COASTAL SETBACK PRACTICES IN THE CARIBBEAN AND OTHER *SIDS*: A TOOL FOR ENHANCING RESILIENCE

David Smith, Smith Warner International/University of the West Indies, david@smithwarner.com
Telica Mussington, Govt. of Anguilla, mussington.telica@gmail.com
Philip Warner, Smith Warner International, philip@smithwarner.com

ABSTRACT
This paper examines and compares existing coastal setback policies in use throughout the Caribbean and in other SIDS globally and considers recent climate change predictions. Recommendations are made for a science-based approach to applying setbacks, which incorporates elements of climate change predictions and longer-term observations. Finally, a case-study comparison is presented, between the most promising coastal setback approaches, and the observed incursion of storm waves at a coastal community in Jamaica during a major hurricane in 2004 (Hurricane Ivan – In Jamaica: 17 killed and US$575 million in damages).

BACKGROUND
Since 1924 the Caribbean region has experienced 37 Category 5 hurricanes, and 5 off these (i.e., 14%) have occurred within the past 6 years. Further, looking at the rate of occurrence within intervals of 50 years up to 2001, and 20 years thereafter, gives the information as shown in Table 1 following.

Table 1. Increasing Occurrence of Cat 5 Storms

Range of Years Considered	# of Cat5 Hurricanes	Occurrence Rate per Year (%)
1851 - 1900	0	0
1901 - 1950	8	16
1951 - 2000	15	30
2001 - 2021	14	70

These numbers indicate increasing frequency of these extreme storms, which were not recorded before 1924. The damage to critical infrastructure from these intense systems means that small island states with limited economies and resources are unable to achieve economic and societal recovery in the short-term. With a growing awareness of the potential impacts of climate change, several management tools are being used by regulatory planning agencies in these SIDS to aid in disaster reduction and resilience boosting. One such important tool used to boost resilience is the application of Coastal Setbacks, which regulates the distance from the high-water line to the location of development.

METHOD
Reviews of setback practices were carried out for the English-speaking Caribbean islands [Cambers 1997]. This was followed by reviews of setback practices in Latin America, Australia, Hawaii, Europe, the Mediterranean and the Maldives. Many jurisdictions apply simple horizontal distance setback regulations without regard for site specific conditions or scientific backing. Only two areas were found to use setback polices on a location-specific basis backed by long-term trends, observed extreme storm impacts and climate change predictions. These were Australia and a few Eastern Caribbean islands. In Australia, the applied setback is achieved from a superposition of (a) long-term shoreline trends; (b) erosion experienced during a severe storm; and (c) global sea level rise estimates. In the Eastern Caribbean, the applied setback was computed as [(a) + (b) + (c)] *d, where the parameters (a), (b) and (c) are as given above, and the parameter "d" requires an experienced estimator to account for shoreline morphology; degree of sheltering; proximity of natural features (e.g., coral reefs or mangrove beds), and related anthropogenic activities. "d" varies from 1.0 for shorelines that exhibit no mitigating factors, to less than 1.0 for shorelines that may be protected by coral reefs, extensive mangrove stands, etc.

RESULTS
Satellite imagery (Google Earth) was obtained for the Caribbean Terrace community in Kingston, Jamaica, before and after the passage of Hurricane Ivan in 2004. These were used in conjunction with available beach profile data to estimate the inland extent of storm surge and wave damage that occurred during that storm. The computed distance of affected shoreline landward of the HWL based on collected data, was then compared with setback predictions using the two preferred methods described above. Both methods compared favourably, with the Eastern Caribbean formula resulting in a small overprediction of safe distance provided by the application of a setback limit. Figure 1 below shows incoming waves during Hurricane Ivan affecting the most seaward row of houses in this development. All these houses were completely destroyed.

Figure 1 – Frontal Row of Houses During Hurricane Ivan (2004)

CONCLUSION

A review of international coastal setback practices has been carried out and two preferred methods were selected, one from Australia and the other from the Eastern Caribbean. Both employ a scientific basis of approach, as opposed to the application of a “blanket” setback, and both have been evaluated against a real hurricane event for which surge, and wave incursion observations were made. The specific hurricane event targeted was Hurricane Ivan in 2004, which wreaked severe damage to the south-east coast of Jamaica.

Good correlation was obtained between the two models and the actual observations of landward extent of damage. Recommendations for some modifications are made, to provide better compatibility with coastlines for small island states and to promote a “one size does not fit all” approach, and for which smaller set-back distances may be more appropriate in “safe” areas and development maximized there, while being decreased in more vulnerable zones.

REFERENCES

Cambers (1997). Planning for Coastline Change. Guidelines for construction setbacks in the Eastern Caribbean Islands. CSI info. 4. Paris: UNESCO.