

Policy Position Statement

Reservoirs: Global issues

Purpose

This Policy Position Statement reviews the issues concerning the construction and use of reservoirs. It highlights the main advantages and disadvantages of reservoirs in both the UK and global context, as well as emphasising the importance of comprehensive appraisal and mitigation.

CIWEM's Position on Reservoirs

1. CIWEM welcomes the framework for decision-making established by the World Commission on Dams.
2. Reservoirs provide many benefits including water supply, floodwater control, power generation, irrigation and recreational use.
3. Conversely, there are many disadvantages, such as loss of high quality agricultural land, displacement of people, changes to downstream flow patterns and impacts on fish migration and microclimates.
4. Many of the environmental impacts associated with reservoirs can be mitigated, and such measures should be employed wherever appropriate.
5. All options to meet the required purpose should be considered in detail before reservoir construction is sanctioned, with full stakeholder consultation throughout the appraisal and planning process.
6. Due to the long planning, construction and filling timescales for reservoirs, decisions must be taken in due time.
7. Storage of wet season runoff is a sustainable long-term water resource option. However, proposed schemes must be subject to full environmental, economic and social impact assessment and all possible options explored.

CIWEM is the leading independent Chartered professional body for water and environmental professionals, promoting excellence within the sector.

Context

The Institution develops policy through its Technical Panels; one of these is the Water Resources Panel. Its members are drawn from all organisations with a concern for water

resources, including the Environment Agency, government, water companies, consultants and environmental organisations.

Reservoirs have provided water and power for many centuries both in the UK and throughout the world. The storage capacity they provide enables water to be captured in greater quantities than would otherwise be possible, and in times of plenty for use in times of shortage. Their construction, however, has sometimes required the relocation of people living in the impounded area, and some reservoirs have had significant environmental impacts. There is a lively debate as to whether the social and environmental impacts outweigh the benefits.

In November 2000, The World Commission on Dams prepared a New Framework for Decision Making in relation to the choice (or otherwise) and design of dams and reservoirs. This looked at the social, environmental and political choices involved. The Commission established core values of equity, efficiency, participatory decision making, sustainability, and accountability as ones which are to be adopted in the process of selecting - or rejecting - dam and reservoir options for addressing water supply-demand, water power, flood control and other problems. The underpinning principle is recognising entitlements and sharing benefits. The onus is placed on the State and the developer to ensure that those affected will enjoy improved livelihoods. In launching the Report, Nelson Mandela noted:

"The problem is not the dams. It is the hunger. It is the thirst. It is the darkness of a township. It is townships and rural huts without running water, lights or sanitation. It is the time wasted gathering water by hand"

The decision as to whether construction of a reservoir produces an overall net gain or loss (with all things considered, over short and long term timescales, and with respect to the interests of all stakeholders) is a far from straightforward one to make. This policy statement considers the issues involved in a global context.

Key Issues – For

Water is a critical resource; without it people cannot survive. For over 5000 years, reservoirs have provided people with the water they need to live. Reservoirs have enabled people to collect water when it was plentiful and save it for dry periods. Reservoirs have been essential to the establishment of towns. In Victorian times new towns suffered up to 50,000 deaths a year from water-borne diseases. The provision of clean water (mostly from upland reservoirs) supported by better sanitation cured this. Few large cities today could survive during periods of drought without their reservoirs. Even where most of their water is obtained by direct abstraction from a river, reservoirs can still be needed to ensure that, during drought periods, water is still available without having to over-abtract from rivers and harm the environment.

The latest climate change scenarios indicate that many parts of the world will have less dry season runoff and that droughts could become more extreme. Water demand management such as leakage reduction, more efficient water-using appliances, metering with appropriate tariffs, and the reuse of treated effluent can reduce the need for water.

Today, the most appropriate policy for sustainable water resources management is the twin-track approach of balancing economical demand management with water resource development. In the UK, most sustainable groundwater is already fully committed, and during droughts there is little water in the rivers that is not required to maintain a healthy

environment. Water transfer between river basins is expensive, and it can result in the mixing of different quality waters in varying proportions, which can itself result in ecological stress and change. It can also lead to transmission of fish disease and new species to catchments which do not have them. Thus most future resources will involve the reallocation of existing resources, the enlargement of existing reservoirs or the construction of new ones.

Water is required for food to grow. In many countries this requires the irrigation of crops. The best growing season is often the dry season when there is comparatively little water available for irrigation. For instance storage of flood flows of the Nile in the Aswan reservoir allows Egypt to grow not just one crop a year but generally two and sometimes three. It also enabled Egypt to cope with the droughts of 1973 and 1980. Without the Aswan reservoir Egypt could only support a much smaller population.

Reservoirs have kept flood waters back so they could be released slowly to protect people and property in the flood plain downstream. In China alone probably 200,000 people have drowned in floods this century. In England, the 1998 Easter floods and subsequently the 2000 floods resulted in serious damage. Urban development, with its harder and often impermeable surfaces, results in more of the rain running off to the river and reaching it faster. This results in increased flooding downstream. UK planning policies are increasingly directing development away from floodplains, and encouraging the use of natural and engineered washland storage in rural parts of the catchment.

Reservoirs can also provide water for hydroelectric power generation. This is a renewable and sustainable resource. Its generation does not result in carbon dioxide emissions and it contributes little to global warming. Hydro power stations have long lives, many of those in Scotland having been operating for about 50 years with much life still left.

Navigation on canals requires water for the operation of locks. On most canals in the UK, much of this water in dry weather is provided by reservoirs.

Increasingly, reservoirs are being used for recreation and conservation and they can enhance the quality of the local environment and amenity value. This includes fishing, boating, sailing, bird watching, and walking and cycling around the perimeter. Several UK reservoirs are now SSSIs, SACs or internationally recognised Ramsar designated wetland sites. Nearly a million people a year visit Carsington Reservoir in Derbyshire, England, for recreation.

Key Issues – Against

There are several disadvantages of reservoirs. The most obvious is that they require large amounts of land, often much of it in valleys. This can be good agricultural land. They can also require the displacement of people and their relocation. Where possible, sites should be chosen where the minimum number of people are affected. Any archaeology in the reservoir basin would be lost on submergence so all sites should be excavated prior to reservoir filling.

Major reservoirs require significant funding, in the order of billions of pounds. There has to be a high level of certainty that a reservoir and its water supply benefits are truly needed.

The reservoir dam will change the pattern of flows released downstream. In Victorian times about a third of the yield of the reservoirs was provided as a constant compensation flow to power the water mills downstream. Today releases can be tuned to meet environmental needs, as has been done at Roadford in Devon, England to facilitate salmonid runs.

Reservoirs also impact on the surrounding environment. Microclimatic changes may occur through varying humidity and this may affect crops and biodiversity downstream of the reservoir.

Dams also inhibit migratory fish movements. Fish passes are now constructed to facilitate passage, although fish pass design and research is only in its infancy, and the effectiveness of fish passes is very variable. Dams can also inhibit navigation but, where necessary, ship lifts can be constructed. In China these have been designed to pass ships up to 8,000 tons.

Mitigation

Much can be done to mitigate most of the environmental impacts associated with reservoir construction, and current practice is to do that, sometimes adding appreciably to the cost of the scheme. For instance, landscaping is invariably used to enhance the visual attractiveness and ecological value of a site. CIWEM emphasises that mitigation measures should be undertaken wherever appropriate.

Selection

A new reservoir will be a very long term feature in the landscape, and so extensive considerations must be made prior to authorising its construction. Demand projections must be carefully prepared incorporating demand management actions. All other ways of meeting the resulting demands should be considered. All available reservoir sites should be investigated, reducing in numbers through successively more detailed screening. Full social and environmental studies should be made of the selected site. All the benefits and disbenefits should be considered when making the decision to proceed with a new reservoir. All stakeholders should be consulted throughout the process, to ensure that the selected scheme has the support and meets the needs of those most affected by it.

However, in the UK, it can take from 15 to 20 years to plan, carry out environmental assessments, promote, design, construct, and fill a new reservoir so it is vital that all decisions are taken in due time.

Conclusion

The need for water for living, for growing food, and for renewable non-polluting power is paramount for society. Storing wet season runoff is a long term sustainable method of providing this. However reservoir schemes need careful environmental and social impact studies in order to test their viability and all appropriate measures should be taken to minimise any negative impacts.

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Note: CIWEM Policy Position Statements (PPS) represents the Institution's views on issues at a particular point in time. It is accepted that situations change as research provides new evidence. It should be understood, therefore, that CIWEM PPS's are under constant review and that previously held views may alter and lead to revised PPS's. PPSs are produced as a consensus report and do not represent the view of individual members of CIWEM.