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DISTENDER

# DISTENDER CLIMATE IMPACT AND VULNERABILITY INDICATORS PRODUCED IN THE EU PROJECT DISTENDER FOR FIVE CASE STUDIES

**Case studies**: Austria; Dehesas(Spain) and Montados(Portugal)(EURAF); The North-east of the Netherlands (HUAS); The Metropolitan City of Turin (CMTo, Italy); Guimaraes (Portugal). More information https://distender.eu/the-project

This document provides a guide for consulting indicators produced within the DISTENDER project. For more detailed information, please refer to sector-specific README files (see table of indicators), relevant project deliverables: D5.1 State of the art impact models; D7.2 Economic impact of strategies for test cases; D5.3: Risk and Vulnerability Assessment Methodology; D9.1 Case Studies and the project's official website (https://distender.eu/).

The DISTENDER climate indicators are organized into several categories to help you navigate and find the information you need. The indicators are classified according to the following fields:

## 1. ROU

The DISTENDER methodology includes two types of simulations to help understand the impact of climate change. The first simulation, labeled **R1** (Round1). "Round 1" assumes that a future climate would materialize within the current socio-economic system. This means that the analyses hold the current socio-economic situation fixed (to a reference 2018 year or period from the past) and show the hypothetical effects of a changing climate under these fixed circumstances. The second simulation is called **R2a** (Round2). In "Round 2" we additionally (to Round 1) assume that also the socio-economic system is changing (e.g. population, GDP, energy demand etc.), according to the chosen socio-economic scenario. Thus Round 2 yields the combined effect of socio-economic and climate change. By comparing Round 2 to Round 1 one can see by how much socio-economic change adds to the effects from a hypothetical "climate change only" scenario.

## 2. GRO

The indicators produced in DISTENDER are grouped by sector, each sector being modelled by a specific type of model. The indicators modeled by the DISTENDER project are available for the following sectors: Air Quality and Emissions; Urban Heat Island; Health; Water; Energy; Agroforestry; Economy; Risk and Vulnerability

## 3. SSP

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DISTENDER project has taken four IPCC (International Panel for Climate Change) socio-economic and climate scenarios named as: **SSP1-2.6**: Sustainability; **SSP2-4.5 and SSP2-4.5-EXTRA (only R2)**: Middle of the Road. **SSP3-7.0**: Regional Rivalry**. SSP5-8.5**: Fossil-fueled Development. The combination of the climate scenarios: EM-SSP1 (2.6), EM-SSP2(4.5), EM-SSP3(7.0) and EM-SSP5 (8.5) with the local socio-economic scenarios (CCS-SSPs, 1,2,3,4,5) is explained in the following table, EM-SSPx represents the local climate signal and CCS-SSPx represents the local socio-economic signal in Round 2 (R2), The following name you can see in this field:

**SSP1-2.6** for the combination EM-SSP1 (2.6)-CCS-SSP1.

**SSP2-4.5** for the combination EM-SSP2 (4.5)-CCS-SSP4.

**SSP3-7.0** for the combination EM-SSP3 (7.0)-CCS-SSP3.

**SSP5-8.5** for the combination EM-SSP5 (8.5)-CCS-SSP5.

**SSP2-4.5-EXTRA** for the combination EM-SSP2 (4.5)-CCS-SSP2.

| **Forcing ($W/m^2$)** | CCS-SSP1 | CCS-SSP2 | CCS-SSP3 | CCS-SSP4 | CCS-SSP5 |
|---|---|---|---|---|---|
| EM-SSP1 (2.6) | X | | | | |
| EM-SSP2 (4.5) | | (X) | | X | |
| EM-SSP3 (7.0) | | | X | | |
| EM-SSP5 (8.5) | | | | | X |

In some sectors the past has also been modelled, in which case the field has been labelled **Historical**. Not defined value means that the indicator is independent of the scenario. For example, air quality emissions for Round1. More information can be found in the Readme files of each sector.

The summary of the global SSPs is the following:

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| Tier 1 CMIP6 Scenarios |
| --- |
| SSP1-2.6: **Sustainability – Taking the Green Road** (Low challenges to mitigation and adaptation). This scenario with 2.6 W/m² by the year 2100 is a remake of the optimistic scenario RCP2.6 and was designed with the aim of simulating a development that is compatible with the 2°C target. This scenario, too, assumes climate protection measures being taken. |
| SSP2-4.5: **Middle of the Ro**ad (Medium challenges to mitigation and adaptation). As an update to scenario RCP4.5, SSP245 with an additional radiative forcing of 4.5 W/m² by the year 2100 represents the medium pathway of future greenhouse gas emissions. This scenario assumes that climate protection measures are being taken. |
| SSP3-7.0: **Regional Rivalry** – A Rocky Road (High challenges to mitigation and adaptation). With 7 W/m² by the year 2100, this scenario is in the upper-middle part of the full range of scenarios. |
| SSP5-8.5: **Fossil-fueled Development** – Taking the Highway (High challenges to mitigation, low challenges to adaptation). Radiative forcing of 8.5 W/m² by the year 2100, this scenario represents the upper boundary of the range of scenarios described in the literature. |

## 4. GCM

The DISTENDER methodology has chosen three global climate models to calculate local climate conditions. The selected models are: **EC-EARTH, MPI-ESM and CanESM**. They are three representative climate models from ten CMIP6 candidates: (a) low-change level (25%) corresponds to MPI-ESM1-2-HR; (b) medium-change level (50%) is for EC-EARTH3; and (c) high-change level (75%) is for the CanESM5 model.

Not Defined value (null) means that the indicator is independent of the global climate model. For example, air quality emissions.

## 5. CST

The DISTENDER methodology has been applied in the following case studies: **Austri**a, national case, represented by BMK; **EURAF** a multiple county case study for the Dehesa (Spain) and Montado (Portugal); **HUAS** is a regional case of the North-East of the Netherlands**; CMTO** case cover the Metropolitan city of Turin and **Guimaraes** is the urban case study of Portugal.

## 6. DOM

The DISTENDER methodology has established a series of spatial domains with varying resolutions to effectively cover the area of interest for each case study. In AFOLU sector the spatial resolution is 100 m. Each domain has an identifier (Id) with the following definition:

| **Case Study** | **Id.** | **Domain Longitud** range | | **Domain Latitude range** | | **Resolution** (º) | **Mean resolution (approx) (km)** |
|---|---|---|---|---|---|---|---|
| Guimaraes | **D0** | -8.666 | -7.765 | 41.182889 | 41.701477 | 0.09 | 9 |
| Guimaraes | **D1** | -8.666 | -7.765 | 41.182889 | 41.701477 | 0.01 | 1 |
| Guimaraes | **D2** | -8.462 | -8.13 | 41.439 | 41.592 | 0.005 | 0.5 |
| Guimaraes | **D3** | -8.373 | -8.256 | 41.415 | 41.462 | 0.001 | 0.1 |
| CMTo | **D0** | 6.37177 | 8.744733 | 44.121578 | 45.997065 | 0.09 | 9 |
| CMTo | **D1** | 6.37177 | 8.744733 | 44.121578 | 45.997065 | 0.03 | 3 |
| CMTo | **D2** | 6.5 | 8.2 | 44.67 | 45.65 | 0.01 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CMTo | **D3** | 7.366611 | 8.011 | 44.835 | 45.29315 | 0.005 | 0.5 |
| HUAS | **D0** | 3.995002 | 7.839331 | 51.535145 | 53.932 | 0.09 | 9 |
| HUAS | **D1** | 4.169413 | 7.40794 | 52.071951 | 53.932 | 0.03 | 3 |
| HUAS | **D2** | 5.3962 | 7.24465 | 52.60971 | 53.46515 | 0.01 | 1 |
| EURAF | **D1** | -9.846654 | -0.749997 | 37.830126 | 41.69773838 | 0.09 | 9 |
| EURAF | **D2** | -9.846654 | -3.35 | 37.830126 | 40.896063 | 0.09 | 9 |
| Austria | **D1** | 9.271 | 17.28983 | 46.019764 | 49.591802 | 0.09 | 9 |

**7.IND**

In each modelled sector, a number of indicators have been produced that serve to quantify the impact of climate change.

See tables the indicators in the following section.

**8. IMP**

The system allows users to visualize both absolute indicator values (labeled as Not defined) and their associated impacts. In R1, the impacts of climate are calculated by comparing future conditions to the present (2018). In R2, the impacts of SSPx are assessed in relation to the findings from R1 (R2-R1). Users can view these impacts as either relative percentages (%), labeled as **RELATIVE** or absolute values, labeled as **ABSOLUTE.** Vulnerability change maps corresponding with Round 2b- Round 2a

**9.YEA**

The value of this field represents the averaged period. In general, the period is one year, from 2015 to 2049, but it same sector additional periods have been simulated, for example urban heat data are available for historical period (from 1981) and quarterly periods.

**10.REF**

In R1 simulations the default reference year is 2018 (in that case the field takes the value Not Defined). For some special indicators the reference period may be other, in which case it is indicated in this field.

**Format:** Geotiff and excel files.

The general pattern for naming data files in DISTENDER is as follows:

***ROU-Round_GRO-Group_SSP-Scenario_GCM-GlobalModel_CST-CCS_DOM-Domain_IND-Indicator_IMP-Impact_YEA-Year_REF-Period***

Each element in the filename encodes specific metadata about the dataset it represents. These elements are separated by underscores for readability and to facilitate parsing via scripts or data management tools. The structure is highly modular and adaptable, accommodating various data types, modeling rounds, and sectors.

- **ROU-Round** refers to the simulation round in which the data was generated. Common values include `R1` (Round 1), `R2a` (Round 2a).

- **GRO-Group** denotes the thematic or sectoral group to which the dataset belongs. Values include `EmisAndAirQuality`, `Urban_heat`, `Health`, `Water`, `AFOLU`, `Risk_vulnerability`, and `Energy`.

- **SSP-Scenario** specifies the Shared Socioeconomic Pathway under which the dataset was generated. Values include the standardized climate policy scenarios: `ssp126`, `ssp245`, `ssp245extra`, `ssp370`, `ssp585`, along with `Historical` (for baseline data) and `Null` (for data not tied to SSPs).

- **GCM-GlobalModel** refers to the Global Climate Model (GCM) used to drive the climate inputs for the simulation. Recognized values include `EC-EARTH3`, `CAN-ESM5`, `MPI-ESM1-2-HR`, and `Null` (for non-climate-driven data).

- **CST-CCS** identifies the Core Case Study (CCS) to which the data pertains. Examples are `Austria`, `EURAF`, `HUAS`, `Guimaraes`, `CMTo`, and 'Null` (if not tied to a specific location).

- **DOM-Domain** indicates the spatial subregion or modeling domain within the case study. Typical values are `D1`, `D2`, `D3`, or `Null`, accommodating nested modeling strategies or administrative divisions.

- **IND-Indicator** specifies the modeled variable (indicator) contained in the file. This is arguably the most flexible and content-specific field. Examples include `TotalCO_t` (total carbon monoxide in tonnes), `ElectricityConsumption_kWh`, `FloodCost_MEUR`, or `TimberYield_tha`. Naming conventions for indicators may encode both the variable type and its unit, enhancing semantic clarity and enabling unit-aware data parsing.

- **IMP-Impact** denotes whether the data represents an **absolute** or **relative** change, typically in relation to a reference period or baseline. The values `Absolute` and `Relative` are used to differentiate between raw values (e.g., t/ha, €/m²) and percent or difference indicators (e.g., % increase from baseline).

- **YEA-Yea**r represents the temporal stamp of the data. This may be provided as a single year (e.g., `2025`), or with seasonal specification (e.g., `2025-Q1-DJF`, referring to the first quarter or winter season).

- **REF-Period** indicates the **reference period** used for comparison in impact datasets. It may be defined as a simple year range (e.g., `2015-2018`) or with seasonal annotation (e.g., `2015-2018-Q1-DJF`). In some cases, this field is labeled `Null` when no explicit reference period is used.

For further information, please contact the DISTENDER project coordinator at: roberto@fi.upm.es

**TABLES OF INDICATORS (IND) DEFINITION.**

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| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Emissions and Air Quality (filter keyword: emisandairquality)***<br><br>For more information:<br><br>Readme R1 | ghg-co2sc<br>(Total annual emissions of CO2 including short cycle) | ton | Total annual emissions of Carbon Dioxide short cycle per grid cell |
| | ghg-co2sc-kg<br>(Total annual emissions of CO2 including short cycle) | kilogram | Total annual emissions of Carbon Dioxide short cycle per grid cell |
| | ghg-co2excsc<br>(Total annual emissions of CO2 excluding short cycle) | ton | Total annual emissions of Carbon Dioxide excluding short cycle per grid cell |
| | ghg-n2o-kg<br>(Total annual emissions of N2o) | kilogram | Total annual emissions of Nitrous Oxide per grid cell |
| | ghg-ch4-kg<br>(Total annual emissions of CH4) | kilogram | Total annual emissions of Methane per grid cell |
| | ghg-ch4<br>(Total annual emissions of CH4) | ton | Total annual emissions of Methane per grid cell |
| | ghg-co2excsc-kg<br>(Total annual emissions of CO2 excluding short cycle) | kilogram | Total annual emissions of Carbon Dioxide excluding short cycle per grid cell |
| | ghg-n2o<br>(Total annual emissions of N2o) | ton | Total annual emissions of Nitrous Oxide per grid cell |
| | pm25<br>(Concentrations of PM25) | µg.m-3 or % (relative) | Concentrations of Particulate Matter with an aerodynamic diameter of 2.5 µm |
| | pm10<br>(Concentrations of PM10) | µg.m-3 or % (relative) | Concentrations of Particulate Matter with an aerodynamic diameter of 10 µm |
| | no2<br>(Concentrations of NO2) | µg.m-3 or % (relative) | Concentrations of nitrogen dioxide |
| | exceedances-pm25<br>(Number of exceedances of PM2.5) | 0 – no exceedance<br>1 - exceedance to the WHO TV<br>2 - exceedance to both the WHO TV and the AQD LV | Number of exceedances of Particulate Matter with an aerodynamic diameter of 2.5 µm .<br>The exceedances to the annual limit values regulated by the European Air Quality Directive (AQD) (Directive 2008/50/EC – EC,2008)<br>and to the annual target values recommended by the World Health Organization (WHO) Air Quality Guidelines (WHO, 2021) |

| | | | |
|---|---|---|---|
| Readme R2 | exceedances-pm10<br>(Number of exceedances of PM10) | 0 – no exceedance<br>1 - exceedance to the WHO TV<br>2 - exceedance to both the WHO TV and the AQD LV | Number of exceedances of Particulate Matter with an aerodynamic diameter of 10 µm<br>.<br>The exceedances to the annual limit values regulated by the European Air Quality Directive (AQD) (Directive 2008/50/EC – EC,2008)<br>and to the annual target values recommended by the World Health Organization (WHO) Air Quality Guidelines (WHO, 2021) |
| | exceedances-no2<br>(Number of exceedances of NO2) | 0 – no exceedance<br>1 - exceedance to the WHO TV<br>2 - exceedance to both the WHO TV and the AQD LV | Number of exceedances of nitrogen dioxide.<br>The exceedances to the annual limit values regulated by the European Air Quality Directive (AQD) (Directive 2008/50/EC – EC,2008)<br>and to the annual target values recommended by the World Health Organization (WHO) Air Quality Guidelines (WHO, 2021) |
| | epm10<br>(Total annual emissions of PM10) | tons | Total annual emissions of Particulate Matter with aero dynamical diameter of less than 10 µm per grid cell |
| | eco<br>(Total annual emissions of CO) | tons | Total annual emissions of Carbon Monoxide per grid cell |
| | enox<br>(Total annual emissions of NOx) | tons | Total annual emissions of Nitrogen Oxides per grid cell |
| | enmvoc<br>(Total annual emissions of NMVOC) | tons | Total annual emissions of Non-Methane Volatile Organic Compounds per grid cell |
| | epm25<br>(Total annual emissions of PM25) | tons | Total annual emissions of Particulate Matter with aero dynamical diameter of less than 2.5 µm per grid cell |
| | enh3<br>(Total annual emissions of NH3) | tons | Total annual emissions of Ammonia per grid cell |
| | eso2<br>(Total annual emissions of SO2) | tons | Total annual emissions of Sulphur Oxides per grid cell |

| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|

| | | | |
|---|---|---|---|
| ***Urban Heat (filter keyword: urban-heat)***<br><br>Only CMTo and Guimaraes case studies<br><br>For more information:<br><br>Readme R1<br><br>Readme R2 | hotdayshotnights-annually or hotdayshotnights-quarterly | Number | The total annual/seasonal number of days when both minimum and maximum temperatures exceed their respected 95th percentile values for July days. The 95th percentiles are computed using historical data (1981 - 2010) of ERA5-Land, aggregated in the domain under consideration. |
| | summerdays-annually or summerdays-quarterly | Number | The total annual/seasonal number of days when maximum temperature exceeds 25 °C. |
| | heatwavesnumberofdays-annualy or heatwavesnumberofdays-quarterly | Number | Heatwave total days. The total annual/seasonal number of heatwave days. |
| | tmin-annually or tmin-quarterly (Minimum temperature) | ºC | Minimum temperature. The annual/seasonal average value of daily minimum temperatures. |
| | heatwavesnumberofevents-annualy or heatwavesnumberofevents-quarterly (Heatwave frequency) | Number | Heatwave frequency. The total annual/seasonal number of heatwave events. A heatwave is detected when for a period of at least three consecutive days the daily maximum temperature of a grid cell exceeds the historical 90th percentile of maximum temperature for July days (McCarthy et al., 2019). The 90th percentile is computed using historical data (1981 - 2010) of ERA5-Land, aggregated in the domain under consideration. |
| | avg-annually or avg-quarterly (Average temperature) | ºC | Average temperature The annual/seasonal average value of daily average temperatures. |
| | heatwavesduration-annually or heatwavesduration-quarterly | Number | Heatwave duration in days The annual/seasonal average duration of heatwaves. |
| | tmax-annually or tmax-quarterly (Maximum temperature) | ºC | Maximum temperature  The annual/seasonal average value of daily maximum temperatures. |
| | tropicalnights-annualy or tropicalnights-quarterly | Number | Tropical nights (tropicalNights) The total annual/seasonal number of days when minimum temperature exceeds 20 °C. |
| | urbanheatislandintensity-annually or urbanheatislandintensity-quarterly | ºC | Urban Heat Island intensity. The annual/seasonal average value of the difference between the daily minimum temperature of each urban cell and the average minimum temperature of all non-urban cells. This indicator is provided only for urban cells (based on the CORINE Land Cover Product 2018). |

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| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Health and cost*** | cost-morbidity-pm10-brona | € | Cost of prevalence of bronchitis in adults due to PM10 |
| ***(filter keywords: <u>health-airquality</u> <u>Or</u> <u>health-heat</u>)*** | cost-morbidity-no2-bronc | € | Cost of prevalence of bronchitis in children due to NO2 |
| | cost-morbidity-pm10-bronc | € | Cost of prevalence of bronchitis in children due to PM10 |
| | cost-mortality-yll-no2-nat | € | Cost of Years of Life Lost due to NO2 (all-cause natural) |
| | cost-mortality-yll-pm25-nat | € | Cost of Years of Life Lost due to PM2.5 (all-cause natural) |
| | cost-mortality-heat | € | Damage cost associated to the excess mortality due to heat |
| | mortality-heat | Number | Number of extra deaths due to heat |
| | mortality-no2-nat | Number | Premature deaths due to NO2 (all-cause natural) |
| | mortality-pm25-nat | Number | Premature deaths due to PM2.5 (all-cause natural) |
| | morbidity-pm10-brona | Years | Prevalence of bronchitis in adults due to PM10 |
| | morbidity-no2-bronc | Years | Prevalence of bronchitis in children due to NO2 |
| | morbidity-pm10-bronc | Years | Prevalence of bronchitis in children due to PM10 |
| For more information: | morbidity-yld-pm10-brona | Years | Years lived with disability due to prevalence of bronchitis in adults due to PM10 |
| <u>Readme R1</u> | morbidity-yld-no2-bronc | Years | Years lived with disability due to prevalence of bronchitis in children due to NO2 |
| <u>Readme R2</u> | morbidity-yld-pm10-bronc | Years | Years lived with disability due to prevalence of bronchitis in children due to PM10 |
| | mortality-yll-no2-nat | Years | Years of Life Lost due to NO2 (all-cause natural) |
| | mortality-yll-pm25-nat | Years | Years of Life Lost due to PM2.5 (all-cause natural) |

| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Energy and cost*** | cost-natural-gas-elec | € | Annual natural gas cost for electricity |
| | cost-oil-products-elec | € | Annual oil products cost for electricity |

| | | | |
|---|---|---|---|
| ***(filter keyword: energy)*** For more information: Readme R1 Readme R2 | electricity-consumption | kWh/m² | Annual electricity consumption |
| | electricity-cost | € | Annual electricity cost |
| | natural-gas-consumption | kWh/m² | Annual natural gas consumption |
| | natural-gas-cost | € | Annual natural gas cost |
| | oil-products-consumption | kWh/m² | Annual oil products consumption |
| | oil-products-cost | € | Annual oil products cost |
| | total-consumption | kWh/m² | Annual sum of energy consumption |
| | total-cost | € | Annual sum of energy cost |

For water group, in some case studies the indicator identifier includes the name of the watershed to which the data is referenced: Kamp and Enns (Austria), Po (CMTo) and Tagus (EURAF). There are data to catchment and sub-catchment level.

| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| **Water** ***(filter keyword: water)*** For more information: Readme R1 Readme R2 | et (Evapotranspiration) | mm | Actual evapotranspiration. |
| | sw (Soil wáter) | mm | Soil water content of soil profile |
| | etp (Potential evapotranspiration.) | mm | Potential evapotranspiration. |
| | perc (Percolated) | mm | Amount of water percolated out of the soil profile & into the vase dose zone |
| | wateryld (Water yield) | mm | Water yield sum of surface runoff, lateral soil flow, and tile flow |
| | precip (precipitation) | mm | Precipitation falling as rain and snow |
| | infiltration | mm | Infiltration component water balance subcatchment level |
| | recharge | mm | Recharge component water balance subcatchment level |
| | overlnad | mm | Overland component water balance subcatchment level |
| | transpiration | mm | Transpiration component water balance subcatchment level |
| | Runoff | m³/sec | Daily runoff at selected stations (excel files) |

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| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Agroforestry (filter keyword: <u>afolu</u>)***<br><br>For more information:<br><br>[Readme R1]<br><br>[Readme R2] | potatoes<br>(Potato) | t/ha/year | Annual yield of Potato |
| | olivegroves<br>(Olive groves) | t/ha/year | Annual yield of Olive groves |
| | wwheat<br>(Winter Wheat) | t/ha/year | Annual yield of Winter Wheat |
| | sbarley<br>(Spring Barley) | t/ha/year | Annual yield of Spring Barley |
| | wbarley<br>(Winter Barley) | t/ha/year | Annual yield of Winter Barley |
| | maize<br>(Maize) | t/ha/year | Annual yield of Maize |
| | broadleavedforest<br>(Broad-leaved forest) | t/ha/year | Annual growth of timber in Broad-leaved forest |
| | broadleavedforest-seqco2eq<br>(carbon sequestration Broad-leaved forest) | t CO2-eq/ha/year | Annual carbon sequestration of above-ground biomass in Broad-leaved forest |
| | wbeans<br>(Winter Beans) | t/ha/year | Annual yield of Winter Beans |
| | mixedforest<br>(Mixed forest) | t/ha/year | Annual growth of timber in Mixed forest |
| | coniferousforest<br>(Coniferous forest) | t/ha/year | Annual growth of timber in Coniferous forest |
| | fruittrees<br>(Fruit trees and berry plantations) | t/ha/year | Annual yield of Fruit trees and berry plantations |
| | vineyards<br>(Vineyard) | t/ha/year | Annual yield of Vineyards |
| | coniferousforest-seqco2eq<br>(Carbon sequestration Coniferous forest) | t CO2-eq/ha/year | Annual carbon sequestration of above-ground biomass in Coniferous forest |
| | mixedforest-seqco2eq | t CO2-eq/ha/year | Annual carbon sequestration of above-ground biomass in Mixed forest |

| | | | |
|---|---|---|---|
| | (Carbon sequestration Mixed forest) | | |
| | sfieldbean (Spring Field bean) | t/ha/year | Annual yield of Spring Field bean |
| | pastures (Pastures) | t/ha/year | Annual growth of Pastures |
| | agroforestryareas (Agro-forestry areas) | t/ha/year | Annual growth of timber in Agro-forestry areas |
| | wosr (Winter Oilseed rape) | t/ha/year | Annual yield of Winter Oilseed rape |
| | sugarbeet (Sugar beet) | t/ha/year | Annual yield of Sugar beet |
| | agroforestryareas-seqco2eq (Carbon sequestration Agro-forestry areas) | t CO2-eq/ha/year | Annual carbon sequestration of above-ground biomass in Agro-forestry areas |
| | springosr (Spring Oilseed rape) | t/ha/year | Annual yield of Spring Oilseed rape |
| | annualgrass (Annual grass) | t/ha/year | Annual yield of Annual grass |
| | ricefields (Rice fields) | t/ha/year | Annual yield of Rice fields |

| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Economy - Agroforestry (filter keyword: afoul-grossmargins)*** | springosr-gm | €/ha/year | Annual Gross Margin of Spring Oilseed rape |
| | wwheat-gm | €/ha/year | Annual Gross Margin of Winter Wheat |
| | sbarley-gm | €/ha/year | Annual Gross Margin of Spring Barley |
| | wbeans-gm | €/ha/year | Annual Gross Margin of Winter Beans |
| | sfieldbean-gm | €/ha/year | Annual Gross Margin of Spring Field bean |
| | maize-gm | €/ha/year | Annual Gross Margin of Maize |
| | sugarbeet-gm | €/ha/year | Annual Gross Margin of Sugar beet |
| | wbarley-gm | €/ha/year | Annual Gross Margin of Winter Barley |

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|---|---|---|---|
| For more information:<br><br>Readme R1<br><br>Readme R2 | potatoes-gm | €/ha/year | Annual Gross Margin of Potato |
| | fruittrees-gm | €/ha/year | Annual Gross Margin of Fruit trees and berry plantations |
| | pastures-gm | €/ha/year | Annual Gross Margin of Pastures |
| | wosr-gm | €/ha/year | Annual Gross Margin of Winter Oilseed rape |
| | vineyards-gm | €/ha/year | Annual Gross Margin of Vineyards |
| | ricefields-gm | €/ha/year | Annual Gross Margin of Rice fields |
| | olivegroves-gm | €/ha/year | Annual Gross Margin of Olive groves |
| | annualgrass-gm | €/ha/year | Annual Gross Margin of Annual grass |
| | agroforestryareas-gm | €/ha/year | Annual Gross Margin in Agro-forestry areas |
| | gm<br>(gross margin) | €/ha/year | Annual Gross Margin for reference period |

| GROUP (GRO) | INDICATOR (IND) | UNITS | DESCRIPTION |
|---|---|---|---|
| ***Risk & vulnerability***<br><br>For more information:<br><br>Readme R1<br><br>Readme R2 | pm10-av<br>(Vulnerability by PM10) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by PM10 average concentration |
| | no2-av<br>(Vulnerability by NO2) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by NO2 average concentration |
| | pm25-av<br>(Vulnerability by PM2.5) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by PM2.5 average concentration |

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| ***(filter keyword: risk-vulnerability)*** | em-heat<br>(Vulnerability by Excess mortality due to heat) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Excess mortality due to heat |
| | pd-no2<br>(Vulnerability by Premature deaths due to long-term exposure to NO2) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Premature deaths due to long-term exposure to NO2 |
| | wwheat<br>(Vulnerability by Crop yield of winter wheat) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Crop yield of winter wheat |
| | tot-cons<br>(Vulnerability by Total energy consumption) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Total energy consumption |
| | wateryld<br>(Vulnerability by Water yield) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Water yield (indicator for drought) |
| | pd-pm25<br>(Vulnerability by Premature deaths due to long-term exposure to PM2.5) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Premature deaths due to long-term exposure to PM2.5 |

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| | Perc<br>(Vulnerability by Percolation into ground water) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Percolation into ground water |
| | potatoes<br>(Vulnerability by Crop yield of potatoes) | 1. Not vulnerable, negligible impact:<br>2. Not vulnerable, coping;<br>3. Vulnerable, not coping;<br>4. Vulnerable, impossible to cope | Vulnerability by Crop yield of potatoes |
| | coping-capacity | Units: 0-1, where 0 is lowest coping capacity and<br>1 is highest coping capacity | Coping capacity represents the capitals available to deal with impacts. Therefore, coping capacity maps show<br>are area's ability to overcome adverse conditions in the short to medium term (inverse of vulnerability) |
| | capitals-social | 0-1, where 0 is lowest capital and 1 is highest capital | Social capital available. Two indicators were used to representing each capital |
| | capitals-human | 0-1, where 0 is lowest capital and 1 is highest capital | Human capital available. Two indicators were used to representing each capital |
| | capitals-manufactured | 0-1, where 0 is lowest capital and 1 is highest capital | Manufactured capital available. Two indicators were used to representing each capital |
| | capitals-financial | 0-1, where 0 is lowest capital and 1 is highest capital | Financial capital available. Two indicators were used to representing each capital |