Commercial Buildings Baseline Study

FY 2019-20 Report

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Australia's National Science Agency

Project Overview

Commercial Building Baseline Study Overview

- CBBS
- Create Building Stock Model data warehouse
- Place buildings into taxonomic classes
- Estimate floorspace per building
- Aggregate to geographical regions
- Datasets for downstream analysis

Building Stock Model foundation

- PSMA Australia
- Spatial data products
- Geoscape
  - Catalogue of all buildings in Australia
- Geocoded National Address File (G-NAF)
  - Authoritative source of physical addresses

PSMA Geoscape Buildings

- Catalogued all buildings > 9m2 footprint in Australia
- 15.5M + buildings
- Polygon (footprint) and Point (longitude, latitude) representation
- Attributes
  - Roof and eaves height, roof material and complexity
  - Address count per building
  - ‘Has residential’ flag
- Lacks indicators of building type / use

Geocoded National Address File

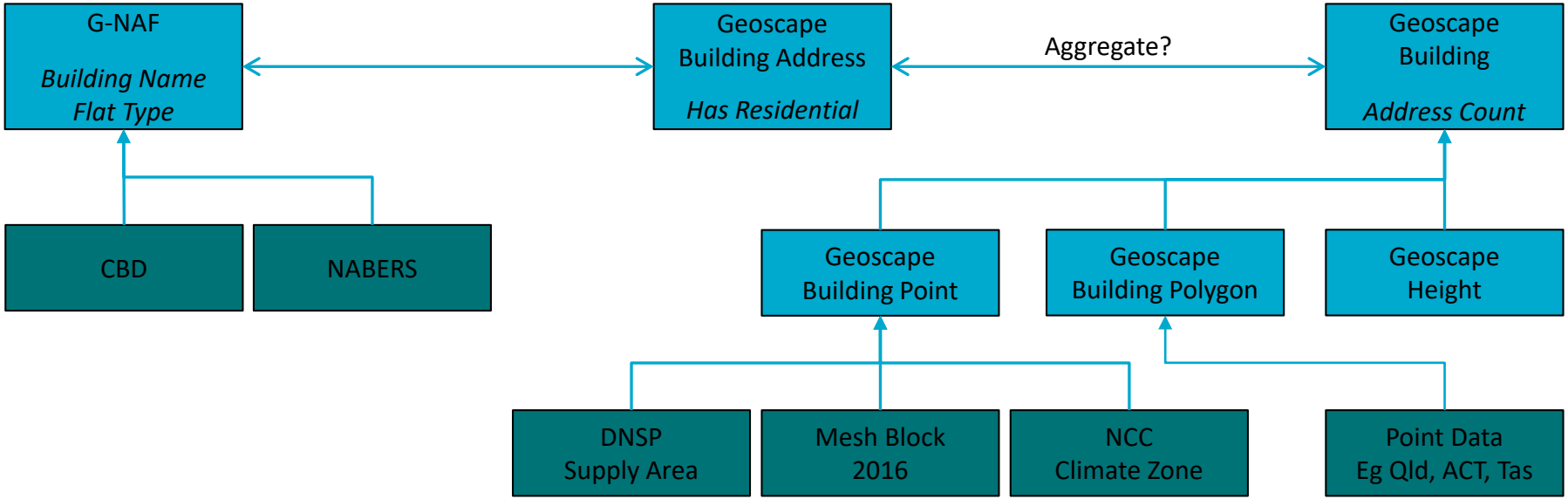
- G-NAF
- Authoritative source of addresses for Australia
- Geocoded – includes point (longitude, latitude) location
- Links to Geoscape Buildings
  - Address may have many buildings
  - Building may have many addresses
- Features that may indicate use
  - Building names
  - Flat type description

Data Sources

Dataset integration

- Geoscape Buildings and G-NAF alone
  - Scant information to classify buildings into taxonomic classes
- Need for enriching datasets
  - Flesh out the Building Stock Model
  - Taxonomic indicators
- G-NAF => address linkage
- Building polygon or point => spatial linkage

Dataset integration



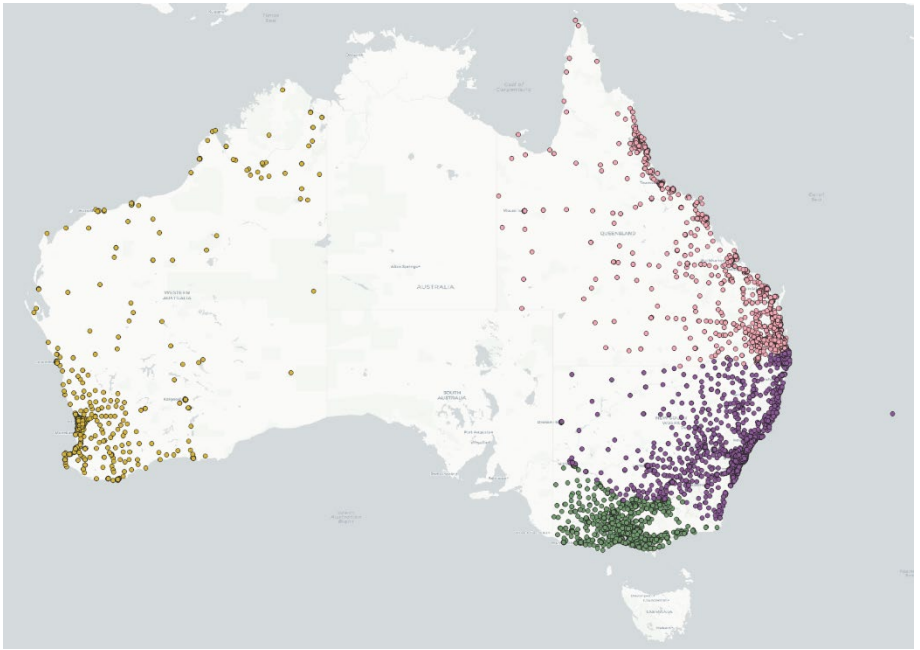
- Issue: Many to many relationship between buildings and addresses
  - Resolve conflicting taxonomic indicators

National

- National Australian Built Environment Rating System (NABERS)
  - Rating Register
- Commercial Building Disclosure (CBD)
  - CBD Downloadable Dataset
- Property Council of Australia Shopping Centres Online
- Commonwealth Declared Hospitals
  - Public, Private

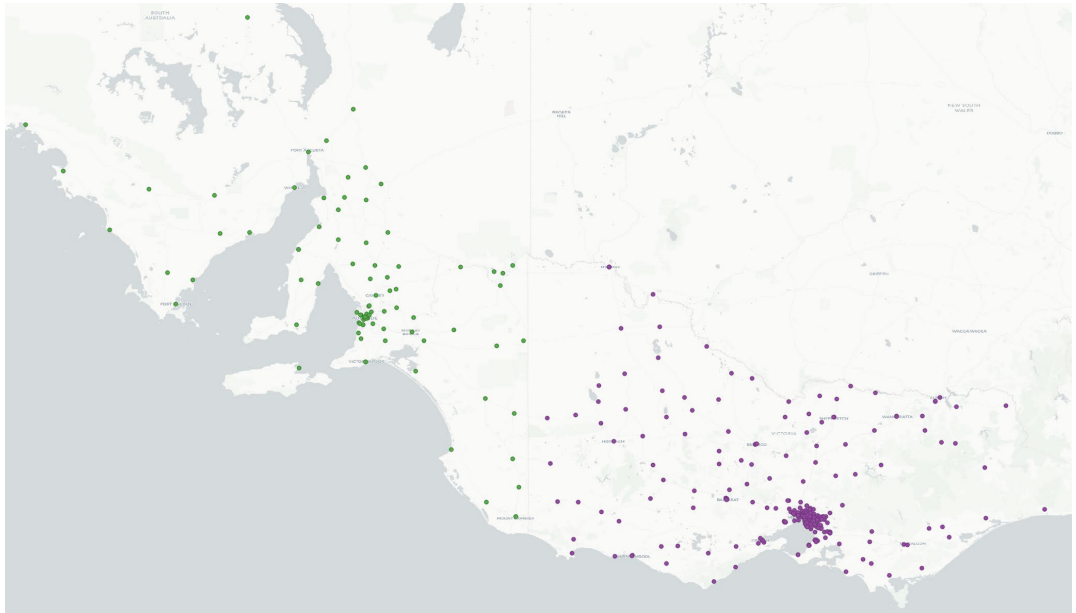
Education facilities

- State Education Departments
- Variation
  - Year levels, definitions
  - Inclusions – public, private, Catholic
  - Pre-school, kindergarten, other types
- G-NAF building name
  - Secondary source



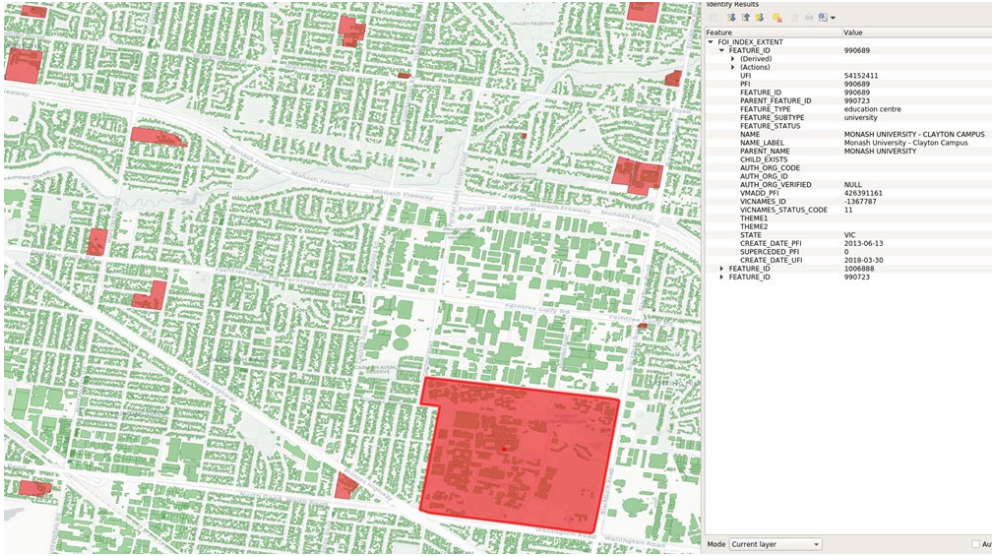
Medical facilities

- Commonwealth Declared Hospitals
  - Public, Private
- State Health Departments
- G-NAF building names



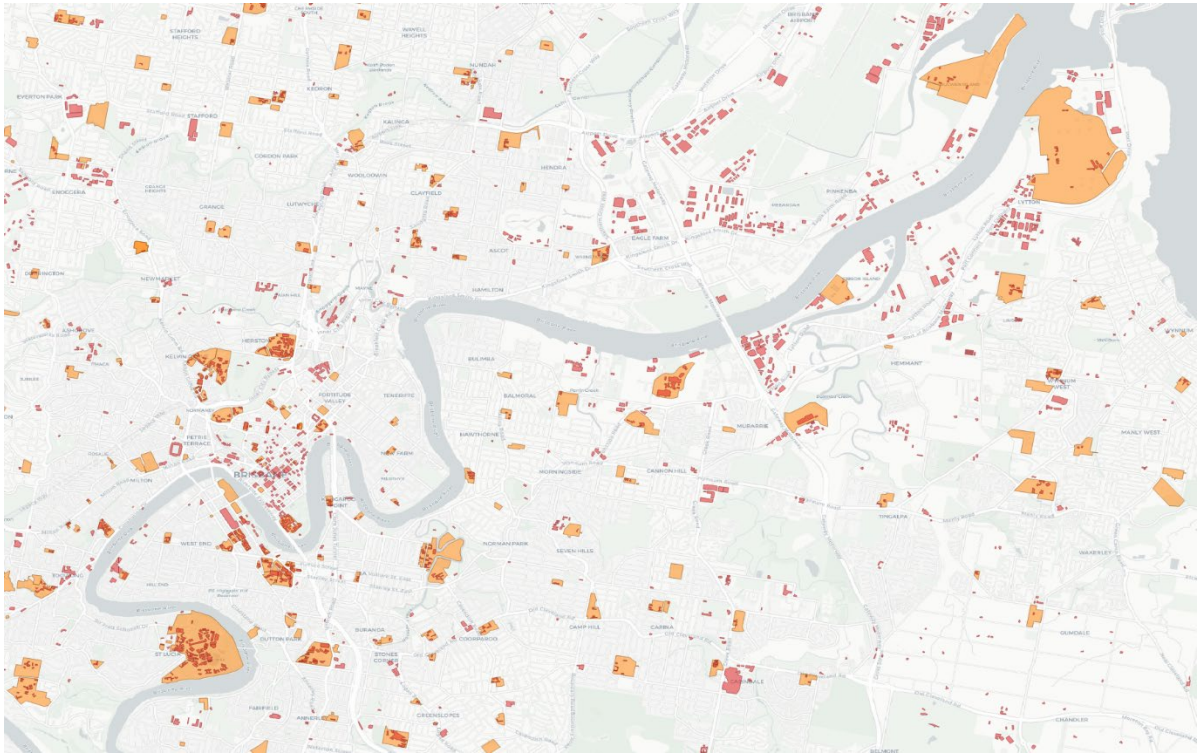
Victoria

- City of Melbourne Census of Land Use and Employment (CLUE)
- Features of Interest (red) and Geoscape Buildings (green):



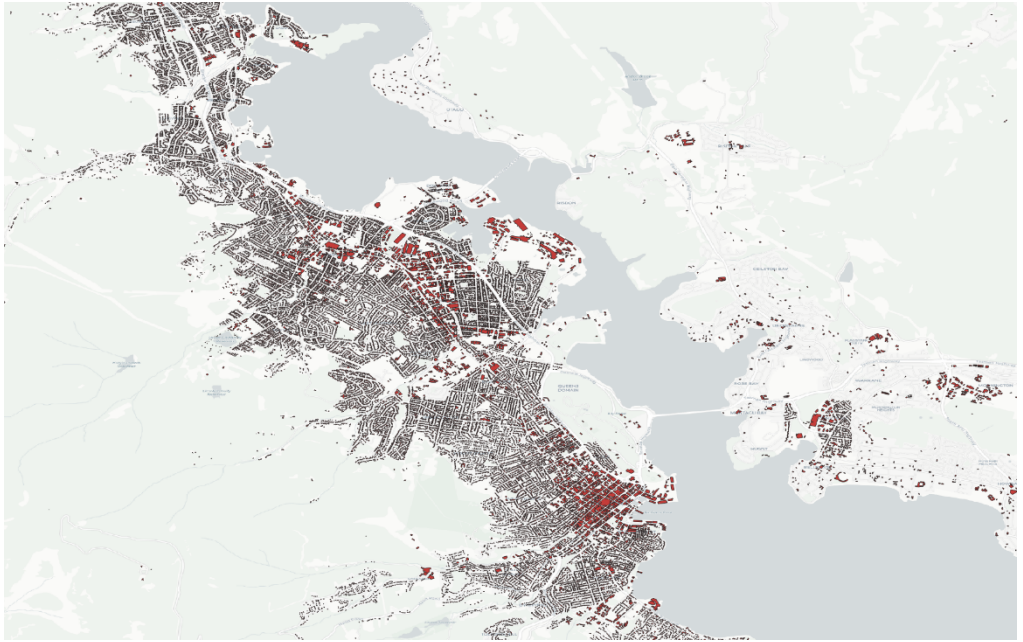
Queensland

- Building polygons
  - footprint > 625m^2
- Building points
  - footprint < 625m^2
- Landmark areas
  - eg University campus
- Community facilities



Tasmania

- The LIST Spatial Data
- Building polygons, points
- Community facilities
- Map to CBBS taxonomy
- Significant amount of sheds!



Australian Capital Territory

- Building polygons
- Map to CBBS taxonomy

Methodology

Building classification

- Geoscape / G-NAF linked to enriching datasets
- Create hierarchy of datasets
  - Highest priority – NABERS, CBD
  - Shopping Centres, Hotels, Hospitals, Schools, etc
  - Last resort – Mesh Block Category
- Link individual buildings to datasets
  - Building may link to > 1 dataset
- Assign building to taxonomic class
  - According to highest ranked dataset

Spatial referencing

- Buildings can be linked / aggregated to geographic regions
- ABS Statistical Areas
  - Mesh Blocks, SA 1-4
  - Link to demographics
- Postcode, Local Government
- Climate Zones
  - NCC
  - NatHERS
- Distribution Network Service Provider (DNSP) areas

Floorspace estimation

- Geoscape provides
  - Building footprint
  - Building height
- Used for shell volume and floorspace estimation
- Infer number of floors by building height
- Floorspace = building footprint * number of floors
- Requires validation against known data
- Scope for refinement

Data Gaps and Limitations

Data gaps

- Commercial and retail types
  - Break down further into subtypes
- Data Centres
- Building classification data for NSW
  - Disaggregated building data not as readily available
  - Geospatial data
- AEMO meter data not yet available
  - FY 2020-21 workplan

Limitations

- Gross floorspace estimation
  - Requires validation and refinement
  - Known floors/levels, floorspace
  - Internal complexity
- Buildings assigned to a single taxonomic class
  - Can recognise sub-tenancies / multiple uses exist
  - Can’t assign floorspace proportionally
  - Can link with datasets with sub-tenancy details
    - eg PCA Shopping Centres

Future Work

Electricity consumption

- Link buildings to AEMO meter data
- Clustering of Buildings
  - Spatial dimensions
    - ABS Statistical Area, Climate Zone
  - CBBS Taxonomy classes
    - Shopping Centres, Offices, Hotels
  - Building characteristics
    - Floorspace ranges, age

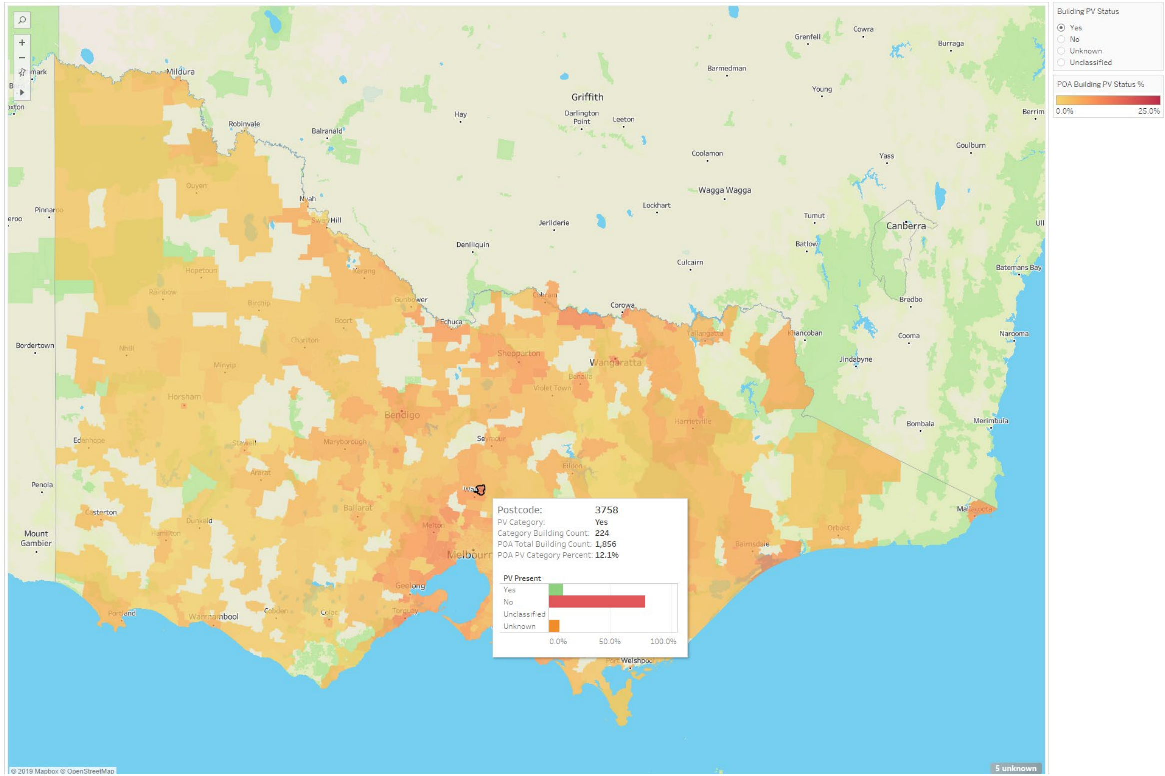
FY 2020-21 Workplan

- Small Retail
  - Relevant to NABERS review
- Residential apartments
  - Representative types
- Impact of NCC on energy use
  - Building clusters linked to energy use

Geoscape

- Numerous features not yet utilised
  - Presence of rooftop PV
    - PV penetration
    - Validate against Clean Energy Regulator
  - Swimming pools
    - Identify areas with pools
    - Demand management
  - Land use and trees layers
    - Heat island effect

Geoscape Rooftop PV by Postcode



Conclusion

Building Stock Model

- Encompasses 15.5M buildings across Australia
- Enriched with numerous datasets
  - Address and geospatial linkages
  - Building characteristics
  - Taxonomic indicators
- Platform for policy development
  - NABERS review
  - Trajectory for Low Energy Buildings
  - Impact of NCC

Thank you

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