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CO2 Storage Potential Europe

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Abstract

- Considered dataset: EU CO2Stop [1], which includes:
  - 3 different CO2 storage potential estimations ((i) conservative, (ii) neutral, (iii) optimistic)
  - different storage types (geological formation, Aquifer, Gas, Oil, HC field)
  - This dataset is a collection of the CO2 storage data entered by each country
    - Some countries entered their own capacity estimation (original capacity)
    - Authors of this dataset also provide their estimation (Institute estimation capacity)
- Validate EU CO2Stop [1] with CO2Stored [2]
  - CO2Stored is a dataset only have CO2 data (capacity, location) in United Kingdom
- Following slides :
  - The structure of the dataset (3 - 6)
    storage structure, capacity tables, maps, relationship between capacity tables and maps
  - Data quality check and the comparison with the British dataset (7)
  - the methodology for dealing with missing values (8-9)
- Results can be found in the html visualization

[1] https://setis.ec.europa.eu/european-co2-storage-database_en
[2] http://www.co2stored.co.uk/home/index

Structure of EU CO2StoP dataset[1]

- Storage Unit:

  basic CO2 storage structure, lower storage density

  volume of HC fields and aquifer daughter units are not considered

- Daughter Unit:

  small parts inside Storage unit, which have higher storage density

  There are two types: **Hydrocarbon(HC) fields** (Oil,Gas) ; **Auqifer Daugther Units**

- Concept Graph:

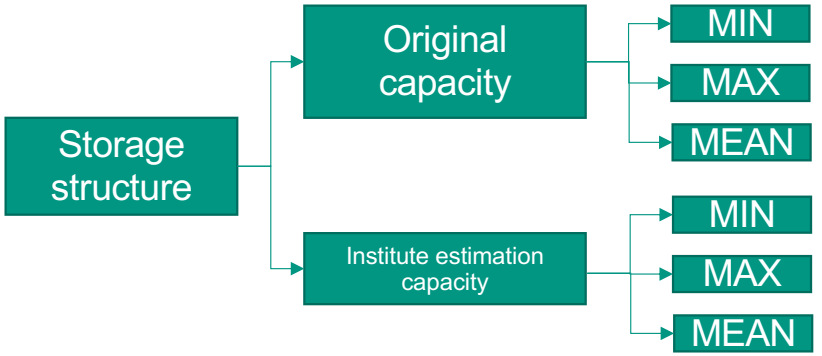
[1] https://setis.ec.europa.eu/european-co2-storage-database_en

Dataset detail: Capacity Tables

- Storage Unit Table (basic storage structure | normal saturation)
  - Storage unit ID
  - Capacity attributes of a storage unit:
    - Storage Unit
    - HC field capacity

- Daughter Unit Table (special part of a storage unit | **higher saturation**)
  - Daughter Unit ID
  - Capacitiy attributes of a daughter unit
    - Aquifer unit
    - Gas field
    - Oil field

Formation Table (useless, not basic storage structure)



Dataset detail: Location Maps

Daughter unit and storage unit have separate map, but same structure

- Most important attributes:
  - ID (correspond to ID in each capacity table, like primary key)
  - Polygon (3D)
  - Arbitrary (Have three possible values)
    - No: means location of polygon is unprecise,
    - Yes: precise,
    - None: also precise, validated with CO2Stored (UK dataset)

- Overlap:
  - Different storage units may in same area but at different depth (3D)

Daughter Unit Map and capacity table

ALL records in capacity table can find a unique match in Map except one record this record in table is in GB

Storage Unit Map and capacity table

ALL records in capacity table can find a unique match in Map except record in Nederland
no capacity (sum is 0) | no coordinate data | only storage unit id in table

Data Quality Check

- Which capacity attribute have least missing value?
  1. Institute estimation capacity Mean in both capacity tables has least missing value
  2. Institute estimation capacities have less missing value than original data from countries

  Decision: Use institute estimation capacity as base capacity in each table

- Which capacity attribute is am closest to already knows value ? (EU: 126 Gt)
  1. MIN Original most close to 126 Gt
  2. MEAN and MAX several times lager than 126Gt

  Decision: Separately treat MIN, MEAN, MAX ; Finally create three different capacities

- Is Map in CO2Stop dataset close to CO2stored (UK) dataset?

  Yes, Daughter Map + Storage Unit Map close to capacity in CO2stored UK dataset

CO2stored (UK) dataset login details:
Username: elisabeth.zeyen@kit.edu Password: CO2Stored20:

Missing value filling

- Before merge capacity table with polygon map
  - Storage Unit and Trap
    - Fill missing value in base capacity with original data
    - Fill missing value in neutral estimation with conservative estimation
    - Fill missing value in optimistic estimation with conservative estimation

Combine Map and Capacity Table