Protecting the South West through improved coastal hazard forecasting

The SWEEP OWWL model is delivering more accurate, site-specific coastal hazard forecasts for the South West. The team worked closely with the Environment Agency (EA) to ensure the improved forecasts have real-world application -helping to protect the environment and properties, save lives, and facilitate cost-savings for marine and coastal businesses.

sweep
Impact Summary

Porthleven during a storm

Daily coastal flood forecasting to **626** Twitter followers and **150** email subscribers, **34** EA flood warning officers and **29** local authorities

Informed EA real-time coastal forecasting plans (£20m) within their **£140m** national coastal forecasting strategy

Providing operational efficiencies to marine business in Lyme Bay

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Ways of Working

Innovative Knowledge Provision → Effective Collaboration → Capacity Building → Tailored Decision Support

sweep OWWL
Operational Wave & Water Level Model

Why it mattered?

The detrimental economic and societal impacts of coastal flooding along the South West's 1014km of highly indented coastline is exacerbated by increasing demands on coastal use, and the threat of climate change and rising sea levels. Better forecasting can potentially saves lives, protect the environment and property, and help marine businesses and flood-response organisations to operate more efficiently.

Coastal flooding is normally considered to be the result of high tides and storm surge, but in the South West an important additional factor is 'wave run-up'. This occurs where large waves hit coastal structures or beaches. The Operational Wave and Water Level Model (OWWL) brought all these

> *Good forecasting is the most cost effective way to safeguard communities at the coast and, ultimately, save lives."*
>
> **Nick Ely, Environment Agency Coastal Modelling & Forecasting Manager**

factors together (See Storm Emma Case study).

Previous forecasting models did not include wave-run up and only predicted offshore wave conditions at coarse resolutions. Whilst useful for area-wide application, these predictions are less useful at the local, site-specific level, and where breaking inshore waves create the greatest damage. There was a need to develop more accurate and localised forecasting.

What we did

In March 2017, Prof. Gerd Masselink, Dr Kit Stokes, and Dr Tim Poate from the University of Plymouth's Coastal Processes Research Group began working closely with the EA and Met Office to a develop a storm impact model - OWWL - to improve coastal flooding and other coastal hazard forecasting in the South West and, for the first time, include wave run-up.
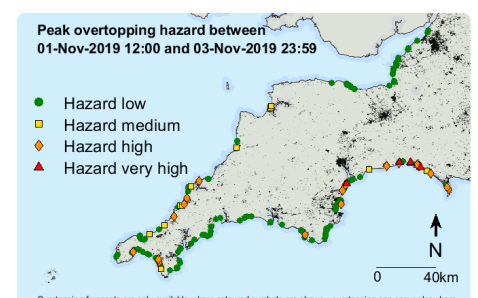
The first version of OWWL was finalised in October 2018 and predicts storm impacts around the South West coastline at a resolution of 1 km. It is delivered daily via the Channel Coastal Observatory (CCO) website, Twitter, and through tailored

alert emails providing site-specific, 'three-day advance' forecasts of coastal overtopping and flooding hazards.

It currently has 70 subscribers, including 19 local EA flood managers who have now used it to inform their decisionmaking over the winter since 2018.

Working with Offshore Shellfish Ltd (OSF), the UK's largest offshore, rope-cultured mussel farm, the SWEEP team developed bespoke OWWL sea-condition forecasts for Lyme Bay.

It is expected that the daily forecasts will support more effective decision-making for the OSF operations team about when to go to sea, and which activities can be undertaken on any given day, for example. Plans are in place to monitor further impacts over winter (2020/21).

Peak overtopping hazard between 01-Nov-2019 12:00 and 03-Nov-2019 23:59

● Hazard low
■ Hazard medium
◆ Hazard high
▲ Hazard very high

N
0   40km

Overtopping forecasts are only available where coloured symbols are shown - overtopping can occur elsewhere

Impacts & benefits delivered

Health & Wellbeing
Improving health and wellbeing: Nick Ely, EA's Coastal Modelling & Forecasting Manager, confirmed OWWL *"has been instrumental in helping us to make more informed decisions on issuing warnings to the public"* and will *"safeguard not only the health and wellbeing of coastal communities during storms, but also the wellbeing of our flood response staff around the southwest coast."*

The development of OWWL has:

Attitudinal/Capacity
Influenced an attitudinal shift at the EA around the importance of having an overtopping tool as part of their national forecasting srategy;

Policy & Legislation
Informed a national-level strategic review of the EA's coastal forecasting strategy, and led to £140m of Defra funding with £20m ear-marked for future, enhanced real-time coastal forecasting plans;

Organisational Function
Influenced EA operational practises: South West local flood warning officers use the daily live OWWL wave overtopping forecast t more accurately predict coastal flooding and more effectively target resources;

Economic
Delivered cost savings to the EA through accelerated improvements in forecasting capabilities and more effective resource targeting.

Organisational Function
Early results indicate that OWWL forecasts have delivered operational efficiencies to Offshore Shellfish Ltd. through being able to make better decisions about when to go to sea, and what activities can be achieved on a particular day.

> *Prior to having the SWEEP-OWWL forecast we would have had a much wider response, a more reactionary response, or perhaps even not have responded at some of the key locations for wave overtopping"*
>
> **Nick Ely, Environment Agency Coastal Modelling & Forecasting Manager**

> *This improvement in resource targeting [as a result of the OWWL model] will have saved the EA thousands of pounds during each of the six largest storms over the last two winters by being able to be more targeted in our working, and reducing unnecessary trips and deployments.."*
>
> **Nick Ely, Environment Agency Coastal Modelling & Forecasting Manager**

Chesil beach during a storm

Looking to the future

Demand for further applications of the SWEEP-OWWL model is growing and the team are currently developing a number of new projects:
- Delivering a bespoke OWWL model for South Wales with Natural Resources Wales and Welsh Coastal Monitoring.
- Developing a beach hazard forecast for Crantock, North Cornwall with the RNLI, National Trust, and Duchy of Cornwall.
- Initial collaboration with potential partners to develop a hydrodynamic forecasting service for the Isles of Scilly.
- Working with the Marine Energy Test Area (META) in Pembrokeshire, Wales to provide bespoke forecasts for marine renewable energy developers.

The team will continue to collaborate with the EA - following the initial success of the OWWL overtopping and coastal flooding forecast, and with Offshore Shellfish - tracking the operational benefits of their use of the bespoke Lyme Bay forecasts over the winter (2020/21).

About SWEEP

The South West Partnership for Environmental & Economical Prosperity (SWEEP) is a partnership between the University of Exeter, the University of Plymouth, and Plymouth Marine Laboratory. Funded by the Natural Environment Research Council and stakeholders together to solve key challenges faced by those working with our natural resources. **www.sweep.ac.uk**

UKRI — Natural Environment Research Council

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