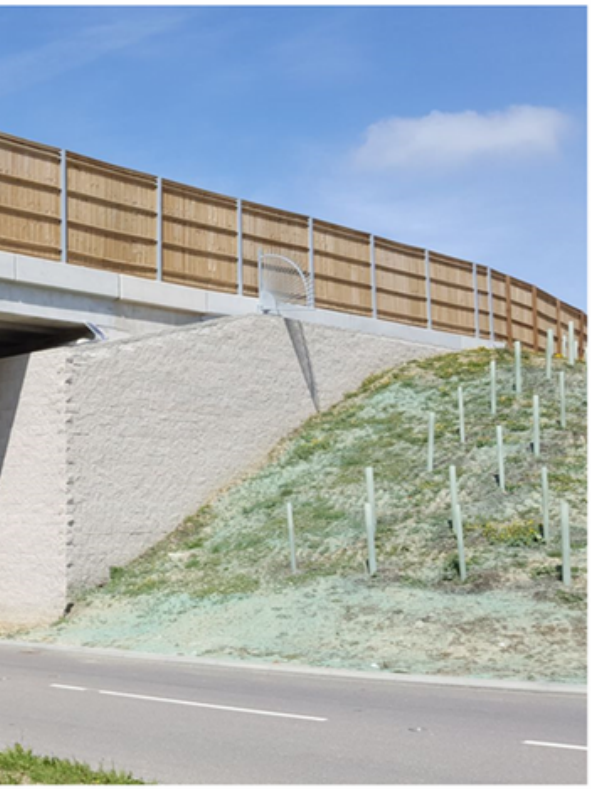
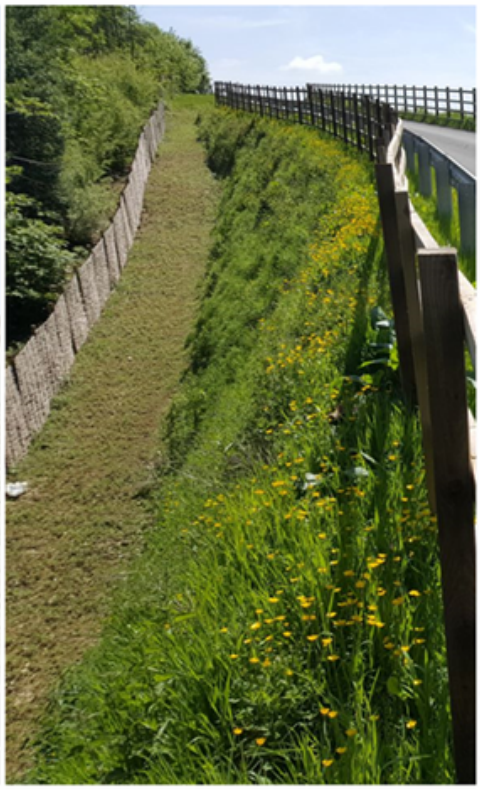
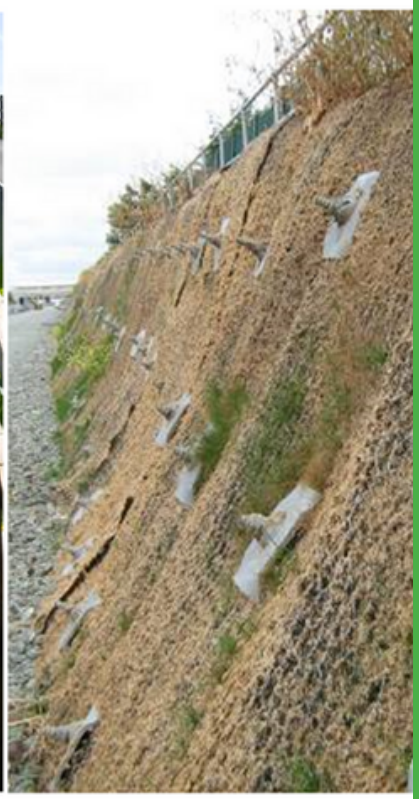
OCTOBER 2023

Sustainable Geosystems in Civil Engineering

Updating WRAP guidance on good practice construction using Geosystems

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About CIRIA

CIRIA is the Construction Industry Research and Information Association, a neutral, independent and not-for-profit member organisation.

Our vision is to be the leading enabler and preferred partner for performance improvement, to drive collaboration across the built environment and construction sectors to research, develop and transfer knowledge.

CIRIA Products

CIRIA delivers robust, authoritative and independent good practice guidance applicable across sectors and designed for a range of users, from policy makers to practitioners.

Our guidance is developed collaboratively with industry and academic experts. Our methods ensure consensus, quality and the latest thinking underpin everything we do. Our work contains case studies to share knowledge and illustrate practice through examples.

We raise awareness of our good practice guidance through training, events, communities of practice, social media, blogs and press releases. Key messages from our projects are widely disseminated to help embed good practice into industry.

CIRIA Research Ambitions

CIRIA's 60+ year history and future purpose are aligned to our ambitions, designed to make a tangible difference to the sectors in which we work. We take a holistic, systems-based approach to critical industry challenges within our 5 core research ambitions.

Embedding Sustainability

Achieving Net Zero Carbon

Increasing Resilience

Improving Delivery

Harnessing Innovation

Sustainable Geosystems

Justification

The Waste and Resources Action Programme (which operates as WRAP) was established by the UK Government in 2000 and has since become a charitable non-government organisation working globally to address climate change and enable a sustainable future. The programme's original scope was to challenge the construction industry to reduce the amount of waste going to landfill and incineration, thereby reducing resource depletion, carbon emissions and the associated negative social and societal impacts.

The construction industry was identified by WRAP to be a major contributor to material waste, particularly that going to landfill – approximately 20 million tonnes annually at the time of the creation of WRAP. Between its inception and March 2015, WRAP delivered a programme of work to support the construction industry to reduce waste and improve resource efficiency. The objective of this work was to reduce construction waste going to landfill/incineration by 50%.

In 2010 WRAP published 'Sustainable geosystems in civil engineering applications' to promote and improve material resource efficiency and to demonstrate that adopting low carbon ground engineering solutions (geosystems) need not introduce additional expense. The study proved, through audited as-built case studies, that it doesn't have to cost more to be 'green' and that the adoption of sustainable geosystems can also reduce project costs and programme, alongside the intended reduction in carbon emissions. The guidance was well received by clients, designers, constructors and regulators, supporting and improving their understanding of when, where and how geosystems could provide cost-effective, programme-efficient solutions that concurrently cut embodied carbon and reduce material waste in construction.

It is now over a decade since the original WRAP guidance was published and during this time the development and use of sustainable geosystems has grown significantly, such that an update is now due. Irrefutable evidence of the impact, and daily realities, of climate change is now the clear primary driver to reduce embodied carbon in construction, particularly where less carbon-intensive materials can perform as effectively and still reduce resource depletion and waste.

The UK Government's legal commitment to 'Net Zero' carbon emissions by 2050, enforces the need to reduce embodied carbon in construction, which is supported by the updated PAS 2080, and other recent academic research and industry studies into the impact of climate change on geotechnical assets and infrastructure. In the context of geotechnical assets, significant carbon reduction can be achieved by adopting alternative approaches to traditional applications. Adopting sustainable geosystems has been shown to significantly reduce both embodied carbon and waste materials from construction, as well as helping to deliver wider biodiversity benefits by creating habitats and 'greening' previously grey infrastructure.

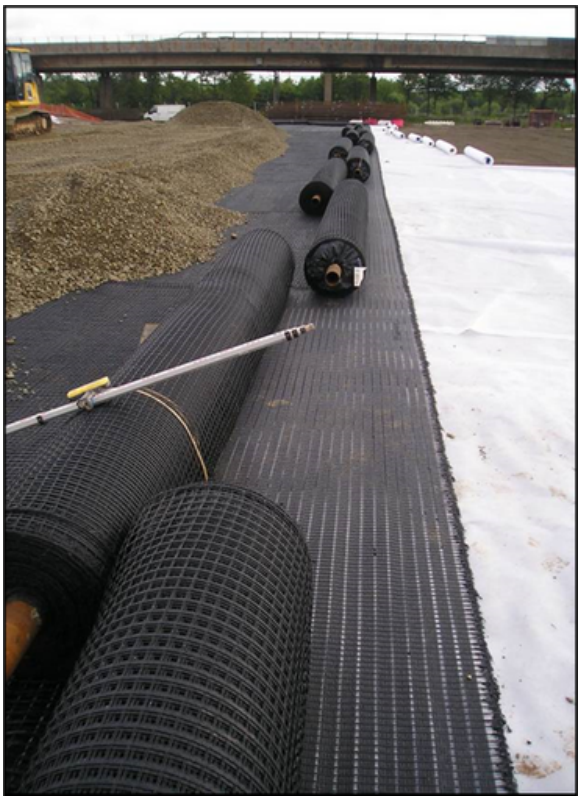
Scope

Geosystems can be defined as composite ground related applications comprising an engineering output, soil and/or rock, and engineered materials or components – they are often also referred to using terms such as geotechnical structures and Special Geotechnical Measures. Sustainable geosystems are those that benefit the three primary viewpoints, or pillars, of sustainability i.e. the environment, society and economy.

Geosystems can often provide 'tried and trusted' alternative solutions to the default specification of carbon intensive 'hard' ground engineering assets which are traditionally constructed. Arguably, the original WRAP report was ahead of its time and while aligned with WRAP's primary objective, to reduce waste to landfill, the guidance may not have had the impact within the ground engineering sector that it could and should have, particularly with regards to the economic case.

Over the past ten years the drive to combat climate change has become increasingly critical and the construction industry is taking note and beginning to more readily consider and adopt new technologies, approaches and alternatives to respond to client and public demands to mitigate carbon emissions. Much of the material used in traditional 'hard' ground engineering assets have carbon emissions linked to their extraction and transportation, with resource depletion also being recognised as a limitation to economic growth and a cause of escalating construction costs. Geosystems present a holistic approach to mitigating carbon emissions in ground engineering, while reducing resource demand and introducing opportunities to use waste and recycled materials in the components or in their construction.

The proposed new CIRIA guidance will reflect current thinking on cutting carbon within the construction industry in relation to climate change mitigation and adaption. While adhering to the principles of the original WRAP Geosystems report, the content will be expanded to reflect developments in geosystems, showcasing improvements and new technologies not available at the time of its first publication. Experiences of the construction, operation and maintenance of geosystems will be introduced, with particular focus on how any maintenance needs impact the operational life of the various geosystem solutions. It is recognised that there would be benefit in including experience from further afield than the UK and therefore international examples will be sought and included to better demonstrate good practice and technologies still not used within the UK. The guidance will be of particular interest to asset owners, supporting informed decision making when selecting appropriate ground engineering interventions. Where new materials, processes and technologies have been developed these will be included in appropriate sections, including 'natural' geosystems to benefit environmental impact and performance. Much of the guidance will be case study based, with examples of audited embodied carbon calculation using recognised carbon calculators and Life Cycle Assessments.



Indicative Timeline

SCOPE	INITIATE	AUTHOR	REVIEW	LAUNCH
Autumn 23	Early 24	Autumn 24	Winter 24	Spring 25

Why invest in a CIRIA project?

The benefits to your company from contributing to our projects

Our reputation

Our reputation in the industry is long established and widely recognised. The principles of quality, sustainability and collaboration have been a foundation for what we do for many years.

Our downloads

Our Guidance is downloaded over 50,000 times per year

Our reach

Our members and downloads span over 50 countries worldwide

The benefits of being involved in a CIRIA project are various:

- Deliver significant corporate value for modest levels of investment.
- Raise awareness of your corporate brand through logo on outputs and submission of case studies and content.
- Network with peers, clients and thought leaders in the sector.
- Get your message heard and influence industry direction.
- Demonstrate tangible leading contribution to improvement in the sector, fulfilling ESG goals
- Provide CPD for your staff, aiding routes to chartership and personal career growth
- Assist future work winning though involvement with industry leading good practice

Want to know more?

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