**Goal: Streamlining national update of New Zealand’s Coastal Change Dataset (NZCCD\_rates).**

New Zealand’s Coastal Change Dataset has been published and is publicly accessible on data.coastalchange.nz. There are two datasets ‘NZCCD\_coastlines’ which are the mapped coastlines for New Zealand’s open coast and ‘NZCCD\_rates’ which are points at 10 m intervals along the mapped coast reporting a variety of coastal changes statistics (EPR, WLR, SCE, NSM etc).

The coastal change statistics have initially been calculated using DSAS version 6 (<https://www.usgs.gov/centers/whcmsc/science/digital-shoreline-analysis-system-dsas>). However, using this tool is time consuming and adds opportunities for error as the process involves converting the data to and from geojson and subsequently merged together before they can be published. Furthermore, DSAS version 6 does not allow us to calculate coastal change statistics at national or even regional scale or input our own transects (transects have to be created within the DSAS tool each time). We would like to use our own transects as we want to make sure that rates of coastal change are calculated at the same position each time the dataset is updated.

Our goal is to update the dataset regularly with new mapped coastlines and updated rates of change. Any new mapped coastlines will be saved separately and eventually added to a new version of ‘NZCCD\_coastlines#1.1’. I am looking into the Kartproject version control tool you suggested to manage this. To update the rates of coastal change ‘NZCCD\_rates’ we would like to develop a code/script that, using a single national shapefile of New Zealand’s coastlines ‘NZCCD\_coastlines.shp’ and our own national transect shapefile ‘New Zealand\_transects.shp’, allows us to calculate:

1. Intersects between each coastline and transect.
2. All coastal change statistics at every transect.
3. Create a time-series for each transect – named using ‘Unique\_ID’ saved as a jpg and .csv.

Coastal change statistics we would like to calculate:

|  |  |  |
| --- | --- | --- |
| Attribute | Example | Description |
| Unique\_ID | 201000147441 | Unique ID given to each datapoint. |
| Region | Northland | The region in New Zealand that the coastal change rate is from. |
| Start\_Date | 21/03/1943 | The date of the earliest coastline used in analysis in DD/MM/YYYY format. |
| End\_Date | 05/11/2022 | The date of the latest coastline used in analysis in DD/MM/YYYY format. |
| Duration | 77 | The duration (rounded to nearest year) of the coastline record at this point. |
| ShrCount | 7 | The number of coastlines used in analysis. |
| Net Shoreline Movement | NSM | The distance (m) between the earliest and the latest coastline for each transect. |
| Shoreline Change Envelope | SCE | The distance (m) between the most landward and most seaward coastline. |
| End Point Rate | EPR | The rate of change (m/year) between the oldest and most recent coastline is calculated by dividing the distance by the time between the two coastlines. |
| End Point Rate Uncertainty | EPRunc | Uncertainty of the end point rate (m). |
| Linear Regression Rate | LRR | The linear regression rate of change (m/yr) is determined by fitting a least-square regression line to all coastline points for a transect. |
| Confidence Interval | LCI | The confidence interval of linear regression (m). |
| Standard Error | LSE | Standard error of linear regression (m). |
| R-Squared | LR2 | The LRR R-squared statistic is a dimensionless index (ranging from 1.0 to 0.0) that describes the scatter (variance in the data). |
| Weighted Linear Regression Rate | WLR | The more reliable data (lower uncertainty) are given a greater weighting in a WLR (m). |
| Confidence Interval | WCI | Confidence interval of weighted linear regression (m). |
| Standard Error | WSE | Standard error of weighted linear regression (m). |
| R-Squared | WR2 | The WLR R-squared statistic is a dimensionless index (ranging from 1.0 to 0.0) that describes the scatter (variance in the data). |

Green highlight: The unique ID will come from the input national transect dataset (New Zealand\_transects.shp)

Yellow highlight: These are fields I have added to the attribute table myself but if it could be handled in the code calculating coastal change statistics that would be great.

Blue highlight: The coastal change statistics that were calculated in DSAS and that we would now like to calculate ourselves.

Lastly, the coastal change statistics are uploaded as points on data.coastalchange.nz. These points ‘New Zealand\_points.shp’ have a common attribute (Unique\_ID) with ‘New Zealand\_transects.shp’. The DSAS output transects attribute table was joined to the points ‘New Zealand\_points.shp’ within ArcPro. If this stage could also be incorporated into the code it would mean the output dataset could be immediately uploaded to data.coastalchange.nz.

Automatically update data.coastalchange.nz with rates and shorelines.

**Data**

Spec sheet and data stored: Z:\Megan\Nick\Streamline update of NZCCD  
  
‘NZCCDv1.shp’ The NZ coastline dataset  
Unique\_ID\_transects: All transects with Unique\_ID attribute. Transect shapefiles seperated by island  
Unique\_ID\_points: All points with Unique\_ID attribute. Point shapefiles seperated by island

**2nd code**

**Query: Adding new transects to newly mapped sections of the coast.**

As we update NZCCD we may map new sections of the coast. In this case we would want to add in new transects and calculate their “Unique\_ID’. What is the best way to achieve this.

* All sections of coast with 3 or more coastlines mapped should have coastal change statistics calculated using transects at 10 m intervals.
* Any new transects created will need to be assigned a ‘Unique\_ID’. This is a 12 digit code based on their Island code and distance from the ‘start’ of the island.
* To calculate ‘Unique\_ID’ for all transects I divided the country up into 6 islands (North Island, South Island, Waiheke Island, Stewart Island, Rabbit Island and Jackett Island).
* Each Island is given a unique island code which forms the first 3 digits of the 12 digit unique ID.

**Island code**

The first three numbers of the uniqueID indicates which island the point/rate/intersect is on.

|  |  |  |  |
| --- | --- | --- | --- |
| North Island | Code | South Island | Code |
| North Island | 100 | South Island | 200 |
| Waiheke Island | 101 | Jackett Island | 201 |
| Matakana Island | 102 | Moturoa Island | 202 |
|  |  | Rakiura Island | 203 |
|  |  |  |  |

* For each island I created a Route shapefile and determined the start point. The distance along the route tool was used to calculate the distance from the start of the route for each point along the route.
* The last 9 digits of the Unique\_ID are made up of the route distance output (6 digits) (MEAS distance) and any necessary leading zeros.
* The output of the distance along the route tool (MEAS) is multiplied by 100, converted to an integer, and saved as ‘DIST’ to ensure each value is unique.

|  |  |  |  |
| --- | --- | --- | --- |
| MEAS | DIST | Code | Unique\_ID |
| 2050.2952311 | 205029 | 201 | 201000205029 |