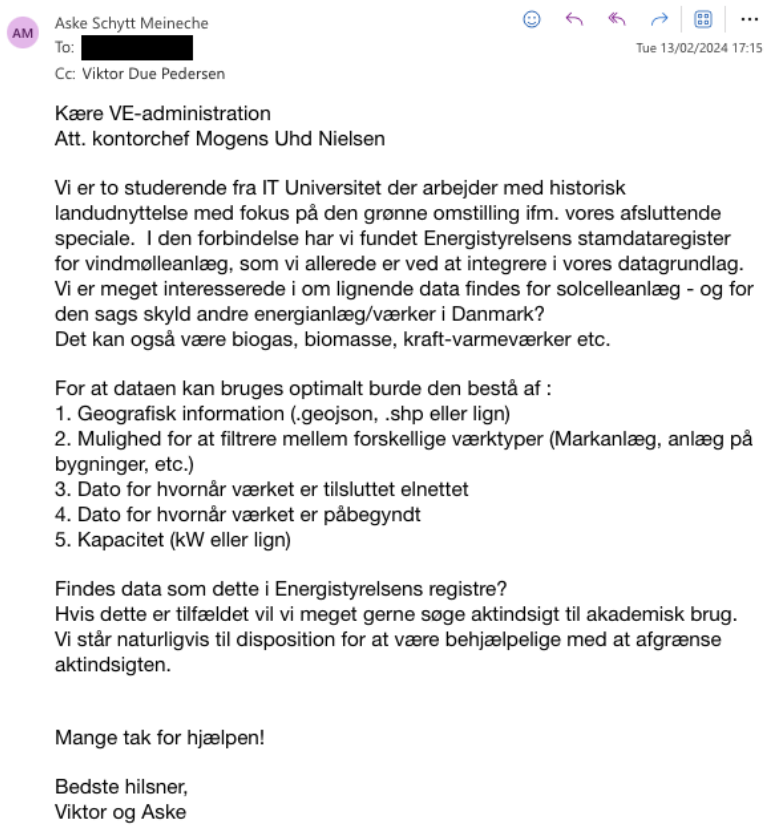
A APPENDIX

A.1 E-MAIL CORRESPONDENCE WITH THE DANISH ENERGY AGENCY



AM Aske Schytt Meineche
To: [redacted]
Cc: Viktor Due Pedersen
Tue 13/02/2024 17:15

Kære VE-administration
Att. kontorchef Mogens Uhd Nielsen

Vi er to studerende fra IT Universitet der arbejder med historisk landudnyttelse med fokus på den grønne omstilling ifm. vores afsluttende speciale. I den forbindelse har vi fundet Energistyrelsens stamdataregister for vindmølleanlæg, som vi allerede er ved at integrere i vores datagrundlag. Vi er meget interesserede i om lignende data findes for solcelleanlæg - og for den sags skyld andre energianlæg/værker i Danmark?
Det kan også være biogas, biomasse, kraft-varmeværker etc.

For at dataen kan bruges optimalt burde den bestå af :
1. Geografisk information (.geojson, .shp eller lign)
2. Mulighed for at filtrere mellem forskellige værktyper (Markanlæg, anlæg på bygninger, etc.)
3. Dato for hvornår værket er tilsluttet elnettet
4. Dato for hvornår værket er påbegyndt
5. Kapacitet (kW eller lign)

Findes data som dette i Energistyrelsens registre?
Hvis dette er tilfældet vil vi meget gerne søge aktindsigt til akademisk brug. Vi står naturligvis til disposition for at være behjælpelige med at afgrænse aktindsigten.

Mange tak for hjælpen!

Bedste hilsner,
Viktor og Aske

Figure 33: The original e-mail we sent to Energistyrelsen (The Danish Energy Agency) to get the solar data.

A.2 LAND USE CHANGE CALCULATION

```
SELECT *,
       intersection_area_sq_km / preceding_area_sq_km * 100 AS percent_change
FROM (
    SELECT preceding_year.chipid,
           preceding_year.name AS preceding_year_name,
           current_year.name AS current_year_name,
           ST_Intersection(preceding_year.result_geom_area, current_year.
    result_geom_area) AS land_use_change,
           ST_Area(ST_Transform(preceding_year.result_geom_area, 25832)) /
    1000000.0 AS preceding_area_sq_km,
           ST_Area(ST_Transform(ST_Intersection(preceding_year.result_geom_area,
     current_year.result_geom_area), 25832)) / 1000000.0 AS
    intersection_area_sq_km
    FROM (
        SELECT chipid,
               name,
               COALESCE(ST_Difference(DynamicWorld.lulc_polygon, SATLAS.
    lulc_polygon), DynamicWorld.lulc_polygon) AS result_geom_area
        FROM (
            SELECT chipid,
                   name,
                   ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_FROM_YEAR_-01-01'
              AND data_origins = 'DynamicWorld'
              AND chipid in _CHIPID_LIST_
            GROUP BY chipid,name
        ) AS DynamicWorld
        CROSS JOIN (
            SELECT ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_FROM_YEAR_-01-01'
              AND data_origins = 'SATLAS'
              AND chipid in _CHIPID_LIST_
        ) AS SATLAS
        UNION ALL
        SELECT chipid,
               name,
               COALESCE(ST_Difference(Solar.lulc_polygon, Wind.lulc_polygon),
    Solar.lulc_polygon) AS result_geom_area
        FROM (
            SELECT chipid,
                   name,
                   ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_FROM_YEAR_-01-01'
              AND data_origins = 'SATLAS'
              AND chipid in _CHIPID_LIST_
              AND name = 'Solar Panel'
            GROUP BY chipid,name
        ) AS Solar
        CROSS JOIN (
            SELECT ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_FROM_YEAR_-01-01'
```

```
          AND data_origins = 'SATLAS'
          AND chipid in _CHIPID_LIST_
          AND name = 'Wind Turbine'
    ) AS Wind
    UNION ALL
    SELECT chipid,
           name,
           Wind.lulc_polygon AS result_geom_area
    FROM (
        SELECT chipid,
               name,
               ST_Union(geometries) AS lulc_polygon
        FROM lulc
        WHERE area = '_AREA_'
          AND year = '_FROM_YEAR_-01-01'
          AND data_origins = 'SATLAS'
          AND chipid in _CHIPID_LIST_
          AND name = 'Wind Turbine'
        GROUP BY chipid,name
    ) AS Wind
) AS preceding_year
INNER JOIN (
    SELECT chipid,
          name,
           COALESCE(ST_Difference(DynamicWorld.lulc_polygon, SATLAS.
lulc_polygon), DynamicWorld.lulc_polygon) AS result_geom_area
    FROM (
        SELECT
               chipid,
               name,
               ST_Union(geometries) AS lulc_polygon
        FROM lulc
        WHERE area = '_AREA_'
          AND year = '_TO_YEAR_-01-01'
          AND data_origins = 'DynamicWorld'
          AND chipid in _CHIPID_LIST_
        GROUP BY chipid,name
    ) AS DynamicWorld
    CROSS JOIN (
        SELECT ST_Union(geometries) AS lulc_polygon
        FROM lulc
        WHERE area = '_AREA_'
          AND year = '_TO_YEAR_-01-01'
          AND data_origins = 'SATLAS'
          AND chipid in _CHIPID_LIST_
    ) AS SATLAS
    UNION ALL
    SELECT chipid,
           name,
           COALESCE(ST_Difference(Solar.lulc_polygon, Wind.lulc_polygon),
Solar.lulc_polygon) AS result_geom_area
    FROM (
        SELECT chipid,
               name,
               ST_Union(geometries) AS lulc_polygon
        FROM lulc
        WHERE area = '_AREA_'
          AND year = '_TO_YEAR_-01-01'
          AND data_origins = 'SATLAS'
          AND chipid in _CHIPID_LIST_
          AND name = 'Solar Panel'
```

```
            GROUP BY chipid,name
        ) AS Solar
        CROSS JOIN (
            SELECT ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_TO_YEAR_-01-01'
              AND data_origins = 'SATLAS'
              AND chipid in _CHIPID_LIST_
              AND name = 'Wind Turbine'
        ) AS Wind
        UNION ALL
        SELECT chipid,
               name,
               Wind.lulc_polygon AS result_geom_area
        FROM (
            SELECT chipid,
                   name,
                   ST_Union(geometries) AS lulc_polygon
            FROM lulc
            WHERE area = '_AREA_'
              AND year = '_TO_YEAR_-01-01'
              AND data_origins = 'SATLAS'
              AND chipid in _CHIPID_LIST_
              AND name = 'Wind Turbine'
            GROUP BY chipid,name
        ) AS Wind
    ) AS current_year ON
                        preceding_year.chipid = current_year.chipid AND
                        ST_Intersects(preceding_year.result_geom_area,
    current_year.result_geom_area)
) ooq
ORDER BY intersection_area_sq_km DESC;
```

A.3 LAND USE CHANGE QUERIES

A.3.1 Solar Expansion

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_to IN ('Solar Panel')
  AND lulc_category_from NOT IN ('Snow & Ice')
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC;
```

A.3.2 Renewable Expansion

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_to IN ('Solar Panel', 'Wind Turbine')
  AND lulc_category_from NOT IN ('Snow & Ice')
  AND chipid NOT IN (
    SELECT chipid
    FROM land_use_change
    WHERE year_from = 2016 AND year_to = 2023
      AND lulc_category_from = 'Wind Turbine'
  )
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC;
```

A.3.3 Urban Sprawl

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_to = 'Built Area'
  AND lulc_category_from NOT IN ('Snow & Ice')
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC;
```

A.3.4 Desertification

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_to = 'Bare ground'
  AND lulc_category_from NOT IN ('Snow & Ice')
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC;
```

A.3.5 Deforestation

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_from = 'Trees'
  AND lulc_category_to NOT IN ('Snow & Ice')
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC;
```

A.3.6 Agricultural Expansion

```
SELECT area, chipid, sum(area_km2) as summed_area
FROM land_use_change
WHERE lulc_category_from != lulc_category_to
  AND year_from = 2016 AND year_to = 2023
  AND lulc_category_to = 'Crops'
  AND lulc_category_from NOT IN ('Snow & Ice', 'Grass')
GROUP BY area, chipid
ORDER BY sum(area_km2) DESC
LIMIT 50;
```