EEB
European Environmental Bureau

EU Mine Data Viewer

A Briefing

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The European Environmental Bureau (EEB) is Europe's largest network of environmental citizens' organisations. We bring together over 180 civil society organisations from more than 36 European countries. Together, we work for a better future where people and nature thrive together.

The EEB is an International non-profit association /
Association internationale sans but lucratif (AISBL).
EC register for interest representatives:
Identification number 06798511314-27
BCE identification number: 0415.814.848
RPM Tribunal de l'entreprise francophone de Bruxelles

Published July 2023
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Introduction

The planned transformation of our economy to counter the climate crisis is one of the largest projects of humankind. Like any large projects of this scale, monitoring and tracking becomes critical to the mission.

The absence of a mine database at an EU level has been acknowledged by researchers, academics and civil society for a long time now. Unlike the reporting streams from the Industrial Emissions Directive (IED) and the European Pollutant Transfer and Release Register[1] (EPRTR) that provide information on the emissions of over 50,000 industrial installations across Europe, there is no comprehensive data reporting which shows the multidimensional impact of mining activity on the environment.

However, despite the legal obligations to report industrial emissions data, it is not easy to access plant level data on emissions, raw material use, production, efficiency or to compare performance, levels of ambition in permit conditions and derogations of the industrial facilities in the EU. Providing easy digital access to these analyses based on information already generated by industry is necessary to increase transparency and accountability of industrial activities. To address these issues, the EEB created the Industrial plant data viewer[2] for industrial facilities in 2020 and with this effort to create a mine data viewer we hope to create a similar platform for coal mines in Europe.

A mine does not only extract minerals from the ground. It also impacts the landscape, vegetation and habitats, the soil, surface and ground water bodies during and after its operation and pollutes the air with diffuse dust emissions produced in the extraction phase. In addition, it displaces communities, affects livelihoods and increases risk of conflicts in the region. Coal / lignite mining operations also have a significant negative impact on the water availability and quality in Europe.

> 57% of the ground water bodies linked to the coal mines in Europe are in poor quantitative status and 55% of them in poor chemical status.

In 2020, the EEB published Mind the Gap[3] which highlighted the impact on EU water bodies due to lignite mining and the lack of appropriate water fees to recover the environmental and resource costs of water services to the coal industry, despite the possibility to do so under the article 9 of the water framework directive.

> Over 36% of all the mines and 55% of the lignite mines are in high water stress areas.

As a follow up to the assessment, we decided to build a mine database of the EU's coal mines which provide accurate locational information, important parameters like size, characteristics of coal mined, employment, operator and parent company details, average coal production and water abstraction, indicators related to the impacts on water bodies (chemical and quantitative status), and calculated Greenhouse gas (GHG) emissions (incl. methane) based on annual production data. The database includes lignite mines in operation in Europe (incl. Turkey, Serbia, Kosovo) and provides a metric for the baseline water stress

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[1] https://industry.eea.europa.eu/
[2] https://eipie.eu/projects/ipdv/
[3] https://eeb.org/wp-content/uploads/2020/12/Report-Mind-the-gap.pdf

in the mining regions using the Aqueduct water atlas[4] produced by the World Resources Institute, a well-known tool for global analysis of water risk and stress. Over one third of all the mines and more than half of the lignite mines are in high water stress areas.

Mines impact the environment even after their operation and require remediation operations until the landscape is brought back to the conditions before mining. Such remediation operations often take decades and the impact on soil and water bodies continue till they are fully remediated.

With the EU racing towards decarbonisation, coal mines and regions are part of the territorial just transition plans[5] to ensure the social and economic transformation of Europe into a climate neutral economy. The introduction of the Just Transition Fund in 2021 and the subsequent activities and funding allocations to the regions require close monitoring of post-closure activities in the mining regions.

A mine data base for Europe should cover all the environmental, social, and economic impacts of mines as well as indicators for the progress of just transition plans. This data base is presently restricted to coal mines and covers only a few other environmental parameters. We hope to cover more environmental and just transition progress indicators in the future.

Purpose of the database:

As explained above, the lack of a comprehensive database for coal mines has motivated us to design a data viewer tool. Our aims from the data base were:

- To enhance the existing coal mine databases for Europe and to ensure basic information like name, location, operator and parent company information and an overview of the mine and mineral produced are accurate and available in an open and easy to access format.
- To provide additional information on production, water abstraction, impact of mining on water quality (e.g., derogations from Water Quality Directive, absence of water cost recovery), thereby revealing the scale of hidden subsidies/external costs of lignite mining.
- To integrate environmentally relevant information from other sources into the database to provide a full picture of the impacts of coal mining.
- Visualisation of the data with satellite maps showing mining geography as well as water abstraction, quality and greenhouse gas emissions (from future digging rates / permitted extraction).
- Promote the mine database to partners in the Beyond Fossil Fuels coalition to encourage more data gathering and to Illustrate the potential of such a project in terms of advocacy and public awareness.

[4] https://www.wri.org/applications/aqueduct/water-risk-atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=30&lng=-80&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&threshold&timeScale=annual&year=baseline&zoom=3
[5] https://ec.europa.eu/regional_policy/funding/just-transition-fund/just-transition-platform_en

Data included in the mine data viewer

Field	Information
Unique identifiers	
EEB Mine ID	Unique indicator for every mine
Latitude, Longitude	Coordinates in decimal degrees
Administrative information	
Name of Mine	Name of mine
Alternative name(s)	Alternative name 1
Mineral field name	Alternative name 2
Mining District	Name of mining field/ district- may be the same as the name of the mine
Mine operator	Operating entity/ permit holder of the mine. Could be owner as well.
Owners	Owner/ Parent company of the mine
Company HQs	Headquarters of the Owner/ parent company
State, Province	Third level administrative subdivision where the mine is located
Country	Country where the mine is located- highest administrative subdivision
Miners/Jobs (associated w/ mine)	Employees in the specific mine.
Mineral characteristics	
Mineral type	Lignite, hard coal and coking coal. Sub- bituminous coal is included in hard coal, bituminous coal is included in coking. Anthracite is not included.
Grade of mineral (source: GEM)	Thermal and metallurgical
Calorific value of mineral (MJ/kg)	Energy content of mineral- expressed in MJ/kg
Sulphur content (%)	Sulphur content of coal.
Mine characteristics	
Status of mine	Operating, Proposed, Closed, Cancelled and Retired.

	Closed indicates that the mine was closed before its lifetime. Retired indicates that the mine has been retired after the end of its planned lifetime before this database was created.
Mine Type	Surface and underground
Mining Method	Open pit, Longwall and Mixed
Mine Depth (m)	Mine depth in metres
Mine area (ha)	Approximate size of mine. Mine boundaries are taken from academic research papers based on visual interpretation of satellite images. Data for Polish mines are taken from the Instrat mine database wherever satellite data is not available.
Production related data	
Mining capacity (mass) Million tonnes/ year	Annual mining capacity- maximum production permitted.
Reserves Total (Proven & Probable)- million tonnes	Reserves assessed according to Global Energy Monitor
Year start	Year when mining operations began in the mine. Does not indicate the opening of newer deposits or expansions.
Reported Life of Mine	Expected lifetime of the mine- based on reserves and production data
data reported year	Year of data reported
Mineral mined -Million tonnes	Millions of tonnes of mineral mined in the specific year
Water related data	
Permitted water abstraction volume m3/y	Maximum water abstraction of a mine, as listed in the operating or water permits
Water abstracted- million m3	Water abstracted from the mine in the specific year
Water abstracted per tonne of mineral mined m3/t	Ratio of production to water abstraction for specific year
cost of water paid EUR/ m3	Water fees paid by mine operators in the country
cost of residential water EUR/m3	Average cost of residential water use in the country where the mine is located
Water bodies under Art. 4.4 exemption	Water Framework Directive (WFD) exemptions from achieving good status.

Water body under Art. 4.5 exemption	Water Framework Directive (WFD) exemptions from achieving good status.
Reason for exemption	
GWB thematic identifier	Thematic identifiers for Groundwater bodies overlapping with the mines, from the WISE[6] reporting system, data not available for Western Balkans (only for EU-27).
Quantitative status - Groundwater bodies	Quantitative status of ground water bodies.
Chemical status - Groundwater bodies	Chemical status of Ground water bodies
Baseline Water stress	Baseline water stress in the region. It does not include other stress like drought risk. Data sourced from Aqueduct water risk Atlas of the World Resources Institute.
CO2 and CH4 emissions	
Coal Mine Methane Emissions (Million m3/yr)	Coal mine methane emissions calculated based on depth of mine. Data sourced from Global Energy Monitor. In case of Poland, data is sourced from Instrat mine database.
Carbon Dioxide Emissions (Mt CO2/yr)	Carbon dioxide emissions based on annual production of coal. Methodology based on Global Energy Monitor.

Data Sources:

List of coal mines:

The database was developed during 2021 by partners of the Beyond Fossil Fuels Coalition with contributions from various national organisations. The data has been provided in good faith and has only been correlated with the Global Energy Monitor's (GEM) coal mine tracker[7] and the Polish coal mine database from Instrat.[8] The nature of the crowdsourced process has not allowed EEB to verify all the information provided, but basic information like locational accuracy, operator and parent company details, and the operational status of the mine has been verified wherever independent public sources are available. Users are requested to verify specific details of the mine before using this database for further analysis. The EEB cannot be held accountable for any errors or any damage incurred while using the data. We welcome all users to report any inaccuracies or contribute to missing data by contacting the EEB at jaikrishna.r@eeb.org.

[6] https://www.eea.europa.eu/data-and-maps/data/wise-wfd-4
[7] https://globalenergymonitor.org/projects/global-coal-mine-tracker/
[8] https://energy.instrat.pl/coal_mines_data

Production data:

The total volume of mineral (coal) produced by each mine is not being reported at the EU level and the data for this has been largely contributed by national members of the Beyond Fossil Fuels coalition. As a result, annual production data is available for 28% of the database. The mining capacity, or the maximum annual capacity of the mine, is taken from GEM mine tracker and serves as an approximate number for analysis. In some cases, the GEM mine tracker also provides annual production data. This situation is likely to improve soon with the commission implementing decision 2022/142[9] including the reporting of yearly production volumes of all mining operations starting from 2023.

Employees/Jobs associated with the mine:

Information on jobs associated with the mine are primarily sourced from GEM mine tracker and the Instrat coal mine data base portal for Poland. The EPRTR reporting system provides the number of employees for every production facility, but the aggregation of mining industry under minerals which also include cement, asbestos and ceramic industry makes it difficult to extract data for every coal mine.

Area of the mine:

The mining area polygons are sourced "A global-scale data set of mining areas"[10] by Victor Maus et al. The data files are available in .gpkg format[11] for ease of use in GIS tools. The research data did not provide all the mining areas in Europe and therefore we have used the available data to match with as many mines in the database as possible. The data has been used to calculate the overall area in hectares occupied by the mine.

Permitted and annual water abstraction volumes:

Water consumption and utilisation data of industrial facilities are not easily available at a European level. The water abstraction data for coal mines in Bulgaria, Czechia, Poland and Germany were obtained by the EEB via access to document requests for our report Mind the Gap[12] . Water abstraction volumes for other countries were collected by partners of the Beyond Fossil Fuels coalition as a part of the crowdsourced data collection process.

Cost of water paid:

Data on how much mining operators pay for water should have been easily available if the cost recovery principle (Article 9) was implemented and if records of water abstractions (Article 11.3.e) were reported by member states, according to the Water Framework Directive[13]. Water resource costs paid by individual mining operators are therefore sourced from the water tariffs applicable for various water users (residential, industry, agriculture, mining) in the regions where the mines are located. We have been able to get data for Germany, Czechia, Romania, Poland and Bulgaria and Hungary in this database.

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[9] OJ L 33, 4.2.2006, p. 1. Commission Implementing decision (EU) 2022/142 of 31 January 2022

[10] Citation: Maus, V., Giljum, S., Gutschlhofer, J. et al. A global-scale data set of mining areas. Sci Data 7, 289 (2020). https://doi.org/10.1038/s41597-020-00624-w.

[11] https://store.pangaea.de/Publications/Maus-etal_2020/Global_mining.zip

[12] https://eeb.org/library/mind-the-gap-report/

[13] OJ L 32, 22.12.2000, p. 1., https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2000:327:TOC

Cost of domestic use water:

The cost of domestic use water (including drinking and wastewater) is sourced form EurEau at member state level. EurEau's 2021 report "Europe Water in Figures[14]" provides average domestic water use cost for most countries. For the UK, 2017 water prices have been sourced from the report "International comparisons of water sector performance[15]" available on the Water UK portal. For Germany, data has been gathered from DESTATIS[16] for drinking water and wastewater and then summed up for the total cost of domestic water use.

Water quality data and exemptions under the Water Framework Directive.

Water quality data is available in the spatial data sets[17] of water bodies reported under the Water Framework Directive's River basin management plans (WFD- RBMP). These data sets are updated for every RBMP cycle and the latest data available is from 2016. It includes the ecological and chemical status of surface water bodies and the quantitative and chemical status of groundwater bodies. The WFD requires all surface and groundwater bodies in Europe to be ranked for their chemical status (pollutants, Priority hazardous substances and other chemicals, linked to Environmental quality standards directive), ecological status (for surface water-determined by the monitoring of biological quality elements) and quantitative status (for groundwater, determined by level and volume of water) into high, good, bad and unknown status.

After the second round RBMP's in 2016, More than half of Europe's water bodies[18] are under exemptions. Two thirds of Europe's surface water bodies and one quarter of groundwater bodies are not in good status[19]. Nearly half of the surface water bodies are not in good ecological status[20] and more than half are not in good chemical status[21].

Exemptions from achieving good status:

Article 4(4)-4(7) WFD lists how and under which conditions Member States may deviate from certain objectives set in Article 4(1) which legally binds the Member States to prevent deterioration and to achieve good status of all water bodies.

Article 4(4) allows for an extension of the deadline after 2015, Article 4(5) allows for less stringent objectives to be applied. Article 4(6) allows for temporary deterioration due to natural causes or force majeure. Article 4(7) allows for deterioration of the status or failure to achieve good status as the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater.

Attributing the poor quality of surface waters to coal mines is not possible without an analysis of the types of pollutants and a method for source apportionment. On the other hand, groundwater body

[14]https://www.eureau.org/resources/publications/eureau-publications/5824-europe-s-water-in-figures-2021/file
[15]https://www.water.org.uk/wp-content/uploads/2018/12/GWI-International-sector-performance-comparisons.pdf
[16]https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Umwelt/Wasserwirtschaft/Tabellen/tw-07-entgelt-trinkwasserversorgung-tarifgeb-nach-tariftypen-2017-2019-land-bund.html
[17] https://www.eea.europa.eu/data-and-maps/data/wise-wfd-4
[18] https://environment.ec.europa.eu/topics/water/water-framework-directive_en
[19] https://www.eea.europa.eu/publications/drivers-of-and-pressures-arising
[20]https://water.europa.eu/freshwater/data-maps-and-tools/water-framework-directive-surface-water-data-products/surface-water-ecological-status
[21]https://water.europa.eu/freshwater/data-maps-and-tools/water-framework-directive-surface-water-data-products/surface-water-chemical-status

status can be linked to local pollution. Since exemptions are provided for water bodies and not for mines, the RBMP's do not provide the detailed information on which industrial facility had caused the poor chemical or quantitative status of the ground water bodies in the region. Therefore, there is no data on water body exemptions specific to a mine in this database.

Instead, the quantitative and chemical status of groundwater bodies in and around the coal mines are shown for correlation. The groundwater body (GWB) thematic identifier is used as a unique identifier of GWB's and a simple overlapping with a GIS[22] tool is used to identify the GWB's in and around the mining areas. Quantitative and chemical status of GWB's is provided for each GWB and are usually represented as good, poor or unknown status.

Our assumptions on the impact of coal mining on ground water bodies and the GIS analysis indicating the poor ground water body status in areas near the coal mines are corroborated by the nature of application of exemptions in the second RBMP's.

In the mining regions of Germany, Czechia and Poland exemptions from achieving good status are granted for many water bodies. In Germany and Poland, all active lignite mines impact groundwater bodies to such an extent that exemptions have been applied. In the Polish part of Oder, the Bełchatów and Turów lignite mines alone are reason for groundwater area of 2752 km^2 to be in poor status and exempted under Article 4(5) due to 'technical feasibility'.[23] In the German part of Elbe and Oder, a groundwater area of 5727 km^2 is under Article 4(5) exemptions due to poor quantitative and/or poor chemical status because of lignite mining[24]. To know more about the exemptions of water bodies because of coal mines, please refer to EEB's report "When the exception becomes the rule[25]".

Baseline Water stress:

The Aqueduct water atlas[26] (version 3, 2019) is a well-known tool for global analysis of water risk and stress. The tool developed by World Resources Institute provides detailed data for different kinds of water risks like quantitative, quality and regulatory/ reputational risk.

WRI defines baseline water stress as "the ratio of total water withdrawals to available renewable surface and groundwater supplies. Water withdrawals include domestic, industrial, irrigation, and livestock consumptive and non-consumptive uses. Available renewable water supplies include the impact of upstream consumptive water users and large dams on downstream water availability. Higher values indicate more competition among users".

Within the quantitative risk, baseline water stress is provided as a separate factor and all the regions are provided a risk level of 1-5, in the following schema.

RAW VALUE	RISK CATEGORY	SCORE
< 10%	Low	0-1

[22] Geographical information system tools. We have used QGIS, a free and open-source GIS. https://qgis.org/en/site/
[23] 2 Polish Waters. Draft 3rd cycle RBMP for Oder
[24] River Basin Community Elbe. 3rd cycle RBMP for Elbe.
[25] https://eeb.org/wp-content/uploads/2022/11/Water-briefing_formatted_PC.pdf
[26]https://www.wri.org/applications/aqueduct/water-risk-atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=30&lng=-80&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&threshold&timeScale=annual&year=baseline&zoom=3

10%-20%	Low- Medium	1-2
20-40%	Medium- high	2-3
40-80%	High	3-4
>80% including over withdrawal of annual available water.	Extremely high	4-5
	Arid and low water use	5

This database only uses baseline water stress as an indicator for water stress in the mining regions. When a region is under high baseline water stress equitable distribution of water among the sectors of water users becomes complicated and increases the conflict between human needs and ecological needs. To know more about the WRI's Aqueduct water modelling study, refer to the technical note[27] published by WRI.

Greenhouse gas emissions:

CO_2 emissions are calculated based on the annual production data or the mining capacity data, meaning the maximum permitted production of the mine. We also assume that all the coal mined is eventually used in a combustion process and the CO_2 is therefore released to the air at some point. Calculations are based on the methodology[28] used by Global Energy monitor. It's dependent on the following three variables and the molecular weight ratio of CO_2.

1. Carbon content of coal
2. Carbon oxidation factor
3. Emission factors of coal, in kg CO_2/ TJ

Standard emission factors for the various types of coal are used. For this calculation, we assume that coking coal is bituminous, hard coal is sub- bituminous. Proposed, cancelled, and retired mines are excluded from this assessment. The values are expressed in million tonnes per year.

Coal Mine Methane Emissions:

CH_4 emissions from coal mines are dependent on the depth of the mine. Therefore, this is more valid for deep hard coal mines rather than shallow open cast lignite mines. The calculation is dependent on mine depth and the methodology[29] used by the Global coal mine tracker database involves average estimates of mine depths for various regions of the world. Emissions are expressed in thousands of tonnes per year to facilitate comparison with CO_2 emissions which are million tonnes per year. For hard coal mines in Poland data has been sourced from the Instrat mine database[30] which report the total emissions of coal mine methane for some mines.

[27]https://files.wri.org/d8/s3fs-public/aqueduct-30-updated-decision-relevant-global-water-risk-indicators_1.pdf
[28] https://www.gem.wiki/Estimating_carbon_dioxide_emissions_from_coal_mines
[29] https://www.gem.wiki/Estimating_methane_emissions_from_coal_mines
[30]https://docs.google.com/spreadsheets/d/15MQg9rzPBecd3c0T-RsH0gmVDCd0_6DJMXckzc0vt58/edit#gid=1617995423

Future data additions:

We propose to include information on

1. Water bodies which have been provided an exemption under Article 4(4) or 4(5) of the Water Framework Directive. Data on exemptions linked to a specific mine are not reported in the River Basin Management plans as of now, making it difficult to interpret the reason behind such exemptions.
2. Ecological and Chemical status of surface water bodies: These are reported at a water body level in the WISE reporting framework and is therefore difficult to interpret the source of the pollutant leading to poor chemical and ecological status in a surface water body. Nearly half of the surface water bodies in the EU are not in good ecological status[31] and more than half are not in good chemical status[32].
3. Status of just transition plans including details of funding and status in the coal mining areas. This data is available for Polish mines in the Instrat coal mine data base portal[33] for Poland.

[31] https://water.europa.eu/freshwater/data-maps-and-tools/water-framework-directive-surface-water-data-products/surface-water-ecological-status
[32] https://water.europa.eu/freshwater/data-maps-and-tools/water-framework-directive-surface-water-data-products/surface-water-chemical-status
[33] https://energy.instrat.pl/coal_mines_data

Analysis

Overview:

This data base contains data for 145 coal mines in Europe. 97 of the 145 are lignite mines, 39 mine hard coal and 11 of them mine coking coal which is largely for metallurgical use. There are 120 mines which are in operation, 7 proposed mines and 19 mines which have been closed, retired or cancelled. 74 of the 137 mines are surface mines, 64 are underground and 7 have both underground as well as surface mining. Lignite mines are largely opencast (71%), while hard coal and coking coal mines are usually deep and underground.

The 10 largest mine holding companies:

Top 10 companies with largest number of mines	
Parent company	No of mines
Polska Grupa Górnicza (PGG)	15
Complexul Energetic Oltenia S.A (CEO)	9
Elektroprivreda Srbije (EPS)	7
JSW Group (Jastrzębska Spółka Węglowa SA)	7
TTK (Türkiye Taşkömürü Kurumu)	7
EPH (Energetický a průmyslový holding)	6
Türkiye Kömür İşletmeleri (TKI)	6
Public Power Corporation of Greece S.A	4
Zespoł Elektrowni Patnow-Adamow-Konin (ZE PAK Group)	4
Ostravsko-Karvinske Doly (OKD)	4

Area occupied by the mines:

The data for mining area data is only available for 64 % of the mines (because of data difficulties and underground mines) in this database. Based on this, the total area under mines is about 260,000 hectares (ha). The countries with the largest area under mines are Poland with 125,000 ha followed by Germany at 42,000 ha and Bulgaria with 26,000 ha.

People employed in the mines:

The database has disaggregated data covering almost 60 % of the 230,000[34] people employed by the coal regions in Europe. The top three countries with the largest number of employees in mines are Poland (53712), Turkey (37600) and Bulgaria (9310) closely followed by Germany (8219).

The top 10 mines with largest number of people employed:

[34] https://energy.ec.europa.eu/topics/oil-gas-and-coal/eu-coal-regions/coal-regions-transition_en

Name of mine- Country	Total number of people employed
Mini Maritza Iztok EAD- Bulgaria	7261
Bielszowice - Poland	6129
Murcki-Staszic-Boze Dary - Poland	4383
Belchatow - Poland	4262
Jankowice - Poland	3437
Marcel - Poland	3358
Novaky - Slovakia	3000
Chwalowice - Poland	2938
Afşin-Elbistan - Turkey	2800
Sobieski - Poland	2626

Baseline water stress:

Over 36% of all the mines are in high water stress areas (extremely high or high baseline water stress) and 55% of all the lignite mines are in high water stress areas. There are no coking coal or hard coal mine in high water stress areas. 27 of the 68 companies have all their mines located in high water stress areas (74% in Turkey). Bulgaria, Kosovo, Germany and Turkey have more than 70% of the mines in high water stress areas. 83% of EPH group's (Energetický a průmyslový holding) mines and 66 % of RWE power's and Polska Grupa Energetyczna (PGE) mines are in high water stress zones. 5 of Poland's 9 lignite mines are in high water stress areas.

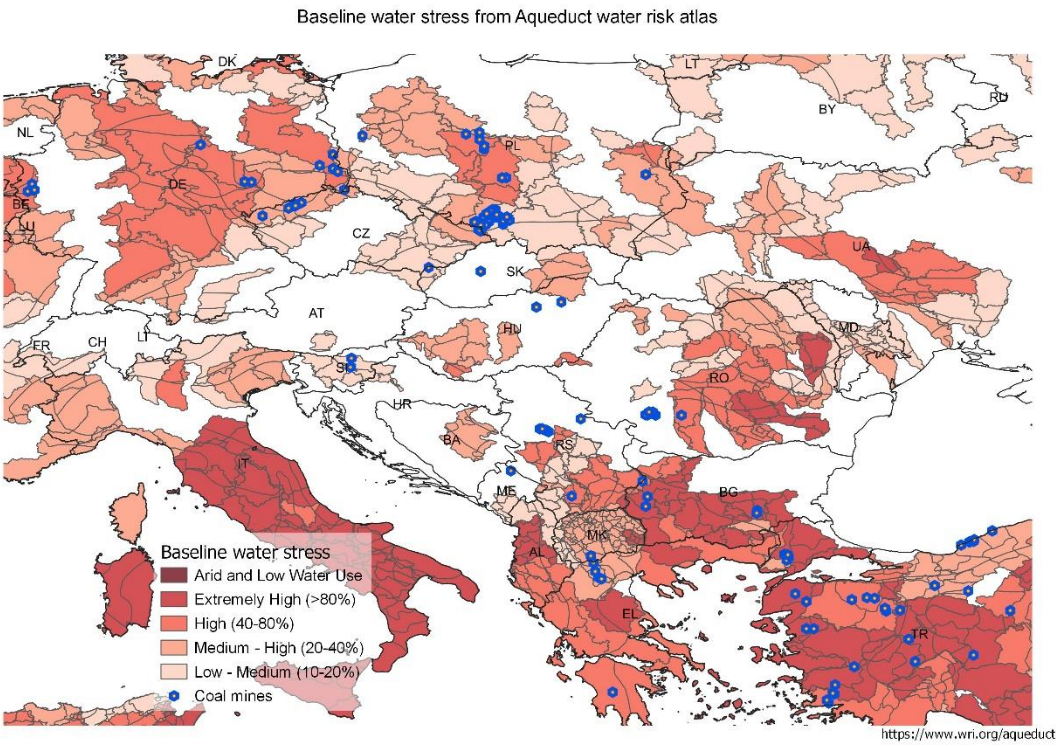

Figure 1: Baseline water stress in Europe and *location of coal mines*

Water quality:

Out of the 146 mines covered in the database, 84 are in the EU and therefore ground water body status data is reported and available in the WISE reporting streams. 76 ground water bodies are linked to the 84 mines and 57% of them are in poor quantitative status and 55% of them in poor chemical status. 57 mines have ground water bodies with poor quantitative status while 63 mines have ground water bodies with poor chemical status. 45 mines have ground water bodies with both poor quantity and chemical status. Note that this data does not explore the causes behind the poor water body status but only provides a correlation between poor water body status and mining regions.

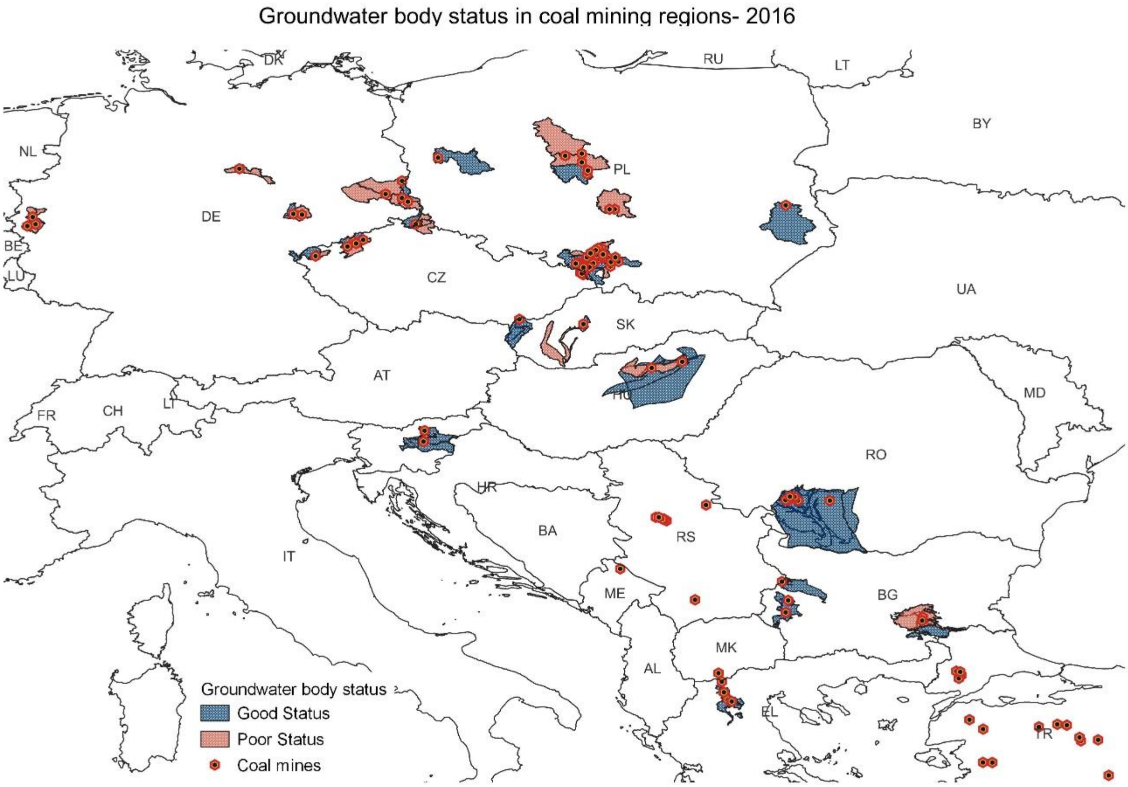

Figure 2: Groundwater body status in coal mining regions, 2016. Data is only available for EU-27.

Water costs:

A comparison of average residential water cost and the cost of water paid by the mining operators is only possible when we have the data on water tariffs for mining operations from the regional authorities. This data is only available for a few countries at this point.

Country	Water cost for mining operations and for own use in EUR/m3	Average cost of residential water in EUR/m3
Germany	0 to 0.05	4.39
Poland	0	2.75
Bulgaria	0.04	1.67
Czechia	0 to 0.11	3.36
Hungary	0.25	2.90

The average residential water cost (including wastewater treatment costs) is 11 to 88 times higher as compared to the cost paid by mining operators.

Greenhouse gas emissions.

The total CO_2 emissions from the mines is 636 million tonnes each year (covering 73% of the mines) and coal mine methane emissions (largely from underground mines) is about 1.47 million tonnes per year (covering 73% of the mines). The top 10 mines (5 in Germany, 4 in Poland and 1 in Turkey) emit almost 40% of all the CO_2 estimated using annual production or maximum mining capacity. 7 out of the top 10 mines with largest coal mine methane emissions are in Poland covering about a third of the total emissions in this data base. This is not surprising because coal mine methane emissions are mostly present in deep underground mines and Poland, as the top producer of coking coal, has many deep underground mines.

Recommendations for future work

Closing Data gaps:

A mine database for Europe, should cover all the environmental, social and economic impacts of mines and indicators for the progress of the just transition plans. There are many data gaps in this database preventing us from fully understanding the impact of mining on the environment.

Annual production and water abstraction are the most important data that are incomplete in this database. The heating value of coal provides a factor of the energy content of coal, which can be used in determining efficiencies. Sulphur content of coal, the sole reason for the toxic SO_2 pollution from the coal power plants, is useful to assess the impact of SO_2 emissions from power plants. Likewise, Mercury content of coal, which is completely missing in this data base is also useful to assess impacts of mercury emissions to air from coal power plants, especially since atmospheric deposition of mercury is one of the main reasons for poor chemical status of many surface water bodies.

Cost paid per unit of water abstracted remains difficult to obtain and prevents us from comparing the costs paid by other water users. It is also an obstacle for assessing the gap in what the polluter is paying and the real cost of environmental damage.

Data on exemptions provided to water bodies, along with the source of the polluting facilities which contributed to the poor status of water bodies would be very useful to identify the precise sources and adopt control measures. However, this data is missing in the RBMP's.

Major data gaps in the database	
Data point	Data gap in %
Annual production data for mines	72
Area occupied by the mine	36
Heating value of the coal mined	57
Sulphur content of the coal mined	90
Annual water abstraction data for mines	90
Cost paid per unit of water abstracted/ drained	57
Exemptions provided to water bodies from achieving good water status for coal mines	100

Lack of EU level reporting on coal as well as non-energy minerals:

There is no legislation covering all aspects (exploration, production and rehabilitation) of mining in the EU. Mining is mostly regulated in the EU member states. Some countries have a specific code for extractive activities, while others have special codes for hydrocarbon extraction or geological research.[35] The MIN-GUIDE[36], a Horizon 2020 funded project to develop a minerals policy guide (excluding energy minerals) had concluded that there is a scarcity of mining data available for the public and that there is no regular statistical reporting on minerals at the EU level[37].

The EU legislations covering parts of the mining activities, like the Mining Waste Directive[38], provide an obligation (article 18) to report information related to events affecting the stability of the waste facility or closure reports related to the adverse environmental effects of a mine.

The Industrial Emissions Directive does not include mines as industrial facilities and therefore not included under annex I of the IED.

The total volume of mineral (coal) produced by each mine is not being reported at the EU level and the data for this has been largely contributed by national members of the Beyond Fossil Fuels coalition. As a result, annual production data is available for 28% of the database. The mining capacity, or the maximum annual capacity of the mine, is taken from GEM mine tracker and serves as an approximate number for analysis. In some cases, the GEM mine tracker also provides annual production data. This situation is likely to improve soon with the commission implementing decision 2022/142[39] enhancing the reporting requirements under the EPRTR regulation (EC 166/2006) by including the reporting of yearly production volumes of all mining operations starting from 2023.

The proposal for a revised Industrial emissions portal regulation[40], which is under revision now, also includes reporting of water, energy, and raw materials of all underground and open cast mining (>25 hectares) operations from 2026.

The proposal[41] for the Critical Raw Materials act in 2023 (which does not include energy minerals) has included a reporting and monitoring requirements (article 19 and 20) including EU production capacities at different stages of the value chain. But it's not clear if this reporting will also include facility level production data.

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35 Recommendations on the framework conditions for the extraction of non-energy raw materials in the European Union, 2014, Page 7
36 Minerals Policy Guidance for Europe https://cordis.europa.eu/project/id/689527
37 Taking stock of standardisation and systematisation requirements of EU MS minerals data Deliverable 6.1,Version1.0
38 *OJ L 102, 11.4.2006, p. 15–34, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32006L0021&qid=1687795066902*
39 OJ L 33, 4.2.2006, p. 1. Commission Implementing decision (EU) 2022/142 of 31 January 2022
40 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0157
41 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0160#footnoteref15

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