# USING BATHYMETRIC LIDAR TO MAP SHALLOW COASTAL AND INLAND WATERS

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## 1. INTRODUCTION

Mapping the world's shallow coastal and inland waters has historically been a challenge for surveyors, engineers and hydrographers. Advancements in acoustic mapping technologies have improved our ability to acquire high-resolution bathymetry data in "deeper" waters, but until recently, mapping the coastal zone and shallow inland waters has been prohibitively dangerous, time consuming and / or expensive.. Despite the fact that bathymetric LIDAR technology has been in existence for over twenty-five years, it has only within the past few years that bathymetric LIDAR technology has gained more widespread acceptance as a viable tool for mapping the world's shallow, clear waters.

This acceptance may in fact be partly driven by an increased demand for the data within these areas. High quality maps and/or high quality bathymetric data in these areas are critically important for safe navigation, jurisdictional boundary resolution, understanding processes, hazard mitigation, monitoring environmental change, establishing and maintaining resource and habitat inventories and policy making [1]. Living by the sea has many benefits. It offers possibilities of trade, travel and increasingly of water-based recreation. But there are risks. Sometimes high tides and storms combine to flood low lying coastal regions causing local damage [2]. There is no question that weather and climate have a major impact on the coast and to a lesser extent inland waters. There is also no question that climate change and sea-level rise as a result of global warming are recognized as at least potential threats by most of the world's coastal states. Most climate change models predict a rise in sea level and an increase in the frequency and severity of weather-related events over the coming years. Nowhere will this have more of an impact than along coastal and inland waters, which are typically densely populated, highly developed and home to sensitive and fragile ecosystems. Understanding and mitigating the potential impact of climate change and sea-level rise are becoming priorities for many coastal states and in fact many states are starting to develop national programs that span the land-water interface.

Until the acceptance of bathymetric LIDAR technology as a viable tool for mapping shallow coastal and inland waters, such an approach was not feasible. Traditionally, differences in onshore topographic versus offshore bathymetric mapping techniques, differences in onshore versus offshore vertical reference frames and the challenges in collecting source data within shallow coastal and inland waters prevented an integration of topographic and bathymetric datasets at the land-water interface [1]. This is no longer the case and modern bathymetric LIDAR systems are capable of "filling" the historical gap and integrating bathymetric and topographic data into a common dataset.

This paper will look at the modern bathymetric LIDAR system to show how it is currently being used to map many shallow coastal and inland waters. In particular, the capabilities and limitations of the technology will be examined to demonstrate, how, when and where such technology can be deployed to successfully acquire shallow water bathymetry data.

[1] Committee on National Needs for Coastal Mapping and Charting – Ocean Studies Board – Mapping Science Committee – Division of Earth and Life Studies – National Research Council of the National Academies, *A Geospatial Framework for the Coastal Zone – National Needs for Coastal Mapping and Charting*, The National Academies Press, Washington, D.C., 2004.

[2] Pugh, D., Changing Sea Levels – Effects of Tides, Weather and Climate, Cambridge University Press, Cambridge, U.K., 2004.