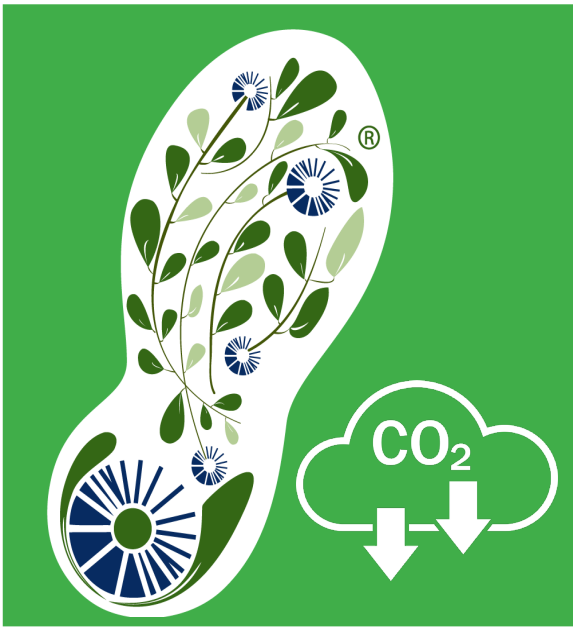
How Green Is Your Rock?

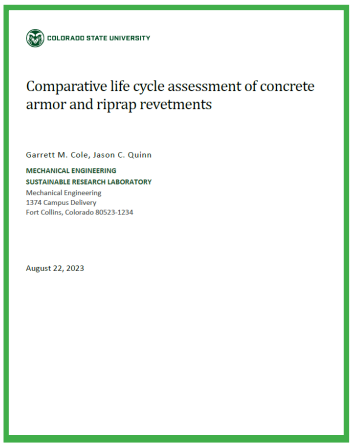
CARBON FOOTPRINT COMPARISON

Stone riprap revetments are widely recognized as the prevailing approach for erosion and scourprtection for channels, rivers, embankments, shorelines, bridge foundations, and other hydraulic structures. However, engineered concrete block revetment systems offer equivalent or greater protection. Although concrete has higher embodied carbon than natural stone, using less material results in a large reduction in transportation emissions and a potential reduction in emissions from material sourcing.

A decision support tool was built to evaluate this trade-off and the greenhouse gas (GHG) emissions associated with revetment installation. Utilizing this comparative life cycle assessment calculator, engineered concrete block revetment systems have been shown to provide up to a reduction of up to 75% GHG emissions versus traditional stone riprap revetments.



COLORADO STATE UNIVERSITY REVIEW



COLORADO STATE UNIVERSITY

Comparative life cycle assessment of concrete armor and riprap revetments

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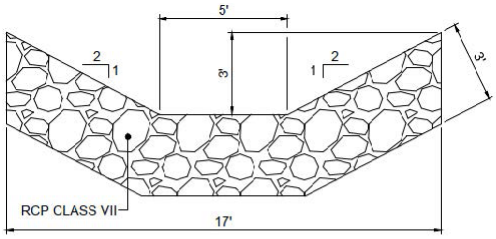
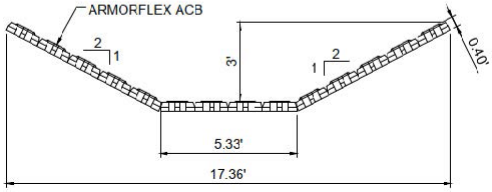
The CSU review states, "Concrete armor revetments offer a sustainable solution by achieving the same level of functionality as riprap revetments while utilizing less material. This reduction in material usage not only minimizes the environmental impact by lowering greenhouse gas emissions during transportation to project sites, but also presents an opportunity for reduced emissions from material sourcing."

"Beyond environmental benefits, the decreased reliance on trucking for material transportation also brings additional advantages like mitigating road noise and reducing road maintenance requirements. Thus, the adoption of concrete armor revetments presents a multifaceted approach towards more sustainable and ecologically conscious channel, river, embankment, and coastal protection strategies."





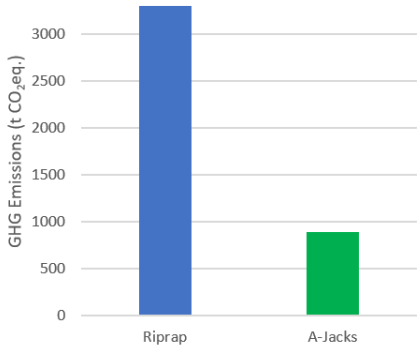
ARMORTEC EROSION SOLUTIONS

- Minimize environmental impact
- Lower installed GHG emissions
- Decrease reliance on trucking
- Lower maintenance costs
- More sustainable solution
- Continued CO_2 reduction

How Green Is Your Rock?

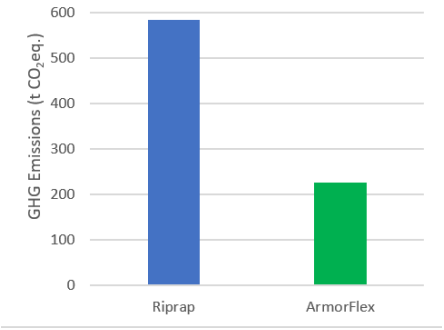
CASE STUDIES

CSU selected three case studies that exemplify the use of different types of concrete block revetment systems.



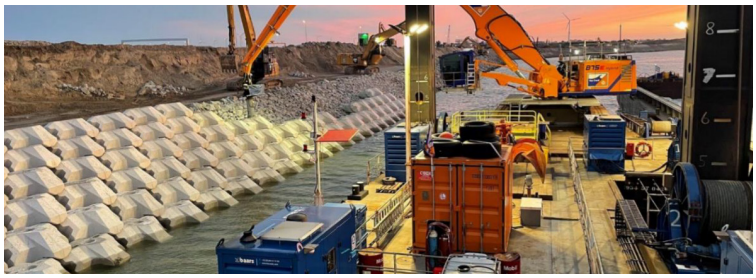
A-JACKS - I-155 CARUTHERSVILLE BRIDGE, TN

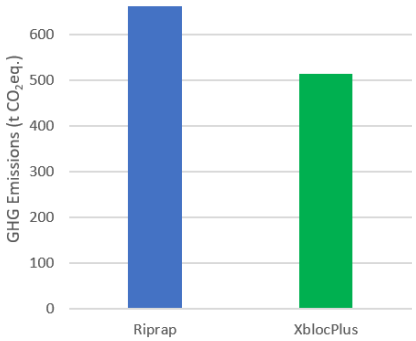
A-Jacks Concrete Armor Units were utilized for pier scour protection on the I-155 Caruthersville bridge crossing the Mississippi River. The initial FHWA HEC-23 riprap design required 2-ton Class IX rock. Due of the angle of attack on the piers, the riprap would be up to 90-ft wide and 29-ft thick. An alternate HEC-23 design required only a single layer of bundled 48-in A-Jacks with no additional excavation. This installation resulted in a 73% savings in GHG emissions.



ARMORFLEX - NORTH HARBOR, LYNN, MA

ArmorFlex Articulating Concrete Block Mats were installed for wave protection on the shoreline of a new apartment complex in Lynn, MA. The development team desired an environmentally responsible alternate to the nearly 6.5-ft thick granite protection typically used in local seawalls. Utilizing the Pilarczyk Method, an 8.5-in thick ArmorFlex system substantially reduced the required section thickness while providing the same wave protection and a 61% reduction in the installed GHG emissions.





XBLOCPLUS - GULF OF MEXICO

XblocPlus Concrete Armor Units were analyzed for a coastal protection system along the Gulf of Mexico where stabilization against wave induced erosion was needed. The initial riprap design required a 48-in D50 with an 8-ft thickness. This size of riprap was not available locally and would need to be transported from a quarry more than 1400 miles away. Casting 0.5-ton XblocPlus units on-site significantly eliminated transportation needs. Additionally, the XblocPlus units required only a 1.33:1(horizontal:vertical) slope compared the 3:1 riprap slope, thus eliminating additional material. Overall, a 22% GHG emission reduction could be achieved.