SwitchCoal instructions step by step

For your preparation: you should sit in front of a large computer screen, using a mouse to work inside maps; a cellphone / smartphone would hardly work (to do exact selections).
Also, we advise to use a Windows system and Google Chrome here (other Operating systems and Browsers may work as well, but were not tested all and thoroughly).

Note: the colors of the detail instructions refer to the indicating arrows (=>)
in the example picture with the same colors here (as for example here: red referencing red).

To begin with open this website:
https://zeroemissionthinktank.com/switch-coal-help-us-save-the-planet/

This is our graphical user interface (GUI) for your data processing.

1) Select a coal plant

1. Now select a '**Country**' via the box top left and likewise a '**Province**' via the box right below.

2. Click in the box right of that: a **'list with coal plants'** shows up
    and you can select one of them for your processing 1)

3. Next the '**Latitude & Longitude Position**' box below indicates the exact location of the selected coal plant; select and copy that value with your mouse.

Now your actual work can start...

2) Find solar resources (see Figure 1)

2a. Open the **global map** published by the World Bank www.globalsolaratlas.info

2b. Paste the copied **<latitude,longitude>-value** in the search box
    and let the selected region build up (showing the exact location of the selected coal plant)

2c. Read out the relevant value (in kWh/kWp, in the example 1592.3 kWh/kWp)
    and paste it in the **'Enter Solar kWh'** box in the GUI

    Note: at sites with a latitude of more than +/-60 degrees (that's e.g. close to Helsinki) the site will state no values (kWh/kWp) any more, visible also with the entire area depicted in grey there. Such cases are rare, however if given just past '0.0' in the **'Enter Solar kWh'** box.

2d. Check with the scale at the bottom left that the measuring unit shows '10 km'
    (as visible in figure 1 already),
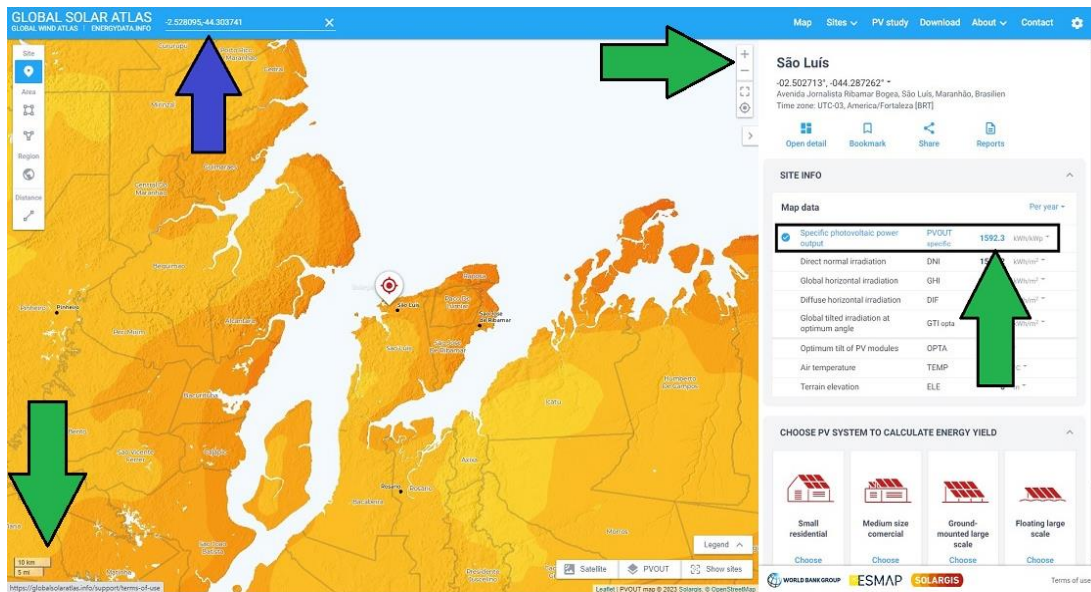   if not at this value yet zoom in or out via the buttons (+/-) until this is given

Figure 1:

2d. Finally save that picture / Figure 1 (via ScreenDump or similar means)
and upload it by pressing button '**Upload Screenshot from GlobalSolarAtlas**' in the GUI 2)5)

Thanks, it's that simple for Solar, almost halfway done!

3) Find wind resources (see Figure 2 - Figure 7)

3a. Open the **global wind map** published by the World Bank www.globalwindatlas.info

3b. Paste the copied **<latitude,longitude>-value** in the search field
and let the view built up (showing again the exact site location of the selected coal plant)

3c. Again check with the scale at the bottom left that the measuring unit shows '10 km',
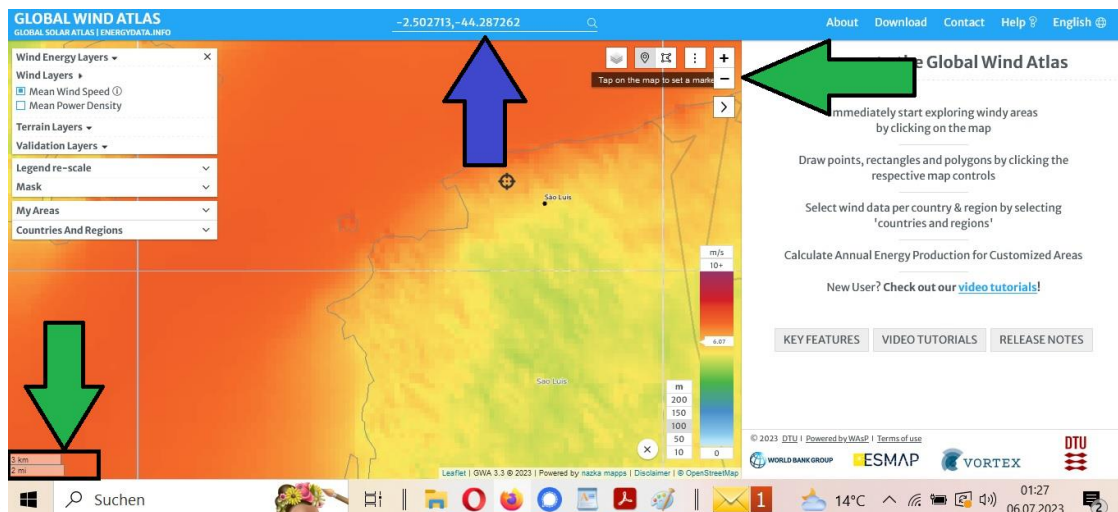if not at this value yet zoom in or out via the buttons (+/-) until this is given (as in Figure 3)

Figure 2:

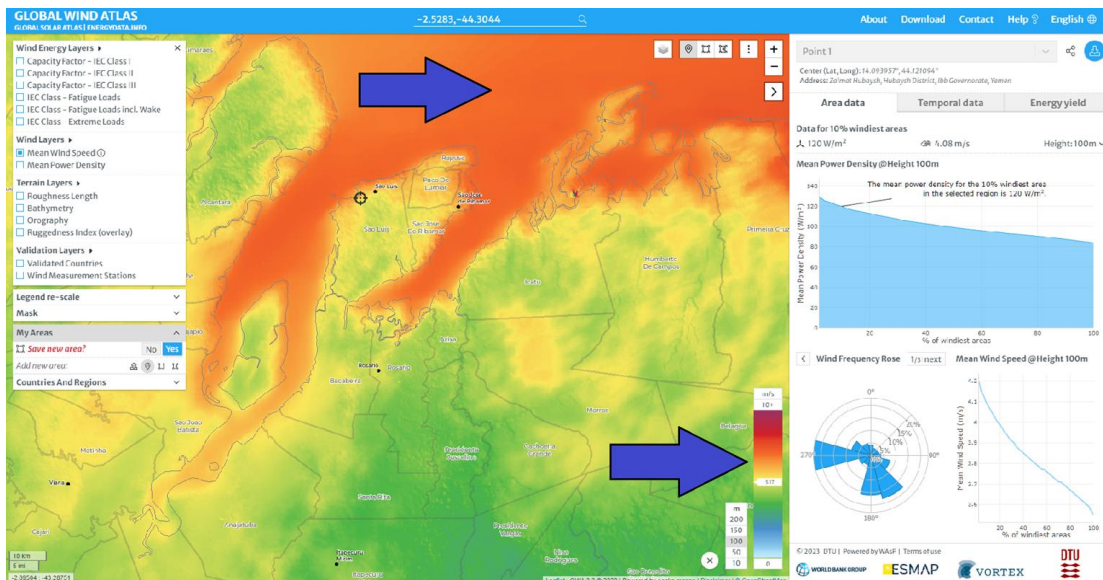So now your picture should look roughly like this:

Figure 3:

3d. Check whether there are water planes (sea or lake) in this area.
The scale at the bottom in the center shows wind speeds:
the darker red the higher is that speed.
Water planes usually have higher and more uniform wind speeds (as visible in figure 3 too).

However if you are uncertain about seeing a coast- or lakeline at all zoom out a few times.
When having a look at a larger area it should be way easier to detect that for sure
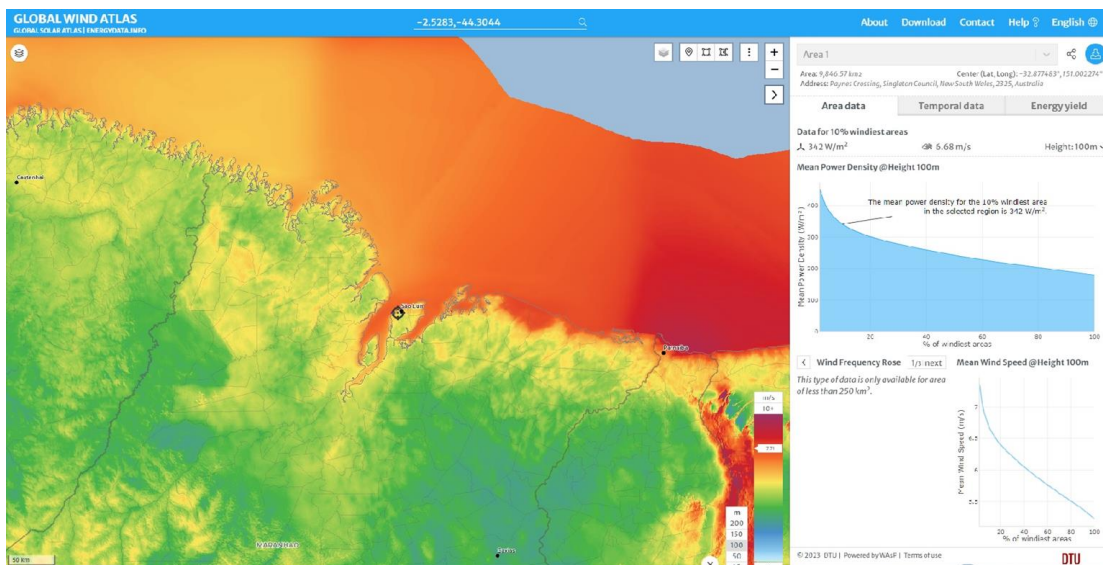(note: by default the map shows coastlines too), as visible in the example here:

Figure 4:

A similar issue may arise with national borders, as potential sites for wind turbines are not
to be deployed in other countries. Such borders are visible as thick lines, in contrast to
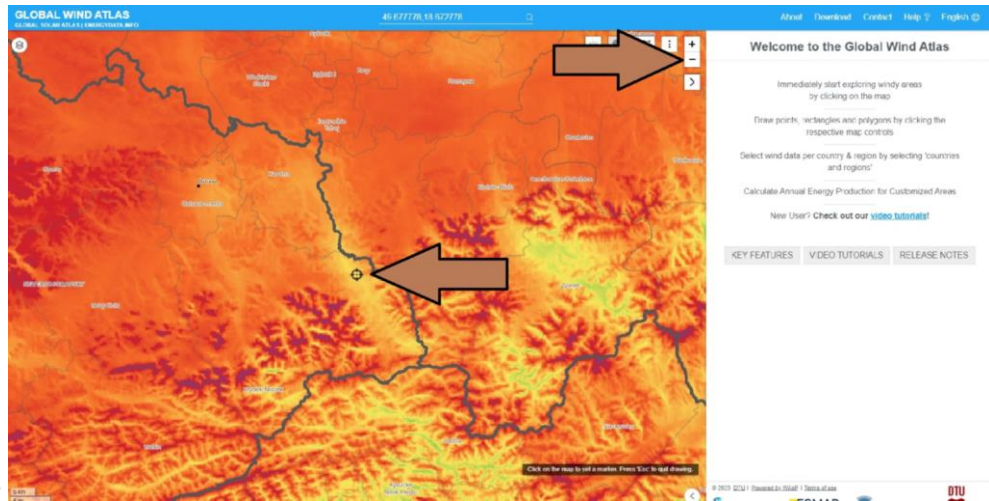thinner ones marking just regions (see an example in figure 3b).

Figure 3b:

The means to see clearer in case of such a suspicion is the same as for water planes: zoom out a few times until the contour of a country, often underpinned by the names of countries become identifiable (see Figure 4b for an example corresponding to figure 3b here).
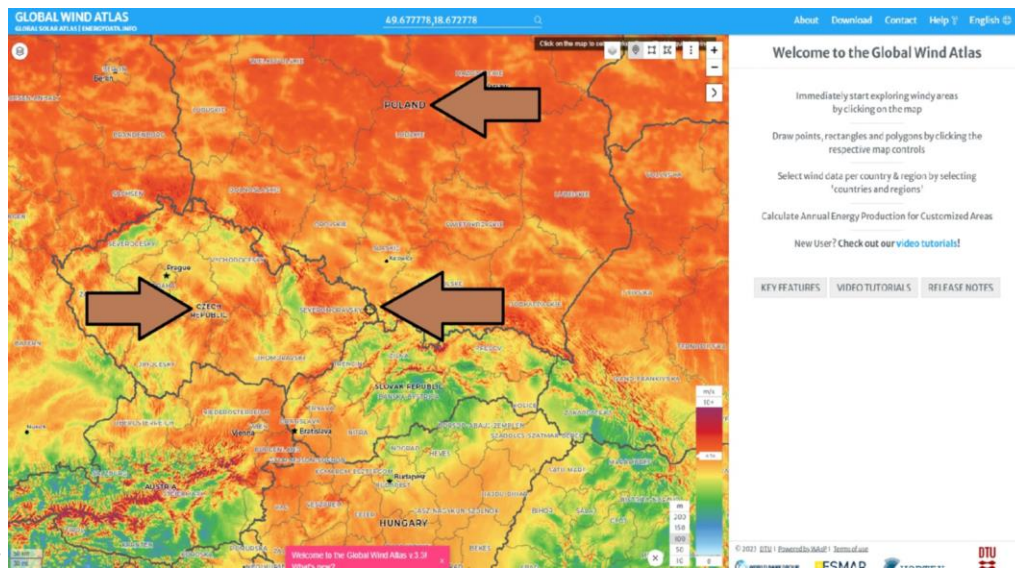

Figure 4b:

Next zoom in again until that measuring unit at the bottom left shows '10 km' again. And keep in mind where the sea- resp. lakelines or national borders are, as needed in further processing 2)
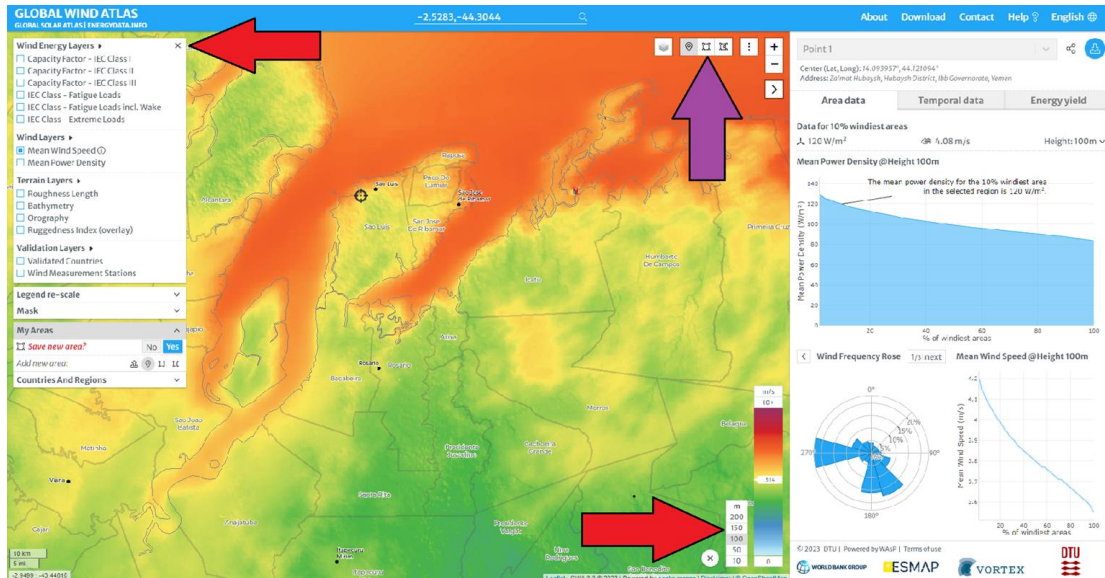
Figure 5:

3e. Click here to set the height of the wind turbine to 150 m.
And mask out the menu bar at the left (by clicking on the cross in the top red corner of it).

3f.   Now you have to find 5 squares (= alternative areas) of appr. 10x10km
in the selected region with optimal wind speeds, i.e. fulfilling these conditions:

  i. Among each other the wind speeds of these squares are very similar

  ii. The variance of wind speeds within each square is fairly small

  iii. The squares should be distributed over the entire area, not to close to each other

  iv. The squares must not be on water planes or beyond detected national borders

  v. Considering all this (i - iv) these squares show the best wind speeds over the entire area.

The results of this may look like illustrated below (in figure 6).
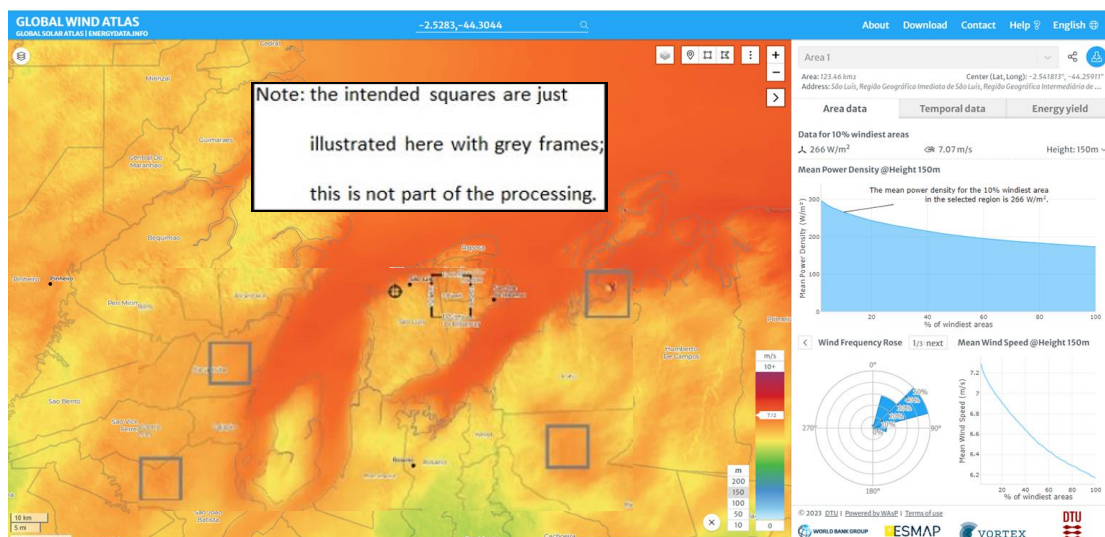**There such intended squares (= alternative areas) are depicted with a gray resp. black frame.**

Figure 6:

So far this potential squares 3) are just imaginary (= alternative areas), drawn by sight.
After you have found up to 5 squares:

vi. Select 1 of them, preferred the closest area to the coal plant.

vii. Press the Draw Rectangle button ⬚⬚⭕⬚⬚ ⋮ + (see figure 5)
in order to mark the frame of the chosen squared area (of appr. 10x10km)

viii. Position the cursor at the intended top left corner of that square,
press the left mouse button
and move the mouse to the bottom right corner to expand the square to appr. 10x10 km.

Finally your screen shall look like this (chosen square with a black frame and scale at its edges):
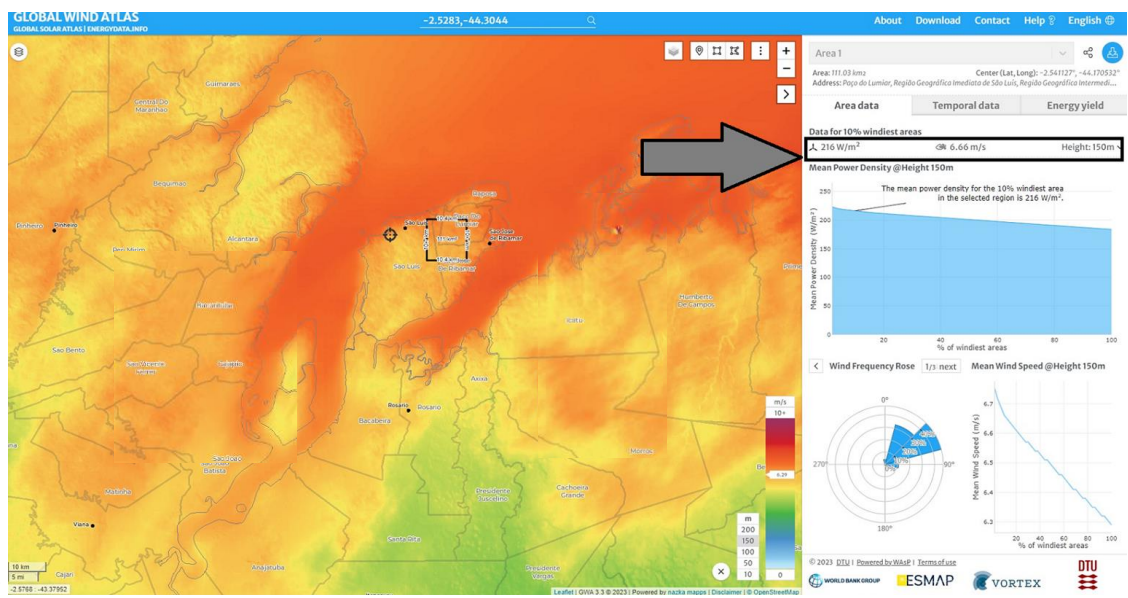

Figure 7:

3g. The menu bar at the right should indicate now:
'**Data for 10% windiest areas**'. Read out the relevant value (in the example 6.66 m/s)
and put it in the '**Enter Wind Speed**' box in the GUI 4)

3h. Then again save that picture / Figure 5 (via ScreenDump or similar means)
and upload it by pressing button '**Upload Screenshot from GlobalWindAtlas**' in the GUI 5)

Eventually fill in some basic personal data and state your privacy preferences please:

So put in your '**first**' and '**last name', 'email address', 'nickname'** in the respective boxes plus
'**confirm your selection**', i.e. preferences for your privacy and further information.

Thank you very much again. That's it - well done!

If you like and can proceed with the next coal plant. **Running this will get faster each time.**

Remarks:

1) Depending on your choice for point 3
   the list shows all coal plants not processed yet in the selected country and province.

2) Why has it to be processed this way?

a) Solar & Wind: in order to be able to deploy enough solar panels resp. wind turbines
   it is advisable to inspect a larger area, so here appr. 200x150 km

b) Wind: next here also the variance of energy conditions is quite high often locally,
   so finding the best conditions is essential

c) Wind: finally coal plants at sea- or lakesides pose a problem:
   deploying wind engines at scale offshore would be tricky, close to the shore almost impossible,
   and often way more costly. So this study shall not consider that. Accordingly we must sort out and ignore
   such water planes in the research; likewise all areas beyond national borders.

   Note: both issues are almost irrelevant for Solar, as variances within the areas are much lower generally there.

3) Why do we look for 5 squares at all?
   Each square is intended to be a potential area for siting the wind turbines needed later on -
   and our study wants this to be doable in reality.
   However for a couple of reasons one or more of the squares may turn out later on not to be suitable actually
   (e.g. because being built areas, nature reserves, or military areas etc.).
   Therefore with 5 squares appr. equal in terms of wind speed there is a reasonable chance
   at least one of them can be applied here.

4) Actually this is not quite correct, as we look for the mean wind speed in the drawn rectangle;
   however as deliberately selected to have a low variance the difference between our value
   and mean wind speed shall be very small, so neglectable.

5) This may be needed for further inquiries and is stored as an evidence too (for both Solar and Wind).