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GREEN Action Task Force

Proposal for a project on green growth and the mining sector in the EECCA region

2017 Annual Meeting of the GREEN Action Task Force, Almaty, 26-27 October 2017

This is a draft proposal prepared by the Secretariat for discussion at the 2017 Annual Meeting of the GREEN Action Task Force in Almaty, Kazakhstan. It provides a background on the importance of the mining sector to the EECCA region, justifies the relevance of developing and applying more sustainable approaches to mining in the EECCA region, and presents potential areas of focus and project outputs.

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Purpose of the note

The mining sector has traditionally been important to many EECCA economies for its significant contribution to export earnings and economic growth. The GREEN Action Task Force's Programme of Work for 2017-18 [ENV/EPOC/EAP(2016)4/REV1] envisaged an activity on addressing environmental impacts of mining. The objective of this work aims to assess, and advise on, how mining can fit into a more sustainable paradigm, and be harnessed to support greener growth.

The purpose of this note is to present possible activities that the GREEN Action Task Force can undertake to develop a better understanding of the environmental impacts of mining activity in the countries of the EECCA region and develop tools and approaches to reduce the environmental impact of mining and while enhancing its potential to support green growth. This work will build on existing OECD work, including the OECD Kazakhstan Mining Competitiveness Project and that of other organisations, including UN Environment.

Introduction

The mining sector currently plays an important role in almost all EECCA countries, contributing to export earnings, employment and economic growth. This is evident across a range of indicators. In the International Council of Mines and Metals' (ICMM)[1] 2016 Mining Contribution Index (MCI)[2], which measures the significance of the mining sector's contribution to national economies, three EECCA countries (Uzbekistan, Kyrgyzstan and Tajikistan) rank among the top ten globally, together with two others (Ukraine and Armenia) in the top twenty. In 2015, in the Kyrgyz Republic, Uzbekistan, and Armenia mineral rents constituted 7.5, 4.6 and 3.2% of GDP respectively. In the same year, ores and metal exports contributed about 44, 16 and 12% of total merchandise exports in Armenia, Georgia and Kazakhstan.

However, mining and associated processing and concentrating techniques are linked to significant environmental degradation and impacts on human health. All mining techniques involve depleting finite, non-renewable natural capital, disrupting the environment in the process. Countries in the EECCA region are faced with both the ongoing legacy of environmentally damaging mining practices from the Soviet-era as well as the challenges of developing a modern approach to the mining sector that can minimise environmental and health impacts while maximising social and economic benefits.

Greening the mining sector can be an opportunity to introduce new, environmentally sensitive practices that can positively impact other related areas of the economy, and ensure that the environmental impact of the mining sector is reduced. For countries with large mining sectors, this is vital, and even for countries where the mining sector is less dominant, it provides a channel to introduce more advanced clean technology.

Almost all EECCA countries have unexploited resources which have not been tapped for various reasons, including unfavourable investment environments, insufficient exploration data, and poor electricity and transportation infrastructure. Governments in the region have expressed interest in supporting new mining development. For example, in Kazakhstan, the government has been developing a new mining code based on those of Australia and the United Kingdom, and has been working at attracting new investment (supported by the OECD, through the OECD-Kazakhstan Working Group on the Mining

Competitiveness). Tajikistan's government has pledged to support the development of its minerals sector through a better permitting process, and the establishment of a Geological Information Centre (US International Trade Administration 2015). Armenia has seen strong growth in its mining sector in recent years, and became an Extractive Industries Transparency Initiative (EITI) member in 2017.

As the region and the world are moving towards a greener economic paradigm, it will be essential to develop these natural assets in a way that minimises environmental and human health impacts while supporting positive green spillovers into other parts of the economy. Thus, even for the EECCA countries that do not currently have a substantial mining sector, the findings from this project will be beneficial.

Economic importance of mining in EECCA countries

Though there are wide variances across EECCA countries in terms of the types and quantities of minerals and metals produced, most of the countries in the region are globally significant producers and exporters of specific products of the mining sector.[3]

Kazakhstan is the largest producer of uranium, the second largest producer of chromium, and a significant producer of many other metals. Belarus is the third largest exporter of potash. Armenia was the sixth largest world exporter of molybdenum in 2015. Tajikistan is the second largest producer of antimony and the third largest producer of mercury. Uzbekistan is a globally significant producer in many mining products, including gold, rhenium, titanium, kaolin, and others. Ukraine is a top producer of gallium, rutile, titanium, iron ore, among other things. Even Azerbaijan, whose exports are dominated by crude oil and natural gas, produces a range of minerals and metals including aluminium, iron ore, steel, bromine and iodine, while Turkmenistan is a leading producer of bromine and iodine (United States Geological Survey 2016).

Many EECCA countries also produce coal, both from open pit and underground mines. Kazakhstan and Ukraine are significant coal exporters, while other countries such as Georgia produce it for domestic consumption. All EECCA countries also quarry building materials, which have some environmental impacts, though relatively smaller than most metals extraction.

Countries in the EECCA region are often divided into two groupings – the resource-rich ones (Azerbaijan, Kazakhstan, Turkmenistan, Ukraine and Uzbekistan) and those with lesser natural endowments (Armenia, Belarus, Georgia, Kyrgyz Republic, Moldova and Tajikistan). However, as Table 1 below illustrates, even in the countries which are not traditionally considered to be resource rich, mineral and metals still have an important role in their economies.

Table 1. Key export minerals and metals in EECCA countries

Country	Selected minerals and metals (percentage of national exports)
Armenia	Copper ore (20), copper (4), ferroalloys (3.9), molybdenum (0.4),
Azerbaijan	Gold (0.6), aluminium (0.5)
Belarus	Potassic fertilizer (10), iron and steel (2.9)
Georgia	Copper ore (9.3), ferroalloys (7.3), gold (4.4)
Kazakhstan	Copper (6.2), uranium (5.1) , ferroalloys (3.4), zinc (1.5), chromium ore (0.35)
Kyrgyz Republic	Gold (42)
Moldova	Gypsum and aggregates (0.3)
Tajikistan	Aluminium (30), gold (17), lead ore (6.7), zinc ore (6.6)
Turkmenistan	Sulphur (1)
Ukraine	Iron and steel (21.2), iron ore (5.5)
Uzbekistan	Gold (32), copper (9)

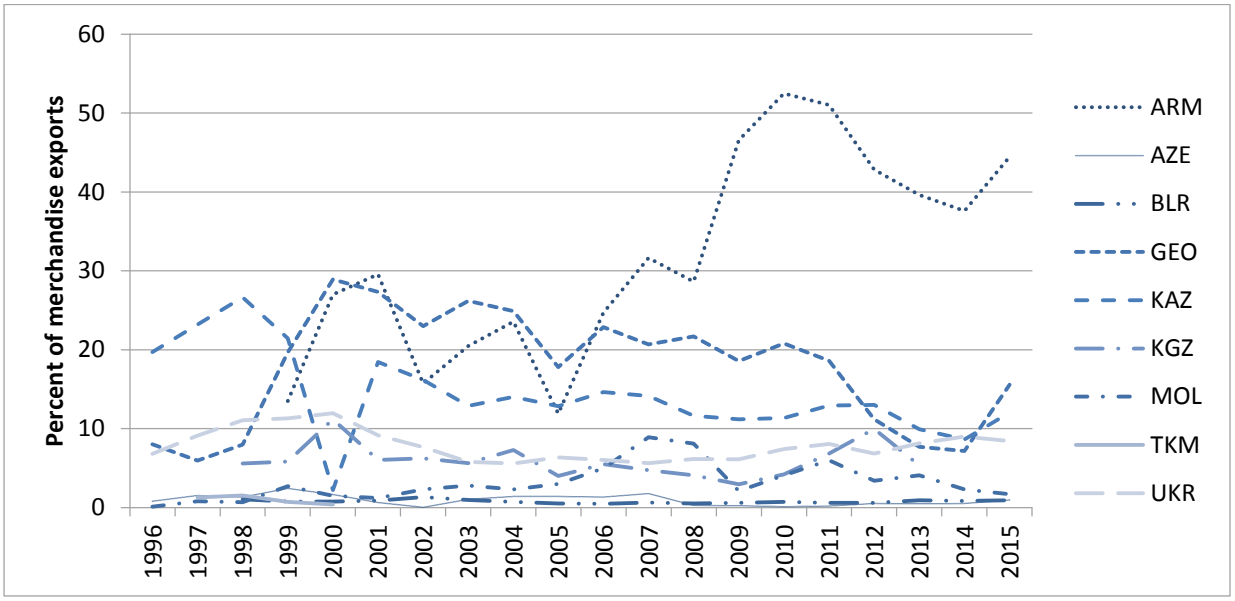
Source: UN Comtrade, Observatory of Economic Complexity, author's own calculations.

As shown in Figures 1 and 2 below, mining accounts for an important share of GDP and products from the mining sector still make up substantial portions of most EECCA country exports. Strong growth in China and other emerging economies from 2000-2012 drove increased demand for almost all minerals and metals. Even while minerals and metals as a share of exports have remained relatively steady (Figure 1), increased commodity prices ensured that its importance to government revenue grew (Figure 2).

Beyond its contributions to export earnings and government revenue, the mining sector is also an important source of employment in many EECCA countries. In Kazakhstan, the mining and quarrying sector employees 277 000 people, amounting to approximately 3% of total employment (KAZ Stat 2017). In the Kyrgyz Republic, the Kumtor Mine is the largest private employer in the country, as well as the largest private sector purchaser of goods and services (Kumtor 2017). In 2014, employment in Armenia's mining sector accounted for 10% of total industrial employment (World Bank 2016). Even when the mining sector it not a significant employer on the national scale, mines are often located in rural and remote areas in which they are regionally important employers.

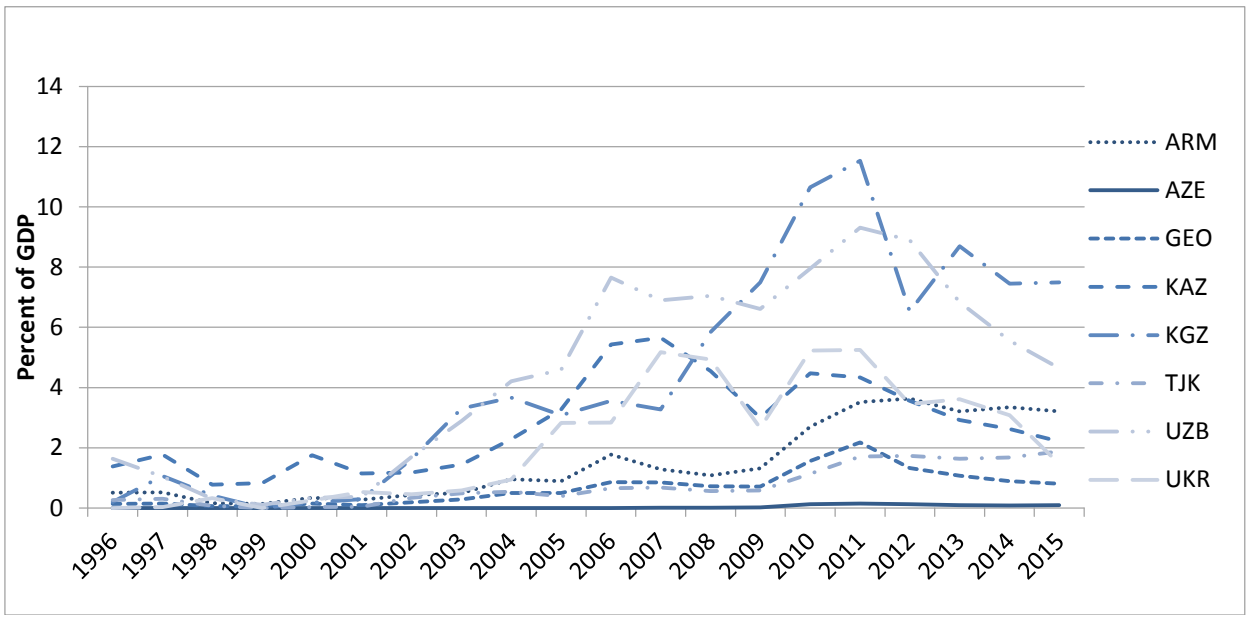
Direct employment from mines only captures one dimension of the overall impact, which in addition to royalty and tax revenue include goods and services purchased locally, the development of related industries, and horizontal linkages such as power and transportation infrastructure. In some cases, mines also support forward linkages to downstream industries as well.

Figure 1. Ores and metals as share merchandise exports for EECCA countries



Note: (1) Uzbekistan and Tajikistan were not included due to insufficient data. (2) Merchandise exports refers to exports of goods only (excludes services) (3) Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, minerals nes); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals).
Source: World Bank Development Indicators database.

Figure 2. Mineral rents as percentage of GDP for selected EECCA countries



Note: (1) Belarus, Moldova and Turkmenistan were not included due to insufficient data. (2) Mineral rents are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.
Source: World Bank Development Indicators database.

Environmental and health impacts of mining in the EECCA region

The environmental and health impacts of mining can take different forms, often resulting in land degradation, habitat destruction for flora and fauna, contamination of surface water, soil and air and lowering or contamination of groundwater resources. There is also the potential for major negative health impacts for those working in mines, as well as the community around the mines themselves, including exposure to heavy metals and other toxic substances through air and surface and groundwater contamination, which can be further concentrated as it moves up trophic levels in the food chain.

There are environmental impacts associated with the mining, beneficiation, and site reclamation phases. They include the impacts of open pit, underground, in-situ and heap leaching mining approaches. While there are common environmental and health impacts, the specifics vary, as do some of the regulatory and technological solutions. All are in use in EECCA countries, with variance depending on the targeted mineral, the nature and concentration of the ore, the size and characteristics of the site, and the expertise and technology level of the mining enterprise (Box 1).

Box 1. Impacts of different mining approaches

Open pit mines are large pits that are open to the air. They are the most common form of mining. Material is excavated and processed, with different techniques depending on the metals or minerals being sought.

Because the economically viable minerals or metals are generally not at the surface, the removal and relocation of substantial quantities of "waste rock" is required. This has direct environmental impacts – habitats for flora and fauna are destroyed, and ore that can contain radioactive elements and asbestos is exposed.

The pits often go below the level of the water table. In order to facilitate deeper mining, water is progressively pumped out. In addition to the risks of water contamination during the mining process, this also leads to issues when the mine is shut down and the water table rises again; left behind mining by-products can contaminate the water and drastically change its pH level, leading to broader damage to surface and underground water.

Similar to open pit mining, **underground mining** also involves the removal of substantial amounts of waste rock and the disturbance of flora and fauna. It can also contribute to changes in the landscape when tunnels collapse, land subsides and sinkholes develop. Water contamination is a common issue, as water is pumped out of mines that are below the water table – just as with open pit mining, if not properly monitored and controlled that water can contaminate surface and groundwater. The same issues exist as well with tailings ponds.

In-situ leaching (ISL) is a mining process which causes minimal surface disturbance. Holes are drilled from the surface; once the mineral deposit is reached, a leaching solution is pumped into the whole to dissolve the minerals. The solution containing the minerals is then pumped to the surface, where the desired minerals are filtered out.

While ISL does not cause dust or airborne radiation pollution and does not disturb flora and fauna on the surface, it does require the treatment of substantial quantities of wastewater. Because the dissolving solution is highly acidic, it can also dissolve toxic and

radioactive elements. The solution needs to be thoroughly treated before being released again in order to avoid contamination of the water table, or must be stored in tailings ponds.

Similar to ISL, **heap leaching** involves dissolving (leaching) valuable minerals from waste rock. However, the ore is first mined and piled on to a large area with a sealant underneath, to prevent leakage. While it avoids the dust release of the pulverising the rock, and potentially the risk of leaking directly into the water table that ISL has, the solution still needs to be properly treated and disposed of, and the heap leaching area itself must be properly sealed, with waste stored in tailings ponds or treated.

Different mineral concentrating and beneficiation processes, including smelting, electrowinning and floatation usually take place at or nearby the mine site and have significant environmental impacts. In order to separate the targeted material from the waste rock, ore is pulverized and mixed with water into a thick solution. Separating minerals and metals can involve introducing other environmentally harmful substances, such as arsenic. Once separated, the mixture of mixed waste rock and water is left in tailings ponds, which can be toxic and radioactive. If not properly stored, tailings can leak into the water table and surrounding environment. Pulverizing the ore creates dust, which leads to air pollution and can also further release the aforementioned elements.

Potential impacts of new technology and approaches

Significant technology shifts are happening in the mining sector. For the most part, these developments have the potential to decrease the environmental and health impact of mines through more efficient resource use, safer mine sites, and better control of pollutants. They also have potential to support the development of linked green industries. Broadly, these changes include: automation, remote control and sensing, processing techniques with higher recovery rates, reprocessing of tailings ponds, better exploration technologies, integration of renewable energy into off-grid mining sites, and more effective techniques to environmental monitoring, mine clean-up and rehabilitation.

While most of these technologies will create opportunities to make mining more sustainable and support the development of green industries, some will also contribute to a decline in direct employment. Automation and remote control generally reduce the need for direct labour on mine sites. The adoption of more advanced technology can also lead to a decline in potential linkages – local suppliers are not always able to construct or service more technologically advanced equipment.

The global shift towards renewable energy and other green technologies will also drive a shift in demand of certain minerals and metals including copper, lithium, aluminium, and rare earth metals.[4]

Regulatory and financial tools to minimise environmental impact and maximise social and economic benefits of mining

In order to equip governments in the EECCA region with concrete and context specific approaches to 1) limit the environmental and health impacts of operational and non-operational mine sites and 2) capitalise on the mining sector's potential to promote green technology uptake, local development, and green economic diversification, the project will potentially examine the following:

Regulatory approaches including good practices around single window and permitting, optimal standards for pollution and post-mining site remediation, and regulatory enforcement and non-compliance responses including administrative and judicial penalties.

Incentives and instruments to encourage greener mining practices including green public and private finance, economic and tax incentives, research and development collaboration between public sector institutions and private sector, and grants for technology development.

Information based instruments including reporting on environmental performance, certification, compliance promotion, environmental management systems, and information provision and sharing.

Social aspects including obtaining the acceptance of impacted communities ("social license" to operate), developing local employment opportunities, and addressing social impacts of mine closure.

Proposed scope of the project

It is proposed that the work under this project focuses on analysing country-specific contexts and sector-wide approaches that can reduce the environmental and health impacts of mining at all stages in the mining life cycle, including exploration, production, and site remediation. For the purposes of the project, mining encompasses minerals and metals, as well as mined energy products (coal and uranium). However, it will not encompass other hydrocarbons such as natural gas or crude oil.

Beyond generating a better understanding of the environmental impact of mining in the region and building a basis for more environmentally sustainable mining going forward, the proposed project will differentiate between regulatory approaches to new projects, existing projects, and mine sites that require rehabilitation.

It is proposed that the project will help provide governments with the tools to attract investment to their mining sector while ensuring that new mines minimize their environmental impact and are in line with international good practices.

The project will result in actionable policy recommendations on policies, laws, and regulations that take into consideration the challenges of time-bound regulation ("grandfathering") for old facilities and site remediation sites that are no longer operational. Considering the lack of regard for environmental impacts that typified mining in the Soviet Union, site remediation will be of particular importance, including to countries that do not currently have a substantial mining sector but may have a legacy of mining.

Proposed outputs and next steps

1. **Output 1:** Development of mining sector profiles of all EECCA countries, including the endowments, analysis of specific environmental and health risks and impacts, and opportunities for green growth related to the mining sector. This will be contextualised and framed within the context of national and sub-national development strategies and policies. The project will look at the environmental impacts of the four most common forms of mining: open pit, underground, in-situ leaching, and heap leaching. It will also examine those four forms across the five

stages of the mining process: exploration, design, development, production, and decommissioning.

2. **Output 2:** Development of a companion report to the country profiles that will include analysis of selected good country- or sector-specific approaches to reducing the environmental and health impacts of mining, both during operation and after mine closure. These will be drawn from OECD and where appropriate EECCA countries. This report will also discuss new technological developments, highlighting the opportunities and potential costs presented by undertaking greener mining practices.
3. **Output 3:** In 2-3 interested countries, support the capacity development of government, investors and mine operators to better manage environmental and health risks, maximise social and economic benefits and enhance local development opportunities related to mining.

Project timeline

Milestone	Proposed target
Discussion and review of project proposal	October 2017
Finalisation of project plan based on feedback from national representatives	December 2017
Identification of interested countries for capacity development	January 2018
Completion of country mining profiles (Output 1)	March 2018
Country-level workshops for capacity development (Output 3)	May 2018
Completion of companion analysis report (Output 2)	July 2018
Finalisation of project report	September 2018
Launch of project report	October 2018

[1] ICMM is a mining and minerals industry association that includes the world's largest mining companies and associations among its 23 members.

[2] The MCI is included in the publication *the Role of Mining in National Economies*. The MCI is scored based on a composite of four different indicators: the total contribution of mining to export earnings, the change in export earnings in the preceding five years, the value of mineral production as a percentage of GDP, and mineral rents as a percentage of GDP. Available at: https://www.icmm.com/website/publications/pdfs/society-and-the-economy/161026_icmm_romine-supplement_third-edition.pdf

[3] Many EECCA countries are also substantial producers of hydrocarbons but in the proposed project gaseous and liquid hydrocarbons will be excluded, because of the very different processes involved in their extraction.

[4] However, examining the impact of this shift may be beyond the scope of the proposed project.