COLLABORATING ON THE COAST – TWEED AND BYRON SHIRE COUNCILS' REGIONAL COASTAL PROCESSES AND HAZARDS ASSESSMENT

C Knight[1], J Lofthouse[2], B Fitzgibbon[3]
[1]Byron Shire Council, Mullumbimby, NSW
[2]Tweed Shire Council, Murwillumbah, NSW
[3]Office of Environment and Heritage, NSW

Abstract

Between the two northernmost coastal NSW LGAs, Byron and Tweed Shire Councils have the care and oversight of approximately 74 kilometres of coastline, including two areas prone to coastal erosion and long-term recession risk; being Belongil Beach and Kingscliff Beach respectively.

Both Councils recently undertook a review and update of their Coastline Hazard Definition studies, the updates were produced collaboratively by the one consultant.

This paper will look at the process that led to, and facilitated this collaboration and will touch on some of the benefits, outcomes, and lessons learnt.

The original suggestion for a regional collaboration between Byron and Tweed Councils came from the Office of Environment and Heritage (OEH), with the aim of improving the regional understanding of coastal processes and hazards. This was supported by work undertaken by the NSW Coastal Panel at Kingscliff during 2011.

Based on the findings of the hazard studies, the short to medium term evolution of the far-north coastline of NSW appears to be responsive to, amongst other factors, the littoral sediment transport system as influenced by regional wave climate over timescales of years to decades. Assessment and consideration of these physical processes on a regional scale has highlighted the dynamic interconnectivity of the far north coast beaches, the processes that may contribute to that dynamism, and the historical variability of region-wide beach erosion and accretion phases. Historical and future long-term shoreline evolution is also investigated.

Some of the practical outcomes from this project include; economies of scale; application of contemporary methodologies for assessing regional coastal processes and defining coastal hazards, including shoreline evolution modelling and historical photogrammetry analysis and; development of a collaborative relationship between the two Councils' project managers, both of whom are grappling with similar issues in coastal management. The project also resulted in more efficient use of OEH expertise and funding under the NSW Government's Coastal Management Program.

Introduction

By virtue of regional and local coastal processes operating over time scales of millennia to weeks, the largely unconsolidated sedimentary coastline of Byron and Tweed Shires (Figure 1) is in a constant state of flux, and is subject to coastal hazards including beach erosion, long-term recession, and coastal inundation. These hazards present a significant risk to the built environment at key locations within each Shire. Belongil Beach in the Byron Shire has been identified as a 'coastal erosion hotspot'. Kingscliff Beach, while not meeting the criteria of a hotspot, like Belongil Beach has experienced significant erosion in recent years. These coastal hazard threats are likely to be exacerbated in the future by projected climate change impacts, in particular sea level rise.

As the agencies primarily responsible for management of the NSW coastal zone, coastal councils may, or must if directed to do so, prepare and submit Coastal Zone Management Plans (CZMPs) to the NSW Minister for the Environment under the *Coastal Protection Act 1979 (*CP Act). From the Guidelines (OEH, 2013, p. 1), the main purpose of a CZMP is to "…describe proposed actions to be implemented by a council, other public authorities and potentially by the private sector to address priority management issues in the coastal zone over a defined implementation period."

Under the CP Act, Byron Shire Council has been directed by the Minister to submit a coastal zone management plan (CZMP) for the Byron Bay Embayment by 30 June 2014. Tweed Shire Council has resolved to prepare a CZMP for Kingscliff Beach by 31 December 2013 and recently completed the Coastal Zone Management Plan for Tweed Coastal Estuaries (Cudgen, Cudgera and Mooball Creeks).

In accordance with the statutory Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013, p. 10), CZMPs are to contain a description of:

- *coastal processes within the plan's area to a level of detail sufficient to inform decision-making*
- *the nature and extent of risks to public safety and built assets from coastal hazards*
- *projected climate change impacts on risks from coastal hazards…based on council's adopted sea level rise projections or range of projections. Councils should consider adopting projections that are widely accepted by competent scientific opinion*[i]

These three dot points underpin the coastal hazards assessments undertaken by coastal councils across NSW for informing their CZMPs.

As part of the NSW coastal management framework for coastal hazards assessment and management, hazard definition studies for the Byron and Tweed Shire coastlines were completed by WBM Oceanics more than ten years ago (2000 and 2001 respectively). These studies were both independently updated recently by the University of New South Wales Water Research Laboratory to include the sea level rise benchmarks contained in the previous NSW Sea Level Rise Policy Statement (DECCW, 2009).

The Office of Environment and Heritage (OEH) advised both councils of the considerable merit in updating their coastal hazard studies prior to preparation of their CZMPs to ensure a better understanding of historical trends as based on a longer data set. This would also improve confidence in deriving future projections. These studies required 'updating' with the analysis of recent photogrammetry and bathymetry data, as well as contemporary hazard definition knowledge and methodologies. Any relevant requirements under the recently amended *Coastal Protection Act 1979* and guidelines would also need to be addressed.

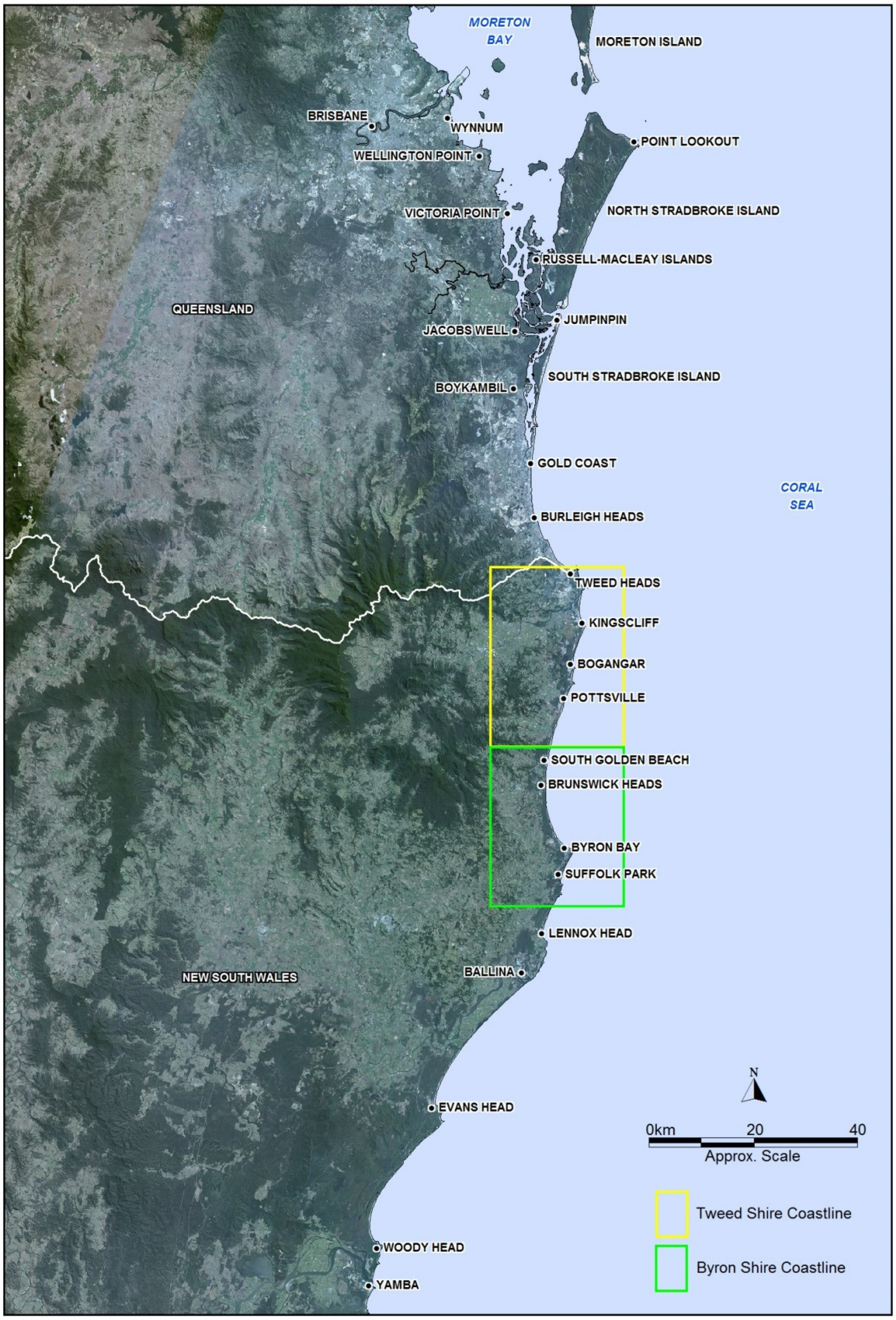

Figure 1 Regional Coastline System – Clarence River to Moreton Bay (Source: BMT WBM, 2013)

With timing seemingly in alignment, the OEH recommended a collaboration between both LGAs towards their respective coastal hazard study updates. This was in recognition that both LGAs reside in the same regional sediment compartment and share or have in common a number of processes that influence coastal hazards, including coastal geomorphology and evolution, regional wave climate, meteorological influences and astronomical tidal regime. The Minister for the Environment specifically requested the collaboration, noting that this would assist both Councils' in development of their respective CZMPs.

Accordingly both Councils submitted funding applications to the state government's (OEH) 2011-12 Coastal Management Program for undertaking their hazard study updates. These applications reflected the objective to undertake the project 'in partnership…to ensure consistency in approach and methodology across adjoining coastal zones.'

Defining a collaborative approach to the hazard updates

Both Councils were successful in receiving funding from the OEH Coastal Management Program for their hazard study updates – being a 50 per cent funding contribution to each study. A project-specific condition of the funding agreement with the state government was for each hazard study update to be undertaken together with the other Council's hazard study.

A project management group was established between the two Councils to progress the studies and to define and implement the collaboration. This was comprised of coastal management staff from Tweed Shire Council, Byron Shire Council and the OEH. This group met face to face and kept in regular email contact throughout the collaborative components of the joint project.

Scoping the project, preparing and distributing the project brief

The collaborative effort began with defining the scope of each Council's hazard study and preparing the consultant's project brief for inclusion in each Council's respective procurement documents.

In large part, the project brief was very similar for both Councils, with differences arising where the brief called upon background information or addressed the requirements of the project at the scale of local government area (LGA) coastline or 'beach compartment'. Specific requirements of each project, for example compartment (Belongil Beach / Kingscliff Beach) scale analysis, reporting and timeframes, were developed separately.

The key collaborative component of the project in terms of a project deliverable, was an overview of coastal processes operating at the regional and sub- regional scale. This was defined in the project brief, an extract of which is provided at Box 1.

The project management team initially reviewed and worked on the two briefs together, and then worked separately to tailor each brief to their respective LGA. The OEH 'Technical brief for preparation of a Coastal Zone Management Plan' proved a useful template on which to base the briefs. The OEH provided comment on and oversight of both briefs.

Box 1 Extract from Tweed and Byron project briefs showing common project deliverable regarding regional and sub-regional coastal processes

> **4.2 Coastal Processes - Regional Setting**
> An overview is to be provided of regional coastal processes (from the Clarence River entrance at Yamba to Moreton Bay Qld, the geographical extent of which is recognised as a regional sediment compartment. This is to include a conceptual sediment budget overview with assessment of trends and prognosis.
>
> The cost of this work is to be shared equally between Byron Shire Council and Tweed Shire Council (Byron Shire Council will accept and invoice for 50% cost of this item cost).
>
> **4.3 Coastal Processes - Tweed – Byron Coastline Setting**
> The coastal processes operating along the Tweed and Byron Shires' coastlines (from the Tweed Shire Council northern boundary at Point Danger, south to Byron Shire Council southern boundary at Seven Mile Beach) are to be described within the context of the regional processes identified and described in section 4.2 above.
>
> Similar to the regional overview, a conceptual overview of the sediment budget and prognosis for the Tweed - Byron coastline unit is to be provided in concept.
>
> Where macro sediment movements within the sediment budget can be quantified (in approximation) in the conceptual model this information is to be provided.
>
> The cost of this work is to be shared equally between Byron Shire Council and Tweed Shire Council (Byron Shire Council will accept and invoice for 50% cost of this item cost).

The briefs were distributed on the same day to a pre-selected group of consultants considered to have relevant expertise and 'local' knowledge, as agreed prior, and in accordance with each Council's procurement policies. Each brief and the invitation to quote or tender, cross referenced the other Council's brief. Consultant proposals were due back on the same day for both Councils.

Evaluating consultant proposals and engaging the consultant

Prior to release of the brief, the project management team agreed on a common set of evaluation criteria with weightings determined jointly afterwards. It was agreed that each member of the team would conduct an evaluation independently, and the team would meet to make a final determination on the successful consultant. The consultant would be engaged under two separate contracts and all financial transactions would be dealt with independently by each Council. It was considered highly preferable that the one consultant be engaged to undertake both studies and this was noted in the brief.

As an outcome of the evaluation process, all parties agreed on the one consultant for both studies, being BMT WBM Pty Ltd, with the project lead being undertaken by Director and Principal Coastal Engineer Dr Dean Patterson. The BMT WBM proposal was considered to outline a methodology that provided for the analysis of coastal processes operating at a regional/sub-regional scale, in line with the collaborative approach, whilst also embodying a thorough and contemporary hazards assessment that met the requirements of the briefs and the OEH Guidelines (OEH, 2013). In addition, it was considered that this consultant had significant experience in and knowledge of coastal processes and hazards operating within the study area.

The cost for the regional component part of the study would be shared equally by each Council and the consultant would invoice each Council separately.

Project management and review of the common project deliverable 'regional and sub-regional analysis of coastal processes'

The consultant proposed to undertake a regional and sub-regional analysis of coastal processes which would be common to the two studies/reports. This included the development of a regional scale shoreline process model based on EVO-MOD software. The cost for this part of the study would be shared equally by each Council.

The common regional analysis was prepared and undertaken in the initial stages of the project. The consultant presented overviews of this work, as it progressed, to meetings of the project management group. The draft chapters of the reports that were specific to the regional analysis were reviewed concurrently by the members of the project management group and a collated agreed set of comments was submitted to the consultant for consideration. This review was undertaken over a period of time, with several iterations and a number of extended meetings.

Outcomes of the Collaboration

Regional and sub-regional understanding of coastal processes

Both LGA coastlines have similar geomorphologic form, are subject to a similar regional wave climate, meteorological and astronomical influences, and reside within the same regional sediment compartment.

Geological context

Over the past 120,000 years, within the Pleistocene - Holocene geological period, global sea level fell to approximately 120m below its current level before rising to 1–2m above (6,000 to 7,000 years BP), and then falling again to around its current level approximately 3,000 years BP (Chappell and Polack, 1991 and Sloss *et al.,* 2007 cited in BMT WBM 2013). Sea levels began rising again during the late 19th century, and from detailed analysis of global tide gauge records the IPCC (2007) concluded that the total 20th century rise was estimated to be 17 ± 5 cm (cited in Watson & Lord 2008). IPCC (2013) concludes that over the period 1901 to 2010 global mean sea level rose by 19 ± 2cm.

As a result of variations in sea level over the last 120,000 years two readily identifiable sand dune barrier units are observed in the study area that reflect differences in the local coastal sediment budget (Roy 1998 cited in BMT WBM, 2013), namely:

- Older Pleistocene inner barrier deposits, and

- Younger Holocene outer barrier dunes that abut un-conformably seaward of, or overlie, the Pleistocene system.

The Holocene outer barrier dunes are considered to have resulted from shoreward migration and cross shelf transgression of marine sand associated with the Pleistocene-Holocene rise which began some 18,000 years BP (BMT WBM, 2013). The dunes and beaches of the study area are, therefore, considered to be comprised of mature marine sand derived from the continental shelf, and not contemporaneously derived fluvial sand (Roy & Crawford 1977; Roy & Thom 1981; Roy *et al.*, 1994 cited in BMT WBM 2013).

As perhaps insight into continuing processes at the upper shelf and shoreface, Patterson (2013) (cited in BMT WBM, 2013) utilised modelling of the coastline evolution processes to suggest that there perhaps still remains a net shoreward supply of sand to the beach system from the lower shore-face of about 1-2m^3/m/year. The modelling suggested this process may be occurring along most of the regional coastline between the Clarence River and the Gold Coast and is further discussed under the following section 'Sediment Budget and Transport'.

In discrete locations of the study area, the younger Holocene dunes are largely eroded with older Pleistocene "Coffee Rock" deposits outcropping on beach faces or in back beach escarpments (e.g. Belongil Beach). In other areas, a substantial Holocene dune buffer still exists (e.g. Cudgen area) thus highlighting the variable width of the Holocene outer barrier deposited along the study area shoreline and/or the variable rates and spatial extent of historical beach erosion and long-term recession. BMT WBM (2013, p. 12) summarise the general sediment transport and deposition trend as:

> *The Pleistocene-Holocene dune barriers increase in width and volume towards the north along the coastline north from the Clarence River to Fraser Island, indicating the importance of the northward wave-induced net longshore transport of sand along the coast associated with the predominantly southeast sector waves in the region. The inner nearshore shore-face sand unit, in the upper part of the profile from the shoreline to approximately 8-10m depth, indicates an almost continuous sediment pathway along the New South Wales and southern Queensland beaches.*

The location and alignment of the sandy beaches of the Tweed and Byron Shire coastlines are thus considered highly susceptible to wave induced longshore sediment transport budget and global sea level. Should significant changes in wave climate or sea level occur in the future, significant changes in coastal planform may be expected. The Pleistocene back barrier dunes in the Byron Bay embayment provide insight into historical shoreline alignments under higher sea levels (Figure 2).

Sediment Budget and Transport

Both LGAs reside within the one regional sediment compartment, extending from the Clarence River entrance at Yamba in the south to Moreton Bay Queensland in the north. The analysis of coastal processes and sediment budget operating within the regional sediment compartment provides insights into the longshore sediment gradient and hence, the approximate expected long term recession and shoreline change at the beach compartment scale.

Figure 2 Pleistocene dune barrier deposited during higher sea levels – Byron Bay embayment (Department Lands Aerial Photography 2009, update of Plate 32 PWD, 1978)

Alongshore sand transport rates proposed by BMT WBM, (2013) for the Clarence River area northwards to the NSW/QLD border show a significant net increase in the volume of sediment transported northwards with decreasing latitude. Historical studies on transport rates through the region were reviewed by BMT WBM (2013) who concluded that previous studies were hampered by a lack of reliable directional wave data, were undertaken in a somewhat 'piecemeal' manner, and did not benefit from applying consistency along the entire coastline unit. Importantly, the geological evolutionary history is interpreted to evidence a continuous alongshore transport of sand where shoreline change responses at particular beaches affect responses at adjacent beaches.

Patterson 2007(a) (cited in BMT WBM, 2013) used detailed SWAN wave modelling and longshore sand transport calculations based on the wave data available to show that potential transport rates vary from approximately 200,000m^3 at Iluka to 550,000m^3/year at the Gold Coast. Patterson (2013) (cited in BMT WBM, 2013) utilised shoreline modelling of the late Pleistocene–Holocene shoreline evolution through to present day to indicate the same longshore transport pattern (Figure 3).

Of the potential 200,000m^3/yr at Iluka, BMT WBM (2013) propose that some 120,000m^3/yr of lower estuary marine sand is input to the system by the Clarence River Estuary, in addition to the 70,000m^3/yr being supplied from the south (Figure 3).

The average longshore sediment budget gradient of 350,000 to 400,000m^3/yr along approximately 150 km of coastline between Iluka and the Gold Coast is calculated by BMT WBM (2013) to be equivalent to 2.3 to 2.7m^3/m/yr. However, analysis of photogrammetry spanning 1947 to 2010 identifies lower recession rates than this gradient suggests. The shoreward supply of sand from the lower shore-face of about 1-2m^3/m/year (Figure 3) proposed by BMT WBM (2013) has been used to account for the relatively lower rates of regional recession observed in the photogrammetry, as compared to the recession rate expected from the calculated gradient.

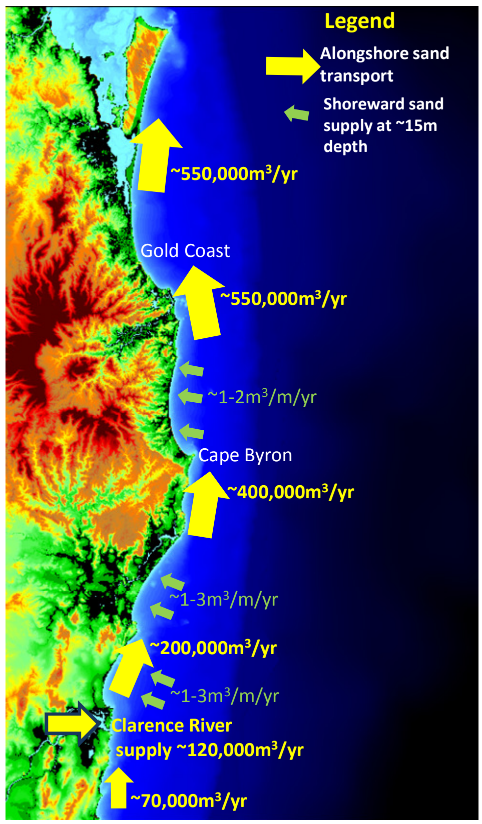

Figure 3 Regional sand transport regime proposed by BMT WBM (2013) (Source: BMT WBM, 2013)

Regional wave climate

BMT WBM (2013) assessed wave data provided by the NSW Manly Hydraulics Laboratory from the directional Byron Wave Rider Buoy. The non-directional data set dates back to 1976, however, directional recordings have only been captured since late 1999. Wave rider buoy data gaps were filled using other wave data sources including Wave Watch III global wave model information since 1992, and British Meteorological Office wave model information to the period 1989 to 1995.

Through application of SWAN wave modelling at a regional scale, BMT WBM (2013) confirmed a general understanding that Cape Byron has a profound effect at the shoreline along the coastline to its north for southerly vector waves, with wave height substantially reduced in height (refer Figure 4). More easterly swells arrive at the study region beaches relatively less refracted than do southerly swells (refer Figure 5). Therefore, smaller swells from directions anti-clockwise of ESE may have as much impact or more on sediment transport and beach response than do larger southerly swells. This pattern of varying wave exposure, as dependent on location and incident wave conditions, leads to associated spatial and temporal variations in alongshore sediment transport along the study region coastline. This results in varying shoreline response between locations and differing incident wave regimes (BMT WBM, 2013).

Further to this, BMT WBM 2013 (p. 23) noted that:

> *More southerly waves cause increased sand transport along north-south aligned shorelines but are typically substantially attenuated by refraction and thus relate to decreased sand transport at the southern ends of coastline embayments. More easterly waves result in reduced sand transport at north-south aligned shorelines, even downcoast transport immediately south of embayment headlands, but increased sand transport at the southern ends of coastline embayments. These patterns of sand transport have substantial effects on shoreline accretion and erosion patterns within beach compartments and on variations in the alongshore transport of sand between compartments, including 'slug' like sand supply past headlands.*

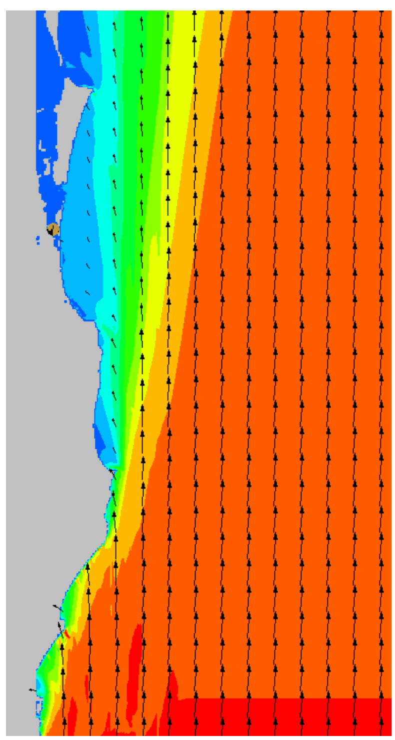

Figure 4 Wave refraction pattern for southerly swell showing the significant down-drift shadow effect of Cape Byron (Source BMT WBM, 2013).

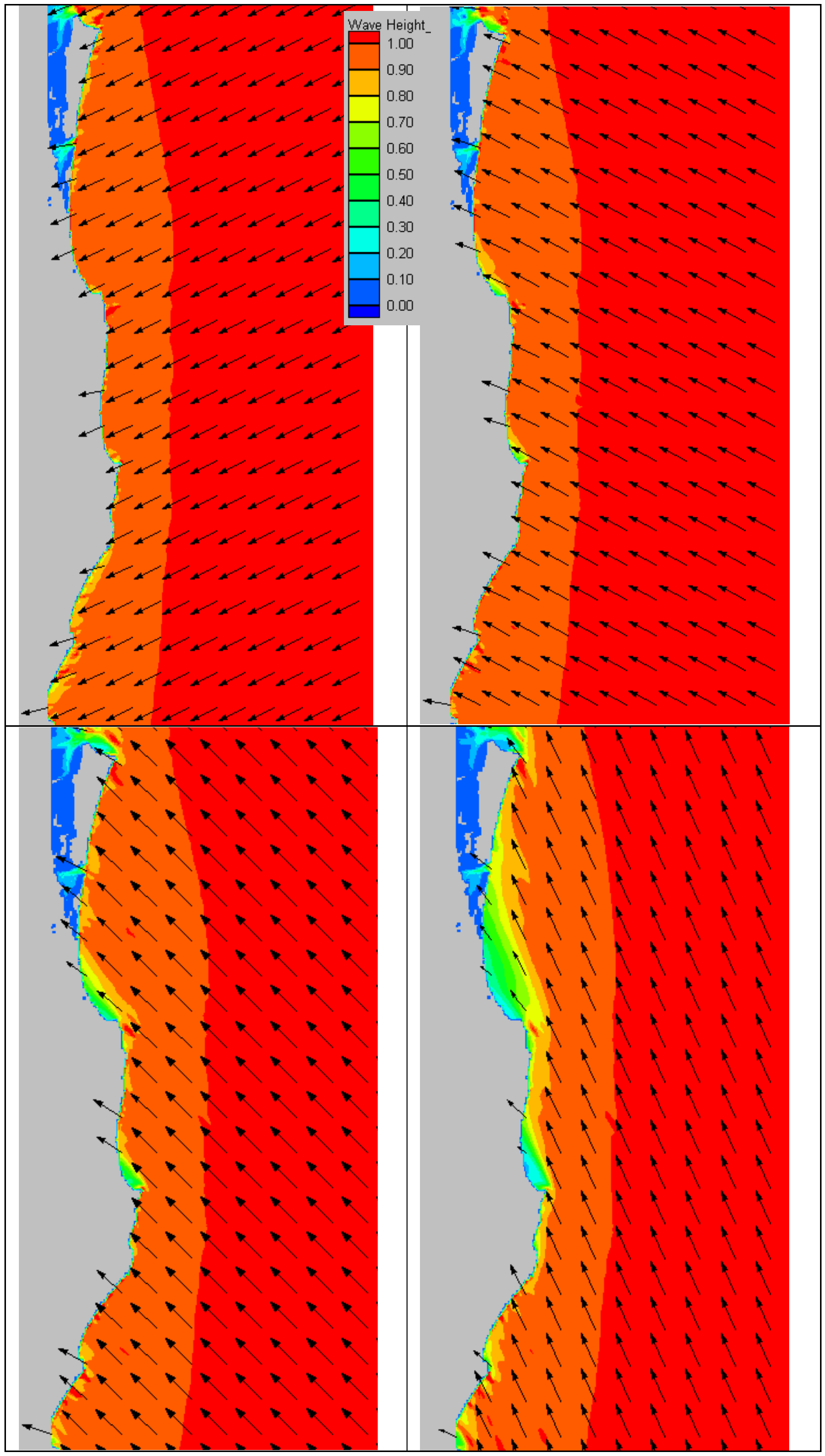

Figure 5 Typical wave refraction patterns along study region (Source BMT WBM, 2013)

BMT WBM (2013) examined the impact of wave climate variability on alongshore sediment transport and shoreline erosion and accretion patterns, noting that other researchers had found reasonable correlation between the Australian east coast wave climate and the El Nino Southern Oscillation (ENSO) index. An assessment of monthly mean wave energy and direction was undertaken for the period January 1989 to July 2012. Direct correlation between SOI and the wave parameters was attempted although was not clearly evident in the time series format used by BMT WBM (2013) who suggest that comprehensive analysis of the correlations between wave parameters and ENSO is restricted by the relatively short duration of reliably recorded directional wave data. There does however, appear to be a tendency for high energy storm wave occurrences that can be related to ENSO patterns as shown for respective years (Figure 6).

For example BMT WBM (2013, p. 25) note:

- The prolonged La Nina dominant climate phase from 1945 to 1977 (during which time significant erosion was experienced throughout much of the study area) is likely to have had a different prevailing wave climate and consequence on shoreline behaviour than the predominantly El Nino phase that followed.
- The El Nino dominated period 2002-2003 shows a predominance of high energy southerly waves.
- The La Nina dominated period of early 2009 and 2011-12 display a wave pattern with occurrences of high energy waves from east to south east (Figure 6).

A prolonged dominance of a La Nina phase, for example, may therefore result in a prolonged period during which the high energy storm wave occurrences are more east in direction. This would appear to have significant consequences for headland bypassing from south to north around Cape Byron, a major control feature in the study area, and Cudgen Headland at Kingscliff. Easterly wave propagation into the southern corners of Byron Bay embayment and Kingscliff Beach may then result in significant sand transport out of the areas, without a natural nourishment sand feed being delivered from the south, thus resulting in beach erosion. Conversely, strong southerly swell regimes derive headland bypassing from south to north, thus, delivering sand around headlands to naturally nourish the down drift coast where wave energy is reduced due to the shadowing effects of the control features. This enables some nearshore and inner nearshore accretion in the southern and central compartment areas.

Future Shoreline Evolution and Hazard Definition

Data for the physical processes and properties of the study area were input into the regional shoreline model. The model extended from the southern boundary of the Byron Shire LGA to Tweed Heads. It was validated by comparing it to the measured shoreline recession rates as evidenced in the photogrammetric record for the Tweed - Byron region.

The directional wave data set was used and looped to inform the shoreline evolution modelling which derived sea level rise induced recession for the 2050 and 2100 planning horizons. The results of the shoreline evolution model were compared with Brunn Rule calculations for comparative purposes.

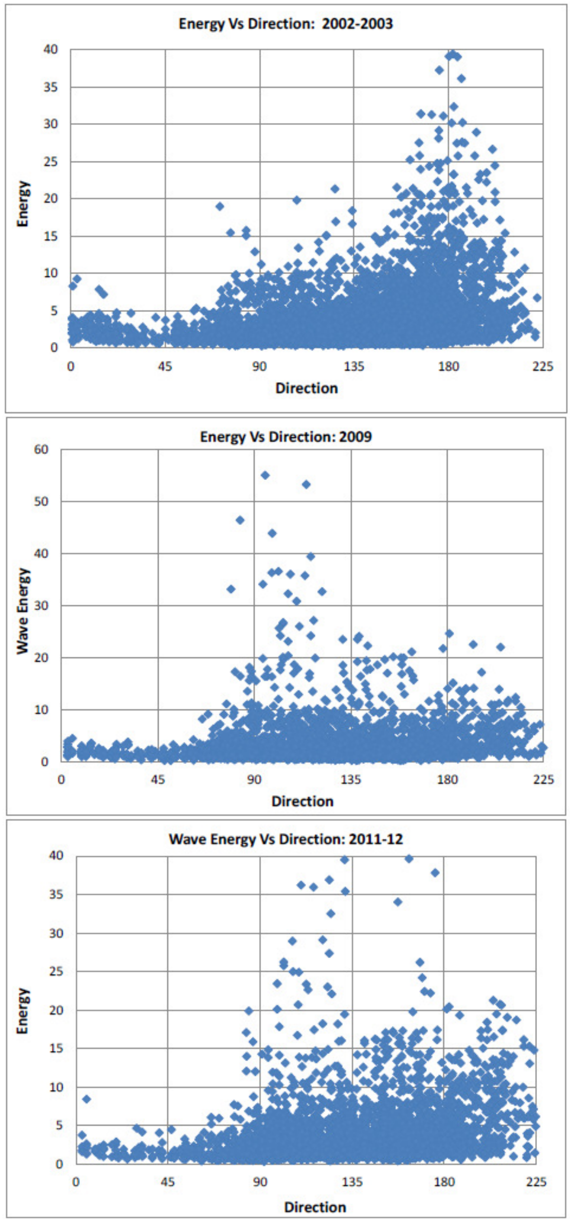

Figure 6 ENSO related wave patterns: El Nino (top) and La Nina (centre / bottom) from BMT WBM (2013).

BMT WBM (2013) identify that the beaches in the study region experience significant short term fluctuation (days, weeks, months, years), and short to medium term (years) variability due to changes in the incident wave and water level conditions, including storm events and shifts in the predominant wave direction. Previous studies such as the Byron Coastline Hazard Definition Study (WBM, 2000) and the Tweed Coastline Hazard Definition Study (WBM, 2002) identify a general regional trend of underlying long term shoreline recession. This understanding is supported by BMT WBM (2013) who also suggest that while there may be periods of sustained shoreline accretion and or/ periods of above average shoreline recession, the short to medium term patterns may mask the underlying trend if a sufficient length of data is not considered. The general prevailing underlying long term recession trend evident throughout the study region including short/medium term fluctuations is illustrated by Figure 7.

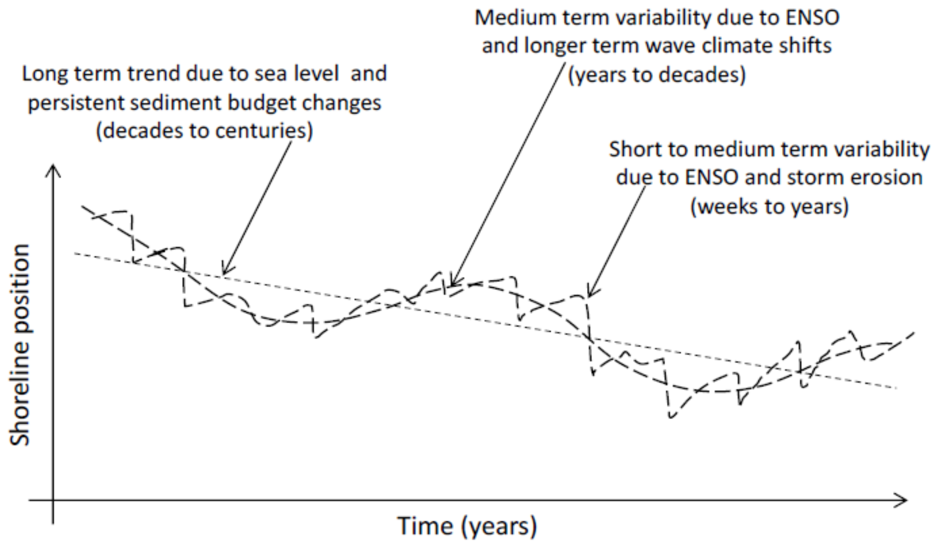

Figure 7 Conceptual diagram of shoreline variability as broadly applicable to the study region (WBM, 2013).

The regional analysis and shoreline evolution model assisted with understanding long term recession patterns in both LGAs and helped to determine appropriate boundary conditions for input into the compartment scale models, which were further refined versions of the regional model.

Patterson (2013, p. 86) notes that for the Byron Bay Embayment compartment, the information provided by the regional model ensured a "…proper connection between the processes within the embayment and the immediately adjacent shorelines to the south and north."

Of particular interest for the Tweed Study was the relationship of the episodic longshore transport and subsequent impact on beach width variability along Kingscliff Beach. This finding has implications for management of the risk associated with this hazard and the subsequent potential for impact on local social and amenity values in particular.

The specific findings of each study and mapping of hazard areas will be available from the respective Councils following adoption of the studies. It is beyond the scope of this paper to provide detail on the study outcomes.

Value for Money

The value for money component was derived from the breadth of analysis that was made possible through a common regional study being undertaken for two separate studies. This enabled a greater scope for the brief than if undertaken by one Council individually. Similarly, cost savings were made by avoiding 2 x project start up costs had each Council undertaken the hazard update separately. Savings were also made through the sharing of meeting costs, consultant presentations, etc.

Efficiency in the use of OEH staff expertise was achieved through needing to assist in the development of only one regional hazards report covering two LGA coastlines, rather than needing to assist with two reports had each Council undertaken this project separately.

Both projects were governed by separate contracts. This meant that the collaboration did not compromise flexibility, the separate contracting arrangements allowing for additional works to be commissioned by each Council, in addition to the original scope of works, for developing the local components of their studies. This also enabled each Council to have a degree of flexibility in outputs, while still taking advantage of the broader cost savings.

A further advantage was a consistency of approach between two adjoining LGAs, where the community often look 'over the border' to see if there are perceived advantages being given to residents under another authority.

Building of collaborative and collegial relationships

As well as the benefits of value for money and consistency of approach as outlined above, the project enhanced the collegial relationship between the two adjoining LGAs. Consistency of approach assists Local Government in having a stronger voice when addressing local issues that require guidance and input from higher levels of government.

An example of this is the strategy employed by both Councils' coastal management staff in response to the state government withdrawing statewide Sea Level Rise (SLR) benchmarks (as formerly recommended in DECCW, 2009). This reform was announced as part of the 'Stage 1' coastal reforms and occurred some months after the hazard study projects commenced; thus having implications for the analysis of coastal hazards for both LGAs regarding the 2050 and 2100 planning timeframes.

To facilitate greater efficiency and a consistent approach across arbitrary LGA boundaries, the rationale and recommendations put to each respective Council on the SLR benchmark issue were shared, discussed, and a similar approach undertaken. This collaboration helped to ensure that both Councils adopted a robust scientific approach but did not head down the expensive, time consuming and fraught road of developing individual SLR benchmarks for the planning timeframes.

The relationships built as a result of the collaboration has important implications in an expanding area of local government - being coastal management and climate change adaptation, in which there is limited local expertise as opposed to more traditional local government roles in, for example, road construction and maintenance. Coastal management and climate change adaptation are two areas that require local government officers to look to their neighbours and to share knowledge, ideas, solutions and innovations.

An important component of this collaboration was also the input from the NSW Government through the OEH, coordinated by the regional officer who also facilitated input from other levels of that department. The input and assistance provided by the regional OEH officer was essential in translating State Government policy where it had relevance to the studies. In addition this input was important in assisting with the technical aspects of the project, particularly where expertise was required for the review of draft reports. As the CZMP projects progress for each LGA, this expertise will be important for developing effective planning and management documents at the local level. It is crucial that the State Government maintains and retains expertise at this practical, regional level, to provide guidance that would otherwise only be available to LGAs through expensive consultancies (NB: this is the opinion of the Local Government authors of this paper).

Conclusion

The collaborative components of this project provided a real opportunity for improving the collective understanding of the coastal processes operating within the Clarence-Tweed region, in turn translating into an improved understanding of coastal hazards manifesting at the LGA and beach compartment scale. In addition it resulted in economies of scale, cost savings and value for money for all three organisations. Of equal significance, it provided an opportunity to build collaborative and collegial relationships between the parties and the organisations involved, fostering knowledge sharing and building capacity in an area of governance that is critically important and has many historical and ongoing challenges - coastal management and climate change adaptation.

The lesson du jour – talk to your neighbours!!

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[i] Prior to the stage one reforms to the CP Act, which commenced 21 January 2013, and the resultant revision to the statutory guidelines (OEH, 2013), the third dot point read (DECCW, 2010, p. 10):

- *the impact of climate change on risks from coastal hazards including incorporation of sea level rise planning benchmarks*