

# Scalable Space-Based Hydrospatial Solutions Deployed for Surveying Remote Locations in the Maldives and Arctic Canada

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## Background

Seabed 2030's objective is to map the entirety of the ocean floor. In 2021, funded by the IHO, TCarta completed a SDB demonstration project in the Maldives for the Seabed 2030 program.

## Objectives

Satellite Derived Bathymetry (SDB) offers efficient surveying of remote locations. The multitude of images available in combination with cloud computation expands the geographical potential for this technique and facilitates rapid, scalable data production.

## Methods

Freely available data archives of the Sentinel 2 A/B satellites and the ICESat-2 space-based laser operated by NASA provide the raw materials to produce a 10m resolution bathymetric surface. Imagery from a 3-year period is assessed and 30-35 most suitable images are selected for SDB production. A pixel-wise composite image is created to create an optimized image for SDB derivations, free of nearly all environmental detractors from SDB quality, including cloud/ shadow, turbidity, sun glint and anthropogenic artifacts. A machine learning SDB algorithm is deployed using the ICESat-2 bathymetric depths as training data and a Deep Learning model used to remove erroneous results and assign uncertainty.

## Results

In less than a month, over 3,200 images were assessed with 509 selected for SDB processing for a multi-temporal pixel-wise image composite to produce over 4,200 sq km, applying 1.1M ICESat-2 depths for algorithm training and surface validation.

## Discussion

A similar approach, fine-tuned for the Arctic and deployed to challenging environmental conditions in Canada further demonstrates the efficiency and effectiveness of SDB as a "first-pass" surveying tool in remote and inaccessible areas along the coast of Baffin Island.

## Conclusion

The variable urgency, need and precision of surveying remote regions of the world requires an efficient data collection strategy. As demonstrated, SDB provides a scalable and readily-deployable technology for efficiently surveying remote areas in the Maldives and Arctic Canada.