

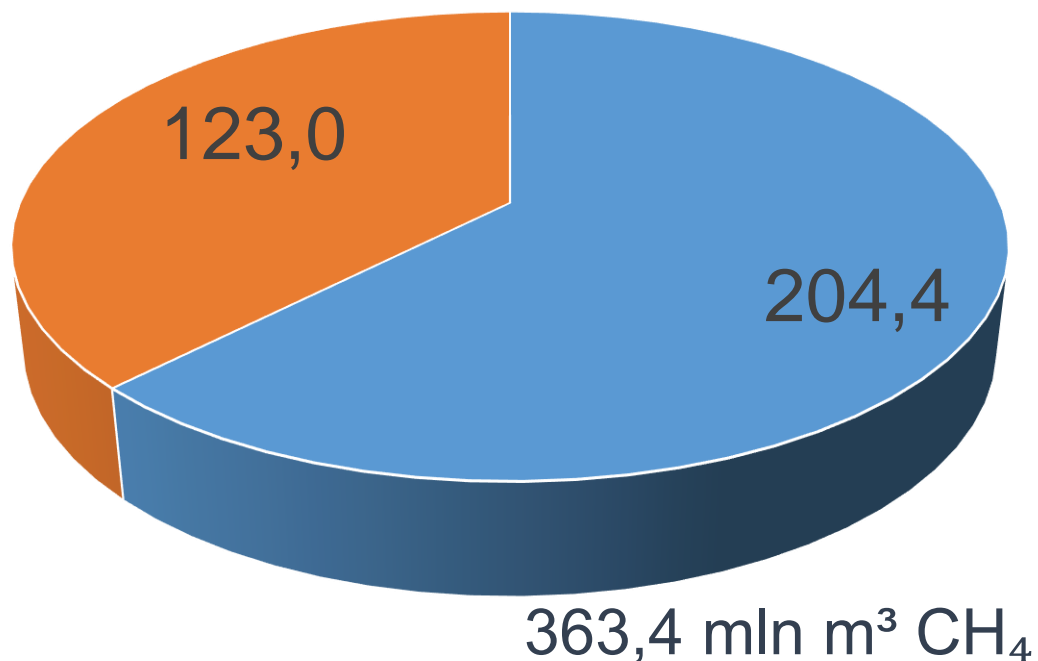


Projects implemented by JSW SA- ICE - CMM cooperation

Artur Badylak
Methane Drainage
and Management Office

The release of methane during exploitation

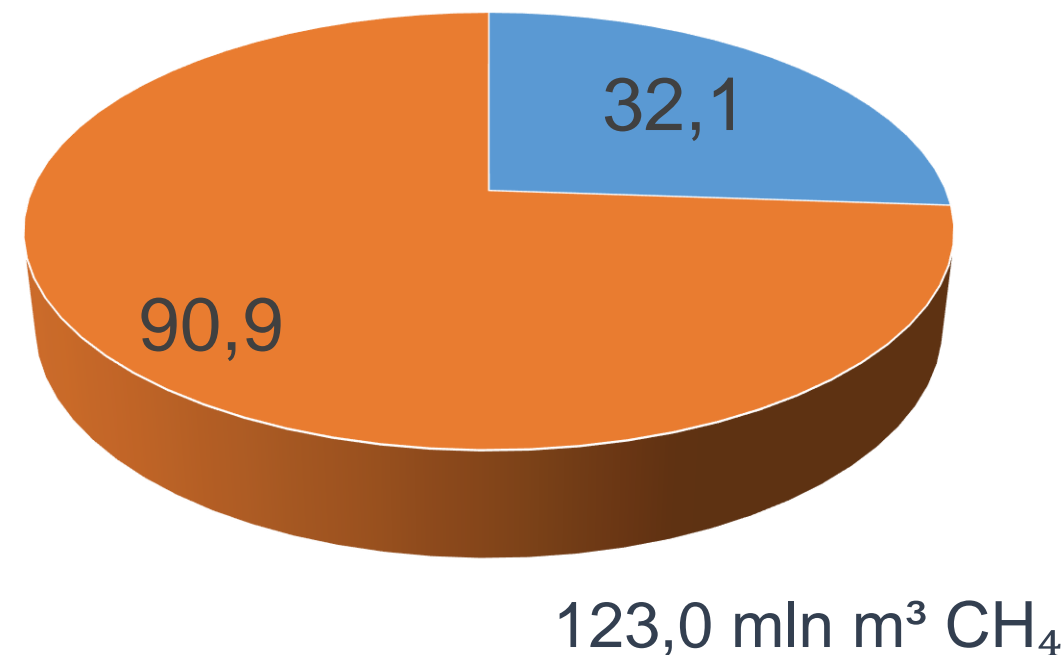
Total amount of methane released in the coal mining process in JSW S.A. mines for 2022 [mln m³ CH₄]



- The amount of methane emitted to the atmosphere through ventilation [mln m³ CH₄]
- The amount of methane captured by methane drainage stations [mln m³ CH₄]

Management of captured methane

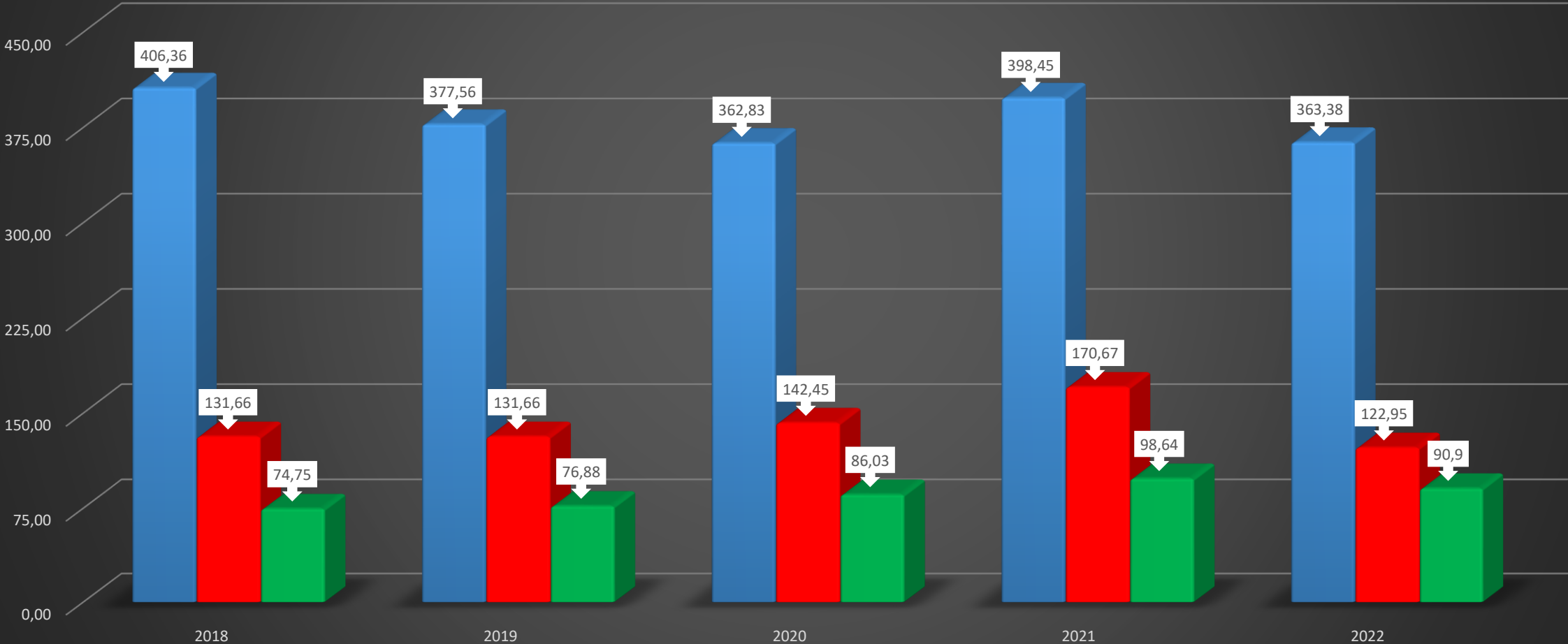
Utilization of managed methane for 2022 [mln m³ CH₄]



- The amount of methane captured in surface methane drainage stations released to the atmosphere [mln m³ CH₄]
- The amount of methane captured in surface methane drainage stations for economic use [mln m³ CH₄]

JSW's methane 2018-2022 [mln m³]

■ Methane capacity ■ Methane drainage ■ Economic use



JSW CG environmental strategy by 2030 and in 2050 perspective



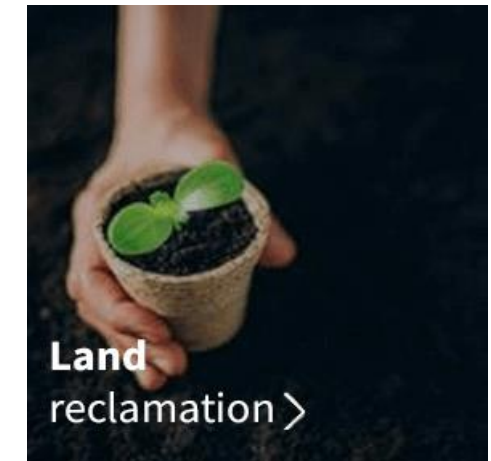
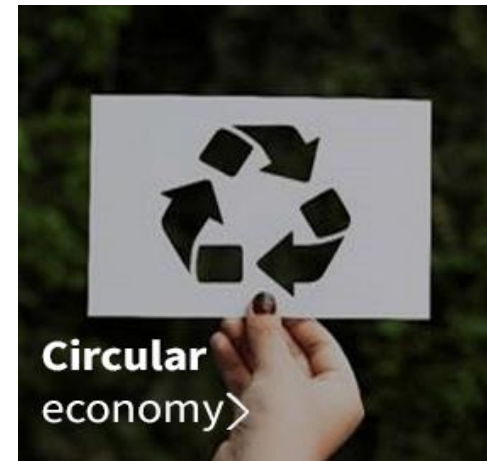
The basis of the Environmental Strategy is to clarify the role of JSW CG in the environmental and energy-climate transformation of Poland and the European Union as a response to changes in the external environment – regulatory, technological and market environment.

Overarching objective: **aiming to achieve climate neutrality by 2050**
Intermediate objective: **reduction of carbon footprint by 30% by 2030 compared to 2018**

72% of JSW CG's carbon footprint is **METHANE** => **Methane Emissions Reduction Programme to 2025**
methane capture of approximately 50% and its economic use of up to 95%

Additional measures to further optimise electricity consumption and improve energy efficiency, develop our own RES capacity and increase the share of 'green energy' in the volume of energy purchased from the market. Planned innovation and development initiatives related to the reduction of ventilation air methane (VAM) emissions

4 key areas of pro-environmental and pro-climate action:



REM Project in Pniówek Coal mine



Universidad de Oviedo

The European Research Fund for Coal and Steel gave the highest rating to the REM project submitted by a consortium of companies: GIG, INiG-PIB, JSW. S.A., PIG-PIB, UNIOVI (Universidad de Oviedo), INSEMEX (Institutul National de Cercetare Dezvoltare Pentru Securitate Minierasi Protectie Antiexploziva Insemex Petrosani). It was recognised for its innovation and its importance for environmental protection.

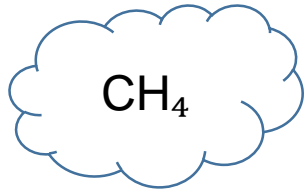
The project budget amounts to € 21 493 154 and the EU co-financing is € 10 746 577.

The grant is the largest single EU grant to the Polish mining industry so far.

REM Project in Pniówek Coal mine

Methane emissions forecast in 2025 – 82 mln m³

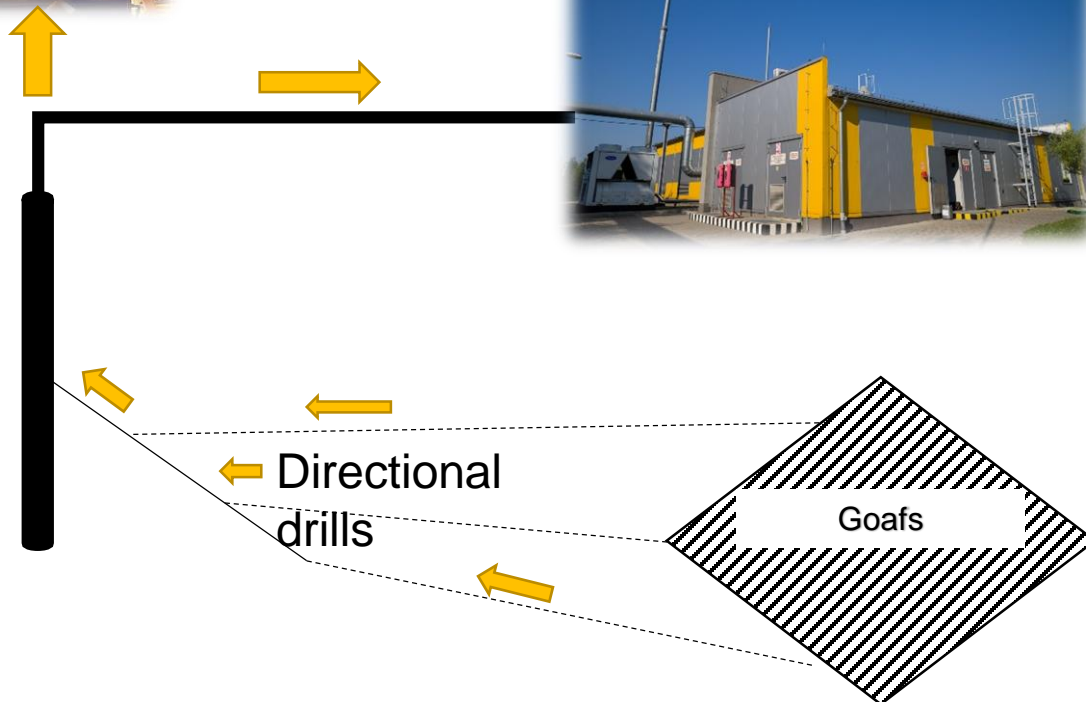
REM project methane emissions forecast in 2025 – 63 mln m³



Methane-reduced demethanation system.
Drainage station



Energy production
60 000 MWh/year



- Building a spatial and flow model of methane accumulation in goafs,
- Identification of methane accumulation locations in the reservoirs - delineation of goaf areas,
- Directional drilling to extract methane from selected goafs,
- Sealing post-mining goafs,
- Analysis of methane emissions into ventilation air and atmosphere,
- Concept, design and construction of methane drainage installation with reduced methane content,
- Production of electrical energy and heat in specially designed gas engines

Jastrzębska Spółka Węglowa S.A. has submitted a request to the President of the State Mining Authority for approval to deviate from the requirements of the Regulation of the Minister of Energy of 23 November 2016 on detailed requirements for the conduct of underground mining plants with regard to:

- § 350(3)(1) - i.e. vacuum generating equipment in the methane drainage station shall be stopped when the concentration of methane in the collective methane pipeline is less than 20%;
- § 350(4)(1) - i.e. in the event of a failure of a device that automatically shuts down the methane drainage station when the methane concentration in the methane pipeline falls to less than 20%, operation of methane drainage station is permitted if the methane concentration in the methane pipeline is not less than 30%.

31 January 2023 The President of the Higher Mining Authority has given his consent to the waiver.

This approval is valid until 25 January 2028. Basic conditions for the application of the waiver:

- Methane concentration measurement and negative pressure measurement in the pipelines of methane drainage station and on the levels included in the visualization system,
- Remote-controlled gate valves in methane pipelines,
- Possibility of connecting a drainage hole or a dam as approved by the Methane, Gas and Rockburst Hazards Recognition and Mitigation Team.

EUROPEAN MINING IN THE GREEN AND DIGITAL ECONOMY ERA

A project under the Horizon Europe - Framework Programme for Research and Innovation (2021-2027) with a global scope. The aim of the project is to develop technological and methodological solutions for the sustainable and innovative development of the mining industry.

- Project budget – €13 840 490
 - Grant – €11 963 526
- GIG and JSW S.A. budget – €1 130 988
 - GIG and JSW S.A. grant – € 962 309

The project will involve a consortium of 22 units (including 2 from Poland):

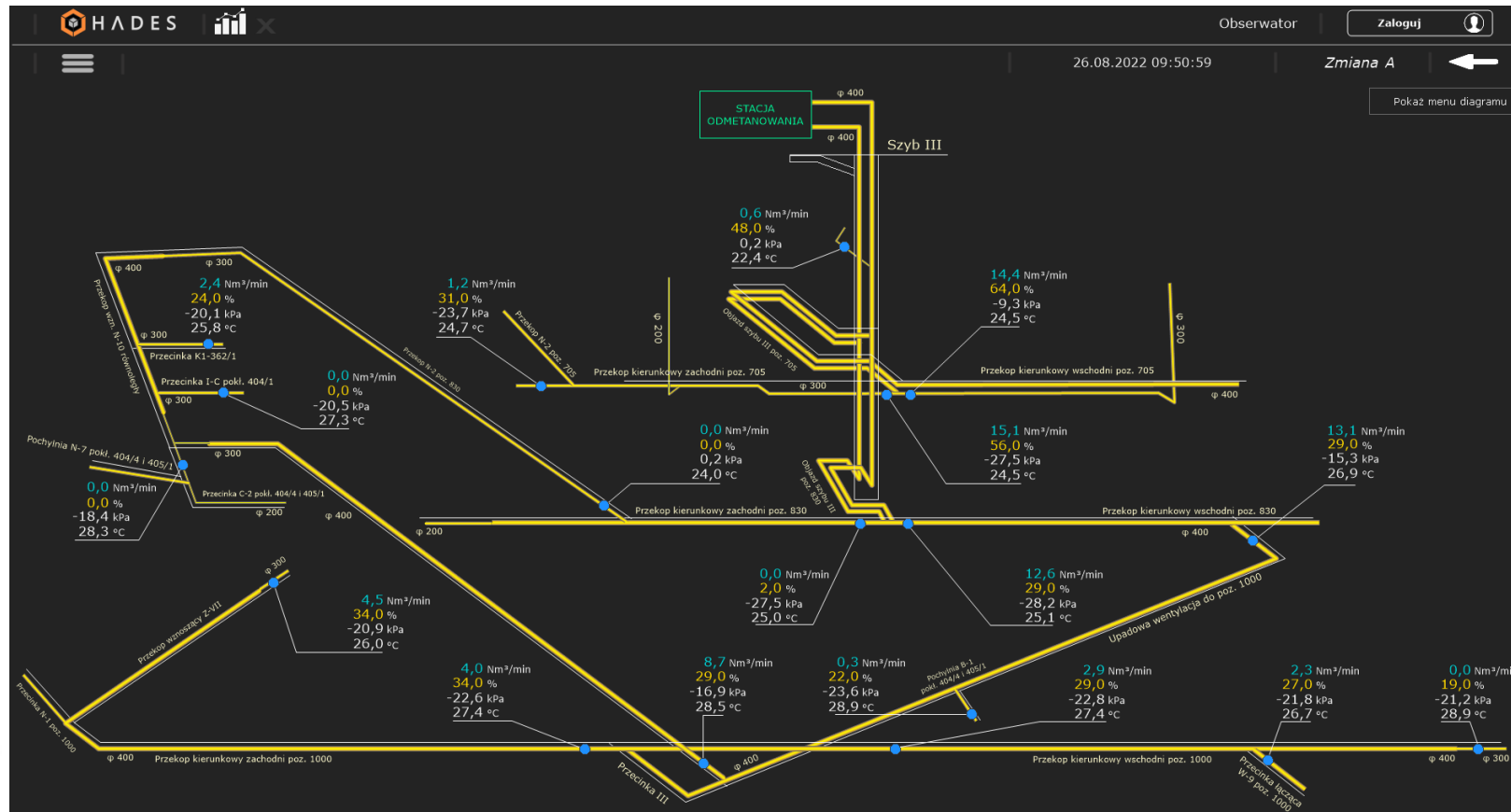
- INSTITUTO TECNOLOGICO DE ARAGON (ES)
- CORE KENTRO KAINOTOMIAS AMKE (EL)
- INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS (EL)
- FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (DE)
- **GŁÓWNY INSTYTUT GÓRNICWA (PL)**
- DIMOKRITIO PANEPISTIMIO THRAKIS (EL)
- TAMPEREEN KORKEAKOULUSAATIO SR (FI)
- ARISTOTELIO PANEPISTIMIO THESSALONIKIS (EL)
- UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG (ZA)
- SUBTERRA INGENIERIA SL (ES)
- AURORA GEO LP (EL)
- LIBRA AI TECHNOLOGIES PRIVATE IDIOTIKI KEFALAIOUCHIKI ETAIREIA (EL)
- STRATAGEM ENERGY LTD (CY)
- TERRADUE SRL (IT)
- DARES TECHNOLOGY SL (ES)
- DIGITALTWIN TECHNOLOGY GMBH (DE)
- IOTA STIFTUNG (DE)
- TAPOJARVI OY (FI)
- THARSIS MINING SOCIEDAD LIMITADA (ES)
- TERNA MAG SA (EL)
- **JASTRZĘBSKA SPÓŁKA WĘGLOWA SA (PL)**
- ETICAS RESEARCH AND INNOVATION (ES)



Mining companies participating in the programme:

- La Parilla mine, located in the province of Caracas (Spain) - an open pit mine extracting about 2,700 tonnes of **tungsten** and 500 tonnes of **tin** per year;
- TERNAMAG - mine located in the northern part of the island of Evia (Greece) extracting **magnesite** and **magnesia**;
- Kemi deep mine and Siilinjärvi open pit mine located in Finland; Kemi supplies **chromite** while Siilinjärvi is the only **phosphate** mine in Western Europe;
- The THARSIS group's mines are the only Spanish mines with 100% Andalusian capital, and are involved in the mining of **copper, silver, gold** and **cobalt**;
- SIBANYE-STILLWATER is an international metals mining and processing group based in South Africa, they mine **platinum, palladium** and **rhodium**;
- JSW SA - is one of the largest producers of **coking coal** and **coke**, located in southern Poland.

Polish partners involvement in the project (JSW S.A. and GIG) will focus on the development of an intelligent network to support the optimal methane drainage of hard coal mines. As part of the work, a network concept will be developed covering both hardware needs and the necessary software. The project should conclude with the modernisation of the existing drainage installation to enable it to be controlled from the surface or to operate autonomously based on data from a suitably developed sensor system.



MASTERMINE proposes a structural multilevel change for the mining operations, focusing on the top-down axis of Culture, Strategy and Tactics. The first opening meeting of the project work took place at the end of January 2023 in Seville with representatives from all consortium members.

JSW S.A. and GIG are participating in the modules:

- *METAMINE*- a virtual world will be created for the mine by introducing the concept of mining metaverse, hosting all the technologies, along with Digital Twin and Business Intelligence to provide simulation capabilities and decision support.
- *CYBERMINE*- the objective of this task is to develop plans for the digital transformation of 4.0 mine
- *GREENMINE*- the sustainability of the mine will be enhanced by improving key performance indicators (KPIs) such as energy consumption, air quality and greenhouse gas emissions, water savings and waste valorisation.
- *OURMINE*- creating a project platform to bring communities together by building trust around the sustainability compliance of raw materials and fostering social innovation.



Thank you

For further information visit our website: www.cmm-energy.eu

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SPÓŁKA NOTOWANA NA
 **GPW**

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