems to be one that includes two elements:

- Recognition that the remaining dam safety costs are, at present, at least in principle avoidable – if the need for the dam services ends or is very substantially restructured – and care is needed not to develop a cost allocation approach that precludes good market insights into whether these costs should be incurred or not.

  - It does seem likely that the costs could be justified through IWSS supply of water, even if not justified at current levels of irrigation use, but there is a real and important efficiency issue to be resolved here.
  - Forcing the expenditures to be made under current arrangements as a result of a legacy argument may risk incurring costs that would not be justified by subsequent usage patterns.
- Recognition that there is flexibility to allocate costs differently from the original nominal cost sharing formula, based on the then estimated cost of only $20m, that would clearly have very different incentive effects from those implied by the current cost estimates.

In short, the original BWSA appears to have failed to adequately address the allocation of a range of risks and opportunities. The proposals now on the table have strong efficiency as well as equity dimensions – at least unless and until it can be clearly demonstrated that the costs need to be incurred and can be justified by the value of the economics activities they will allow. In this setting, heavy reliance on legacy arguments could well be counterproductive, and a fresh review of how best to handle the new costs, including whether to proceed, to what extent and how to allocate the costs, seems more appropriate.

2.6 Dam costs and the value of water rights

The 1996 decision to draw a line in the sand with, effectively, a zero initial regulatory asset value for the purposes of pricing would appear to have implemented pricing consistent with the lower bound pricing principles developed by the NWI and its pricing working group[5]. The Harvey Water submission on the Issues paper makes the same point.

Paper 3 discusses the wider range within which there is scope for basing efficient pricing. With the benefits of hindsight, it is clear that substantially higher prices could legitimately have emerged from that process if the potential future value of the assets in supporting water trading opportunities had been recognised at the time (value that has since been realized),. Instead that capital was regarded as devoted to irrigation supply and hence effectively sunk. Only now, when the depth of the current drought and the impact of reduced regional rainfall due to climate change have emerged, is it clear that the 'affordable' upper limit might have significantly higher than it was envisaged originally.

[5] A possible complication is noted in Paper 3, where there is discussion of whether the effective market value of the assets, had the current estimate of forward dam safety costs been on the table, may have been negative. Again, subsequent emergence of trading opportunities has probably rendered that possibility no longer plausible.

An effect of the decision to price at the lower bound was to increase the value of the water rights held within the Harvey Water region, with possible spillovers to the value of farms with significant sunk investment in irrigation infrastructure. The implied lower service costs of using the water rights would have translated as capitalization into the value of those water rights and assets capable of exploiting the lower costs. The effect was to establish a equity position with the value of dam assets for pricing purposes, that were to be owned by Water Corporation, set low and the value of the water rights owned by irrigators and others set higher than would otherwise have been the case.

The subsequent emergence of trading opportunities, and increased pressures on water supplies in the IWSS, would have served to further increase these values, still inclusive of the capitalization of the low dam asset base for pricing purposes. The emergence of a likelihood of a significant increase in dam service pricing as a result of the reassessed cost of safety upgrades has presumably worked in the opposite direction – and any confirmation of a significant block of upgrade costs to be passed through in bulk water prices would certainly reinforce this effect.

All of this means that, in thinking about equity, affordability and level of subsidy, the combined implications of past and possible future decisions for water right values (and possibly for regional farm values) as well as for dam asset values is important. At the same time, anyone who, since 1996, has purchased water rights at the elevated price has received no special benefit to offset any threat of a rise in bulk water prices now. In the cases where water rights have traded at least once, the 'windfall' element of those benefits has effectively left the scene.

It is arguable that the major implication of an underestimate of the cost of the dam safety program being used in the BWSA negotiations was to inflate the value of the water rights – to the benefit of early sellers and early uses of the water.

To the extent that water rights have increased substantially in value, the cost of the dam upgrades may well be quite affordable – taking into account capital as well as cash flow capacity. However, there is a difference between affordability and willingness to pay. If the holding costs of water rights move high enough, and there are alternative, lower water-using ways of deploying the other assets (farms etc) then trading of water to urban uses that are under elevated pressure is likely to be made increasingly attractive.

The way that the BWSA was struck, and the information ion which it was based, appears likely to have had some unexpected and somewhat arbitrary consequences in terms of both equity and affordability. Any subsequent trades amongst irrigators have probably meant that there is no strategy now available

that will look cleanly equitable to all stakeholders – but care is probably needed in making judgments as to the 'unaffordability' of any cost implications.

3 Option value of water

Following from this last discussion, a situation has emerged since 1996 that implies that water used for irrigation in the SW region – at least water from those dams with physical connection to the IWSS – has an opportunity value that may well now bear little relationship to its value in irrigation use. Similarly, the 'market value' of the dam assets can be expected to have changed in response to the emergence of these market opportunities and option value.

However, preservation of the 1996 'line in the sand' RAV valuation would essentially mean that the value increase should be captured principally in the value of the water rights, rather than the dam assets. The extent to which this higher value feeds into traded price for these water rights will reflect the characteristics of supply and demand in this trading market. The likely outcome is a sharing of the benefits in the form of a somewhat elevated price paid for the rights, coupled with this price being somewhat less than the full opportunity value of the water to Water Corporation. The fact that Water Corporation is the sole buyer on behalf of the IWSS system, while there are potential a number of sellers, probably increases its capacity to acquire the rights at below its maximum willingness to pay. Broadly speaking, economic theory indicates that trading should take place at a price between the minimum price sellers would be willing to accept and the maximum price the buyer would be willing to pay – with the determination of where the price lands in this range being influenced by relative negotiating power.

The fact that a line in the sand approach has been adopted to the RAV, along with effectively a zero capital value for the assets in 1996, does alter the affordability of irrigation use of the water relative to the outcome that would have flowed from the application of a depreciated optimised replacement cost approach, as is discussed in Paper 3. This can be expected to have influenced negotiating power (increasing that of irrigators), the traded price (raising it) and the level/rate of trades (lowering them) relative to a more aggressive capital pricing approach within NWI/NCP principles.

Significant trading has already occurred, and it is clear from the Water Corporation submission on the Issues Paper that they see value in ensuring that incentives for future trading are not distorted. This would seem desirable.

There are various ways of looking at the value of this water if made available to the IWSS.

- As a source of supply augmentation, it could allow deferral of other investments in augmentation that would otherwise be necessary to satisfy future demand.
  - This should translate into a beneficial impact on the long run marginal cost of water.
- Presumably water from this region provides some source diversification to the IWSS, possibly lowering the security/reliability pressures on system yield, again allowing some deferral of augmentation that should be picked up in the above calculations.
- Given that the desalination plant has just been commissioned, access to supplies from the SW region may allow the plant to be operated at lower cost, through either or both of intermittent operation and operation of only some of the modules.

The third of these perspectives offers good insights into the immediate value of the water and we understand that ERA is already undertaking analyses that reflect this view. It is important to recognise that Water Corporation does not need to acquire the water rights now in order to access some of the benefits of having done so, and as a near-monopoly buyer it may well be in its interests not to do so.

Understanding that a market is available to access these rights may well be enough to allow less aggressive use of desalination while targeting system security and reliability objectives. The presence of the water in the SW supply system implies the availability of *options* to tap additional water. These do not need to be accessed preemptively or permanently in order for their value to be derived – provided that Water Corporation accepts some price risk and monitors system status to ensure that the options are maintained. Alternatively, Water Corporation could enter the market and seek to acquire call options on the water in the future, should the need arise. With these options in place – formal derivatives or simply an understanding of the market that could be accessed – there is scope for reducing immediate requirements to incur costs in the form of either or both of desalination operation and water restrictions.

Under these circumstances, a part of the value of the water lies in the non-zero prospects of the drought continuing in a manner that triggers the desirability of Water Corporation exercising these options – to lower system costs through reduced costs of operating desalination, of severe demand management or of actively augmenting supply in other ways supply[6].

[6] Elements of this thinking as to cost effective ways of managing supply risk are closely analogous to the 'readiness options' approach that has been built into the recently revised Sydney Metropolitan Water Strategy, with indications that this allows cost deferral and offers very large reductions in expected system costs of managing system reliability. The

Some indication of the values involved here can be obtained from what is known of the economics of the desalination plant. The figures used are intended to be broadly indicative, and to deliver a feel for the likely scale of any value, rather than precise point estimates.

Operating costs for the desalination plant are probably around $0.60/kL, based operating all the time. We understand that the transport costs for water sources from the SW region are of the order of $0.35/kL (##does this include incremental treatment costs that presumably do not apply to desalination? Does it account for losses?). After allowing for incremental treatments costs for the water transferred, this suggests a direct cost avoidance opportunity of the order of then order of $0.20/kL. However, if the savings were to be achieved through more intermittent operation of the plant, this could be expected to involve some offsetting costs that could lower the figure somewhat.

Even allowing for this, avoided costs of this order of magnitude, if likely to be sustained as a result of long term pressures from both demand growth and climate change, could suggest values to the IWSS for water that are several times the current trading price. For example, a permanent avoidance of $0.20/kL would suggest value in a permanent water right, even with diminished reliability, of several thousand dollars per megalitre – at least for water in dams that are logically connected to the IWSS. This does not imply the rights should be trading at these prices – for the above reasons they might trade at prices well below this. Such pricing would be less out of kilter with current drought-based prices for temporary transfers, reflecting the normal operation of these temporary markets in response to drought pressures.

Valuation based on long-run marginal cost – assessed by the Authority (Economic Regulation Authority, 2005) in its Inquiry into Urban Water & Wastewater as lying in the range of $0.82 to $1.20, could imply substantially greater value at source. These estimates were based on Water Corporation modelling of forward costs across a range of possible demand and rainfall scenarios. Realistically, the true value is likely to lie between the value of avoided operating costs for desalination and the long-run marginal cost.

Under these circumstances, valuation of the dams on the basis of a deprival value – the cost to the water supply system of not having access to the dam services, could be very high, possibly approaching the DORC levels discussed in Paper 3. However, it does not follow from this that water users are being subsidised under line in the sand pricing arrangements. It would, however, strongly suggest that any limitation of the passing on to irrigation of a

plan is available at:
http://www.waterforlife.nsw.gov.au/about_water_for_life/metropolitan_water_plan

reasonable share of 'efficient dam safety expenditures', on grounds of affordability in irrigation use, would imply a subsidy and distortion of usage incentives. The reasonable share might, for example, be indicated under a beneficiary pays principle, taking into account recreational use and possible flood mitigation values, as well as regional non-irrigation use of the water.

For the reasons discussed early, this is not so clear in respect of any costs in excess of 'efficient dam safety expenditures'.

4 Efficiency impacts

A key concern in developing arrangements for sharing costs 'equitably' is to seek at least to limit any detrimental impact that may flow through to the incentives for developing and using infrastructure and other resources efficiently – in a manner that delivers the greatest value, broadly defined, to the community.

Paper 3 in this series deals systematically with key issues in relation to the setting of regulated pricing to take account of capital and operating costs – and with key implications in the Harvey Water setting. Almost inevitably these have equity consequences.

The potential for conflict and constraint on 'fair' sharing of costs is likely to be greatest where the need for and level of dam safety expenditures is a variable – where it can be affected by who owns the water and how the water is to be used. If essentially the same package of investment is needed under all future usage patterns (logically including the possibility that it may be most cost effective to 'dismantle' the dams, though we do not expect this to emerge as competitive), then these safety expenditures start to look a lot like sunk costs – they are going to be incurred, there are no incentive issues associated with whether they will be incurred and it is an accident of history that they have not yet been incurred.

In this situation, it would be feasible to go back and revisit the original regulatory asset base and pricing framework and to explore what might have emerged had the current cost estimates been on the table then. It is not inconceivable that back then, without serious consideration of water trading and severe climate change imperatives, this could have resulted in the view that the regulatory asset base (and the associated market values) might actually have had negative value – if the dam safety expenditures were to be rolled into forward prices. Alternatively, the upgrade costs could have been treated as legacy costs with no adverse efficiency consequences. This is almost certainly no longer the case – with the dams likely to now have a substantial value in supplying the IWSS if irrigation use cannot justify the opportunity costs.

Whether it was ever the case is not quite so clear based on the information available at the time of writing. Key issues are being addressed in separate review, by Marsden Jacob, of the empirics of the system and the proposed upgrades.

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