Submission
No 66

INQUIRY INTO RATIONALE FOR, AND IMPACTS OF, NEW DAMS AND OTHER WATER INFRASTRUCTURE IN NSW

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Submission

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Rationale for, and impacts of, new dams and other water infrastructure in NSW

Chair:	Faehrmann, Cate (GRNS, LC Member)
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	Cusack, Catherine (LIB, LC Member)
	Franklin, Ben (NAT, LC Member)
	Mallard, Shayne (LIB, LC Member)
	Sharpe, Penny (ALP, LC Member)

TERMS OF REFERENCE 1. That Portfolio Committee No.7 - Planning and Environment inquire into and report on the rationale for, and impacts of, new dam and mass water storage projects proposed by Water NSW including Wyangala, Mole River and Dungowan Dam projects, the Macquarie River reregulating storage project, the Menindee Lakes Water Savings Project and the Western Weirs project, particularly: (a) the need for the projects, including the historical allocation of water and consideration of other options for ensuring water security in inland regions, (b) the economic rationale and business case of each of the projects, including funding, projected revenue, and the allocation and pricing of water from the projects, (c) the environmental, cultural, social and economic impacts of the projects, including their impact on any national or state water agreements, or international environmental obligations, (d) the impacts of climate change on inland waterways, including future projections, and the role of dams and other mass water storage projects in ensuring security of water supply for social, economic and environmental outcomes (e) water infrastructure technologies that may promote enhanced environmental outcomes, (f) any other related matter. 2. That the committee report by 22 March 2021.

Submission sent via https://www.parliament.nsw.gov.au/committees/inquiries/Pages/lodge-a-submission.aspx?pk=2614

Submission Content

Dams are a very important component of the communities and industries ability to store and handle water.

Dams can vary greatly in size and in location.

Traditionally dams are built by placing a wall across the downstream end of a major depression however with modern earthmoving and construction techniques dams can be built almost anywhere.

Dams have four major components.

A catchment, a holding area, a wall and a spillway.

Each of the components has characteristics and limitations.

The catchment or water source may range from being a large geographic area to a simple pipe. The catchment may provide a large amount of water in a short time or range to a small flow over a long time. The steepness of the terrain and the ground cover are major factors.

The holding area of the dam determines the amount of land space that is made unavailable for other purposes. The surface area has a major relationship to the water loss due to evaporation. It must be recognized that evaporation can exceed fill rates especially in times of drought. Generally seepage from dams established to store long term water is not significant.

The dam wall must be strong enough to ensure safety of the captured water. The design and construction methods will vary greatly. Key factors include the site characteristics, the height, the wall width and the freeboard required. Additional water may be stored to assist with flood mitigation and or to maintain river flows.

The dam wall normally incorporates a method of discharging and regulating water outflow. This may incorporate the generation of electricity.

The dam spillway is a purpose built structure designed to allow excess water to escape in a safe and controlled manner. The spillway may be part of the dam wall or can be an independent structure.

The location of the dam and the end use of the water are very important factors.

Dams broadly have four key purposes.

Agriculture, water catchment flow control structures, Industrial water storage and the urban water supplies.

Agricultural dams are normally in remote localities and are commonly small in size. Farm dams normally hold water for use by livestock or crops on the property on which the dam is located. Farm dams generally are for constant and seasonal use and are not designed for long term water security. Farm dams are normally constructed cheaply with basic earthmoving equipment.

Water Catchment flow control structures are commonly designed for flood mitigation purposes or weirs to temporally trap water. Commonly weirs are used to assist in pumping from rivers or streams.

Industrial water storages have a wide range of purposes and can include storing water for cooling, storing and disposing of polluted water, storing water for reuse and recycling, for fire-fighting and the generation of electricity. The quantities stored can be quite large and the storages quite complex.

The storage of water for urban water supplies is a major function of many of the sizable dams in NSW. Although many may have dual function of supplying water for Agriculture and Horticulture.

A key function of urban water supply dams is that they are a prime provider of sustainable water to towns and cities in times of sustained drought.

Urban water supply dams must have the following characteristics:-

- Be highly efficient at delivering drinking water standards quality water to each household on demand all day every day.
- Be capable of delivering water to all parks, gardens, recreation areas and sporting fields on demand all day every day.
- Be capable of delivering water to industry, construction enterprises for purposes of manufacture, cleaning, dust suppression, heating and cooling etc.
- Urban water must be capable of being delivered efficiently from the dam to the end user via appropriate water filtration equipment. Losses and contamination of water in transit must be minimal.

In the urban dam situation where sustainability is important the use of water restrictions needs a major shakeup.

Traditionally water restrictions are applied when water levels fall to low levels (commonly 50% and less). This strategy needs to be reviewed and the emphasis needs to be on maintaining dam levels at or above 70%.

This could be done by:-

- Dedicating a working capacity for a dam.
    - The upper level would be freeboard for floods
    - The mid-level for normal use
    - The lower level for extreme drought use (eg 1:100 events)

- By maximizing dam input pumping
- Discharging water from bores, desal plants, recycled water and storm water harvesting into dams to enhance the catchment capacity
- By minimizing evaporation.
    - Dam normal working capacity should have minimal surface areas and maximum depth

        - The extreme drought storage area should trigger special measures to minimize surface evaporation and contamination.
- Dam Safety regulations could be upgraded to include requirements to raise water quality and storage efficiency.

There is a great need for water storage projects that are not traditional dams. That is structures that hold considerable volumes of water that have little or no natural catchment. Grahamstown Dam, in the Hunter Water distribution area should be classified as a reservoir. Although it can hold 182,305ML only 35% of its capacity comes from surface inflow from its own catchment. Most of its storage is pumped from the Williams River (ex Chichester Dam (18,356ML) or from nearby sandbeds.

Dams are old technology, destroy the environment and are very expensive to build operate and maintain. Dams in their lifespans commonly fail to meet the needs of their original designers.

The following list is examples of dams from or near the Hunter that have failed to meet their needs:-

- Quipolly Dam (replaced by new dam) + (upgrade proposed)
- Chaffey Dam (major upgrade and capacity increase)
- Dungowan Dam (proposed replacement by new dam)
- Glenbawn Dam (major capacity increase)
- Lake Liddell (complemented by Plashett Dam)
- Wyangala Dam ($43m upgrade planned)
- Mardi Reservoir (major upgrade)

Dams are commonly very remote from the customers they serve in an urban water network.

The distance is a major problem when the discharged water is allowed to travel via natural watercourses as water loss and contamination can be very significant. Evaporation, contamination, algae and seepage can cause

100% water waste after large sums of money have been used to collect the water.

Piping the expensive dam water from the dam to the user's location keeps the water clean and eliminates evaporation however is normally at considerable expense and subject to water pipeline leaks. Pumping may also be required and this is an additional expense.

The cost of dam water to the user's tap should be calculate when determining the choice of water sources.

The calculations should include but not limited to:-

- Dam catchment costs
    - Catchment management costs
    - Cost of restricting the use of the land
- Dam Wall costs
    - Capital costs
    - Interest on funds invested
    - Maintenance costs
    - Insurance costs
- Less
    - Evaporation losses
    - Leakage
    - Contamination
    - Unrecoverable water
- Discharge costs
    - Stream and pipeline waste
    - Cost of maintenance
- Pumping costs
    - Capital cost
    - Power
    - maintenance
- Water treatment
    - Capital Cost
    - Power

        - maintenance
    - Billing
        - Cost
        - Bad debts

A dam in the corner of a paddock to give livestock may be the best option however dams used for urban water supplies will frequently prove to be very costly options and unviable.

Statements like the following quote from "Three Dams Project – Mole River Dam Project Terrestrial and Aquatic Biodiversity Ecological Constraints Assessment":-

> "The need to deliver the dams is critical to the State's drought recovery process and needs to be completed to the highest standard in relation to the assessment and delivery. Each dam is to be constructed rapidly to create security for the various town water supplies and associated industries reliant on the delivery of water for viability."

This statement needs to be strongly challenged for the following reasons:-

- The drought recovery process cannot be satisfied by a new empty dam because:-
    - The filling of a new dam starves the area downstream of the wall of water until the dam spills
    - Dams can prevent water entering the aquifers fed by the catchment.
    - First flush water is commonly very dirty and highly contaminated especially after bushfires. This can take a dam out of service for a considerable time. Eg Bushfires severely harmed the vegetation of the Cotter River Catchment and caused water quality problems in the three dams in the catchment: Corin, Bendora and Cotter Dams. For quite some time after the fires, turbidity in the water due to silt and ash from surrounding burnt-out forests meant Canberra had to rely on other water sources.

- needs to be completed to the highest standard in relation to the assessment and delivery.
    - This is a measure of construction quality and has very little bearing on its ability to deliver water in times of drought.
    - Lower standards may significantly reduce the costs and dam life. A cheap dam may be affordable whereas an expensive dam may be un-fundable and or the consumer price for the water may be unacceptable.

- Each dam is to be constructed rapidly to create security for the various town water supplies and associated industries reliant on the delivery of water for viability
    - Constructing a dam rapidly is a very poor strategy. Dams and water storages take time and considerable thought and planning if a quality product is to be achieved
    - The speed of a dam to fill is far more important than the speed at which the dam is constructed. The Tillegra Dam proposed for the Dungog area was estimated to take up to 18 years to fill. Chaffey Dam (100 gigalitres) was built as a better option to doing work on Dungowan Dam. Chaffey Dam was very slow to fill however as a result of major rain and run off filled to capacity in "one night". The rain stopped just in time. The authorities were scared of dam failure and in about 2010 raised the wall, changed the original spillway and added a second spillway.
    - Glenbawn Dam has been enlarged and is augmented with water pumped from the Barnard River. The Barnard River Scheme is an inter-basin water transfer system in New South Wales, which can transfer water from the Barnard River in the upper Manning River catchment over the Mount Royal Range into the Hunter River and then flows down to Glenbawn Dam located near Aberdeen. Glenbawn Dam has very rarely been full in its life.

- Dams are very dependent on rainfall and run off. This is very unpredictable. Dams cannot be depended on to provide water in severe droughts.

Dams are very expensive, unreliable, remote and old technology.

Dams are rapidly being replaced by new technology and strategies to provide water from sources near to the end users.

Some of these strategies include:-

- Desalination Plants
  - Desal plants can be highly efficient, reliable and cost effective
  - They can be very large like the Sydney. The Kurnell plant can be scaled up to 500ML
  - They can be small like the proposed Belmont facility that could produce 15mL per day.
  - Small scale desal plant technologies are improving rapidly due to the use by cruise liners to provide fresh water.
  - The location of desal plants in the ocean provides an endless source of water
  - Future desal plants are likely to be established in rivers, ocean lakes and tidal areas due to the need to reduce the volume of salt from the intake water.
  - Desal plant operating costs are cost effective.
  - The Australian Water Association estimates the cost of supplying desalinated water varies widely, from $1 to $4 per kL

- Mine Voids

  Mine voids from open-cut mining can hold huge volumes of water however the water is often very contaminated. The use of equipment such as desal plants may well prove suitable for converting this water into usable qualities.

  Mine voids can be fed from aquifers.

Many mine voids would be capable of capturing river flood flows. The flood flows would dilute the mine water. This would provide an potential source of new water. The water may not be able to be treated to drinking water standards however could satisfy many uses thus complementing recycled water supplies.

- Raw Water

  Many rivers and streams contain high volumes of water that is capable being used for urban purposes without water treatment. Considerable volumes of this water are used for irrigation of crops and other farm purposes,

  In urban situations especially for parks and gardens raw water should be harnessed and distributed. Reticulation systems are needed.

- Recycled Water

  Recycled water is in most cases recovered from sewage at sewer treatment plants. Whilst this is a very valuable source of water it is very expensive to produce and does not attract a cheap sale price.

  Recycled water requires its own distribution nework.

  The use of recycled water needs a serious rethink.

  Consideration should involve how the reclaimed water is used, its market price, its distribution and its use as a blend with other grades of water.

- Reuse Water

  There are many occasions where potable water is used once and is then discarded. This discarded water could be reclaimed and re used. The discharged water from a washing machine can provide a worthwhile source of water for the garden. Water from a commercial carwash can be collected, filtered and reused many times over. Rainfall and other runoff water from a site such as a coal export terminal can be collected and used for dust suppression.

Much more needs to be done to reuse water.
Increasing the use of reuse water can be achieved by:-

- Changes to legislation to permit reuse
- Better equipment to collect, store and use the water
- Financial incentives to use reuse water.

➢ Storm Water Harvesting.

Urban areas have extensive drainage networks where run off from roofs, land, carparks, paths and roadways are drained to low points via curbs, gutters, drains and other infrastructure. Commonly this drainage ends up in central points, creeks, rivers and streams. This water frequently drains out to sea and is totally wasted. Newcastle has buy way of example a major network of concrete lined drains. This water should be harvested and placed into reservoirs.
There is normally no cost for the catchment. To harvest the water storage reservoirs and pumps would be used.
Installations such as these could produce high volumes of very cheap water

❖ Rainwater Tanks

The value and importance of rainwater tanks should not be underestimated particularly in high frequency rainfall areas.

Rainwater tanks are simple, easy to setup and relatively cheap.

What is needed to support rainwater is simple water testing kits and better information about filtration.

Most farmers, motorhome and caravan users use tank water with very few issues.

❖ Pipelines and water Transfer Systems.

Rainfall, especially from storms, is commonly very patchy in distribution. Linking, dams, storages and distribution networks together can be a very valuable procedure to improve the sustainability of supplies. The pipeline between the Central Coast and the Hunter when completed will be very useful.

Water Pricing is the Key

A lot can be said about water.

The Committee will no doubt spend considerable time reading about and discussing water however water is probably the best product mankind has.

Water is provided to the world free, extremely pure, and in plentiful supply.

Water in raindrops far exceeds the quality and consistency of air molecules.

Water gains a price when we change the quality, store it and distribute it.

Thus pricing is the key to water management.

The value of water should never be side stepped.

Luckily water has a simply defined volume and importantly it is very easy to measure.

Water is also very easy to value.

All water issues are solved by having user pays pricing.

AND users will set their own value on the water. If the price is acceptable they will buy. If the price is high they will conserve.

Water allocations, water security, water storage and water distribution are all solved by:-

- Placing a unit value on water
- Classifying water into grades
- Using standard water volumes
- Setting a price per unit volume per grade

If realistic prices are set for water traded there will be three follow ons:-

1. The profit margin will finance water infrastructure, research and development
2. The price will regulate demand
3. The price of water will stimulate the adoption of new methods and processes.

Using water is good, storing water is fine but wasting water is terrible I urge the Committee not to encourage condone or in any way support water waste.

Conclusion

Dams are very expensive, environmentally harmful and obsolete technology.

There is a real need for storages to be located close to the end users

There are an increasing number of options available to provide cheap water to our communities.

The diver for efficient storage and water supplies for rural, urban and industrial water is based on the fundamental principle of **user pays.**

Pulling the plug on water waste is a must.

Thank you.

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