# Variables required in PALM

|  |  |  |
| --- | --- | --- |
| Name | Remark | Methods |
| Zt | topography | From dem |
| Vegetation type |  | From land use  Need a csv table to convert |
| LAD |  | See LAD paper |
| LAI |  | See LAD paper |
| Pavement type |  | OSM + road shapefile |
| Building type |  | No data set constant |
| Water type |  | NZ parcels and land use - Albedo is the same set constant |
| Soil type |  | Based on vegetation type |
| Building 2d |  | DSM-DEM |
| Building id |  | Take FID or any ID if possible |
| Building 3d | 3d structure of buildings | This needs to include z |
|  |  |  |
| Surface fraction |  | 0 fraction of vegetation (according to vegetation\_type)  1 fraction of pavement (according to pavement\_type)  2 fraction of water (according to water\_type) |

# Data availability

## Version 1

|  |  |  |
| --- | --- | --- |
| Data | Year | Link |
| DEM | 2015 | https://data.linz.govt.nz/layer/53587-canterbury-christchurch-and-selwyn-lidar-1m-dem-2015/ |
| DSM | 2015 | https://data.linz.govt.nz/layer/53588-canterbury-christchurch-and-selwyn-lidar-1m-dsm-2015/ |
| NZ parcels | Last extract 24 OCT 2019 | https://data.linz.govt.nz/layer/51571-nz-parcels/ |
| OSM | Latest (last extract date: 2020-05-17T20:59:03Z) | https://download.geofabrik.de/ |
| Building outline | Last extract 24 OCT 2019 | https://data.linz.govt.nz/layer/101292-nz-building-outlines-all-sources/ |
| LCDB | 2012 v4.1 | https://lris.scinfo.org.nz/layer/48423-lcdb-v41-land-cover-database-version-41-mainland-new-zealand/ |

## Version 2 (update June 2020)

|  |  |  |
| --- | --- | --- |
| Data | Year | Link |
| DEM | 2018 | https://data.linz.govt.nz/layer/104497-canterbury-christchurch-and-ashley-river-1m-dem-2018/ |
| DSM | 2018 | https://data.linz.govt.nz/layer/104498-canterbury-christchurch-and-ashley-river-1m-dsm-2018/ |
| NZ parcels | Last extract 4 June 2020 | https://data.linz.govt.nz/layer/51571-nz-parcels/ |
| OSM | Latest (last extract date: 2020-05-17T20:59:03Z) | https://download.geofabrik.de/ |
| Building outline | Last extract 4 June 2020 | https://data.linz.govt.nz/layer/101292-nz-building-outlines-all-sources/ |
| LCDB | V5.0 (class 2018, last update 29 Jan 2020, extract on 4 June 2020) | https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/ |

# Remark

* Switch off background processing in Arcmap
* When resolution > 100 m, use 15 m dem and dsm
* OSM buildings seem more up to date but only for some area -> have to combine OSM buildings with NZ building outlines (NZ building outlines have multiple sources so more houses can be seem but not very “new”)

# Processing steps – in ArcGIS

1. **To extract data to a certain region/area:**
   1. Right click layer -> extract data -> choose extent
2. **Merge DSM and DEM files together**
   1. See this link for procedure: <https://support.esri.com/en/technical-article/000015258>
3. **Topography directly from DEM** 
   1. 1 m resolution to WGS84 projection
   2. If need resample, resample to required resolution and then reproject to WGS84
4. **Surface structure height = DSM – DEM (minus tool in Arcmap)**
5. **Water shape taken from either LCDB or NZ parcels by extracting “hydro”** 
   1. Select by attribute -> extract data
   2. Merge two water shapefiles together
   3. Convert to raster
6. **Building 2d equals to DSM-DEM and building outlines**
   1. Process step 4
   2. Extract by mask (Spatial analysis-> extraction) with shapefile (NZ building outlines)
7. **Building id from building outlines**
   1. Shapefile (polygon) to raster with FID
8. **Road shapes can be extract from NZ parcels “road”**
   1. Convert OSM class to PALM with buffer width (see PALM Geospatial paper)
      1. Export OSM attribute table
      2. Export OSM2PALM table from the paper
      3. Run python script to convert the types
      4. Add the buffer width and palm (street/pavement) types to attribute table
   2. Buffer polyline with width
   3. To raster
9. **Tree height** 
   1. Process step 4
   2. Buffer building shape with 1 m?
   3. Erase building shapes from NZ parcels
   4. Extract by mask using the erased shapefile
10. **Vegetation type needs a converting table for LCDB**
    1. Convert to raster with class 2018
11. Soil type needs a converting table and would be defined after all types are given
12. Surface fraction would be defined after all types are given

## Intermediate results contents:

|  |  |  |
| --- | --- | --- |
| File name | Description | Can be used as |
| CHCH\_ROAD\_1M.tif | Pavement location and type from buffered OSM | Pavement\_type |
| CHCH\_STREET\_1M.tif | Street location and type from buffered OSM | street\_type |
| CHCH\_LCDB\_1M.tif | Land cover dataset | Vegetation\_type  Soil\_type  Airport runway -> pavement\_type |
| CHCH\_WATER\_1M.tif | Water bodies location from NZ parcels hydro and LCDB | Water\_type |
| CHCH\_noBLD\_1M.tif | DSM-DEM without buildings | Process to LAD, LAI and tree location |
| CHCH\_BLDH\_merged\_1M.tif | Building height with mask=NZ building outlines + OSM buildings  (no merged is for NZ building outlines only) | Building\_2d and building\_3d |
| CHCH\_BLDID\_merged\_1M.tif | Building FID and location/shape with mask=NZ building outlines + OSM buildings | Building\_id |
| CHCH\_DEM\_1M.tif | DEM | Zt – topography |
| CHCH\_DIFF\_1M.tif | Difference between DSM and DEM |  |
| CHCH\_DSM\_1M.tif | DSM |  |

# Processing steps – in Python

1. LAD function is from palm\_csd
2. Building 3d is from palm\_csd
3. See python code…