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- Beach volume equilibrium for long-term beach protection strategy and planning - Case study of Burleigh Heads/Tallebudgera Creek and Palm Beach/Currumbin Creek, Gold Coast, Australia.

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The aim of this research was to improve beach nourishment effectiveness. To achieve this, beach morphodynamics needed to be understood in a more general approach than strict sand bar and shoreline dynamics analyses in order to guarantee an efficient buffer zone in time. Indeed, sand bar volumes equilibrium and localisations variations of a particular stretch of beach are extremely random in time and space. The objective of this research was thus to find verifiable values and parameters defining a healthy beach profile which could be used for long-term beach protection strategy and planning.

The periodic nourishment/dredging sites since 1974 of Burleigh Heads/Tallebudgera creek and Palm Beach/Currumbin creek on the Gold Coast, Australia were analysed using ongoing data collection over a thirty year period. These data provide a powerful tool for the establishment of a time-dependent analysis of beach volume profile and beach nourishment scenarios. For this work, it was decided to study the overall beach profile to the depth of closure, instead of dissecting upper beach and intertidal bars volume evolutions. The surf zone is extremely dynamic and its equilibrium is constantly adapting to wave climate or other forcing parameter. There is no need for controlling this part of the beach system, but overall beach profile volume instead, to guarantee an efficient buffer in time and space. Total beach system volumes are analysed and compared on a time scale ranging from 5 years to 30 years, with a priority given to the study of the total volume budgets of the beach and their distribution along

profile for 1:5 to 1:100 storm return period.

Effort has been devoted to use both field data and numerical modelling to understand how nourishment sites, adjacent beaches and estuaries dredging sites interact and evolve during and after the operation. Although the Burleigh Heads/Tallebudgera Creek and Palm Beach/Currumbin Creek case study analyses are site specific, they show how to improve beach nourishment scheme effectiveness worldwide and to implement a new approach for analysing beach dynamics over time.