Elevating blue carbon restoration: The importance of bathymetry and elevation

Blue carbon ecosystems (mangrove forests, tidal marshes and seagrass meadows) occur in a thin green band between the land and sea. Mangrove and tidal marsh occupy the narrow area between the tides. Seagrasses extend further seaward, up to 40 metres deep or more where the water is clear enough for light to penetrate. Their distributions are defined by how far tides can reach landward, with the limits varying among ecosystems and species.

To predict where these ecosystems might occur, whether in the context of restoration under contemporary tidal limits or planning for future occurrence as sea level rises, we need to know where tides might reach, or where permanent inundation might occur. To do this, we need information on elevation (height above sea level) and bathymetry (depth below sea level). We combine these to create a **Digital Elevation Model (DEM).**

Elevation - height above sea level

Bathymetry - depth below sea level


Credit: Curioso Photography

How are we using elevation data?

To generate a DEM that we could use in a consistent way for the entire Australian coastline, we first located as much high-quality publicly-accessible elevation data we could find for all states and territories. The sources, methods, and reference information for all this data was variable — which is normal, because they were collected for different reasons by different groups.

With the data compiled, the next step was to standardise them to the same spatial reference. All datasets were translated so they have the same height datum, that is where “zero elevation” is defined. The datasets were also transformed so they would have the same coordinate space — in other words, so that numerical estimates of distance and area would be consistent. Where two or more datasets were available for the same area, finer resolution data were preferred over coarser data.

What is a Digital Elevation Model?

A **Digital Elevation Model (DEM)** represents the bare topographic surface of the Earth. It excludes any surface objects, such as trees and buildings. For example, a DEM would give the elevation of the ground in a forest and not the elevation of the treetops.

Next, we combined these datasets to create a nationally consistent DEM of the Australian coastline using high detailed data from the above datasets (see figure below). To begin, we generated a gap-free baseline map comprising of the highest resolution datasets that together covered the whole area of interest.

Below sea level, the dataset used was Geoscience Australia's 250-m bathymetry. Above sea level, a 90-m international DEM was selected. Next, we updated the baseline map with better data in areas where such data were available (e.g. high-resolution data from LiDAR and other methods). All data were resampled to a 10- m resolution before being combined. To make the production and further use of the DEM practical, we performed this processing on tiles with extents matching those of the 100-km Digital Earth Australia (DEA) tiles.

What are Digital Earth Australia tiles?

DEA tiles are like pieces of LEGO® that break down Australia into smaller sections. Each of these pieces has a special name or code, which helps people find and use data about different places in Australia. These pieces hold data like satellite images, terrain details, and climate info for specific areas.

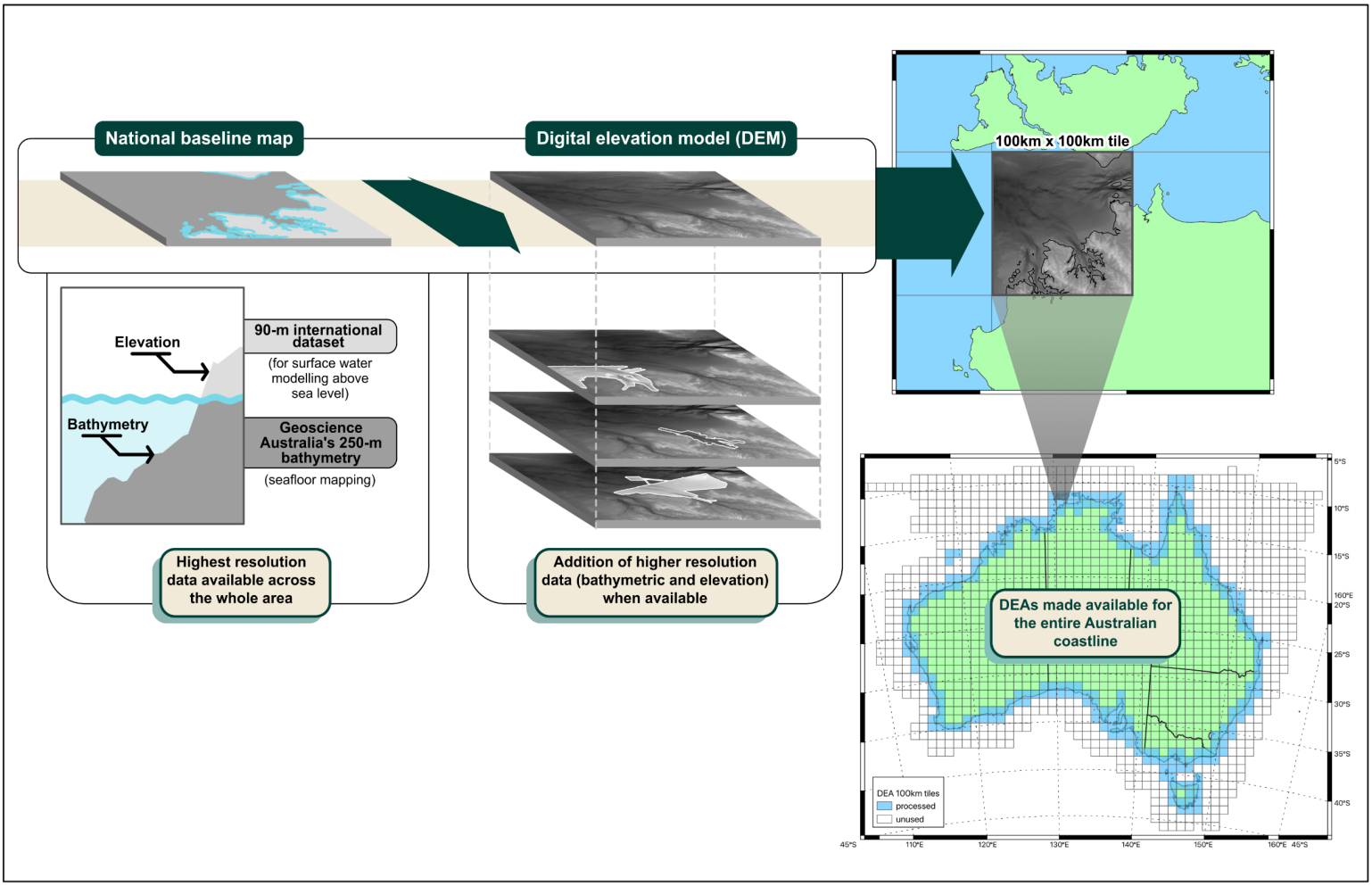

Figure. A schematc illustration showing how a nationnally consistent Digital Elevation Model of the Australian coastline was created using high detailed data.

Illustration created by Antoine Minne

For further information

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