WHERE WE PLAY: USING WSD TO HIT A CARBON EMISSIONS OUT OF THE GOLF COURSE

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ABSTRACT

The development and operation of golf courses results in a significant amount of CO2 emissions. Roughly 33% of the CO2 emissions results from the initial development of the course. The installation plus the materials for stormwater management and drainage on a golf course produces an average of 1,400 metric tons of CO2 (O. Saito, 2010), just over 10% of the total CO2 emissions from course development. Water sensitive design can help offset and sequester CO2 emissions.

Water Sensitive design was a large part of the Te Arai Links golf course infrastructure design and overall development. The stormwater management and drainage on Te Arai Links golf courses resulted in the installation of 2.8 ha of swales, raingardens and bioretention basins. Around 35% of drainage related CO2 emissions were reduced and offset through water sensitive design.

A reduction of CO2 emissions was achieved by reducing the amount of concrete pipe installed underground and keeping the drainage on the surface. One meter of 225 mm diameter concrete drainage pipe results in 17.17 kg CO2 emissions for production and transport (Concrete Pipeline Systems Association 2011). Using vegetated swales kept 15,000 lineal m of stormwater drainage above ground. The above ground drainage reduced the CO2 emissions by 250 metric tons. Further CO2 emissions reductions resulted from the vegetated swales requiring less hours of heavy earth moving equipment operation for installation. Unlike traditional drainage pipes, vegetated swales do not require trenches and deep excavations to be installed.

We know that vegetated swales, bioretention devices, and other green infrastructure remove metals and nutrients from stormwater runoff by mimicking natural systems. The same natural systems that remove contaminants are also efficient at sequestering carbon.

Grasses and reeds, common to vegetated swales and biotreatment systems continuously sequester carbon, offsetting CO2 emissions resulting from construction. Bioretention basins and swales sequester an average of 3.1 metric tons/ha/year of carbon (Kavehei 2020). The sequestered carbon is permanently stored below ground within the roots and rhizomes where microorganisms help lock the carbon into the soils. Over a 30-year period, the 2.8 ha of bioretention devices, swales and raingardens will sequester 260 metric tons of CO2.

As we were able to use the local sands overlain with coconut mating in the installation of the swales and biotreatment devices, the areas will not require excavation for maintenance or media replacement. As such, the CO2 will remain permanently sequestered. The use of coconut matting had the added benefit of reducing greenhouse gas emissions resulting from the use of synthetic landscaping fabrics.

The water sensitive design can successfully reduce and offset CO2 emissions on a large project. The measurable reduction or offset was just over 1/3 of the CO2 emissions associated with golf course drainage. The water sensitive design also reduced costs as pipes and pipe installation are more expensive than swales and biotreatment basins. As the green infrastructure has become part of the overall landscaping it adds to the amenity value of the overall project.

KEYWORDS

Water Sensitive Design, Carbon Sequestering, CO2 Reduction