

ABSTRACT

The construction industry faces pressing challenges, including resource depletion, environmental degradation, and waste management. This study investigates Hybrid Fiber Reinforced Concrete (HFRC) incorporating Recycled Coarse Aggregate (RCA) as a sustainable alternative to conventional materials. Replacing natural aggregates with RCA reduces environmental impact, conserves natural resources, and addresses construction waste issues. The addition of hybrid fibers, such as steel, polypropylene, and glass, enhances the mechanical properties of the concrete, including tensile strength, crack resistance, and overall durability. The research involves a detailed analysis of concrete mix design, mechanical and durability testing, and an environmental life-cycle assessment to evaluate sustainability. Furthermore, economic feasibility is assessed, focusing on material cost savings and reduced maintenance expenses. The findings demonstrate that HFRC with RCA provides a high-performance, eco-friendly solution, promoting sustainable construction practices while extending the lifespan of infrastructure.