PROTECTING AND ENHANCING SURF AMENITY

Advanced tools for modelling breaking waves, coastal processes, and quantifying surf amenity

SURFING AMENITY – A KEY CONTRIBUTOR TO LOCAL ECONOMIES

Surfing is an estimated USD 7.3 billion global industry. With over 20 million participants worldwide, surfer numbers are increasing significantly each year.

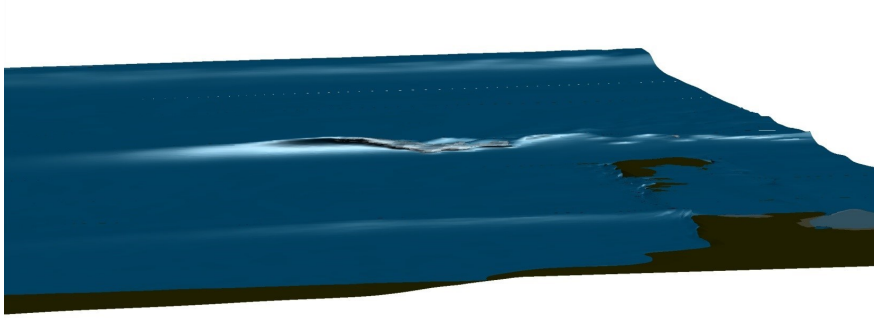
Numerous studies around the world have shown that the presence of high quality surfing resources brings enormous economic benefits to local economies through increased tourism, population growth and development. On the Gold Coast (Queensland, Australia), the surfing industry directly contributes an estimated 10% to the local economy's total output and supports around 13% of total employment within the Gold Coast Local Government Area – equivalent to around 22,000 full-time positions.

Surf amenity is a significant natural resource for many local economies. As such, it requires ongoing maintenance and protection in order to ensure the long-term sustainability and growth of local communities and economies.

ADVANCED TOOLS TO ASSESS SURF AMENITY

Authorities are realising the importance of surfing amenity to local economies and are under increasing pressure from surfing communities to protect surfing resources. This has resulted in a rapid increase in the demand for surf amenity considerations to be incorporated into coastal management plans and as part of the regulatory approvals process for new coastal developments.

To meet increasing demand for surfing amenity assessments by government agencies and community stakeholders, we have developed a range of tools that



Coupling the MIKE 21 BW Boussinesq wave model to a fully non-linear CFD model allows for detailed assessment of wave breaking characteristics along famous surf breaks around the world. © DHI

CLIENT

- Coastal development proponents
- Port and harbour authorities
- Government agencies and regulators

CHALLENGE

- Increasing development pressures on coastal environments
- Balancing the needs of multiple stakeholders related to coastal developments with conflicting interests
- Need to take complex and highly coupled physical processes into account when trying to estimate impacts of coastal developments

SOLUTION

The development of state-of-the-art tools that can be used to undertake a quantitative and integrated assessment of surf amenity for coastal developments

VALUE

- Protects surf amenity resources and associated significant economic benefits
- Increases confidence in government agencies managing and regulating coastal development
- Improves the ability to manage community stakeholder interests

enable us to undertake a quantitative and integrated assessment of surf amenity, including:

- fully non-linear wave modelling
- surfing amenity quantification modelling
- advanced shoreline evolution modelling

These tools provide government agencies and other stakeholders with the confidence and certainty needed to evaluate the potential impact of coastal developments on the local surf amenity.

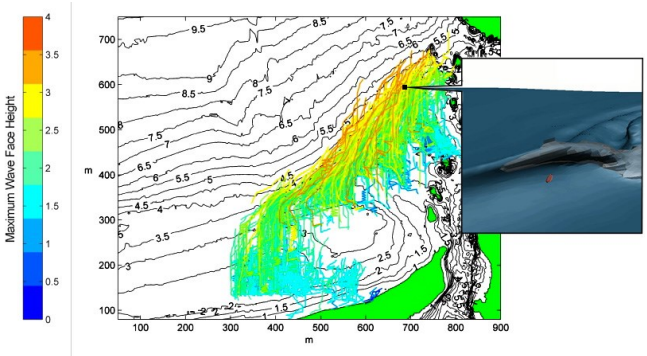
FULLY NON-LINEAR WAVE MODELLING

We have pioneered the application of fully non-linear, Volume of Fluid (VOF) wave models to model breaking waves explicitly and accurately. The VOF wave models enable us to undertake very detailed investigations of surfing wave quality and the impacts to surf quality in response to changes to the incident bathymetry. By coupling the VOF model with our MIKE Powered by DHI's MIKE 21 Boussinesq Waves (BW) model, we can also investigate the influence of larger scale transformations to the incoming wave field that could be impacted by coastal development.

OPTISURF – A UNIQUE MODEL FOR QUANTIFYING SURF AMENITY

OPTISURF is our numerical model that explicitly integrates the key wave variables relevant for assessing surfing quality, directly from the simulation of three-dimensional (3D) breaking waves. Using an iterative vector-based scheme, OPTISURF analyses the gradient and curvature of the modelled wave forms as they progress in time to produce a series of:

- potential surf rides
- associated time-series of relative surf speed
- wave steepness
- wave height
- ride lengths



OPTISURF calculates surf-ability using a detailed wave-by-wave approach. It produces hourly statistics of the distribution of ride length, wave pealing speed, and wave face height. © DHI

These model predictions can also be compared directly to actual measured surf ride trajectories obtained by a high frequency GPS mounted on the board.

ADVANCED SHORELINE EVOLUTION MODELLING

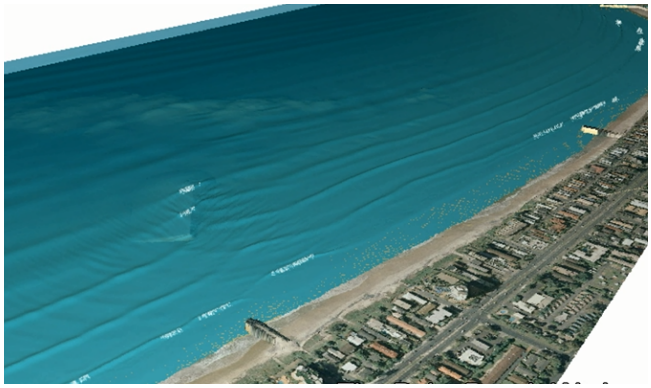
Accurate prediction of the evolution of sandy shorelines due to coastal developments are critical to ensure that the developments do not cause unwanted impacts to adjacent shorelines or negatively impact the surf amenity. Our next generation shoreline evolution models ensure the highest degree of accuracy and certainty available for investigating potential impacts of coastal developments on complex sandy shoreline environments.

DESIGNING MULTI-PURPOSE REEFS FOR EROSION CONTROL AND ENHANCED SURF AMENITY

Using advanced VOF wave models in combination with OPTISURF aids in the design of multi-purpose reefs that can be used for both enhancing surfing amenity and protecting vulnerable sections of coastline.

This provides highly detailed information on the expected performance, safety and structural integrity of the reefs – critical for evaluating the overall surf amenity enhancement and coastal protection that could be expected from these structures.

The placement and design of multi-purpose reef structures within the littoral zone requires very careful evaluation to ensure the structures provide coastal protection along sensitive sections of the beach. At the same time, the structures must not cause downdrift erosion impacts or adversely affect adjacent surf amenity or other beach uses. Our shoreline evolution modelling provides the sophistication and reliability necessary to balance these competing constraints on the design of multi-purpose reefs.



Our tools allow for an integrated assessment of surf amenity enabling us to undertake detailed investigations and concept design of multi-purpose surfing reefs for erosion control and enhanced surf amenity. © DHI

Contact: info@dhigroup.com
For more information, visit: www.dhigroup.com