



The Civil Research Group covers a wide range of topics within four main laboratories: materials and structures; geotechnics; water and environmental resources and development technology.

Structures & Materials

www.warwick.ac.uk/go/structures

Dr. Toby Mottram, Dr. Tak-Ming Chan,

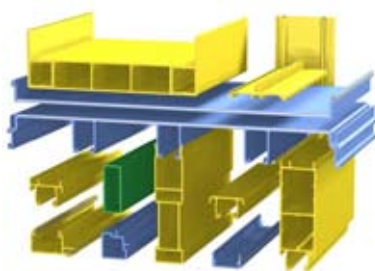
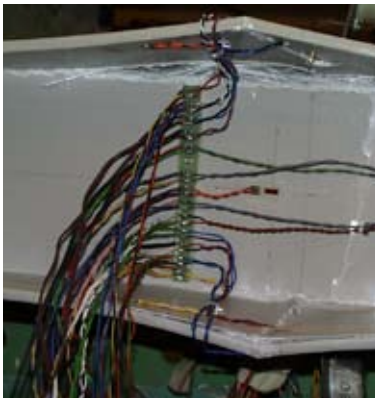
Dr. Stana Zivanovic, Dr. Qing Ni

The UK Government has set a number of challenging targets for improving sustainability, with the overarching goal of a 60% reduction in carbon emissions by 2050. Without dramatically improving the life-cycle environmental cost of infrastructure stock, it will not be possible to reduce resource consumption and meet this declared environmental target.

Construction materials and structures therefore have an important role to play in sustainable development through efficient application, energy performance and durability. Developing new and modifying existing use of materials and their hybrid combinations permit significant improvements in the environment and the quality of life that can be achieved.

Good design is synonymous with sustainable construction and this requires materials and structures research. Current research is focussing on the characterisation of components, joints and whole structures of new or traditional materials, and/or of innovative or unusual forms. Research involves evaluation of results from both full-sized static and dynamic testing in our structures laboratories and advanced computational modelling.

Research into vibration pollution and human-structure interaction is being developed with the potential to develop collaboration across the School of Engineering. There are links with other research groups focussing on health monitoring and smart structures. Smart structures use integrated communication and sensor systems to monitor and manage performance and within buildings to support the lifestyle choices of the occupants. Complementary research on soil-structure interaction is also undertaken. The transfer of academic results into the drafting of standards, industry manuals and codes of practice is also undertaken and this ensures there are strong links with end user groups.

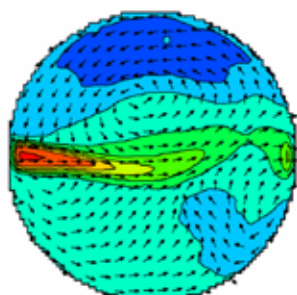
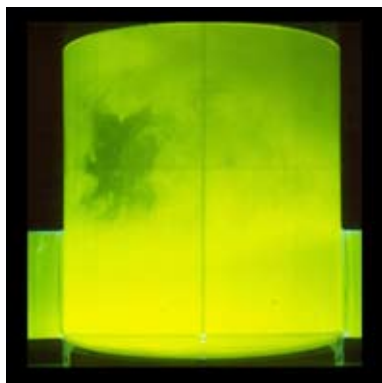




warwickWater
Water & Environmental Resources

www.warwick.ac.uk/go/warwickwater

Prof. Ian Guymer, Dr. Jonathan Pearson, Dr. Klaus Richter



Warwick Water undertakes research into aspects of water engineering, the environment and sustainability. The group focuses on identifying and quantifying the fate of soluble pollutants and contaminated fine sediments within rivers, urban drainage systems and the coastal environment.

Recent projects include work on the accumulation and dispersal of suspended solids in watercourses. Vehicles and highway-maintenance activities produce a number of environmental contaminants which can enter watercourses during rainfall events. Field monitoring has quantified this load and investigated the effects of highway derived contaminants over a number of years at field sites across the UK. Results have been linked directly to the impact on receiving water ecology. Laboratory and field-based studies have been performed to elucidate hyporheic exchanges and transient storage in rivers.

More frequent storms, increased development and improved environmental legislation all necessitate an enhanced understanding of mixing and transport in urban drainage systems. A number of projects are assessing how urban drainage structures (manholes, storage tanks, combined sewer overflows, ponds and wetlands) influence these processes.

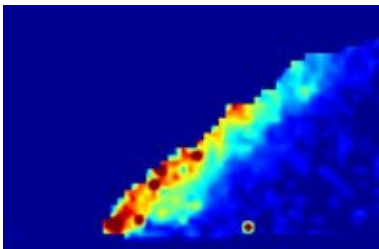
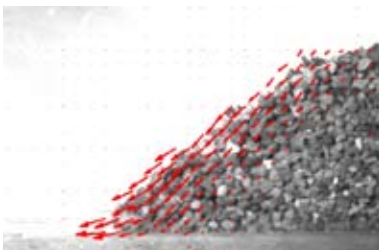
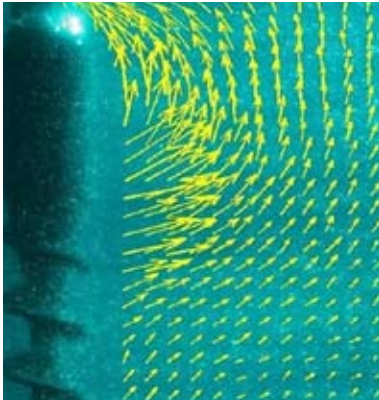
Projects have been conducted in both the nearshore and estuarine environments. The nearshore zone experiences pollutant loading through both the shoreline and seaward boundaries. From the seaward boundary, pollutant loading is transported landward towards surfzone wave activity, whilst from the shoreline boundary, run-off pollution, which can contain faecal indicator bacteria and human viruses, can drain into the surfzone. The effects of wave period, height, direction and spectrum are all important.

The long term aim of the research is to improve the knowledge of fundamental mixing processes, quantify their relative magnitude and enhance the predictive capacity of models describing the transport, mixing and fate of pollutants and fine sediments within the water environment.

Geotechnical Engineering

www.warwick.ac.uk/go/geo

Dr. Qing Ni, Dr. Klaus Richter, Prof. Ian Guymer



The Geotechnical Engineering Special Interest Group at the University of Warwick is at the forefront of research into soil mechanics and underground construction processes, utilising novel approaches and technologies.

The group is actively investigating disturbances caused by ground engineering methods and the impact of environmental change on soil behaviour. Of special interest is the visualization of these processes, as they occur for example in underground construction and slope failure processes. A thorough understanding of the governing mechanism will lead to improved engineering practices in various aspects, which will reduce the cost of construction for contractors and owners, prevent the hazard of ground failure to the public, avoid possible environmental contamination, and preserve the historical artifacts.

Utilizing innovative technologies like digital imaging and particle image velocimetry, physical modelling of soil behaviour can be performed to accurately determine disturbances and movements inside the soil body.

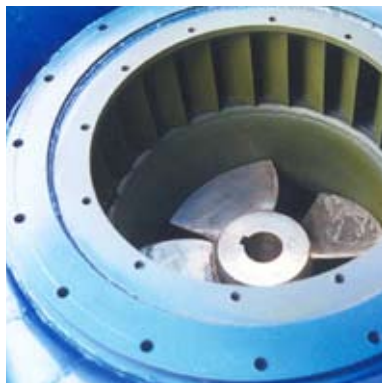
Two dimensional models are used for natural granular and cohesive materials. In addition, the technology to produce novel material of a “transparent soil” has been developed. The transparency of the artificial soil material, with engineering properties broadly similar to clay, allows the visualization of processes within three dimensional soil bodies. The group is working to further improve the material and imaging technique, to perform true three dimensional modelling and analysis of construction processes.

A similar technique is also applied to research into the flow of granular materials. Flumes and high speed digital imaging equipment are used to visualise flow processes of such materials.

For the analysis of test and soil disturbance processes standard industrial and specialist academic numerical software is used and developed. The group has a well equipped laboratory that has apparatus for standard soil testing, such as shear box measurements and triaxial compression testing. In addition small and large ring shear machines are available.

For information concerning postgraduate study please contact:
Postgraduate Admissions Secretary
School of Engineering, University of Warwick
Coventry, CV4 7AL, UK
T: +44 (0) 24 7652 2046
E: pgadmissions@eng.warwick.ac.uk
www.eng.warwick.ac.uk/postgrad

For information concerning industrial or academic research collaboration please contact:
Research Development Officer
School of Engineering, University of Warwick
Coventry, CV4 7AL, UK
T: +44 (0) 24 7652 2118
E: rdo@eng.warwick.ac.uk
www.eng.warwick.ac.uk/rdo



Development Technology Unit

www.warwick.ac.uk/go/dtu

Dr. Terry Thomas, Dr. Colin Oram,

Prof. Ian Guymer, Dr. Klaus Richter, Dr. Jonathan Pearson

The Development Technology Unit (DTU) promotes sustainable technologies that are appropriate for application within low-income countries. The Unit engages in the development and transfer of technologies appropriate to rural areas of tropical countries, and also studies “bottom up” industrialisation in these countries.

The DTU conducts its own research programmes and also works in collaboration with local organisations in some 10 countries. It is currently establishing a field station/workshop in Uganda.

Professionals are becoming increasingly worried about water scarcity, particularly in the developing world. Domestic roofwater harvesting (DRWH) provides an additional source for local water needs. DTU research into DRWH started in 1999 and is ongoing; findings are published through books and specialist media. The Unit also works on the design of water lifting devices both for irrigation and for drinking water.

The practical implementation of ecological and engineering principles in integrated storm water management has been studied through an EU funded Asia Link award— CITYBLUES. This involved investigations to understand the effects of: hydraulics (roughness effects of vegetation); vegetation (biological filtering and the production of biomass); sediment (biodiversity and thickness) and water quality processes.

The DTU researches materials for low-cost housing. Lime and hydraulic lime using burnt rice-husks may be a cost and CO₂ effective alternative to burnt bricks. Mortarless brick/ block construction using interlocking and post-tensioned construction is currently being investigated, as are alternative suspended floors and roofs.

Low-cost vehicles, both motorised and animal drawn, for rural goods transport, is also an active area. A novel system of equine harnessing has been developed. Single and two-wheeled motorcycle drawn trailers are currently researched in Kenya and Uganda. “South-south” transfer of long-tail boat engines to the lakes of Africa is long overdue.