



# Water

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How to deal with our most valuable, and potentially deadliest, resource (Part 1 of 2)

**W**ater has been making the headlines across the world recently—as it often does—for tragic reasons. Brisbane, Australia after years of drought, has been struck by flash flooding that has left some parts of this affluent city over 5 metres under water. When the authorities were announcing the peak of the flooding, it was a bright, hot summer day with not a cloud in sight.

So it's fair to ask, could Beirut be next? The Merriam-Webster dictionary defines flash flooding as “a local flood of great volume and short duration generally resulting from heavy rainfall in the immediate vicinity.” We all know about the intensity of the storms that can occur in Lebanon... so in short, the answer is “possibly”.

Flooding, and in particular flash flooding, is a concept sometimes difficult to understand because where the rain falls and where the flood occurs can be in completely different locations. The important matter to hand is how water is evacuated from where rain has fell. In the environment's natural state, the soil absorbs most of the water, which then feeds the underground aquifers. The rest of the water runs off into streams that transform into rivers and lakes, eventually ending up in the sea.

A substantial problem is that the urbanization of our population has created large swaths of land that have been paved over, with roads laid and buildings erected. Where nature would've normally simply absorbed the rainwater into the soil it was landing on, now it is channeled and concentrated into smaller and smaller areas. If infrastructure has been adequately built and developments properly designed, the rainfall would be controlled by sewers, infiltration, reservoirs, and water treatment plants.

Based on the World Bank's 2010 Review of Water in Lebanon, only 58% of used water is treated—with wide discrepancies across the country. However, during periods of intense rainfall these water treatment plants are overloaded and even more raw sewage is discharged into rivers, vacant land, and the Mediterranean...



This is where the role of sustainable buildings comes into play. LEED, BREEAM, and other international green building certifications recognize the importance of reducing storm-water runoff in sustainable buildings. Developments are rewarded for implementing a Stormwater Management Plan that results in a decrease in both the volume and discharge rate of rainwater from the site, post-construction. Stormwater management strategies are determined on a case-by-case basis for each project and may consist of a mix of soft measures—augmenting surface permeability and infiltration—combined with structural solutions promoting retention and discharge slow-down.

While regulation on reducing stormwater run-off in Lebanon remains non-existent, elsewhere it features prominently. In the UK for instance, all developments must ensure that they do not increase the amount of water going to the sewers. Therefore, if a project is on a Greenfield site, careful consideration must be given as to how to manage the water that would've normally been absorbed by the soil.

Thus, even in the absence of regulation, rainwater management should be considered in every project, all the more if the project claims to be green. Just as every part of the built environment contributes to flash flooding, every new building has the potential to reduce the risk of flash flooding

and alleviate the pressure on the sewage infrastructure, especially in a country with inadequate infrastructure at the best of times.

So practically speaking what can be done? The simplest and first element to look at is how much hard landscaping is being planned for a development, and trying to minimise this by favouring vegetated areas. Then various types of permeable paving should be considered and adapted to the particular needs of the site. For example, there is wheelchair compliant permeable paving while other types of permeable paving can be specified for car parks. After reducing hard landscaping, permeable paving is often considered the cheapest option in controlling rainwater runoff. In addition, contaminants from large parking areas such as oil, fuel, lubricants, materials from tire wear, etc, would be filtered and decomposed through the earth's top soil before reaching the underground aquifer, rather than being channelled straight to receiving streams and the sea. Furthermore, designing green roofs and vegetated terraces also promotes infiltration and delay run-off during flash rainfalls by acting as a massive sponge.

Other more elaborate options, generally known under the name of Sustainable Urban Drainage Systems (or SUDS), consist of creating, on site, artificial ponds, swales, or pools of water, turning the rain

into a feature within the landscape. More adventurous landscaping actually allow certain parts of a site to temporarily flood, for example turning a playground into a pond. "Egg crates" are another popular solution: Essentially empty plastic crates that can be stacked next to and on top of each other and placed under roads or carparks; the eggcrates fill with water and either act as a soakaway/reinfiltration system, or as a storage/attenuation system. Containment tanks can alternatively be used to hold the water during periods of heavy rainfall, releasing it back gradually into the sewers when the infrastructure has passed the point.

With water becoming scarcer yet at the same time falling in more intense bursts, it would also make sense to try to address both problems with a single solution. Tanks and water holding facilities would reduce the risk of flooding and overloading sewers while having the potential to use the collected water for non-potable uses, such as gardening, toilet flushing, and laundry. In most countries and situations, it would not be possible to have a single tank that acts as a buffer and at the same time for collection because to act as a buffer the tank has to be empty, and to provide water the tank has to be full. However, due to Lebanon's particular sporadic rainfall, could this be a solution that kills two birds with one stone? ■