SALT MARSHES VS THE SEA

This transcript is of the second short film in a series in which a team of Geographers and Geologists explain how they are planning to shed light on what makes salt marshes resistant to storm waves (Film 1) and then (Film 2) how their use of the latest remote sensing and soil scanning technologies alongside one of the world's largest indoor wave flumes, has allowed them to gather the evidence for just how resistant salt marshes are to storm impacts.

On much of the world's coast, salt marshes provide an important first line of defense against coastal erosion and flooding, but vast areas of these valuable coastal buffer zones are rapidly changing around the world.

We are a team of geographers and geologists and for the past two years we have worked hard to figure out just how stable these salt marshes; formed of plants and sediment; are. To be prepared for the next big storm we need to understand whether a severe storm may destroy these valuable natural features. When they are gone our homes cities and infrastructure become a lot more vulnerable.

To find out what controls their likely response to future storms, we have put intact soil columns from a muddy marsh on the east coast of the UK and a sandier marsh from the west coast into a CT scanner to see what the soil and roots look like inside. We then carefully cut one side open and put them into a giant wave flume to let waves crash into and over them. We use digital imaging techniques to map areas of the soil that eroded and washed away, and other areas that swelled under the water. We also studied the composition of the soil; how much organic matter, the type and size of particles, and what type of roots it contained.

Our results show that particular species of plants, and particular types of particles, caused the soil to bind together more than others. We use medical CT scanning to look at what is under the marsh in three dimensions and study the structure of roots and voids. Our CT images show that the shape and distribution of roots and voids varies with vegetation and sediment type.

In field and lab tests we find that both the sediment type and the vegetation type have an important effect on the resistance of the marsh. In the flume we see more erosion in the sandy sediments than the muddy ones, but in both cases, we see most erosion close to where we see roots and voids.

We can map what is on the ground from above using drones and satellite images. In this way we can map how the soil structure and its possible response to the influence of waves and tides varies across an area. The images we can get from the drone are great for measuring erosion, but we can also use them to map different plant species and infer their effect on sediment stability.

Salt marshes play a very important role in the context of climate change, they reduce the impact of storms and they take carbon from the atmosphere. By better understanding mechanisms of erosion, we can help to protect these important environments and plan for the future. A future, in which sea levels are rising, and storms may be increasing in frequency and magnitude, and a future in which we are becoming increasingly reliant on our natural surroundings for protecting us, and everything we do, from the impact of a changing climate. The great thing about the RESIST project is that it's shown us that natural coastal features form extremely strong natural defenses that self-repair and grow with rising sea levels. They also safeguard our fisheries, they give us beautiful spaces to enjoy, they store carbon, and they increase biodiversity. Now that we know all this, we need to continuously monitor them, and we need to recognize them within our policy and planning frameworks.

Here at British Geological Survey we have to try and understand the vulnerability of our coastline in England and Wales to erosion overtopping by waves and storm surges. Working with the RESIST team has really helped us to understand how we score the vulnerability in low-lying land, particularly with salt marshes. By understanding salt marshes much, much better we're improving our data project and we're also able to improve our support to local authorities with their shoreline management plans.