**AIDRES**

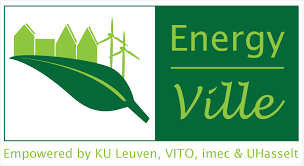
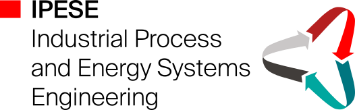
**“**Advancing industrial decarbonization by assessing the future use of renewable energies in industrial processes”

**Methodology used to map the industrial plants in the EU**

(D3.2)

-

Technical description geodatabase



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Unit B.5 — Innovation, research, digitalisation, competitiveness

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**AIDRES**

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**Methodology used to map the industrial plants in the EU**

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Technical description geodatabase

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1. Brief summary: AIDRES project

In recent years many studies have been published aiming to gain a better understanding of potential pathways towards carbon neutrality of various end-use sectors in general and Energy Intensive Industries in particular. But previous studies have to a large extent focused on carbon-neutrality pathways for individual sectors in isolation, based on generic processes assumptions. At the same time the successful transformation of Energy Intensive Industries will play a pivotal role if the EU Green Deal and Fit for 55 (FF55) strategies will prove successful, from an environmental and economic point of view.

The AIDRES project (Advancing industrial decarbonization by assessing the future use of renewable energies in industrial processes), builds a spatially explicit database covering future demands for renewable energy carriers (electricity, gases, liquid fuels and heat) representing future pathways for 6 energy intensive energy industrial sectors (steel, chemical, cement, glass, fertilisers and refineries) in the European Union. More specifically the AIDRES project aims to:

* Identify the magnitude of renewable energy demand for potential technological innovation paths of energy intensive industries towards carbon neutrality and more circularity, at medium (2030) and long term (2050).
* Compare effectiveness, efficiency and investment needs of technological innovation path options.
* Identify potential symbiosis with other sectors.
* Determine where resulting renewable energy demands will be located within the EU.

**Work Package 1 - Systematic and comparative analyses technological innovation paths in energy intensive industrial sectors, and potential symbiosis between industries and other sectors**

This WP is designed to develop models for present and future technologies applicable for the selected energy intensive industries steel, chemical, cement, glass, fertilisers and refineries within the European context. The methodology leverages on the existing (EPOS Project[[1]](#footnote-2)) blueprint models for industries and construct high-level models of energy-intensive processes in the identified sectors. As a subsequent step, possibilities of industrial symbiosis between sectors and in geographical regions identified in WP2 will be evaluated. This approach will generate solutions (technological pathways) for transitioning sectors to more sustainable future operation and be documented for the years 2030 and 2050.

**Work Package 2 - Mapping EU-industries renewable energy demand** focuses on analysing and determining where the future demand for the associated energy inputs is located within the EU. Hence, a mapping of all relevant industrial plants for the considered sectors is carried out and forms the base of this study. Next, supporting industrial parameters will be derived at the level of industrial plants which allow WP1 to calculate energy and feedstock inputs and to identify symbiosis opportunities. The outcome is a geographical database at the level of plant location and aggregated at NUTS3 granularity; it combines information on the type of installations, industrial parameters and current and future energy and material demands, production rates and GHG emissions for the defined model solutions within WP1.

The document describes the methodology used to model and characterize the industrial products in the EU (as part of WP1). Results can be consulted through the Energy and Industry Geography lab on the EU Science Hub, following **this link:**[**https://data.jrc.ec.europa.eu/dataset/14914982-70a9-4d1d-a2fc-cdee4a1d833d**](https://data.jrc.ec.europa.eu/dataset/14914982-70a9-4d1d-a2fc-cdee4a1d833d)

**Work Package 3 - System Prefeasibility Analysis Adequacy and barrier screening** concentrates on the analysis and determination of key system adequacy indicators for the future European power grid. This is achieved by integrating the AIDRES-generated electricity demand figures with existing scenarios on system development, specifically the EU Reference Scenario 2020 and the Ten-Year Network Development Plan (TYNDP) developed by ENTSO-E and ENTSOG. The projected power system, resulting from this integration, is analysed to gain insights into the expected regional self-sufficiency and the principal power system flows and barriers. This work package also offers guidance for further system assessments, thereby facilitating a comprehensive understanding of the potential challenges and opportunities in the transition towards a carbon-neutral power system in Europe.

*“The information and views set out in this report are those of the author(s) and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this study. Neither the Commission nor any person acting on the Commission’s behalf may be held responsible for the use which may be made of the information contained therein.”*

The AIDRES database

T2.1 focuses on the analysis and determination of where the future demand for the associated renewable energy inputs in WP1 would be located in the EU, based on the present location of these industries within the EU. The outcome is deliverable **D3.2 Final geographical database**. To this end WP2 created a **POSTGRESQL database** which we refer to as the AIDRES database.

The database contains the results:

* From WP2, the mapping of current industrial production for six energy intensive sectors using ETS installations as a maximum list of the energy intensive industry in the EU. Current production capacities reported in the AIDRES database are retrieved from public databases, through a desktop inventory and estimates based on emission factors per sector (WP2; see methodology in Clymans et al., 2022)
* From WP1, the future energy requirements, costs and related emissions using the process modeling approach (cit. industrial blueprint methodology in (WP1)

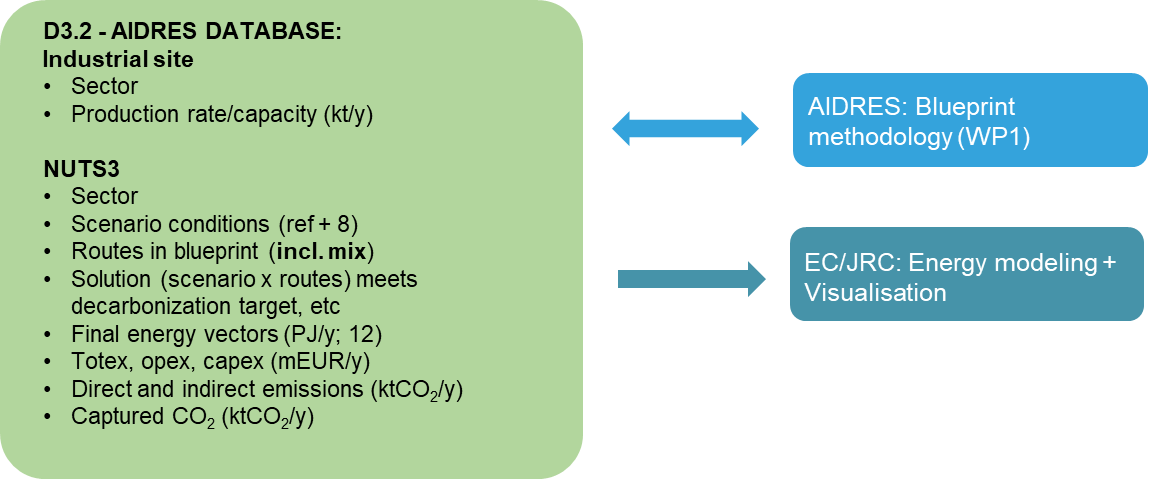


Figure 1 High-level overview of deliverable D3.2 AIDRES Database providing information at the geographical level of industrial site and NUTS3 region, and the relation with WP1 and future use by the European Commission and JRC.

The supporting document provides a technical description of the AIDRES database which is complementary to the metadata.

1. ER-diagram

The AIDRES database is set-up as a relational database. The ER-diagram gives an overview of all the tables, their fields and which fields are linked between tables. Current technology options being the production route(s) at the site.

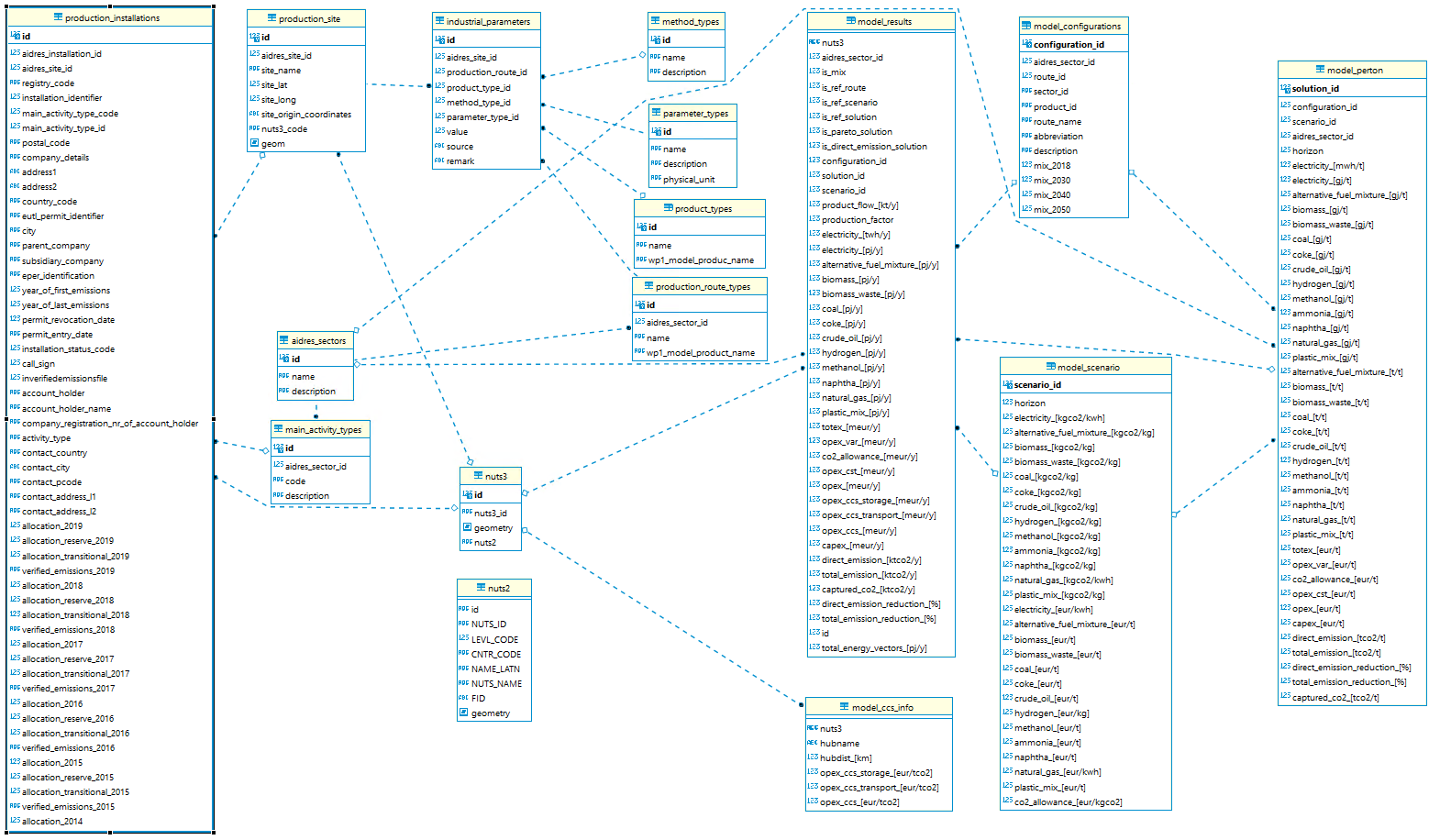


Figure 2 The ER-diagram of the AIDRES database showing the tables and fields per table included and the unique links between tables

1. Database tables and content

The AIDRES database contains 16 tables containing data (production capacities per site, energy requirements per NUTS3 level, key intensity numbers per technology option), background information and geometry information…

Table 1 Tables within the AIDRES database

| Name | Description |
| --- | --- |
| aidres\_sectors | Classification used to identify the six relevant AIDRES sectors e (Steel, Cement, Glass, Refineries, Fertilisers, Chemical). Other production processes are grouped under other. |
| industrial\_parameters | Industrial parameters per production site as derived from the ETS installations database and production route as identified in the blue-print models. The origin and method of data collection is identified per parameter. Aggregated data per production route at the nuts3 level is the basis for the WP1 modeling. |
| main\_activity\_types | Conversion table between ETS activity code and the six relevant AIDRES sectors |
| method\_types | Industrial parameters are derived differently depending on data-availabilty and sector. This table gives an overview of the methods used. |
| nuts3 | Geometry of the NUTS3 regions |
| nuts2 | Geometry of the NUTS2 regions |
| parameter\_types | Description industrial parameters included in the AIDRES project that serve as input to the blue-print models |
| product\_types | Relevant classification on product type to differentiate production route further to the level of product (only applicable for crackers and fertilizers) |
| production\_installations | Installations as included in the ETS database but limited to the six relevant AIDRES sectors and actively reporting on emissions. Enriched with information on main activities according to nace-classification and EPRTR reporting. Geometry included. |
| production\_route\_types | Description of production routes as identified within the AIDRES project. Not all production routes are linked to a blue-print model (e.g. steel processing) |
| production\_sites | Industrial sites, aggregated per sector from the ETS installations database within the AIDRES project, and the level at which industrial parameters are collected. Geometry included. |
| model\_configurations | Description of future technology options per sector and product type used in the blue-print modeling, and there contribution to the AIDRES EU mix production routes for that specific sector and product type. The output table (model\_results) at NUTS3 of the blue print models. |
| model\_ccs\_info | CCS parameters per NUTS3 region for the reference year 2018 used in the blue-print modeling. |
| model\_results | Output of the blue-print models at the level of nuts3 region (currently limited to six sectors) |
| model\_scenario | Scenario settings for the energy requirements and cost of the future technology options |
| model\_perton | Key intensity numbers being energy requirements (TWh, PJ), cost (€) and emissions (CO2) per ton product for all current and future technology options per sector and product type at specific scenario settings. |

* 1. AIDRES\_SECTORS

Description: Classification used to identify the six relevant AIDRES sectors (Steel, Cement, Glass, Refineries, Fertilisers, Chemical). Other production processes are grouped under other.

Table 2 Field catalogue aidres\_sectors

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each relevant AIDRES sector within the | serial4 |
| name | Name of the industrial sector | varchar |
| description | Description of the industries included in the defined AIDRES sector | varchar |

* 1. INDUSTRIAL\_PARAMETERS

Description: Industrial parameters per production site as derived from the ETS installations database (version 2021.03) and production route as identified in the blue-print models. The origin and method of data collection is identified per parameter. Aggregated data per production route at the NUTS3 level is the basis for the WP1 modeling.

Table 3 Field catalogue industrial\_parameters

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each set of industrial parameters included in the AIDRES database | serial4 |
| aidres\_site\_id | Number corresponding to the unique ID for an industrial site included in the AIDRES project (see aidres\_sectors) | int4 |
| production\_route\_id | Number corresponding to the unique ID for a production route included in the aidres project (see production\_route\_types) | int4 |
| product\_type\_id | Number corresponding to the unique ID for a product type included in the aidres project (see product\_types) | int4 |
| method\_type\_id | Number corresponding to the unique ID for a method of data collection type included in the aidres project (see method\_types) | int4 |
| parameter\_type\_id | Number corresponding to the unique ID for a parameter type included in the aidres project (see parameter\_type) | int4 |
| value | Value for the defined parameter type and unique combination of site, product route, product type included in the aidres project | float8 |
| source | Reference to the source of the value which can be a report, a weblink, online database or article. | varchar |
| remark | Notes to support the interpretation of the content | varchar |

* 1. MAIN\_ACITIVITY\_TYPES

Description: Conversion table between ETS activity code and the six relevant AIDRES sectors.

Table 4 Field catalogue main\_acitivity\_types

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for ETS activity code used in aidres db | serial4 |
| aidres\_sector\_id | Number corresponding to unique number for each relevant AIDRES sector (see aidres\_sectors) | int4 |
| code | ETS activity code used in 2019 ETS database | varchar |
| description | Description of the ETS activity code by which ETS installations are classified | varchar |

* 1. METHOD\_TYPES

Description: Industrial parameters are derived differently depending on data-availabilty and sector. This table gives an overview of the methods used.

Table 5 Field catalogue method\_types

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each set of industrial parameters included in the AIDRES database | serial4 |
| name | Method by which industrial parameters are derived from reports or attributed as a default value or based on emission factors | varchar |
| description | Description of the data collection method | varchar |

* 1. NUTS3

Description: Geometry of the NUTS3 regions.

Table 6 Field catalogue NUTS3

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each NUTS3 region (EU27) included in the AIDRES database | int4 |
| nuts3\_id | Unique code for each NUTS3 region (EU27) - (Nomenclature of Territorial Units for Statistics (NUTS) 2021 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | varchar |
| geometry | Type geometry | geometry |
| nuts2 | Unique code for each NUTS2 region (EU27) - (Nomenclature of Territorial Units for Statistics (NUTS) 2013 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | varchar |

* 1. NUTS2

Description: Geometry of the NUTS2 regions.

Table 7 Field catalogue NUTS2

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each NUTS2 region (EU27) included in the AIDRES database, identical to NUTS\_ID | text |
| NUTS\_ID | Unique code for each NUTS2 region (EU27) - (Nomenclature of Territorial Units for Statistics (NUTS) 2013 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | text |
| LEVL\_CODE | Level at which the NUTS2 regions are mapped - (Nomenclature of Territorial Units for Statistics (NUTS) 2013 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | int8 |
| CNTR\_CODE | Country code from which the NUTS2 region is an administrative unit - - (Nomenclature of Territorial Units for Statistics (NUTS) 2013 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | text |
| NAME\_LATIN | Latin name NUTS2 region | text |
| NUTS\_NAME | Official name NUTS2 region | text |
| FID | Indexed ID for each NUTS2 region | text |
| geometry | Type geometry | geometry |

* 1. PARAMETER\_TYPES

Description: Description industrial parameters included in the AIDRES project that serve as input to the blue-print models.

Table 8 Field catalogue parameters\_types

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each industrial parameter included in the AIDRES database | serial4 |
| name | Name of industrial parameter | varchar |
| description | Description of industrial parameter | varchar |
| physical\_unit | Unit in which industrial parameter is expressed | varchar |

* 1. PRODUCT\_TYPES

Description: Relevant classification on product type to differentiate production route further to the level of product (only applicable for crackers and fertilizers).

Table 9 Field catalogue product\_types

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each product type included in the AIDRES database | serial4 |
| name | Name of product produced | varchar |
| Wp1\_model\_product\_name | Name of production route used in WP1 to calculate model results | varchar |

* 1. PRODUCTION\_INSTALLATIONS

Description: Installations as included in the ETS database (version 2021.03) but limited to the six relevant AIDRES sector and actively reporting on emissions. Enriched with information on main activities according to nace-classification and EPRTR reporting. Geometry included.

Table 10 Field catalogue production\_installations

| Field Name | Description | Type |
| --- | --- | --- |
| ID | Unique number for each installation within the AIDRES project based on the ETS installation db | serial4 |
| AIDRES\_INSTALLATION\_ID | Unique identifier for **each installation** within the AIDRES project | int4 |
| AIDRES\_SITE\_ID | Unique identifier for **each site** within the AIDRES project (Site is defined as unique combination of account\_holder\_name; postal\_code; AIDRES\_SECTOR) | int8 |
| REGISTRY\_CODE | Country code for the registration (31 countries; see sheet with List\_RegistryCode) | text |
| INSTALLATION\_IDENTIFIER | Identifier that is allocated per country - so is not a unique code! Needs to be combined with REGISTRY\_CODE | int8 |
| MAIN\_ACTIVITY\_TYPE\_CODE | ETS main activity type as listed in the sheet Activity\_Type\_Code | int8 |
| MAIN\_ACTIVITY\_TYPE\_ID | Unique number for ETS activity code used in AIDRES db | int8 |
| POSTAL\_CODE | Postal code of the installation | text |
| COMPANY\_DETAILS | Company details of the installation | text |
| ADDRESS1 | Address of the installation (not always complete for example missing street number or spread over ADDRESS2) | text |
| ADDRESS2 | Address of the installation (overflow of ADDRESS1) | text |
| COUNTRY\_CODE | Country where the installation is located (abbreviation, see glossary https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Country\_codes) | text |
| EUTL\_PERMIT\_IDENTIFIER | As registered at the national/regional level of country | text |
| CITY | City where the installation is located | text |
| PARENT\_COMPANY | Parent company of the installation (Optional) | text |
| SUBSIDIARY\_COMPANY | Subsidiary company of the installation (Optional) | text |
| EPER\_IDENTIFICATION | Registration in European Pollutant Emission Register (EPER) which is replaced by E-PRTR (https://prtr.eea.europa.eu/#/home) | text |
| YEAR\_OF\_FIRST\_EMISSIONS | Date for first emission data avilability for the installation | int8 |
| YEAR\_OF\_LAST\_EMISSIONS | Date for last emission data avilability for the installation | float8 |
| PERMIT\_REVOCATION\_DATE | Date for revocation permit (no data available after this date = not *active* anymore) | float8 |
| PERMIT\_ENTRY\_DATE | Date of permit registration | text |
| INSTALLATION\_STATUS\_CODE | Code 1 is active, 2 and 3 are not active because permits revoked or not reporting | int8 |
| CALL\_SIGN | Unique identifier for each sign within the CALL project | float8 |
| inVerifiedEmissionsFile | 0/1 to indicate if emissions | int8 |
| ACCOUNT\_HOLDER | (Parent) company account name (local) | text |
| Account\_Holder\_Name | (Parent) company account holder name (general) | text |
| Company\_Registration\_Nr\_of\_Account\_Holder | (Parent) company registration number within the national/regional level | text |
| Activity\_Type | Description ETS main activity type as listed in the sheet Activity\_Type\_Code | text |
| Contact\_Country | Contact country of the company | text |
| Contact\_City | Contact city of the company | text |
| Contact\_PCode | Contact postal code of the company | text |
| Contact\_Address\_L1 | Contact address line 1 of the company | text |
| Contact\_Address\_L2 | Contact address line 2 of the company | text |
| ALLOCATION\_2019 | Unique identifier for each 2019 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2019 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2019 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2019 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2018 | Unique identifier for each 2018 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2018 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2018 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2018 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2017 | Unique identifier for each 2017 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2017 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2017 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2017 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2016 | Unique identifier for each 2016 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2016 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2016 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2016 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2015 | Unique identifier for each 2015 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2015 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2015 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2015 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2014 | Unique identifier for each 2014 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2014 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2014 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2014 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2013 | Unique identifier for each 2013 within the ALLOCATION project | float8 |
| ALLOCATION\_RESERVE\_2013 | Unique identifier for each reserve within the ALLOCATION project | float8 |
| ALLOCATION\_TRANSITIONAL\_2013 | Unique identifier for each transitional within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2013 | Unique identifier for each emissions within the VERIFIED project | text |
| ALLOCATION\_2012 | Unique identifier for each 2012 within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2012 | Unique identifier for each emissions within the VERIFIED project | float8 |
| ALLOCATION\_2011 | Unique identifier for each 2011 within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2011 | Unique identifier for each emissions within the VERIFIED project | float8 |
| ALLOCATION\_2010 | Unique identifier for each 2010 within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2010 | Unique identifier for each emissions within the VERIFIED project | float8 |
| ALLOCATION\_2009 | Unique identifier for each 2009 within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2009 | Unique identifier for each emissions within the VERIFIED project | float8 |
| ALLOCATION2008 | Unique identifier for each 2008 within the ALLOCATION project | float8 |
| VERIFIED\_EMISSIONS\_2008 | Unique identifier for each emissions within the VERIFIED project | float8 |
| ACCOUNT\_CLOSURE | Unique identifier for each closure within the ACCOUNT project | text |
| eprtr\_Installation\_INSPIRE\_ID | Unique identifier of installations (primary key). Based on EPRTR v38 db using 3f2\_ETSIdentifier (installation\_ID or PERMIT\_CODE) | text |
| nameOfFeature | Name of installation. | text |
| eprtr\_main\_Activity\_Code | Installation’s main industrial activity code. | text |
| eprtr\_main\_Activity\_Name | Installation’s main industrial activity name. | text |
| status | Status of the installation (functional, decommissioned etc.). | text |
| pointGeometryLat | Latitude of the installation derived from EPRTR | float8 |
| pointGeometryLon | Longitude of the installation derived from EPRTR | float8 |
| lat\_google | Latitude of the installation ETS based on API GOOGLE using Name, Postal code, Street, City, Country | float8 |
| long\_google | Longitude of the installation ETS based on API GOOGLE using Name, Postal code, Street, City, Country | float8 |
| lat\_combo | WGS84 - Combined lat\_google, and secondly pointGeometryLat if absent or obvious mismatch - manual corrections possible in db | float8 |
| lon\_combo | WGS84 - Combined long\_google, and secondly pointGeometryLong if absent or obvious mismatch - manual corrections possible in db | float8 |
| origin\_coordinates | Origin of the coordinates based on google API, EPRTR or through MANUAL correction | text |
| NACE\_Rev2\_2014 | NACE rev2 code based on matching EUTL and nace (version 2014) (EC) | text |
| NACE\_V2\_Description | Description NACE rev2 based on matching EUTL and nace (version 2014 (EC) | text |
| nuts3\_code | NUTS3 identifier based on NUTS 2021 - version date 01/02/2020 (EC) | text |
| geometry | Type geometry | geometry |

* 1. PRODUCTION\_ROUTE\_TYPES

Description: Description of production routes as identified within the AIDRES project. Not all production routes are linked to a blue-print model (e.g. steel processing)

Table 11 Field catalogue production\_route\_types

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| id | Unique number for each production route type included in the aidres database | serial4 |
| aidres\_sector\_id | Identifier for the industrial sector to which the production route belongs | int4 |
| name | Name of production route | varchar |
| WP1\_model\_product\_name | Name of production route used in WP1 to produce model results | varchar |

* 1. PRODUCTION\_SITE

Description: Industrial sites as aggregated per sector from the ETS installations database within the AIDRES project, and the level at which industrial parameters are collected. Geometry included.

Table 12 Field catalogue production\_site

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| ID | Unique number for each site within the AIDRES project based on production\_installations | serial4 |
| AIDRES\_SITE\_ID | Unique identifier for each site within the AIDRES project (Site is defined as unique combination of account\_holder\_name; postal\_code; AIDRES\_SECTOR) | int4 |
| SITE\_NAME | Country code for the registration (31 countries; see sheet with List\_RegistryCode) | varchar |
| SITE\_LAT | WGS84 - Combined lat\_google, and secondly pointGeometryLat if absent or obvious mismatch - manual corrections possible in db | float8 |
| SITE\_LONG | WGS84 - Combined long\_google, and secondly pointGeometryLong if absent or obvious mismatch - manual corrections possible in db | float8 |
| SITE\_ORIGIN\_COORDINATES | Origin of the coordinates based on google API, EPRTR or through MANUAL correction | varchar |
| nuts3\_code | Unique code for each NUTS3 region (EU27) - (Nomenclature of Territorial Units for Statistics (NUTS) 2021 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | varchar |
| geom | Type geometry | geometry |

* 1. MODEL\_CONFIGURATIONS

Description: Description of the future technology options per sector and product type used in the blue-print modeling, and there contribution to the AIDRES EU mix production routes for that specific sector and product type. the output table (model\_results) at nuts3 of the blue print models.

Table 13 Field catalogue model\_configurations

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| aidres\_sector\_id | Identifier for the industrial sector to which the production route belongs | Int8 |
| configuration\_id | Unique identifier for each technology option within a specific sector and for a specific product type used in the blue-print models within the AIDRES project | int8 |
| route\_id | Unique identifier for each technology option for a specific product type used in the blue-print models within the AIDRES project | int8 |
| sector\_id | Unique number for each relevant AIDRES sector | text |
| product\_id | Unique number for each product type as defined in the blue-print models within the aidres project | text |
| route\_name | Name for each technology option for a specific product type used in the blue-print models within the AIDRES project | text |
| Abbreviation | Abbreviation for each technology option for a specific product type used in the blue-print models within the AIDRES project | text |
| Description | Full description for each technology option for a specific product type used in the blue-print models within the AIDRES project | text |
| mix\_2018 | Fraction of the production route in the energy mix 2018 (reference case) | float8 |
| mix\_2030 | Fraction of the production route in the energy mix 2030 | float8 |
| mix\_2040 | Fraction of the production route in the energy mix 2040 | float8 |
| mix\_2050 | Fraction of the production route in the energy mix 2050 | float8 |

* 1. MODEL\_CCS\_info

Description: CCS parameters per NUTS3 region for the reference year 2018 used in the blue-print modeling.

Table 14 Field catalogue model\_CCS

|  |  |  |
| --- | --- | --- |
| Field Name | Description | Type |
| nuts3 | Unique code for each NUTS3 region (EU27) - (Nomenclature of Territorial Units for Statistics (NUTS) 2021 - Statistical Units - Data set with URI {15ADF8E2-502D-477B-9BE2-99C989EAB0A4}) | int8 |
| HubName | Name of the closest carbon storage hub | float8 |
| HubDist [km] | Distance of the closest carbon storage hub | text |
| opex ccs storage [EUR/tCO2] | carbon storage operation expanditure per ton of CO2 | int8 |
| opex ccs transport [EUR/tCO2] | carbon transport operation expanditure per ton of CO2 | int8 |
| opex ccs [EUR/tCO2] | carbon transport and storage operation expanditure per ton of CO2 | int8 |

* 1. MODEL\_RESULTS

Description: Output of the blue-print models at the level of nuts3 region (currently limited to six sectors).

Table 15 Field catalogue model\_results

| Field Name | Description | Type |
| --- | --- | --- |
| nuts3 | nuts3 region index | text |
| aidres\_sector\_id | industrial sector index | int8 |
| is\_mix | Synthetic (mix) route | int8 |
| is\_ref\_route | Reference route | int8 |
| is\_ref\_scenario | Reference scenario | int8 |
| is\_ref\_solution | Reference solution (route and scenario) | int8 |
| is\_pareto\_solution | Non dominated solutions (per tons scenarios) | int8 |
| is\_direct\_emission\_solution | Solution reaching section specific emission reduction target in 2030 and in 2050 | int8 |
| configuration\_id | Configuration index (specific production routes) | int8 |
| scenario\_id | Scenario index | int8 |
| product\_flow [kt/y] | Annual production | float8 |
| Production factor | Multiplication factor of the product flow in different horizon | float8 |
| Electricity [TWh/y] | Electricity annual energy consumption in TWh per year | float8 |
| Electricity [PJ/y] | Electricity annual energy consumption in PJ pear y | float8 |
| Alternative fuel mixture [PJ/y] | Alternative fuel mixture annual energy consumption | float8 |
| Biomass [PJ/y] | Biomass annual energy consumption | float8 |
| Biomass waste [PJ/y] | Biomass waste annual energy consumption | float8 |
| Coal [PJ/y] | Coal annual energy consumption | float8 |
| Coke [PJ/y] | Coke annual energy consumption | float8 |
| Crude oil [PJ/y] | Crude oil annual energy consumption | float8 |
| Hydrogen [PJ/y] | Hydrogen annual energy consumption | float8 |
| Methanol [PJ/y] | Methanol annual energy consumption | float8 |
| Naphtha [PJ/y] | Naphtha annual energy consumption | float8 |
| Natural gas [PJ/y] | Natural gas annual energy consumption | float8 |
| Plastic mix [PJ/y] | Plastic mix annual energy consumption | float8 |
| totex [mEUR/y] | Annualized total expenditure (TOTEX) | float8 |
| opex var [mEUR/y] | Annual operation expenditure from the energy consumption | float8 |
| CO2 allowance [mEUR/y] | Annual CO2 allowance | float8 |
| opex cst [mEUR/y] | Annual constant operation expenditure (OPEX) | float8 |
| opex [mEUR/y] | Annual operation expenditure (OPEX) | float8 |
| opex ccs storage [mEUR/y] | Annual carbon storage operation expenditure | float8 |
| opex ccs transport [mEUR/y] | Annual carbon transport operation expenditure | float8 |
| opex ccs [mEUR/y] | Annual carbon transport and storage expenditure | float8 |
| capex [mEUR/y] | Annual capital expenditure (CAPEX) | float8 |
| Direct emission [ktCO2/y] | Direct annual CO2 emissions at the plant | float8 |
| Total emission [ktCO2/y] | Direct at the plant and indirect upstream annual CO2 emissions | float8 |
| Captured CO2 [ktCO2/y] | Captured CO2 at the plant annually (production process and fumes) | float8 |
| Direct emission reduction [%] | Direct emission reduction | float8 |
| Total emission reduction [%] | Total emission reduction | float8 |
| Total energy vectors [PJ/y] | Total annual energy consumption which is the sum of all reported energy vectors (Electricity, Alternative fuel mixture, Biomass, etc) | float8 |

* 1. MODEL\_SCENARIO

Description: Scenario settings for the energy requirements and cost of the future technology options

Table 16 Field catalogue model\_scenario

| Field Name | Description | Type |
| --- | --- | --- |
| scenario\_id | Scenario index | int8 |
| Horizon | Time horizon of the scenario | int8 |
| Electricity [kgCO2/kWh] | Electricity indirect upstream emissions | float8 |
| Alternative fuel mixture [kgCO2/kg] | Alternative fuel mixture indirect upstream emissions | float8 |
| Biomass [kgCO2/kg] | Biomass indirect upstream emissions | Int8 |
| Biomass waste [kgCO2/kg] | Biomass waste indirect upstream emissions | int8 |
| Coal [kgCO2/kg] | Coal indirect upstream emissions | float8 |
| Coke [kgCO2/kg] | Coke indirect upstream emissions | float8 |
| Crude oil [kgCO2/kg] | Crude oil indirect upstream emissions | float8 |
| Hydrogen [kgCO2/kg] | Hydrogen indirect upstream emissions | float8 |
| Methanol [kgCO2/kg] | Methanol indirect upstream emissions | float8 |
| Ammonia [kgCO2/kg] | Ammonia indirect upstream emissions | float8 |
| Naphtha [kgCO2/kg] | Naphtha indirect upstream emissions | float8 |
| Natural gas [kgCO2/kWh] | Natural gas indirect upstream emissions | float8 |
| Plastic mix [kgCO2/kg] | Plastic mix indirect upstream emissions | float8 |
| Electricity [EUR/kWh] | Electricity price | float8 |
| Alternative fuel mixture [EUR/t] | Alternative fuel mixture price | float8 |
| Biomass [EUR/t] | Biomass price | int8 |
| Biomass waste [EUR/t] | Biomass waste price | int8 |
| Coal [EUR/t] | Coal price | int8 |
| Coke [EUR/t] | Coke price | int8 |
| Crude oil [EUR/t] | Crude oil price | int8 |
| Hydrogen [EUR/kg] | Hydrogen price | float8 |
| Methanol [EUR/t] | Methanol price | int8 |
| Ammonia [EUR/t] | Ammonia price | int8 |
| Naphtha [EUR/t] | Naphtha price | float8 |
| Natural gas [EUR/kWh] | Natural gas price | float8 |
| Plastic mix [EUR/t] | Plastic mix price | int8 |
| CO2 allowance [EUR/kgCO2] | CO2 allowance | float8 |

* 1. MODEL\_PERTON

Description: Energy and emission intensities used in the blue-print models at the level of production routes.

Table 17 Field catalogue model\_perton

| Field Name | Description | Type |
| --- | --- | --- |
| solution\_id | Solution index (route and scenario) | int8 |
| configuration\_id | Configuration index (specific production routes) | int8 |
| scenario\_id | Scenario index | int8 |
| aidres\_sector\_id | industrial sector index | int8 |
| Horizon | Time horizon of the scenario | int8 |
| Electricity [MWh/t] | Electricity annual energy consumption in TWh per ton of product | float8 |
| Electricity [GJ/t] | Electricity per ton of product energy consumptionin PJ pear y | float8 |
| Alternative fuel mixture [GJ/t] | Alternative fuel mixture per ton of product energy consumption | float8 |
| Biomass [GJ/t] | Biomass per ton of product energy consumption | float8 |
| Biomass waste [GJ/t] | Biomass waste per ton of product energy consumption | float8 |
| Coal [GJ/t] | Coal per ton of product energy consumption | float8 |
| Coke [GJ/t] | Coke per ton of product energy consumption | float8 |
| Crude oil [GJ/t] | Crude oil per ton of product energy consumption | float8 |
| Hydrogen [GJ/t] | Hydrogen per ton of product energy consumption | float8 |
| Methanol [GJ/t] | Methanol per ton of product energy consumption | float8 |
| Ammonia [GJ/t] | Ammonia per ton of product energy consumption | float8 |
| Naphtha [GJ/t] | Naphtha per ton of product energy consumption | float8 |
| Natural gas [GJ/t] | Natural gas per ton of product energy consumption | float8 |
| Plastic mix [GJ/t] | Plastic mix per ton of product energy consumption | float8 |
| Alternative fuel mixture [t/t] | Alternative fuel mixture per ton of product mass consumption | float8 |
| Biomass [t/t] | Biomass per ton of product mass consumption | float8 |
| Biomass waste [t/t] | Biomass waste per ton of product mass consumption | float8 |
| Coal [t/t] | Coal per ton of product mass consumption | float8 |
| Coke [t/t] | Coke per ton of product mass consumption | float8 |
| Crude oil [t/t] | Crude oil per ton of product mass consumption | float8 |
| Hydrogen [t/t] | Hydrogen per ton of product mass consumption | float8 |
| Methanol [t/t] | Methanol per ton of product mass consumption | float8 |
| Ammonia [t/t] | Ammonia per ton of product mass consumption | float8 |
| Naphtha [t/t] | Naphtha per ton of product mass consumption | float8 |
| Natural gas [t/t] | Natural gas per ton of product mass consumption | float8 |
| Plastic mix [t/t] | Plastic mix per ton of product mass consumption | float8 |
| totex [EUR/t] | per ton of product total expanditure (TOTEX) | float8 |
| opex var [EUR/t] | per ton of product operation expanditure from the energy consuption | float8 |
| CO2 allowance [EUR/t] | per ton of product CO2 allowance | float8 |
| opex cst [EUR/t] | per ton of product constant operation expanditure (OPEX) | float8 |
| opex [EUR/t] | per ton of product operation expanditure (OPEX) | float8 |
| capex [EUR/t] | per ton of product capital expanditure (CAPEX) | float8 |
| Direct emission [tCO2/t] | Direct per ton of product CO2 emissions at the plant | float8 |
| Total emission [tCO2/t] | Direct at the plant and indirect upstream per ton of product CO2 emissions | float8 |
| Direct emission reduction [%] | Direct emission reduction | float8 |
| Total emission reduction [%] | Total emission reduction | float8 |
| Captured CO2 [tCO2/t] | Captured CO2 at the plant per ton of product (production process and fumes) | float8 |
| solution\_id | Solution index (route and scenario) | float8 |
| configuration\_id | Configuration index (specific production routes) | float8 |
| scenario\_id | Scenario index | float8 |
| aidres\_sector\_id | industrial sector index | float8 |
| Horizon | Time horizon of the scenario | float8 |

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