

Coastal Erosion and Accretion

Coastal erosion is the loss of sediment from the beach, and coastal accretion is the gain of sediment to the beach¹. Both erosion and accretion can occur *via* the agency of the atmosphere (winds, rainfall) or the oceans. A useful relationship here is that at steady state, the *average* rate of erosion (E , from all routes) = the *average* rate of accretion (A , from all routes).

$$A + E = 0$$

Note that *average* here means over the averaging period, usually taken to be decades of time. So thinking of Southshore, it is a matter of record that on *average* the seaward side of the Spit is accreting (*i.e.* sediments are being added to the beaches) and this has been the case for decades, for example see Figure below².



However, during that time this does not mean that along the whole of the Spit open coastline there has not been any erosion, rather than on *average* the open coastline is accreting, but at some specific locations or for short periods some erosion may occur. It is often the case that the time-bases of the erosion and accretion processes are different. In the Southshore situation, usually erosion is caused by short intense storms (increasing wave heights *etc.*) that take place over a few days, whereas the accretion process is largely continual, fed by sediments eroded by and emitted from the Waimakariri River, and then carried down the coast by longshore drift. The relationship between A and E is governed by the sediment budget (which is the subject of the NIWA papers you mention). If $A > E$, then the system is said to be 'in surplus', and accretion will

¹ "beach" in this document is used because geographically in the area under discussion the boundary between ocean and land is not a cliff but actually a beach.

² From Coastal Hazard Assessment Stage Two: Christchurch City Council (Tonkin and Taylor, 2015)

be occurring. The NIWA reports you mention³, indicate that not only is the average situation accretion, but also that accretion will still be occurring even with predicted enhanced storm intensity and frequency, and 1.4m of sea-level rise. In this context the concept of erosion seems not have significant meaning.

It could be however, that the Staff were referring not to the average situation, but the result of individual or groups of storms. In that situation, it is likely that along some parts of the coast erosion will occur for short periods of time, but in the context of continual replenishment from the longshore particle flux, that will be temporary, and not likely to change the overall picture.

³ Hicks et.al (2018) Coastal sand budget for Southern Pegasus Bay Stage A (April 2018) #NIWA 2018062CH Project #CCC18501 and Hicks et.al (2018) Coastal sand budget for Southern Pegasus Bay Stage B: Future sand budget (June 2018) #2018172CH Project #NIWA CCC18501