



Studying natural hazards in Kent

Alina Congreve relates how students at the University of Hertfordshire conducted a field exercise to assess environmental risks and map the results

Students in Further Education are often familiar with environmental risks and natural disasters from desk studies of developing countries. Working closer to home can give them first hand experience of conducting risk assessments and hazard mapping. It can also make them aware of the job opportunities that are available in emergency planning and promoting resilience to natural hazards here in the UK.

In a recent project at the University of Hertfordshire students engaged with the very varied range of natural hazards that occur in Kent. They had two assignments to complete. First, to compile a large-scale hazard map covering an area from Folkestone to Rye, including Dungeness and the Romney Marsh. Second, to produce a detailed hazard map at 1:10,000 scale for Folkestone and Folkestone Warren.

Ideal location

Kent provides an ideal location in which to explore some of the range of natural hazards that affect the UK and the way in which they interact with human activity. The county contains a disproportionate amount of our critical national infrastructure including the Channel Tunnel Rail Link, the Dartford Crossing, and the Dungeness nuclear power station. Offshore, the Dover Strait is the busiest shipping lane in the world.

In terms of natural hazards, Kent is vulnerable to flooding on the north Kent coast at Sittingbourne, Whitstable, Herne Bay and the Isle of Sheppey. An even larger continuous area is highlighted by the Environment Agency flood maps in the south of the county, from

Folkestone westwards to Rye in Sussex. The area includes the Dungeness foreland and the Romney Marsh.

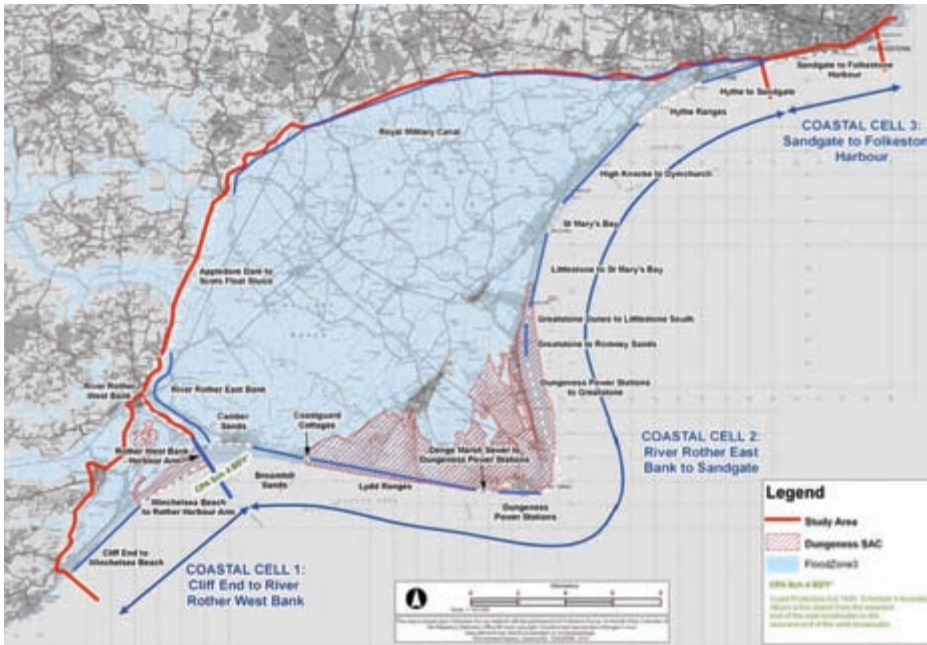
The gravel foreland at Dungeness has been a relatively stable feature in geological terms over the last 5,000 years. Palaeogeographic studies by Long and associates (2006) emphasise the resilience of the depositional complex, surviving repeated 'catastrophic' breaches over the centuries. Behind and east of the Dungeness gravel foreland areas of marsh have formed, called Romney Marsh.

All of the Romney Marsh area is either just above or in some places below sea level. While catastrophic flooding may not destroy the landforms, such a flood today would be a risk to over 16,000 homes as well as businesses, railway lines, and 25,000 hectares of agricultural land. Of particular concern is the flood risk to the nuclear power station at Dungeness should sea defences fail.

Assessing vulnerability

To assess the vulnerability of the Dungeness and Romney Marsh area to flood risk, the students needed to consider the range of coastal protection measures that had been put in place along the coast. This section of coast is an ideal location for students to research these issues because of the diverse coastal defence strategies that have been adopted.

Between Folkestone and Sandgate, rock headland structures and imported shingle have been used to create bays that were supposed to maintain a static equilibrium. Static equilibrium (or crenulated



Study area superimposed on Environment Agency flood map from: "Planning for the Future. Folkestone to Cliff End flood and Erosion management strategy".

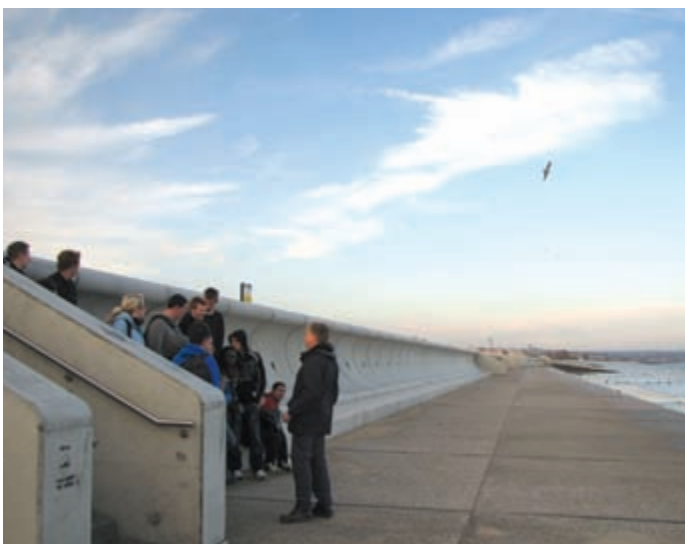
Home destroyed by early landslip at Folkestone Warren



Student group on Folkestone Warren looking at landslip



Sea Defences on Kent Coast



Sea defences at Dymchurch with student group



Home on the edge at Folkestone Warren

Student group at cliff base on Folkestone Warren



bay) beaches occur naturally on coastlines around the world and the engineering work attempted to recreate this natural feature. The obvious signs of artificial beach replenishment during the site visit suggested that while the features had been successful in protecting properties from coastal flooding a natural state of equilibrium had not been reached.

Continuing along the coast to Dymchurch one finds a recent example of the hard engineering approach to coastal management. The sea wall at Dymchurch cost £60 million pounds and was opened by the Environment Agency chairman in July this year. It is designed to withstand a one-in-200 year flood.

Filling the Gap

Continuing further westwards to the Coastguard Cottages at Jury's Gap (near Camber Sands) the students had a chance to meet local residents campaigning for improved sea defences.

Jury's Gap had been protected by a programme of shingle recycling since the 1960s. Lorries transported shingle from the tip of the Dungeness foreland and drove it to Jury's Gap. This material gradually migrated back to the tip of the Dungeness foreland through coastal processes.

This beach enrichment at Jury's Gap stopped in 2007 when concerns were raised about removing shingle from an internationally-designated wildlife habitat. Instead, sand and gravel from a nearby quarry was used. This has an entirely different composition to beach gravel and erodes much more quickly, leaving the coastline more vulnerable and creating small cliffs on the beach. The vulnerability of Jury's Gap is important, argue local residents, because flood water could enter here and inundate large areas of Romney marsh, flooding behind the new defences at Dymchurch.

Slip, sliding away

In addition to flooding, coastal areas of Kent are also at risk from landslides in the area called the Folkestone Warren. Landslides are a notable hazard in the UK and have caused significant damage and injury to the built environment and people respectively. The geology at Folkestone Warren makes the cliffs susceptible to rotational slides. Water

percolates through the chalk until it reaches the Gault Clay.

The Gault clay is impermeable and when water reaches the clay it reduces the friction between the two beds. The Gault clay at the base of the Warren is easily eroded by wave action. The development and extension of the harbour wall in Folkestone has reduced the sediment supply reaching the cliffs east of Folkestone, reducing the natural protection for the cliff base.

The students carried out a landslide hazard assessment to determine the potential for mass movement on slopes adapted from the work of Gade and associates (2005) and Bell (2003). Landslide hazard only becomes a risk if there is a potential for vulnerable people or assets to be affected. Landslide risk is determined multiplying the likelihood or probability of mass movement occurring, by the severity of the potential damage or injury that would be caused.

The most notable feature at risk is the railway line that runs through the lower slopes of earlier landslips. Motion sensors have been placed by the railway line to detect any movement in the slope and alert rail authorities. Also at risk are two caravan sites and some of the homes in the village of Capel le Ferne.

The area at risk of future landslides can be mapped through a combination of field assessment and study of geological maps. The rate of coastal change in this part of Kent was brought home by talking to the rescue archaeology volunteers, working to save artefacts from a Roman villa on Folkestone Warren. Originally built hundreds of meters from the cliff edge, this part of local history could disappear in the next large storm. Mapping the natural hazards of the South Kent Coast has provided students with an excellent opportunity to get first hand experience of some of the challenges that face professionals today.

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Note: examples of mapping compiled by students will be found in the online edition of this article at www.geoconnexion.com