

**When is water in an artificial
reservoir in the economy /
when is it a produced asset?**

Michael Nagy, Alessandra Alfieri,
Michael Vardon and Peter Comisari

Introduction

- This issue was raised 14th LG Meeting in Canberra April, 2009. ([LG/14/13](#)).
- The Group was unable to take a final decision and asked for a follow-up paper to be produced
- The group sympathised with the argument that water accumulation in artificial reservoirs has parallels with cultivated forest growth

Key questions?

- Why is it important when water enters the economy?
- Is it in all cases clear what an artificial reservoir is?
- What are borderline cases?
- When is water in artificial reservoirs „in the economy“?

Why is it important when water enters the economy?

- Significant losses are caused by artificially increased surface areas of water
- Current recording means that no economic unit is responsible for these water losses
- By excluding these losses the water consumption efficiency of industries, and in particular the water supply industry and units of the electricity industry engaged in hydropower production, is not fully comparable with other industries
- Water use and water consumption indicators used by UN-agencies, OECD or the European agencies (e.g. EEA) currently do not take into consideration that the natural water balance might be significantly altered by artificial reservoirs.

- The World Commission on Dams (WCD) estimated that evaporation from reservoirs is 188 km³ per year or more than 8% of the total human consumption of freshwater

Existing definitions for „(Water) Reservoir“

- WCD: *Any natural or artificial holding area used to store, regulate or control water.*
- EEA (I): *Reservoirs are human-made lakes created by the damming of rivers to serve one or more purposes, such as hydropower production, water supply for drinking, irrigation and flood protection.*
- EEA (II): *Water reservoir: Artificial or natural area of water, used for storing water for domestic or industrial use.*

Definition „Artificial (Water) Reservoir“

- SEEAW (2007): „Artificial reservoirs are man-made reservoirs used for storage, regulation and control of water resources.“
→ in other words: any kind of man-made “water container”

Examples for borderline cases „Artificial Reservoir“

1. Impression of a natural condition
2. Cascading systems of dams in rivers
3. Detention reservoirs (flood protection)
4. Flooded gravel pits
5. Fish ponds
6. Fire extinction ponds
7. (Natural) lakes where the water level has been raised artificially
8. (Natural) lakes where the water level is managed via locks and artificial water recharge

When does water enter the economy?

- The current treatment of water in SIEEA 2003 and SIEEA-Water 2007 is that water enters the economy when it is abstracted for use
- This includes water abstracted from natural water bodies, such as lakes and rivers as well as artificial reservoirs
- The recharge of artificial reservoirs could be considered as a production process

When is water as a produced asset?

The accumulation of water in artificial reservoirs is analogous to growth of cultivated forests or cattle and sheep raised on farms. This would result in produced water if there is control and management of an institutional unit, in which labour and assets are used. → produced asset.

Recharge of artificial reservoirs constitutes production

- In the SNA, production is understood to be a physical process, carried out under the responsibility, control and management of an institutional unit, in which labour and assets are used to transform inputs of goods and services into outputs of other goods and services. (2008 SNA paragraph 1.40).
- The key-question is: How far is the production process dependent from human intervention?

Two cases are presented to inform this question of does water come into existence via a process of production.

- Desalinated water stored in water tanks by the water supply industry
- Water stored in artificial reservoirs

Desalination

- In the case of desalination it would seem clear that freshwater is produced from saltwater.
- Fixed assets, energy and other inputs are used to turn saltwater into freshwater.
- This water is usually supplied to other users as it is produced but it could be stored for future use.
- Desalination in most countries provides a very small fraction of water supplied and used, although in particular areas, such as in some Middle Eastern countries, it is very important.

Water stored in artificial reservoirs

- Water is accumulated in artificial reservoirs for a variety of economic purposes (including navigation, recreation or drainage)
- In many cases continuous management and control is needed to maintain a certain water level or water quality
- The question is
 - What kind and intensity of human intervention is needed to consider it as production?

Degree of human intervention

- Water in artificial reservoirs is in the economy (i.e. produced) if
 - there are permanent or nearly daily human interventions needed to maintain a certain water level or water quality
 - a clear indication is when such interventions are binding from a legal or technical point of view (maintenance plan exists)
 - excluded are ad-hoc measures and interventions in longer intervals (such as once per week / month / year)

Large dams

- Defined by the International Commission on Large Dams and used by WCD:
 - >15 dam height
 - 5-15 dam height + 3 mio. m³ capacity
- about 45,000 large dams exist

Questions

Does the LG agree:

1. That water might be considered “in the economy” when it is stored in artificial reservoirs?
2. That the decision whether water has entered the economy (in the case of artificial reservoirs) is dependent from the intensity and regularity of human intervention
3. That all listed borderline cases are artificial reservoirs with the exemption of (natural) lake with managed water level (natural water resource)
4. That without doubt water stored in large dams has entered the economy