UABDIVULGA
BARCELONA RECERCA I INNOVACIÓ

07/03/2016

Environmental optimisation of municipal drinking water tanks

A study onstorage systems of drinking water in 147 municipal deposits confirms that the material characteristics of these are the main contributors to their environmental impact, rather than transportation or the installation system. The storage capacity, dimensions combination and position of the installation are particularly affected. The application of the standards obtained to three case studies shows a significant reduction in CO_2 equivalent emissions.

Author: iStockphoto/Andrew_Rybalko

The construction of infrastructures related to the urban water cycle is key to ensuring the sustainability of this basic system. Several studies have assessed the sustainability of the urban water cycle but until now none had focused on municipal drinking water tanks from an environmental perspective.

The study evaluated 147 (theoretical) water tanksfrom a technical (amounts of materials) and environmental (quantification of environmental impacts) perspective. The study was conducted as part of a collaboration between the UABand the Universitat Politècnica de Catalunya, combining a vision of civil engineering with a more environmental approach.

The tanks under assessment included water storage capacities between 100 and 10,000 m^3. For

each tank volume, different combinations of dimensions (radius and height) and positions (surface, buried, semi-buried) were considered. Using a life cycle approach, the materials and processes for the construction of tanks were accounted for. Subsequently, a study was conducted that took into consideration the amounts of materials needed, and applied the methodology of life cycle assessment to quantify the environmental impacts.

The results show that the consumption of materials is the main contributor to the environmental impact, rather than transport, installation or demolition. Also, deposits with a storage capacity of between 1,000 and 2,500 m^3 are less impacting. Regarding the dimensions, higher tanks are less impacting (for a 10,000 m^3 tank, the highest option is 60-70% less impacting than the shortest). Finally, the surface placement option impacts 15-35% less than that of burying the tank, as earthmoving and transport is avoided.

In addition, environmental standards (selecting the best environmental option when building a new water tank) obtained from the study have been applied to three realistic case studies. For example, the application of these standards to an 8,000 m^3 tank can save 170.5 tons of CO_2 equivalent emissions (16% of the total).

Consideration given to these results by the construction sector may allow a significant reduction in environmental impacts and contribute to the environmental sustainability of cities.

David Sanjuan Delmás
Institute of Environmental Sciences and Technology (ICTA)
david.sanjuan@uab.cat

References

Sanjuan-Delmás, David; Hernando-Canovas, Elena; Pujadas, Pablo; de la Fuente, Albert; Gabarrell, Xavier; Rieradevall, Joan; Josa, Alejandro. Environmental and geometric optimisation of cylindrical drinking water storage tanks. The International Journal of Life Cycle Assessment. 2015, vol. 20, num. 12, p. 1612-1624. doi: 10.1007/s11367-015-0963-y.

View low-bandwidth version