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A strategic approach to selecting policy mechanisms for addressing coal mine methane emissions: A case study on Kazakhstan

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ABSTRACT

Coal production globally is projected to grow in the foreseeable future. Countries with heavy reliance on coal could reduce methane and other emissions through the capture and utilization of coal mine methane (CMM) in the short and medium term, while they pursue structural and long-term economic changes. Several countries have successfully implemented policies to promote CMM capture and utilization; however, some countries still struggle to implement projects. This paper outlines key factors to consider in adapting policies for CMM mitigation. The authors propose an approach for selecting adequate mechanisms for stimulating CMM mitigation that involves reviewing global best practices and categorizing them functionally either as mechanisms needed to improve the underlying conditions or as CMM-specific policies. It is important to understand local policy frameworks and to consider whether it is more feasible to improve underlying policy conditions or to provide targeted incentives as an interim measure.

Using Kazakhstan as a case study, the authors demonstrate how policymakers could assess the overall policy framework to find the most promising options to facilitate CMM projects. Kazakhstan's emissions from underground coal mines have been increasing both in total and per tonne of coal production, while overall production has been declining. CMM mitigation presents an opportunity for the country to reduce its greenhouse gas emissions in the near and medium term, while the government pursues sustainable development goals. Analysis shows that policymakers in Kazakhstan can leverage existing policies to stimulate utilization by extending feed-in tariffs to cover CMM and by developing working methodologies for companies to obtain emission reduction credits from CMM projects.

1. Introduction

Methane emissions from global coal production continued to grow through the last decade. Coal production might not have been growing as rapidly in recent years (IEA, 2015), but integrated assessment models project that global coal production, and associated methane emissions, will continue increasing into the foreseeable future. A study by Höök indicates that the average of model projections shows growth in coal production through 2050 for all emission scenarios, except in B1 scenarios ('local environmental sustainability'), in which coal production grows through 2040 (Höök, 2011). Developing countries, in particular, are expected to continue to rely on coal as a dominant fuel because of their need for a cheap and reliable energy source for social development (IPCC, 2014). In addition, countries are not likely to give up infrastructure in place, such as power plants, until the end of their lifespan, which may take decades. As nations are seeking to reduce reliance on fossil fuels, coal mine methane (CMM) mitigation projects can help reduce emissions from coal in the medium term.

Methane is a potent greenhouse gas, with a global warming potential of 28–36 over 100 years, yet it is the only pollutant that can be used as a source of fuel, making methane mitigation projects potentially cost-effective in coal-producing countries. Utilization of CMM has many benefits, such as reduced greenhouse gas emissions, improved energy intensity, improved mine safety, job creation, and others. CMM projects can help attain these benefits without compromising sustainable development goals, because countries will likely continue to rely on coal for several decades even with long-term plans for low-carbon economies. Methane mitigation will be particularly relevant since methane emissions per tonne are likely to increase as coal is mined deeper and deeper (IPCC, 2010; KazNIIEK, 2010). In an alternative scenario, if countries rapidly switch to renewables, the closing of mines will still require methane management of methane, as gassy mines will continue

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to release methane for some time.

Many policy instruments are available to support CMM projects in their capacity to meet environmental and social goals. Yet quick and effective adoption will require strategic selection of appropriate measures.

Kazakhstan is a member of the Global Methane Initiative (GMI), an international voluntary partnership that promotes the use of policy and industry best practices to reduce methane emissions in several industrial sectors. The GMI works in Kazakhstan to promote strong policies that encourage and enable CMM capture and utilization. Kazakhstan is the world's 10th largest coal producer and is a net coal exporter (EIA, 2015) but ranks as the 6th largest emitter of methane from the coal sector (EPA, 2012), indicating that Kazakhstan's mines are gassy. In this paper, the authors discuss a strategic approach to devising policies for incentivizing CMM mitigation in the country, which can, in turn, be applied in other countries.

2. Analytical framework and methodology

Many countries have experimented with various incentives and policies to encourage recovery and use of CMM. The most common policies and incentives include (adapted from Evans et al., 2009):

1. Institutional frameworks
2. Defined gas property/lease rights and licensing
3. Access to gas and power markets
4. Price of natural gas and electricity
5. Mine safety requirements, adequate technical regulations, and their implementation
6. Feed-in tariffs and obligations
7. Tax incentives
8. Environmental tax regulation and emission trading.

These mechanisms can be classified as either underlying economic/policy conditions or as CMM-specific policies. The underlying conditions are institutional framework, gas property/lease rights and licensing, access to gas and power markets, price of natural gas and electricity, mine safety requirements, and related technical regulation. Favorable underlying policy conditions might enable CMM projects without any CMM-specific policies. On the other hand, these policies can be harder to implement since they typically affect a broader sweep of policies, require involvement of more stakeholders, and need to be addressed in context. For example, providing access to natural gas and power markets requires review of such rights for all relevant industries, such as small electricity generation companies and all natural gas companies.

If the underlying conditions are not adequate to stimulate investment, policymakers can add additional incentives. CMM-specific policies can also be used to temporarily fill in gaps in underlying policy conditions. For example, China incentivized CMM to improve implementation of safety regulations. Policies, such as tax incentives, feed-in tariffs, and environmental regulation usually exist in countries in some form; building on the existing framework and aligning it to support methane mitigation might lead to easier adoption and faster capacity building. For example, a country with a well-functioning system of tax incentives might consider these incentives for stimulating CMM investment, whereas a country with strong environmental policy might consider expanding it for coal. Finally, to get a comprehensive policy one needs to consider implementation under the local conditions and consider how to enhance implementation of existing policies and whether the approach is feasible. Fig. 1 shows a sample policy framework for incentivizing CMM mitigation.

To propose strategic mechanisms for stimulating mitigation of CMM emissions in Kazakhstan, the authors relied on literature research to learn about Kazakhstan's policy and major stakeholders. The authors used statistical data from the International Energy Agency (IEA) and

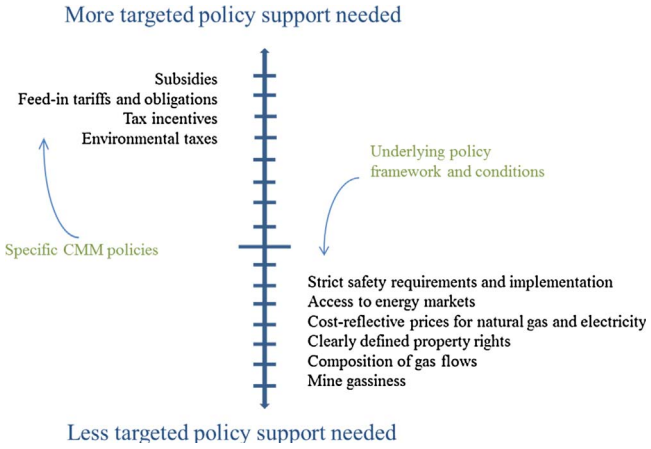

Fig. 1. Policy framework for incentivizing CMM mitigation.
Source: Roshchanka and Evans, 2014.

Kazakhstan's national inventory submissions to the United Nations Framework Convention on Climate Change (UNFCCC). In some instances, the authors used national statistics of Kazakhstan, reviewed laws and reports, and accessed local news articles. The authors supplemented this information with in-country meetings and interviews with representatives from government, companies, and non-governmental organizations. The authors assessed Kazakhstan's overall policy framework affecting CMM utilization to understand what practices are best suited for adoption locally. Information and data collection was conducted under the auspices of GMI coal mine sector activities.

3. Background on Kazakhstan's coal sector and methane emissions

As in many coal-producing countries, Kazakhstan's coal sector represents a large share of domestic energy supply (see Fig. 2). Coal fuels over 80% of the country's electricity, and almost all of the heat supply comes from coal and coal products (IEA, 2015). Total production and export of coal and coal products in Kazakhstan have recently been shrinking, yet the country's domestic consumption has more than doubled over the past decade. Considering that the country is invested in coal production, coal-fired electricity, and district heating, Kazakhstan highlights an example of how countries with coal-fueled infrastructure are not likely to give up coal rapidly. For this reason, CMM mitigation is an important element of climate policy.

Kazakhstan's two major coal basins are Ekibastuz and Karaganda, which produce coal from opencast and underground mines, respectively. Opencast mines in the Ekibastuz region also produce about 90% of the country's coal, and thus, are a significant source of methane emissions. Underground coal mines in Kazakhstan are some of the most gassy in the world and prone to violent gas outbursts. The gas content of the coal averages between 12 and 53 cubic meters (m^3)/tonne, with the average value for sampled mines at 30 m^3/t (KazNIIEK, 2010). However, since Kazakhstan has been commercially extracting coal for over a century, the remaining coal lies deep, in most cases, at depths of over 500 m, and has low permeability. This and the complex geology make mines dangerous and degasification difficult and time-consuming (Baimukhametov et al., 2012). Kazakhstan's major coal producer from underground mines is Arcelor Mittal Temirtau Coal Division, a multinational company with headquarters in Luxembourg. The company operates eight underground mines in the Karaganda region that account for about 15% of the country's total coal output (including opencast mines). Government agencies in Kazakhstan also manage 13 closed mines, which also collect methane. Such mines also present an opportunity for methane utilization projects.

Even though coal production from underground mines has declined,