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Transition of the coal mining sector

Concept note: principles for consideration during closure of coal mines

Note by the Secretariat

I. Critical factors that impact the success of coal mine closures

1. In recent years, a number of United Nations Economic Commission (ECE) member States have undergone rapid changes in their energy economies. As a result, since reliance upon thermal coal as a primary energy source has diminished, many coal mines and coal-fired power plants have closed. The ECE region is very diverse and the need to have available and fairly priced energy is satisfied in a variety of ways. Thermal coal extraction and use is still prominent in parts of the region and new mines are planned for commissioning in the near future. Metallurgical coal extraction and use is following a different arc and will likely continue to be mined in future decades until suitable substitutes are found for coal in the steelmaking process. Conventional cement manufacturing is dependent on thermal coal for use in the calcining process and while development and implementation of technology that features energy-efficient, low carbon production methods is making progress, adoption of these processes has not yet reached the point where coal use in the cement process has significantly diminished.

2. Clearly, the uneven nature of the energy economies of ECE member States and their uptake of green industrial processes makes it difficult or impossible to forecast a point in time when thermal coal mines are shuttered across the region, and primary energy production will come from alternate sources. Yet, coal mines will inevitably close. Prior planning is crucial for achieving successful outcomes of mine closures. Public safety, management, and preservation of natural resources for future use, are key objectives of mine closure and they are critical prerequisites to sustainable redevelopment of mined lands. Successful results are dependent upon identification of risks and hazards that occur when a coal mine is closed and taking the appropriate corrective actions.

3. Planning and implementation of monitoring and control of pollutants, hazards, and other risks are essential to sustainable redevelopment of mined land. Otherwise local communities will be imperilled, and mined land and other natural resources will be devalued or destroyed. Appropriate actions must be taken to ensure safe and environmentally sound mine closure, including:



(a) Management and remediation of groundwater and surface water drainage systems where needed to ensure ample supply of clean water and preserve water resources;

(b) Prevention of air pollution from fugitive gases such as methane, carbon dioxide and others are critical to local and regional air quality and impacts on the global climate. Gassy mines will require additional actions to ensure the safety of neighbouring communities and that fugitive emissions are controlled. Monitoring, reporting, and verification of potent greenhouse gas (GHG) emissions from coal mines is of vital importance in halting human-induced climate change;

(c) Extinguishing and preventing underground coal fires or those that occur in waste dumps is important because they produce carbon monoxide, particulate matter and other gases which can be especially dangerous if toxic gases migrate into adjacent areas or civil structures;

(d) Monitoring of subsidence of mined lands and prevention of other ground surface movement such as landslides that can occur for many years after mining ceases is an important safety measure. Options for establishing the best use of the land is dependent upon accurately mapping and mitigating the risks and avoiding hazards posed; and

(e) Monitoring and remediation of chemical pollutants that may leach from mine waste dumps and can pollute water or soil is necessary to ensure future sustainable use of mined land.

4. Successful land reclamation hinges on identification of risks and remediation of environmental and other safety hazards. Completion of post-mining reclamation and remediation process is a key precondition for repurposing mined land for future use. These processes must be planned early in the closure process and carefully implemented to provide the highest post-mining value. A good practice is to plan for closure as a mine is being prepared for commissioning.

II. Standards and planning are needed to ensure risk identification, reduction, and hazard mitigation

5. Implementation of risk- and principles-based standards for mine closure ensure that mined lands are safe and can be repurposed for the best use. Using mine closure standards as the basis for planning the inevitable end to active coal extraction is beneficial because the process identifies risks that can be mitigated and hazards that can be avoided while the mine is still active. Further it provides opportunities for mine operators to minimize costs and optimize the value of mined land and associated natural resources.

6. Mine closure standards must address public safety, land stability, mitigation of chemical impacts, environmental reclamation, emissions control, and post-closure land use.

7. These standards must be applied in three operational domains:

(a) **the surface domain** of the mined land which historically has attracted the most attention by the public and in many cases the most rigorous legal treatment. The surface disturbance is often regarded as the face of mining by surrounding communities and therefore needs to be regarded as key to the mining sector maintaining its license to operate;

(b) **the subsurface domain** which may not present hazards or other risks for decades after closure but must be monitored. A mining void is an enduring interface with subterranean geologic processes that can threaten the environment and safety of communities, often does not receive the level of consideration that should occur early in the mine closure process. Consequences of inattention to subsurface processes including subsidence and unintended migration of water and fugitive emissions of methane and other gases are the cause of serious and costly events, some which will continue for decades;

(c) **the legal, regulatory, and financial domain** which provide requisite guidance and enforcement of environmental and other applicable laws within the jurisdiction. The legal and regulatory framework ensures proper treatment of mined land and provides oversight of funds that may be set aside as surety bonds and other sources of finance which can be applied

to land reclamation and environmental remediation. One important step in preparing for mine closure is to determine if the legal and regulatory frameworks need to be strengthened to facilitate and enforce even application of closure standards. Including communities and other stakeholder in robust discussion early in mine planning and the inevitable closure process is critical to sustainable mined land reclamation and repurposing.

8. Specialized expertise is required for application of mine closure standards and to recognize and redress issues and challenges that occur during and after mine closure. Moreover, mining personnel can be trained while employed by the mine operator or retrained as closure plans proceed to provide needed expertise and services, thereby creating jobs that are needed after mines are closed.

III. Mine closure is inevitable and early assessment and preparation is key

9. Foremost in preparation of mine closure is the welfare of people and communities. A more detailed examination of just transition and the issues that impact people and mining communities is provided in the document “Responding to the challenges of a just transition in the United Nations Economic Commission for Europe sustainable energy subprogramme” (ECE/ENERGY/2021/14). The importance of managing the cultural issues in mining communities is addressed in the document “Cultural issues: managing the social aspects of the transition of industries along the coal value chain and coal-dependent regions” (ECE/ENERGY/GE.4/2022/4).

10. Early inventory and assessment of mined land and co-located natural resources, prior to planning for closure will reduce the cost of reclamation and repurposing and will prevent unnecessary destruction and waste of the associated assets.

11. Mapping and classifying natural resources that remain on mined land will contribute to the asset value of mined land and provide options that lead to the suitable repurposing.

12. The United Nations Framework Classification for Resources (UNFC) should be employed as a part of planning and preparation for mine closure to inventory and classify remaining natural resources and potentially recoverable valuable minerals. Natural resources and minerals that may remain and should be accounted for include but are not limited to, water, hydrocarbon gases, industrial minerals, rare earth minerals, and coal. The mine void may be suitable for storage of fluids and other materials or may be employed for other safe and environmentally sound purposes which should be considered while planning mine closure. The Figure illustrates the conceptual process through which mined land is prepared for repurposing and options for resource utilisation are considered after assessment and classification so that sustainable redevelopment can take place.

IV. Recommendations for future work of the Group of Experts on Coal Mine Methane

13. Several organizations, including members of the Group of Experts on Coal Mine Methane and the ECE secretariat, are working or have worked on mine closure standards. The World Bank has undertaken work on mine closure standards and just transition issues over the last several years. Some of this work has been published and additional publications and tools will be forthcoming following peer review. The Group of Experts will be asked to participate in the review but also in providing a forum for discussions that lead to further advancement of standards and development of tools. A small task force has been established and it is recommended that the Group of Experts works with the World Bank in these efforts by:

(a) Expanding the task force that has been formed relative to mine closures and just transitions, and building on the Group’s experience with abandoned mine methane (AMM), to encompass mine closure standards and tools that can be used by countries as they face inevitable coal mine closure;

(b) Working with other organizations to formulate an agenda for a conference that is organized to discuss issues that have arisen after mine closure and ways to incorporate what has been learned into standards and tools. The organizations that should be invited to work with the Group of Experts in addition to the World Bank, are the International Labour Organization (ILO), European Commission's Platform for Coal Regions in Transition, and other relevant organizations within countries that provide oversight for mine closure and just transition.

14. The Group of Experts on Coal Mine Methane should work with the Expert Group on Resource Management to apply UNFC to problems and issues that will be encountered in mined land repurposing and sustainable redevelopment. If any gaps are identified the Groups should work together to close those gaps.

Figure
Conceptual diagram illustrating a process for assessment and classification of mined land and associated resources that can lead to post-mining repurposing and sustainable redevelopment

