

JOINT RESEARCH CENTRE

Energy, Transport and Climate

Knowledge for the Energy Union (JRC.C.7)

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# ENSPRESO integrated dataset

The ENSPRESO integrated dataset contains harmonised ENSPRESO data from wind, solar and biomass potentials. It is fully based on a selection of the data contained in the separate ENSPRESO data files. The data is taken for EU + UK and only 2030 data is used. The ENSPRESO integrated dataset consists of two CSV files:

1. ENSPRESO\_Integrated\_NUTS2\_Data.csv
2. ENSPRESO\_Integrated\_EEZ\_Data\_Offshore.csv

# ENSPRESO Integrated NUTS2 Data.csv

|  |  |
| --- | --- |
| **Column code** | **Column description** |
| biomass\_production\_twh\_medium\_total | Data for medium scenario – total for all 3 groups |
| biomass\_production\_twh\_low\_total | Data for low scenario – total for all 3 groups |
| biomass\_production\_twh\_high\_total | Data for high scenario – total for all 3 groups |
| biomass\_production\_twh\_medium\_agri&landscape \_residues | Data for medium scenario –agri&landscape\_residues |
| biomass\_production\_twh\_low\_agri&landscape \_residues | Data for low scenario – agri&landscape\_residues |
| biomass\_production\_twh\_high\_agri&landscape \_residues | Data for high scenario – agri&landscape\_residues |
| biomass\_production\_twh\_medium\_energy\_crops | Data for medium scenario – energy\_crops |
| biomass\_production\_twh\_low\_energy\_crops | Data for low scenario – energy\_crops |
| biomass\_production\_twh\_high\_energy\_crops | Data for high scenario – energy\_crops |
| biomass\_production\_twh\_medium\_forestry | Data for medium scenario – forestry |
| biomass\_production\_twh\_low\_forestry | Data for low scenario – forestry |
| biomass\_production\_twh\_high\_forestry | Data for high scenario – forestry |
| wind\_onshore\_capacity\_gw\_medium | Data for reference scenario (Reference - Large turbines) |
| wind\_onshore\_capacity\_gw\_low | Data for low scenario (1200m from settlements) |
| wind\_onshore\_capacity\_gw\_high | Data for high scenario (400m from settlements) |
| wind\_onshore\_production\_twh\_medium | Data for reference scenario (Reference - Large turbines) |
| wind\_onshore\_production\_twh\_low | Data for low scenario (1200m from settlements) |
| wind\_onshore\_production\_twh\_high | Data for high scenario (400m from settlements) |
| wind\_onshore\_land\_use\_percentage\_medium | Data for reference scenario (Reference - Large turbines) |
| wind\_onshore\_land\_use\_percentage\_low | Data for low scenario (1200m from settlements) |
| wind\_onshore\_land\_use\_percentage\_high | Data for high scenario (400m from settlements) |
| solar\_capacity\_gw\_medium\_total | Data for medium scenario (170 W/m2) – total for all 3 types |
| solar\_capacity\_gw\_low\_total | Data for low scenario (85 W/m2) – total for all 3 types |
| solar\_capacity\_gw\_high\_total | Data for high scenario (300 W/m2) – total for all 3 types |
| solar\_capacity\_gw\_medium\_pv\_roof | Data for medium scenario (170 W/m2) – roof & façade PV |
| solar\_capacity\_gw\_low\_pv\_roof | Data for low scenario (85 W/m2) – roof & façade PV |
| solar\_capacity\_gw\_high\_pv\_roof | Data for high scenario (300 W/m2) – roof & façade PV |
| solar\_capacity\_gw\_medium\_pv\_ground | Data for medium scenario (170 W/m2) – ground PV |
| solar\_capacity\_gw\_low\_pv\_ground | Data for low scenario (85 W/m2) – ground PV |
| solar\_capacity\_gw\_high\_pv\_ground | Data for high scenario (300 W/m2) – ground PV |
| solar\_capacity\_gw\_medium\_csp | Data for medium scenario (170 W/m2) – CSP |
| solar\_capacity\_gw\_low\_csp | Data for low scenario (85 W/m2) – CSP |
| solar\_capacity\_gw\_high\_csp | Data for high scenario (300 W/m2) – CSP |
| solar\_production\_twh\_medium\_total | Data for medium scenario (170 W/m2) – total for all 3 types |
| solar\_production\_twh\_low\_total | Data for low scenario (85 W/m2) – total for all 3 types |
| solar\_production\_twh\_high\_total | Data for high scenario (300 W/m2) – total for all 3 types |
| solar\_production\_twh\_medium\_pv\_roof | Data for medium scenario (170 W/m2) – roof & façade PV |
| solar\_production\_twh\_low\_pv\_roof | Data for low scenario (85 W/m2) – roof & façade PV |
| solar\_production\_twh\_high\_pv\_roof | Data for high scenario (300 W/m2) – roof & façade PV |
| solar\_production\_twh\_medium\_pv\_ground | Data for medium scenario (170 W/m2) – ground PV |
| solar\_production\_twh\_low\_pv\_ground | Data for low scenario (85 W/m2) – ground PV |
| solar\_production\_twh\_high\_pv\_ground | Data for high scenario (300 W/m2) – ground PV |
| solar\_production\_twh\_medium\_csp | Data for medium scenario (170 W/m2) – CSP |
| solar\_production\_twh\_low\_csp | Data for low scenario (85 W/m2) – CSP |
| solar\_production\_twh\_high\_csp | Data for high scenario (300 W/m2) – CSP |

# ENSPRESO Integrated EEZ data Offshore.csv

|  |  |
| --- | --- |
| **Column code** | **Column description** |
| wind\_offshore\_capacity\_gw\_medium\_total | Data for reference scenario – total |
| wind\_offshore\_capacity\_gw\_low\_total | Data for low scenario – total |
| wind\_offshore\_capacity\_gw\_high\_total | Data for high scenario - total |
| wind\_offshore\_capacity\_gw\_medium\_0-30 | Data for reference scenario - water depth 0-30m |
| wind\_offshore\_capacity\_gw\_medium\_30-60 | Data for reference scenario - water depth 30-60m |
| wind\_offshore\_capacity\_gw\_low\_0-30 | Data for low scenario - water depth 0-30m |
| wind\_offshore\_capacity\_gw\_low\_30-60 | Data for low scenario - water depth 30-60m |
| wind\_offshore\_capacity\_gw\_high\_0-30 | Data for high scenario - water depth 0-30m |
| wind\_offshore\_capacity\_gw\_high\_30-60 | Data for high scenario - water depth 30-60m |
| wind\_offshore\_capacity\_gw\_high\_60-100 | Data for high scenario - water depth 60-100m |
| wind\_offshore\_capacity\_gw\_high\_100-1000 | Data for high scenario - water depth 100-1000m |
| wind\_offshore\_capacity\_gw\_high\_0-30\_12nm | Data for high scenario - water depth 0-30m in 12nm zone |
| wind\_offshore\_capacity\_gw\_high\_30-60\_12nm | Data for high scenario - water depth 30-60m in 12nm zone |
| wind\_offshore\_capacity\_gw\_high\_60-100\_12nm | Data for high scenario - water depth 60-100m in 12nm zone |
| wind\_offshore\_production\_twh\_medium\_total | Data for reference scenario – total |
| wind\_offshore\_production\_twh\_low\_total | Data for low scenario – total |
| wind\_offshore\_production\_twh\_high\_total | Data for high scenario - total |
| wind\_offshore\_production\_twh\_medium\_0-30 | Data for reference scenario - water depth 0-30m |
| wind\_offshore\_production\_twh\_medium\_30-60 | Data for reference scenario - water depth 30-60m |
| wind\_offshore\_production\_twh\_low\_0-30 | Data for low scenario - water depth 0-30m |
| wind\_offshore\_production\_twh\_low\_30-60 | Data for low scenario - water depth 30-60m |
| wind\_offshore\_production\_twh\_high\_0-30 | Data for high scenario - water depth 0-30m |
| wind\_offshore\_production\_twh\_high\_30-60 | Data for high scenario - water depth 30-60m |
| wind\_offshore\_production\_twh\_high\_60-100 | Data for high scenario - water depth 60-100m |
| wind\_offshore\_production\_twh\_high\_100-1000 | Data for high scenario - water depth 100-1000m |
| wind\_offshore\_production\_twh\_high\_0-30\_12nm | Data for high scenario - water depth 0-30m in 12nm zone |
| wind\_offshore\_production\_twh\_high\_30-60\_12nm | Data for high scenario - water depth 30-60m in 12nm zone |
| wind\_offshore\_production\_twh\_high\_60-100\_12nm | Data for high scenario - water depth 60-100m in 12nm zone |

# ENSPRESO Biomass

ENSPRESO considers three main sources of biomass:

* **Agriculture sector energy sources** considered are energy crops and residues (primary, secondary and solid). “Energy crops” refers to those crops whose primary target is the production of end-use energy carriers: sugar, starchy and oily crops, energy maize silage for biogas, and lignocellulosic biomass. “Primary residues” includes the dry and wet manure coming from cattle than can be gasified. “Secondary residues” refers to olive pits while “solid agricultural” gathers the waste obtained from pruning of permanent crops (namely orchards, vineyards, olives, citrus, nuts) and the straw and stubbles residues.
* **Biomass from the forestry sector** is classified into roundwood production and primary and secondary residues. The roundwood used for energy purposes is considered. “Primary residues” are logging residues and other pre-commercial thinnings, while the “secondary residues” covers woodchips and pellets, sawdust and black liquor.
* Finally, the **waste sector produces energy biomass** in the primary and tertiary residues categories. The primary residues consist of residues from landscape care management, roadside verges and abandoned lands. The tertiary residues cover biomass residues from different industries and municipal solid waste.

## Selection and aggregation

* Three bioenergy availability scenarios are considered:
  + Low is based on *ENS\_LowForestBaU*
  + Medium is based on *ENS\_Med\_ForestBaU*
  + High is based on *ENS\_High\_Forest400Mm3*
* They differ in assumptions related to land use, agricultural practices, and protected areas. See the original Excel file for the description.Commodities have been aggregated to 3 groups (see table below):
* Sludge and municipal waste was not considered
* An adjustment had to be made for regions UKI1 and UKI2

| **commodity** | **description** | **group** |
| --- | --- | --- |
| MINBIOAGRW1 | Agricultural waste | Agriculture and landscape residues |
| MINBIOGAS1 | Manure solid, liquid | Agriculture and landscape residues |
| MINBIOFRSR1a | Residues from landscape care | Agriculture and landscape residues |
| MINBIOCRP11 | Bioethanol barley, wheat, grain maize, oats, other cereals and rye | Energy crops |
| MINBIOCRP21 | Sugar from sugar beet | Energy crops |
| MINBIOCRP31 | Miscanthus, switchgrass, RCG | Energy crops |
| MINBIOCRP41 | Willow | Energy crops |
| MINBIOCRP41a | Poplar | Energy crops |
| MINBIOLIQ1 | Sunflower, soya seed | Energy crops |
| MINBIORPS1 | Rape seed | Energy crops |
| MINBIOFRSR1 | Fuelwood residues | Forestry |
| MINBIOWOO | FuelwoodRW | Forestry |
| MINBIOWOOa | C&P\_RW | Forestry |
| MINBIOWOOW1 | Secondary Forestry residues - woodchips | Forestry |
| MINBIOWOOW1a | Sawdust | Forestry |
| ~~MINBIOMUN1~~ | ~~Municipal waste~~ | ~~ONLY NUTS0~~ |
| ~~MINBIOSLU1~~ | ~~Sludge~~ | ~~ONLY NUTS0~~ |

# ENSPRESO Wind

## Selection and aggregation onshore

* We select capacity, production and share of land used from the sheet "Raw data"
* The aggregated potential for all sites with CF>20% is selected (the sum of 20% < CF < 25% and CF > 25%)

## Selection and aggregation offshore

* We select capacity and production from the sheet "Raw data"
* The aggregated potential for all sites with CF>20% will be used (the sum of 20% < CF < 25% and CF > 25%)

# ENSPRESO Solar

ENSPRESO Solar provides three scenarios for different **PV and land efficiency (roofs, facades and open field):** 85, 170 and 300 MW/km2. It is assumed that 3% of the available natural areas can be used for solar.

* We select capacity and production for three different types
* The ENSPRESO source sheet is "NUTS2 170 W per m2 and 3%"

# ENSPRESO General information

ENSPRESO is an open dataset for energy models on renewable energy potentials in the EU,

at national (NUTS0) and regional levels (NUTS2). Within ENSPRESO, ENergy Systems Potential Renewable Energy SOurces, technical potentials are provided for wind, solar and biomass, based on coherent GIS-based land-restriction scenarios.

**Open access journal describing ENSPRESO**

<https://www.sciencedirect.com/science/article/pii/S2211467X19300720>

**Data are in line with following JRC reports**

Wind potentials for EU and neighbouring countries, 2018, JRC109698

<https://publications.jrc.ec.europa.eu/repository/handle/JRC109698>

The JRC-EU-TIMES model. Bioenergy potentials for EU and neighbouring countries

<https://publications.jrc.ec.europa.eu/repository/handle/JRC98626>

**References**

* ENSPRESO is one of the datasources used by PRIMES, see for example <https://ec.europa.eu/clima/policies/eu-climate-action/2030_ctp_en>
* <https://www.nature.com/articles/s41467-020-18812-y>
* <https://www.nature.com/articles/s41467-020-20015-4>

**More information**

Data included in this database has been produced under the framework contract JRC/PTT/2013/F.6/0057/OC granted to a consortium lead by ECN

The wind potentials are systematically derived from 30 years of meteorological data based on the MERRA reanalysis dataset and from the Global Wind atlas

<https://gmao.gsfc.nasa.gov/reanalysis/MERRA/>

<https://globalwindatlas.info>

This dataset and the more detailed ENSPRESO datasets are available for download from the JRC data catalogue: <https://data.jrc.ec.europa.eu/collection/id-00138>

ENSPRESO does not include hourly data on wind however we refer to JRC EMHIRES for this:

<https://data.jrc.ec.europa.eu/collection/id-0055>

More information on NUTS2 conversion can be found here: <https://ec.europa.eu/eurostat/fr/web/nuts/history>

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