



ENGINEERS
AUSTRALIA

Productivity Commission Issues Paper on National Water Reform

Engineers Australia submission

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1. Executive Summary and Recommendations

“With a variable climate and much arid land, Australia has a lot to lose if we do not continue to lead in water management.” This opening sentence in the Issues Paper for this Inquiry succinctly states the reason why water management is so critical for Australia.

This submission has been prepared to provide Engineers Australia's input to the Productivity Commission's Inquiry into progress on National Water Reform, based on the Commission's March 2017 Issues Paper. Major milestones in water reform have been achieved, however, with water resources being so vital to our wellbeing, it is important to continue to seek improvements in this area. It is therefore recommended that the Productivity Commission gives consideration to the following issues as part of the Inquiry:

1. Well planned water resource development requires long lead times. We recommend that the Inquiry should review the planning and implementation of water resource development activities, to determine if such development has been carried out in an effective and efficient manner. Such a review should include a review of business cases/ impact studies, post-development assessments and long term infrastructure planning. Have direct and indirect, short and long term benefits and costs been considered/ measured? Has the infrastructure been developed to maximise benefits across sectors and to be resilient to changing circumstances?
2. We support the exploration of providing an entitlements scheme for 'waste' water sources such as stormwater harvesting, aquifer recharge, wastewater recycling or sewer mining. However, such schemes will need to integrate with initiatives to reduce such waste, while also providing certainty for the tradeable (waste-) water entitlements.
3. We recommend that explicit rules should be included in water rights schemes covering reasonably foreseeable conditions such as rare floods and droughts, and that the rules should be developed with an understanding of how climate change may affect the entitlements. With Australia's significant climate variability, and the influence of major climate drivers such as El Niño/La Niña, exploration of the potential for alternative planning and governance arrangements for typical wet and dry periods would be of benefit.
4. Gauged streamflow is the fundamental data behind water resource planning, water property rights, water trading rules, scheme operation rules, environmental monitoring, and climate change assessment (as well as a range of other important community needs such as emergency management). However, stream gauging networks have declined in some areas over recent decades owing to budgetary restrictions. We recommend that the Inquiry should review management of this vital data collection network and its ability to support Australia's needs into the future.
5. Water diversion data is important for water resources assessment and also provides information for the operation of water markets. We recommend that the Inquiry should review the maintenance and availability of diversion data, with a focus on the availability of such data at a range of spatial and temporal scales.
6. We recommend further exploration of the interaction between non-consumptive and consumptive water users, and the potential for applying a tradeable water rights framework to non-consumptive users. With the potential for hydropower to play a bigger role in Australia's future energy supply, reform in the area of non-consumptive water entitlements may have significant benefits.
7. Land development has a number of unintended consequences on our water infrastructure. This includes: increasing development downstream of dams leading to dam safety upgrades, increasing development in water supply catchments leading to increased treatment costs, and increased infill development in our inner suburbs leading to a decrease in fire-fighting capacity. We are concerned that the appropriate price signals are not being sent to developers considering such development, and that limited funding may lead to unplanned or delayed upgrades that reduce the performance of our water assets.
8. Skilled engineering staff are required to regulate, procure, plan, design, construct, operate, maintain, monitor and assess water resource systems and infrastructure. We support the Inquiry's review of

governance and structural issues, with the clear aim of ensuring that water supply systems and infrastructure are appropriately overseen by professional engineers at all stages in their life cycles.

Further information on the above points, and a range of other comments, are included in the body of this submission.

Engineers Australia and its members are available for further input and would welcome further discussion. Please contact: *Jonathan Russell, National Manager for Public Affairs on (02) 6270 6565 or by email at JRussell@engineersaustralia.org.au.*

2. Introduction

“With a variable climate and much arid land, Australia has a lot to lose if we do not continue to lead in water management.” The opening sentence in the Issues Paper for this Inquiry succinctly states the reason why water management is so critical for Australia.

This submission has been prepared to provide Engineers Australia's input to the Productivity Commission's Inquiry into progress on National Water Reform, based on the Commission's March 2017 Issues Paper. Engineers Australia is the peak body of the engineering profession. We are a member-based professional association with over 100,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

Reform in the management of Australia's water resources has been significant since the Council of Australian Governments (COAG) 1994 Water Reform Framework. Major milestones have been achieved. However, with water resources being so vital to the wellbeing of our environment and community, and to our economic prosperity, it is important to continue to seek improvements in this area.

The Issues Paper discusses many of the key issues associated with water management in Australia, and has included a useful list of questions to be addressed through the Inquiry. Many of the issue raised are complex, requiring an integrated response to address. High level technical advice will be required in order to achieve the best outcome. The questions posed in the Issues Paper are good questions, and we look forward to seeing these questions being addressed through the Inquiry.

Engineers Australia and its members are available for further input and would welcome further discussion. Please contact: *Jonathan Russell, National Manager for Public Affairs on (02) 6270 6565 or by email at JRussell@engineersaustralia.org.au.*

3. Water Resources Development

Section 3 of the Issues Paper provides a short history of Australia's water reform journey, highlighting the move from the 'development era' to an era with a heightened focus on managing the water we have.

This change in focus has largely been a good one, with many benefits such as the positive economic impact of water trading and improved urban efficiency mentioned on page 5 of the Issues Paper. We strongly support the increased focus on management of our water resources and existing water infrastructure.

However, further water resources development is still worth consideration in many areas of the country to meet the needs of our growing population. This may include new storages, pipelines, desalination plants, stormwater harvesting schemes, wastewater reuse schemes and aquifer storage and recovery schemes, to name but a few. Such developments are not without impacts, but there may be options where stakeholders can reach consensus that the benefits outweigh the costs.

We note that some water infrastructure projects have been built on limited business cases in the past. It is essential that development proposals are carefully considered. This requires a professional, multi-disciplinary and team-based independent review of the foreseeable short and long-term benefits and costs, considering relevant expertise from the engineering, environmental, economic, social and cultural fields. A dam (for example) may be initially promoted to address the latest topical issue, e.g. water supply after a drought, flood mitigation after a flood, or energy supply after a network failure. Dams often have multiple benefits, and it is important to consider the potential for such infrastructure to contribute to multiple aspects such as: water supply, flood mitigation, hydropower, aquaculture,

and recreational/tourism/cultural opportunities. The water supply dam promoted just after a drought might be able to supply significant flood mitigation or hydropower benefits with a modest incremental cost.

Water supply development can have significant indirect benefits for our community. Many of Australia's settlements, from the largest cities to rural towns and remote communities, would not be where they are today without development of local water infrastructure including dams, irrigation systems, flood levees, distribution systems, treatment plants, bores and rainwater tanks. The indirect and long term benefits of water resource development should be appropriately considered in infrastructure development business cases and impact studies.

Dams also may have significant negative impacts on existing social, environmental, cultural and economic values, and they are expensive to build. With the potential for significant benefits and for significant impacts, it is essential that all significant costs and benefits are appropriately considered in the business case/impact assessment for such infrastructure.

Because of the inter-generational nature of such development, there is a need for national leadership and long term planning in the future development of water resources to underpin our communities and economy. A long-term view is required in water resource planning: a dam cannot be designed and constructed in a year to meet an identified need, and even if it could, we still need to wait for it to rain.

Some water resource developments will require significant inter-state cooperation and national support. For example, expansion of the Snowy Scheme to provide a pumped hydropower 'battery' supply leveller to wind and solar power generation. A second example would be a proposal to develop major potential water sources in the remote regions of Australia. Developing our far north, for example, would require a concerted effort at both federal and state levels in order to understand the resource, plan the infrastructure, co-locate water industries, and protect the environmental and cultural values of these areas. Long term planning (and the early commencement of monitoring, see Section 8) is required.

The Issues Paper makes some mention of recent reforms to promote efficient investment in infrastructure (page 4), but the Inquiry appears to have a limited focus on the review of water resource development activities.

The increased focus on managing our water resources effectively over recent decades is fully supported. However, the management of water resource development activities should be an integral part of the scope of the national water reform agenda. We thus suggest that the Productivity Commission consider the following questions as part of this Inquiry:

- Has the development of Australia's water resources been carried out in an effective and efficient manner?
- Have proposed water resource developments been supported by effective business cases and impact studies, that include a professional assessment of the direct and indirect, short and long term, engineering, environmental, economic, social and cultural benefits and costs?
- Have the multi-sector benefits of proposed infrastructure been maximised, including the effect on water supply, flood mitigation, hydropower, aquaculture, and recreational/tourism/cultural opportunities?
- After such developments have been built, have post-development assessments been carried out by appropriately skilled professionals to compare actual benefits and impacts to those forecast in the business case and impact studies?
- Have planning processes been effectively carried out to identify our long term state and national requirements for future water infrastructure? Have these plans considered the resilience of our infrastructure to a wide range of factors including extreme weather events, technological change, climate change, increasing population density and changes in global economic trends?

4. Secure Water Property Rights (especially groundwater)

Page 10 of the Issues Paper discusses the goal of establishing clear and secure property rights to water and the potential issues with interception activities. We are supportive of the goal to clarify water property rights to integrate all potential activities that affect water availability into the one water planning framework. If it is possible for a major activity, such as extractive industries, to obtain water or impact on water supply outside of the water planning framework, it creates uncertainty in the water trading market. Without certainty, allocations are devalued and trading is affected, potentially compromising the National Water Initiative (NWI) objectives associated with the water trading regime.

However, this is a complex task, particularly where the impact is indirect. For example, an impact on the water quality of entitlements from increased urban development approved through a Council Planning Scheme. It is thus important that the water planning framework and the water property rights scheme integrates well with other key regulations such as the development planning processes.

The potential effects of mining infrastructure on groundwater is of particular concern, both in terms of the potential impact on the environment and the high uncertainty this creates for any market in tradeable groundwater entitlements. The characteristics of groundwater raise a number of issues for a tradeable groundwater rights regime: the extent of groundwater aquifers, their inter-connectedness, their water quality, the slow response time of some aquifers, uncertainty in recharge rates, etc. Some aquifers are very connected to the surface environment, while others have little connection. In addition to the quantity and quality of the groundwater, its pressure is also an issue, particularly in artesian aquifers. Groundwater systems, even more than surface water systems, do not observe state borders, and groundwater trading schemes are thus likely to require close inter-state cooperation and federal oversight.

We thus support the Commission's review of progress in dealing with the potential for land use activities to have an effect on water entitlements, particularly in the area of groundwater entitlements.

5. 'Waste' Water Allocations and Water Quality

Page 11 mentions the possibility of providing an entitlement framework, including the potential for trading, for water sourced from stormwater harvesting or aquifer recharge. Other non-traditional sources, such as sewer mining or wastewater recycling, may also benefit from an entitlement framework approach. Such approaches are of particular benefit where the source is limited, i.e. there is only so much stormwater runoff from an area. With water quality being an important aspect of these water sources, it would be of particular benefit to explicitly define the water quality aspect of the tradeable entitlement for 'waste' water allocations. (Such a clear definition would be of benefit for the more usual water allocations as well, particularly when their quality may be under threat from third parties such as property development.)

A particular challenge for schemes that rely on a source that otherwise causes issues (e.g., wastewater, runoff from impervious urban surfaces, etc.) is to integrate such schemes with efforts to reduce these 'waste' streams. For example, Water Sensitive Urban Design principles versus urban stormwater harvesting. It will be important that the entitlement scheme does not limit good practice in the reduction of these waste streams, but at the same time provides the required level of certainty for the tradeable (waste-) water entitlements.

6. Climatic Variability, Emergencies and Climate Change

With Australia's significant natural climatic variability, we recommend that plans explicitly allow for those events that are reasonably foreseeable, given our understanding of the possible range of climatic variability. The range of conditions considered 'normal' should be wide. For example, the one per cent Annual Exceedance Probability (AEP) drought conditions should be explicitly covered by the operational rules that back the water entitlements in a particular catchment.

We suggest that some care should be taken in applying the 90-95 per cent of the time goal (page 13) for situations covered by the plan. Where at all possible explicit rules should be included for foreseeable circumstances, for example by applying an announced allocation procedure or a restrictions policy. Emergency provisions should be reserved for unprecedented, and unforeseen, events rather than the more predictable variability of the Australian climate.

The 'average' year rarely occurs in Australia. We tend to be in either wetter or drier phases where the types of water use and planning in some ways could be completely different. To better incorporate an explicit consideration of climate variability, the next wave of reforms could examine the potential for alternative planning/governance arrangements for typical wet and dry periods (e.g. El Niño/La Niña in the south east of Australia) and the criteria for swapping between these arrangements. This might include leasable access rights to marginal land/water in wet times that could be exploited for both environmental watering and agriculture/urban uses, then much more stringent allocations in the dry times. Financial arrangements might be put in place to allow landholders to wait for the next wet period (and/or diversify their income generating activities). This may be of particular benefit with climate change potentially increasing climate extremes.

Engineers Australia supports the Inquiry's review of efforts into the adaption of water planning processes to the effects of climate change. The changing amount or pattern of rainfall caused by climate change may have a disproportionately effect on various sectors whose water entitlements are defined in different ways. It is prudent to consider the potential effects ahead of time. Where possible systems should be designed so all sectors are benefitted or impacted in an appropriate manner by a long-term shift in climate patterns. As one example, the traditional 'horizontal' apportionment of stored water in dams has the consequence that the user sector with the top compartment is the most vulnerable to climate change effects. A 'vertical' apportionment approach, such as capacity sharing, may provide a more equitable framework to deal with the impacts of climate change.

7. Trade Restrictions or Trade Opportunities

Page 15 of the Issues Paper notes that physical or hydrological constraints, such as channel capacity, may act as a potential limitation on the ability to trade water entitlements. In some cases, markets may be useful to address such constraints, e.g. in addition to an irrigator receiving a tradeable water allocation they also receive a tradeable share of the peak channel capacity.

Engineers Australia recommends considering whether some of these trade restrictions can be turned into a trading opportunity. However, in some cases such trade barriers serve an important purpose. Proposals to remove such barriers, and/or introduce trading of such limitations, should carefully consider the full spectrum of potential positive and negative consequences.

8. Data Collection and Availability

Page 19 of the Issues Paper highlights the importance of monitoring and reporting on environmental and other public benefit outcomes, and page 16 discusses the importance of timely and reliable information for the operation of water markets.

Reliable data is important for a host of reasons within the water planning framework. The models which underpin water plans and water entitlements are founded on rainfall and stream gauging station data. Streamflow stations, in particular, do not have a good coverage Nationwide. Streamflow stations serve a host of purposes, including assisting in scheme operation and flood warning and providing basic information for a range of development, climate change and scientific assessments. Some jurisdictions, such as the Northern Territory, have seen a number of significant long-term gauging stations closed in recent years. The recent Australian Rainfall and Runoff (ARR) update project has identified a critical lack of quality gauges in small urban catchments. Rating curves, which convert recorded heights to estimated flows, are often poor. Maintenance budgets for stations may be low and consequences can be significant. For example, a station which fails to record data in a largest known flood event will have missed a significant opportunity to collect valuable data. A number of studies have examined the benefits of water monitoring, and have shown that the benefits generally outweigh the costs by a significant margin.

Gauging station records are often held by a range of agencies, and the public provision of data from these stations is uneven and fragmentary. Continued structural change in the agencies managing these stations has further

fragmented the gauging station data and meta-data. The benefits of these data will be maximised if historical records are well maintained and made generally available.

It is recommended that strong consideration be given to a central on-line repository of all Australian stream gauging records and ancillary data (gauging, rating curves, photos, etc), perhaps through a Geographic Information System (GIS) type portal managed by a national agency such as the Bureau of Meteorology.

A review of these humble flow monitoring sites is strongly recommended, as their data is the foundation of the water planning framework. We recommend that the Inquiry considers the following questions:

- Is the gauging station network coverage sufficient to underpin the water planning framework, and other critical needs such as flood warning and climate change assessment?
- Is there adequate coverage in areas of future opportunity or demand, such as for the development of remote parts of Australia, or in the monitoring of urban runoff?
- Are the historical records from our stream gauging network being well maintained in an integrated, accessible on-line database for the benefit of the Australian community.

Water diversion data also tends to be collected for the primary aim of invoicing, with its use in modelling and resource assessment a distant second. There are opportunities to improve the monitoring of diversion data, and to publish that data to inform the operation of water markets and for the future assessments of the resource. This includes the need to focus on urban water data, including low-level (e.g. lot-scale) water use and production, in order to better understand options and business/household opportunities to contribute to water security and sustainable urban livelihoods. This may for example become particularly important as urban food production or advanced manufacturing expands and investors are looking for confidence in water security for such economic sectors.

A review of the maintenance and availability of water diversion data is recommended, both for the purposes of its ability to inform water markets and also in relation to its critical role in assessment and modelling of the resource at a range of spatial and temporal scales.

9. Allocation for Hydropower Generation (and non-consumptive users)

There are a number of non-consumptive users who benefit from water resources but do not 'consume' the water in the traditional sense. Hydropower is perhaps the most topical use at present, given the recent attention to pumped hydropower systems to stabilise the uneven supply from wind and solar generation. Mini-hydro on dam releases is another option to value add to the benefits of dam construction.

The benefits to the nation will be maximised if rules are put in place to encourage power generation and other users to operate in an integrated manner. Without appropriate attention to this topic there may be significant negatives, where the needs for power generation conflict with the needs for urban or rural water supply and environmental flow requirements.

Some thought is thus required in setting up the operational rules for these different sectors, and consideration should be given to the possible use of water allocation markets to encourage a maximisation of the benefits while limiting impacts on other parties or sectors. Some questions to be answered for non-consumptive users include:

- How are the entitlements of non-consumptive users defined?
- How do these entitlements relate to consumptive entitlements?
- Can non-consumptive entitlements be traded, and if so what are the effects on other entitlements, environmental and cultural values, etc?
- Can an entitlement holder rent/resell their entitlement to another party, e.g., order irrigation water at a particular time to suit power generation?

There appears to be some opportunity for further reform in the management of non-consumptive water rights, with the aim of maximising the long term benefits for our community.

10. Infrastructure Charges

The issues in setting charges for the typical user who consumes water from water supply schemes has its challenges. However, this issue is relatively simple compared to the issue of infrastructure charges associated with property development. Development near water infrastructure can have major implications on the safety, performance and cost of operating that infrastructure. It is considered important that new development pays its share of the additional costs imposed on water infrastructure by that development, whether or not that development becomes a consumptive user of that scheme's water.

Many development approval processes include the setting of a headworks charge for such development, but we have some concerns that the full costs are not being recovered. The lack of an appropriate charge has two major implications:

- Developers are not seeing a price signal on why development in a certain location is less desirable than in another location where, for example, the property is not at risk from a dam break event.
- Without collection of these charges infrastructure may not be upgraded, leading to a gradual decline in, for example, the ability to fight residential house fires. Alternatively, such upgrades are funded from general taxation, and the lack of price signal to developers will likely lead to increasing costs to the general taxpayer over time.

We see three main areas related to water supply management that would benefit from review in this Inquiry, as follows:

- Increased development downstream of a dam increases the persons at risk in a dam failure event. An increased number of persons at risk means a higher standard is required at the dam (for flooding stability, earthquake stability, etc.), leading to significant costs on dam safety upgrades. (A related issue is increased development in floodplains generally, leading to increased costs in floodplain management and emergency response.)
- Property development within a water supply catchment increasing poor quality runoff from the catchment, leading to increased costs of water treatment.
- Infill urban development leading to higher fire-fighting water/pipe capacity requirements (from increased building sizes, reduced separation between properties, higher background demand requirements, etc).

Once the headworks charges are recovered, it is then important that the required upgrades are planned and carried out. In many cases the required upgrades are substantial and costly, and thus must be planned over a period of decades. With private or government owned corporations owning and operating some of this water infrastructure, it is important that these agencies:

- Have a clear responsibility to carry out such upgrades;
- Receive the appropriate funding;
- Undertake long term planning of the required upgrades; and
- Carry out the required works.

Engineers Australia therefore recommends that the Inquiry examines current headworks charging schemes for new development, to evaluate whether such costs are being recovered and that agencies are planning and carrying out the required upgrades.

11. Skilled Engineering Staff / Fragmented Water Agencies

The issue raised on page 24 with regard to smaller water utilities facing difficulties in attracting skilled staff is noted. It is important to have appropriately skilled staff managing and maintaining water infrastructure. While there has been a long term trend to outsource engineering services rather than deliver such services within government agencies, it is important that the government retains at least some engineering capability.

Engineering capability is required in order to be an informed regulator of water supply infrastructure and to be an informed buyer of engineering services. Those designing, constructing, operating, maintaining, monitoring and assessing water supply infrastructure need to be appropriately qualified and experienced. Without such critical engineering knowledge there is potential for short term political/business focused decision making to compromise the vital services that communities rely on, leading to major issues such as water contamination, power shortages, or excessive fire or flood damage.

Smaller utilities, and fragmentation of the water industry regulatory bodies, can increase the issues associated with having sufficient appropriately qualified staff to regulate, procure, plan, design, construct, operate, maintain, monitor and assess water resource systems and infrastructure. There is thus some economy of scale in consolidation of such bodies, although this must be balanced with a range of other considerations.

Engineers Australia therefore supports the Inquiry's review of governance and structural issues, with the clear aim of ensuring that water supply systems and infrastructure are appropriately overseen by professional engineers at all stages in their life cycles.

12. Conclusion

Engineers Australia appreciates the opportunity to respond to the Productivity Commission's issues paper on national water reform. It is recommended that the Productivity Commission gives consideration to the issues raised in this submission, and in particular the eight recommendations listed in section 1.

Engineers Australia and its members are available for further input and would welcome further discussion. Please contact: *Jonathan Russell, National Manager for Public Affairs on (02) 6270 6565 or by email at JRussell@engineersaustralia.org.au.*



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