

The background image shows two coal miners in a dark underground setting. They are wearing hard hats with headlamps. The scene is illuminated by warm, yellowish light from the miners' headlamps and some distant lights, creating a high-contrast, atmospheric environment. The miners are positioned on the right side of the frame, looking towards the left. The overall tone is industrial and somber.

Supporting Transition in Coal Regions

**A Compendium of the World Bank's Experience and
Guidance for Preparing and Managing Future Transitions**

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Acronyms

ALP	Active labor program
AMD	Acid and metalliferous drainage
AMM	Abandoned mine methane
ARC	Appalachian Regional Commission
CCB	Community capacity building
CMM	Coal mine methane
ETIS	Employment Training and Incentive Scheme
FYP	Five-Year Plan
GDP	gross domestic product
GW	Gigawatt
HCMC	Poland Hard Coal Mine Closure Project
HCSM	Poland Hard Coal Social Mitigation Project
IAC	Inter-Agency Commission for Socio-Economic Problems of Coal-Producing Regions
IAP	Implementation Assistance Project
IDDR	Institut du Développement Durable et des Relations Internationales
IMCSC	Inter-Ministerial Coal Steering Committee
MCESR	Romania Mine Closure, Environmental and Socio-Economic Regeneration Project
MCSM	Romania Mine Closure and Social Mitigation Project
MSP	Miners social package
NAD	National Agency for Development and Implementation of the Programs for Reconstruction of the Mining Regions
NGO	nongovernmental organization
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PSIA	Poverty and social impact analysis
SECAL	Sector adjustment loan
SEA	Sector environmental assessment
SOE	state-owned enterprise
UDKR	Ukrainian State Company for Coal Mine Closures
U.K.	United Kingdom

Preamble: The Past, the Present,

and the Future of Coal Regions

The World Bank is committed to helping countries achieve their nationally-defined clean energy transitions by securing affordable, reliable, and sustainable energy access for all. With this energy transition, the long-term outlook for coal regions is unfavorable, being negatively impacted by: (i) availability and affordability of alternative lower-carbon energy sources, (ii) technological innovation and mechanization reducing the demand for direct / indirect labor in the coal value-chain, and (iii) clean air policies restricting particulate matter resulting from coal use. The rate-of-change of energy transitions within coal regions will vary by local socio-economic conditions, but overall many are on a common pathway—an unabating transition away from coal.

The degree to which coal regions manage this transformation and shape their future will depend on having the institutions, technical capacities, and funding necessary to protect people and the environment. Moreover, sustaining economic activity will require leveraging the natural, physical, and human capital available in these regions towards a very different future. To achieve these goals, we must learn from the past. This compendium draws upon experience from the 1970s to early 2000s during which profound disruption in coal regions occurred. Large numbers of inefficient coal mines closed leading to significant job losses and a build-up of unaddressed environmental legacy issues. Where alternative energy sources were not available for substitution, the coal industry advanced by undergoing consolidation in which often smaller, less efficient mines closed imparting significant social impacts on workers and communities and leaving unattended environmental legacy issues. During this consolidation, some labor transferred to more efficient and financially resilient mines, and in this way coal remained a part of the long-term strategy of the region.

In preparing this compendium, we recognize that lessons learned from this past experience will need to be applied differently today. Coal regions now face profound challenges. Where a phasing out of coal occurs in a region, irreversible job losses and the shuttering of an industry will set in motion a transformation in which lifestyles, cultural identity, social systems, and economic outlook will all change. The past is only a partial predictor of the future.

Going forward, energy transitions in coal regions must be accompanied by social protection support to directly and indirectly affected workers across the coal value chain, addressing the needs of families with a focus on youth, leveraging existing human capital and providing education and reskilling for jobs of the future, ensuring inclusive processes in which local regions shape future options, and leveraging physical and natural capital through environmental reclamation and repurposing land and physical assets.



Executive Summary

- 1 This report outlines structural changes (adjustments) in the coal sector of eight countries in different regions of the world over the last 50 years that resulted from a transition away from coal to other energy sources in those regions. The countries are chosen because they provide a rich set of experiences from which lessons can be learned to help governments prepare for and manage a transition away from coal. Coal sector adjustment received World Bank support in four of the countries: Russia, Ukraine, Poland, and Romania. Broader observations are provided on four other countries where the World Bank was not providing support: namely, the United Kingdom and the Netherlands, where adjustment started in the 1960s; the United States, where employment adjustment started in the 1980s; and China, where adjustment started in the 1990s.

- 2 These coal sector structural changes have resulted from a number of drivers of change, including the need to lessen rampant air pollution; competition from cheaper and cleaner fuels, in particular natural gas for power generation; international environmental concerns and the global movement toward clean energy; technological innovation reducing the demand for energy; and changes in coal production methods through mechanization leading to increased mining efficiencies and the downsizing of employment. Also, in the case of the former centrally planned economies, a strong, deep-rooted economic adjustment in the 1990s which led to significantly lower demand for coal.
- 3 A key issue observed is the pace of change when adjustment takes place and the degree of government preparedness. When change is rapid and governments are not well prepared, these drivers have led to a crisis in a country's coal industry, as occurred in the United Kingdom in the 1960s, in Russia and Ukraine in the 1990s, and in the United States in the past decade. For these four countries, a largely "unmanaged shock adjustment" took place in the coal industry with little warning or early preparedness and planning. In the case of Russia, Ukraine, and Romania, the preparation and introduction of coal reform programs shifted those countries into more of a "managed shock adjustment." In contrast, the Netherlands and Poland were able to establish adjustment programs before large-scale mine closure programs took place and were able to follow a more managed adjustment.
- 4 Mine closures take place each year in many if not all mining countries but generally affect only a small number of mines at any one time. In many countries, measures are already in place to address social mitigation, physical closure, and environmental remediation needs. However, when coal sector adjustment takes place on a large scale in a relatively short period, scaling up existing practices to meet the needs of a large number of redundant workers and their coal-producing communities and regions, to effectively close mines, and to reclaim mining sites in a satisfactory manner becomes challenging. Furthermore, "one size does not fit all," and social support efforts and mine closure practices need to be tailored to specific needs of different regions and communities and prepared on a "bottom up" rather than "top down" basis.
- 5 The extent of adjustment tends to be larger in state-owned coal industries than in privately-owned coal industries because state-owned industries tend to hoard labor and seek government subsidies to cover losses until reform is finally imposed on them. By comparison, privately-owned companies tend to adapt to market forces more quickly and close loss-making mines and reduce excess labor much earlier in the adjustment process. But whether industry is state-owned or privately-owned, coal sector adjustment will generally result in the least-efficient, labor-intensive mines being closed first, so a large number of redundancies is inevitable. In the case of the United Kingdom, coal industry employment fell by 52 percent compared with only a 26 percent decline in coal production during the decade of the 1960s, largely because production was reduced at the highest-cost, most labor-intensive mines.
- 6 With regard to the four countries that received support from the World Bank, Russia, Ukraine, and Romania went through what was largely an "unmanaged shock adjustment" in the late 1980s and early 1990s until reform programs were prepared in the mid-1990s and implemented thereafter. Adjustment



came a few years later in Poland, which went through a “more managed shock adjustment” of its coal mining sector in the very late 1990s and 2000s. With regard to the other four countries, adjustment is essentially complete in the United Kingdom and the Netherlands, but there will be more to take place in the United States and China.

- 7 Once the first decade of closures was over, all countries moved into more of a “managed descent” through the development of policies, programs, frameworks, and strategies that helped governments move beyond “shock adjustment.” Adjustments that continued for some countries over many decades—in particular, the United Kingdom—with a steady progression of mine closures can be characterized as a “slow burn.” In the United States, employment started to contract in the 1980s, and production has declined since 2008 until recently. China has started on a period of large-scale mine closures following large capacity increases from 2000 to 2014. But coal production from large-scale, more-efficient mines has tended to replace production from smaller, high-cost, labor-intensive mines. However, in 2018 the Chinese government announced that it will cap coal production. Looking forward, there has been substantial growth in world coal production, largely in Asia, in the past 15 years, which will make the scale of potential future coal mine closures, especially in China, much larger than in the past.
- 8 The drivers of change influence the types of policy interventions needed for coal industry restructuring, social protection measures and social recovery programs, and environmental protection, reclamation and asset repurposing. This report uses the following three-pillar approach for assessing coal sector adjustment:

- **Pillar 1** is the coal sector policy and strategy pillar and includes coal sector adjustment policy, strategy, institutional roles and responsibilities, and budget decision making. It also covers coal industry restructuring, energy market dynamics, and the move away from coal to other fuels. It sets in place the conditions, rules, and capacity that are needed for sector adjustment to take place, and importantly also includes a stakeholder engagement strategy.
- **Pillar 2** is the support for people and communities pillar and includes employment downsizing, community impacts, income support measures, and related measures (including active labor market measures and, if needed, mobility assistance) to assist redundant workers to find new employment; it also includes the socioeconomic regeneration of communities and regions and the transition to new economic bases, recognizing that programs will need to be bottom up so that they are specific to communities and regions.
- **Pillar 3** is the environment and land pillar and includes physical mine closure, environmental reclamation, repurposing of useful land and assets, financial securities, and long-term legacy issues. In the past, little repurposing took place, but looking ahead, Pillar 3 includes repurposing of usable land and assets for other productive uses. Repurposing will require the relevant authorities to develop an evolving picture of the alternative economic futures that regions can transition to. This picture – or vision – needs to be developed before large-scale closures take place and will be a key factor in determining how well the adjustment is managed and transition is achieved.

- 9 Decision making within the three coal sector adjustment pillars is considered in terms of three tiers of leadership responsibilities and decision-making authorities, namely:
- a) The highest-level political leadership, including the prime minister, the cabinet, and the legislature, that makes policy and other high-level decisions;
 - b) Institutional leaders, including ministers and politically appointed agency heads, heads of state-owned coal and power companies, and high-level, decision-making groups or commissions appointed by cabinets for specific purposes; and
 - c) Professional staff and managers at all levels within different government in ministries and agencies (and, where relevant, state-owned coal enterprises) who undertake the large bulk of the coal sector adjustment knowledge gathering and preparatory work and then are responsible for and implementing coal sector adjustment measures.
- 10 There are a range of different lessons learned. Seven main overall program lessons are as follows:
- i. Coal sector adjustment was inevitable in the past because of market forces and pollution reduction needs and will be inevitable in the future, largely for the same reasons plus the need for lower-carbon development;
 - ii. Large-scale coal sector adjustment can be accomplished, but it is a challenging process that will likely take decades rather than years;
 - iii. Countries that undertook early preparation and strategically planned their coal sector adjustment and downsizing were more efficient and better able to manage the negative impacts of large-scale mine closures than were those that took an ad hoc approach;
 - iv. Irrespective of the country, mine closures and job losses are immediate, whereas creating alternative employment opportunities, sustaining social assets, and building community-level capacity are activities that can take many years and even decades;
 - v. Employment downsizing is driven not only by mine closures but also by mining mechanization;
 - vi. Even though policies for social mitigation and rebuilding the economic base of mono-industry regions and communities are difficult and costly and the results may be modest relative to job losses, such policies are necessary to prevent previously coal-dependent communities from lagging socially and economically behind other areas of the country in the long term;
 - vii. Physical mine closure and post closure monitoring and maintenance are demanding but can be accomplished in a timely and efficient manner if updated mine closure requirements, good institutional capacity, and adequate planning and funding are in place.
- 11 This report provides the following 23 practical “how to” detailed lessons learned from past coal sector adjustments. Given the size, immediacy, and severity of impacts on workers and their communities, nearly half of the lessons learned relate to social mitigation and alternative employment creation for people and communities. The lessons are

presented according to the Three Pillars and further organized in terms of those that relate primarily to policy and/or rules and those that relate to institutions.

Pillar 1: Coal Sector Policy and Strategy—Detailed Lessons Learned

Policy/Rules

- 1) Social support and mitigation programs and physical mine closures are expensive, and significant budgetary outlays within a sustained programmatic approach are needed if they are to be done well.
- 2) Coal mining laws and regulations need to be modernized.
- 3) Clean energy policies, pollution prevention, and supporting legislation play a major role in the shift away from coal.

Institutions

- 4) Comprehensive adjustment programs need to be prepared and put in place before coal sector adjustment occurs for adjustment to take place efficiently and effectively.
- 5) Strong government commitment and political will are indispensable for adjustment programs to be implemented efficiently and effectively.
- 6) New institutional structures may be needed to fill gaps.
- 7) Effective, well-prepared, and genuine stakeholder engagement and participation are also indispensable in obtaining the

buy-in of affected stakeholders in the implementation of adjustment programs.

- 8) Engagement with women's groups can lead to important program improvements.

Pillar 2: Support for People and Communities—Detailed Lessons Learned

Policy/Rules

- 1) Comprehensive social protection and labor support measures, including income support and active labor market policies as well as funding for building institutional capacity should be put in place before—not after—mine closures take place.
- 2) Unemployment support and redundancy payments above and beyond normally available provisions may be needed for mine workers and for workers in related sectors that depend on the mining industry for their livelihoods.
- 3) Regulatory reforms may be needed to put the necessary rules and procedures in place, especially for subsidy allocation.
- 4) Careful consideration is needed to select a package of the most-effective active labor market measures to support redundant working age workers finding new employment.
- 5) There are trade-offs between periodical and lump sum income support. In certain circumstances, periodical payments might be superior to lump sum packages, which might be rapidly used up by recipients who,

in the absence of new employment, might then seek more assistance.

Institutions

- 6) Adequate provisions need to be made for the transfer of social assets, land, and other useful assets from coal companies to local government or other parties who would then manage and operate them.
- 7) Community-level capacity building and mobilizing and involving key stakeholders are essential if communities are to achieve better community outcomes and respond to, and eventually recover from, the contraction of mine production and mine closures.
- 8) Mobilization of a range of different institutions, according to the comparative advantages of each and preferably with one lead institution, is required to link economic recovery to other regional development initiatives.
- 9) A bottom-up approach is needed to tailor socioeconomic regeneration measures to the specific needs of different regions and communities.
- 10) Socioeconomic regeneration schemes and strategic planning assistance that induce a sense of ownership in the community can enable communities to reestablish themselves, find new income sources, and better meet the needs of the most vulnerable in the community.
- 11) Support for workers to relocate to places with a broad (not narrow) economic base can enable them to move to places where jobs are more readily available and/or can be more easily created.

Pillar 3: Physical Mine Closure and Environmental Reclamation— Detailed Lessons Learned

Policy/Rules

- 1) Modern mine closure regulations and standards are needed if mine closure is to take place efficiently and effectively.
- 2) Mine closure can also involve long-term, post closure environmental legacy issues that require careful monitoring and maintenance, including water management and reducing methane emissions at closed underground mines.

Institutions

- 3) Physical mine closure is demanding but can take place in a timely and efficient manner if there are competent institutions, adequate funding, and good practice procedures.
- 4) Coal mine adjustment can contribute to an overall upgrading of coal industry environmental practices and performance.

The report proposes three stages for preparing and managing coal sector adjustment, as follows:

- *Stage 1:* Advance planning and establishment of a knowledge base;
- *Stage 2:* Preparation of the adjustment program; and
- *Stage 3:* Implementation of the adjustment program.



- ¹² The importance of the first two stages—advance planning and establishment of a knowledge base and preparation of the adjustment program—is paramount. A government that is well prepared for sector adjustment will undertake actions in a phased and integrated manner. This will involve an “adaptive management” approach of putting in place new capabilities and adaptive systems and policies which will include setting targets, measuring progress and updating targets and measures as the situation improves or conditions change. By comparison, in a shock adjustment situation, industry downsizing will take place with little planning or preparation, as happened in the case of Russia and the United Kingdom when key steps, such as stakeholder engagement and updating laws and regulations, took place many years after mines were already closed, and institutional strengthening, such as establishing a mine closure company, did not take place at all.
- ¹³ This report concludes with Guidelines on Preparing and Implementing a Coal Sector Adjustment Program—organized according to the Three Pillars and the three tiers of government decision making and responsibilities. The Guidelines are designed to support governments to prepare for and implement coal sector downsizing and adjustment tailored to individual country and local circumstances, based on the World Bank’s more than two decades of experience in coal sector adjustment across Europe and Central Asia. However, the report does not address coal sector adjustment in relation to the larger issue of climate change, for which a large universe of literature exists. Instead, the report is complementary to and mutually reinforcing of broader commitments and measures to address climate change and prepare and implement low carbon development strategies.
- ¹⁴ The coverage in the report of the Netherlands, the United Kingdom, and the United States draws extensively and uses material directly from studies prepared by IDDRI and Climate Strategies. A summary of useful toolkits and guidelines for physical mine closure and environmental reclamation work is provided in the Annex.

Introduction and Methodology

¹⁵ Section 1 describes some of the key characteristics of the coal sector adjustment process that started in Western Europe in the 1960s and is taking place today in other countries, including the United States and China. Section 1 also outlines the underlying drivers of change, notes the impact of mechanization on reducing coal employment, and points to a substantial increase in world coal production that has taken place over the past 15 years—an increase that will make the scale of future coal mine closures all the larger. It also notes the importance of governments making early preparation for adjustment and outlines the report’s methodology, which consists of a three-pillar approach for assessing coal sector adjustment and a three-tier structure for government policy and decision making.

Drivers of Change

16 Drivers of Change Over the past 50 years, multiple drivers have led to structural changes in the coal sector in many countries. These drivers frequently have precipitated a crisis in a country's coal industry that has led to an initial "shock adjustment" of greatly reduced production and employment in the first decade, followed by a subsequent decline of both production and employment that in some cases has lasted for several decades. Drivers of change can be specific to a country or a particular geographic area within a country and include:

- Rampant air pollution (Western Europe in the 1960s and today in Poland and South and East Asia);
- Competition from cheaper and cleaner fuels, in particular natural gas for power generation, leading to substitution away from coal (in all countries over the past 50 years and, notably in the past decade, the growth of shale gas in the United States);
- International environmental concerns and the global movement toward clean energy to reduce carbon emissions, which includes the shift away from coal to renewable energy sources with lower or no carbon emissions (especially in Europe, the United Kingdom, and the United States) and improved energy efficiency to reduce overall energy (including coal) demand, and;
- Technological innovation reducing the demand for energy, including coal, relative to gross domestic product (GDP) (in all countries);
- Changes in coal production methods

through mechanization leading to increased mining efficiencies and improved labor productivity, which reduces coal employment (in all countries but especially the United States in the past four decades and China in the past two decades); and

- A strong, deep-rooted economic adjustment leading to reduced energy subsidies and market pricing of energy and significantly lower use of coal (centrally planned economies becoming market economies in the 1990s).

17 Declining Employment Is Inevitable These drivers of change were present in the past, are present today, and will be present in the future. The key issues are the pace of change as it takes place and the degree of government preparedness. When the pace of change is rapid and governments are not well prepared, these drivers have led to a crisis. The highest-cost mines with the largest losses are closed first, and these are inevitably the most labor-intensive mines. Production is then consolidated around the remaining most-competitive and efficient mines, which will generally be the most mechanized with the least need for labor. Even if production stays level or increases, employment downsizing is likely to take place as mechanization is introduced to reduce costs. Thus, regardless of whether coal production has increased or decreased, experience indicates that coal industry workers will lose jobs and governments will need to address the social and labor impacts.

18 Mechanization The impact of mechanization is often underappreciated. Job losses occur not only from the closure of mines because of falling coal demand but also from the mechanization of operating mines, even where other drivers, such as reducing air

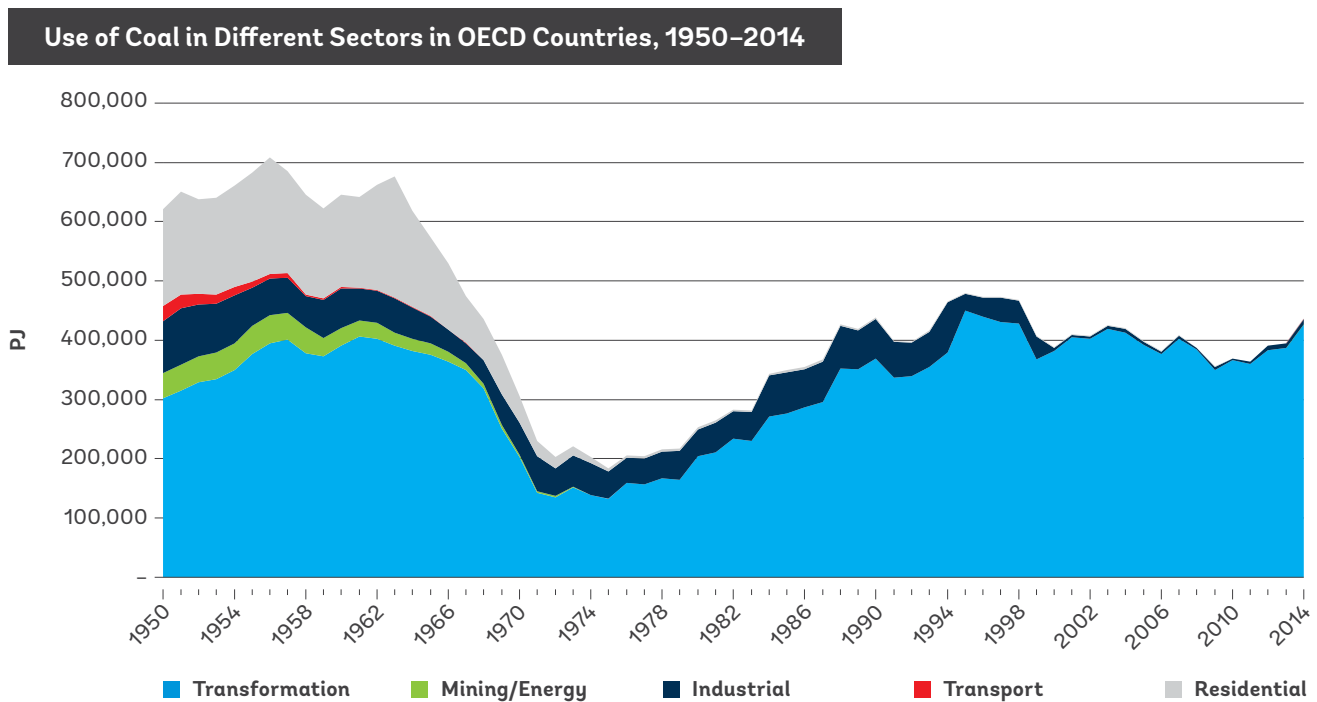
pollution and/or moving to low-carbon energy alternatives, are absent. It is also of note that increased mechanization can lead to the consolidation of the industry into fewer, larger mines and can contribute to improved regulatory oversight, which in turn can lessen social and environmental impacts providing there is effective implementation of good-practice policies, laws, and regulations.

19 **Time Frames** There are different time frames for industry restructuring as compared with social support and recovery. Governments have mostly been able to introduce and manage coal industry restructuring in terms of downsizing and closing companies, restoring industry competitiveness, and improving the governance of state-owned companies, and in some cases privatizing them within one to two years. By comparison, social mitigation and social recovery programs can take many years to work effectively,

and improved outcomes may take decades to achieve—and in the worst cases may never be achieved—for the most distressed communities, such as coal communities built around coal mines in remote areas.

20 **Declining Coal Use in the 1960s** Figure 1 illustrates a two-thirds decline in coal use from 1960 to 1970 in Organization for Economic Co-operation and Development (OECD) countries, which led to considerable coal sector adjustment and downsizing in Western Europe starting in the 1970s. The apparent recovery in coal use from the late 1970s to the mid-1990s is largely attributable to the growth of coal consumption in the United States over that period. However, coal use in OECD countries has since flattened. Countries that have undergone coal sector adjustment include those in which coal mines are predominantly or totally state owned enterprises (SOEs) (for instance, the United

Figure 1



Source: Ben Gales and Rick Hölsgens 2017. *Coal Transitions in the Netherlands*.

Kingdom, Germany, the Netherlands, and China), those that have made transitions from more centrally managed economies to market economies (such as Russia, Poland, Romania, and Ukraine), and those in which the coal industry is completely owned by the private sector (in particular, the United States).

- 21 **Multidecade Process** For almost all countries in which the coal sector was restructured, adjustment followed a multidecade programmatic process. Only the Netherlands, which had a relatively small coal industry and significant natural gas availability, saw a complete closure of the industry within a decade. More often, a country's least-efficient, most labor-intensive, loss-making mines were closed first, with some of their production shifting to the remaining mines that are more mechanized and efficient or have undergone subsequent capitalization to improve efficiencies. Closure of the most

labor-intensive mines resulted in employment downsizing taking place much more rapidly than declines in production. Furthermore, declining coal production has resulted in excess capacity and unmanageable coal mining sector financial losses and financial stresses on energy and power systems, in the United States and China in recent years and in SOEs in Russia and Ukraine in the early 1990s.

Global Coal Growth

- 22 **Global Coal Production Growth** Although coal use in countries belonging to the OECD has declined by around 40 percent in the last 50 years (Figure 1), global coal production is now at an all-time high. About 1.5 billion tons of coal mining capacity has closed over the past 60 years in Western Europe, Russia, Eastern Europe, and North America.

Table 1

World Coal and Lignite Production 2000–15¹ (million tons)

Country	Production Change 2000–15	Production 2000	Global Share 2000 (%)	Production 2015	Global Share 2015 (%)
China	2,161	1,377	30	3,538	47
India	428	336	7	764	10
Indonesia	308	79	2	387	5
Australia	164	307	7	471	6
Russia	107	242	5	348	5
South Africa	24	224	5	248	3
United States	-152	972	21	820	11
Poland	-27	163	4	136	2
Germany	-19	205	4	186	2
Others	-43	718	16	675	9
Total	2,951	4,623	100	7,574	100

Source: Enerdata 2016. *Global Annual Statistical Yearbook*.
<https://yearbook.enerdata.net/coal-and-lignite-production.html#coal-and-lignite-production.html>

This number includes the loss of about 200 million tons in annual capacity from 2000 to 2015. At the same time, world coal and lignite production has increased from about 4.6 billion tons in 2000 to about 7.6 billion tons in 2015, with the increase almost entirely in Asia and the Pacific, in particular China (over 2 billion tons per year), India, and Indonesia (Table 1). As a result, coal and lignite still provide about 27 percent of total world energy supplies. Oil and liquids account for about 32 percent, natural gases about 21 percent, and renewables (including hydroelectricity) about 20 percent.² This large growth in world coal and lignite production that has taken place over the past 15 years will make the scale of future mine closures all the larger and more challenging.

Preparing for Adjustment

23 Adjustment Is Inevitable Countries with large or rapidly growing coal industries will sooner or later face a necessary coal sector adjustment and restructuring with drivers of change, such as air pollution concerns, competition from cheaper and cleaner fuels and renewables, international environmental climate commitments, rapid technical innovation, and improved mining efficiencies, bringing about a need for a coal sector adjustment. A shift away from coal or a deliberate sector adjustment through industry consolidation to larger-scale more efficient mines will result in the need to close coal mines and address the needs of redundant coal industry workers and communities, as well as other industries along the coal chain, including coal users and industries that are suppliers to coal mining operations.

24 Scale Matters Mine closures take place in all mining countries but generally are for only a small number of mines at any one time. Such closures are generally the result of operations depleting reserves at different times, although closures of high-cost mines may also be caused by unsustainable losses, including during severe mineral price slumps. In many countries, measures are already in place to address the social mitigation and physical closure needs of individual mine closures. But when coal sector adjustment takes place on a large scale in a relatively short period, it is a formidable challenge to scale up existing practices to effectively liquidate mines and reclaim and repurpose mining sites in a satisfactory manner on a large scale and to meet the social support and socioeconomic needs of many different coal-producing communities and regions and tailor measures to the specific needs of each so that they can transition away from coal dependency to a new, sustainable economic future.

25 Adequate Preparation Countries that strategically planned their coal sector readjustment were more efficient and effective in their efforts than were those that took an unprepared ad hoc approach. Based on the experiences of countries that have undertaken either planned or unplanned restructuring, a coal sector adjustment carries with it strategic and policy issues that must be addressed by various institutions and that engage leadership at all levels throughout the different stages of the process. Government entities, the private sector, and communities all have roles to play in and are affected by coal sector adjustments. An important lesson learned is the importance of putting in place the necessary strategy, funding, institutional capabilities, and physical mine closure and



social mitigation measures—including prelayoff planning and assistance, postlayoff services, income support packages, labor redeployment services, relocation services, active labor programs (ALPs), social assistance, and local economic development support—before, not after, closures and redundancies take place. The funds needed for mine closure and environmental reclamation and subsequent repurposing are often large, and coal mining sites may be abandoned in situations in which governments and enterprises have not planned adequately and put aside the needed funds for closure activities. Because many coal mines began production decades ago, the cumulative environmental issues to be addressed through proper closure and reclamation may represent a significant carried-forward financial liability.

26 **Location and Connectivity** It must also be recognized that location can have a strong influence on the speed at which economic transition takes place. Good connectivity and proximity to nearby cities and regions with strong economies can considerably ease the adjustment and transition to other economic activities. The recovery of the coal mining areas around Katowice in Poland is an example. Correspondingly, distance from areas of strong economic activity can considerably hinder and delay the recovery process as happened to some of the coal mining towns in northern England and towns in Western Macedonia. Investments to improve transport infrastructure, especially road and public transport connections, can be an important measure to assist recovery in more remote areas. Good connectivity can not only provide opportunities for new job creation through economic diversification, but also enable workers and their families

to remain in their homes while finding new employment in strong economic areas nearby.

27 **Private Sector Mine Closures** Private sector coal adjustment can have added complexity compared with the closure of state-owned mines in the event that private enterprises have not planned and made adequate financial provisions for adequate amounts of money to be put aside for physical mine closure, including ensuring that sufficient funds are available in the event of an unexpected mine closure. Funds are needed not only for site reclamation but also for employee and retiree health and pension obligations that result from and add to the costs of mine closures. Further consideration beyond this report is needed regarding the procedures for making provisions for post closure environmental monitoring, mitigation of further impacts, and site reclamation of private sector mines. It should also be noted that attention is now being given to reducing coal mine methane (CMM) emissions and abandoned mine methane (AMM) emissions which add to climate change concerns.

Methodology: A Three-Pillar

Assessment Approach and a

Three-Tier Government Policy

and Decision-making Structure

28 The report uses a three-pillar approach for assessing coal sector adjustment and a three-tier structure for government policy and decision making. The three-pillar approach is as follows:

- **Pillar 1** is the coal sector policy and strategy pillar and includes coal sector adjustment policy, strategy, institutional roles and responsibilities, and budget decision making. It also covers coal industry restructuring, energy market dynamics, and the move away from coal to other fuels. It sets in place the conditions, rules, and capacity that are needed for sector adjustment to take place, and importantly also includes a stakeholder engagement strategy.
- **Pillar 2** is the support for people and communities pillar and includes employment downsizing, community impacts, income support measures and related measures (including active labor market measures and, if needed, mobility assistance) to assist redundant workers to find new employment; it also includes the socioeconomic regeneration of communities and regions and the transition to new economic bases, recognizing that programs will need to be bottom up so that they are specific to communities and regions.
- **Pillar 3** is the environment and land pillar and includes physical mine closure, environmental reclamation, repurposing of useful land and assets, financial securities, and long-term legacy issues. In the past, little repurposing took place, but looking ahead, Pillar 3 includes repurposing of usable land and assets for other productive uses.

²⁹ This three-pillar assessment approach is then placed in an overall institutional context of a three-tier government policy and decision-making structure that consists of the following.

³⁰ **Tier 1: Policy and Decision Making by the Political Leadership** Tier 1 decisions are made by the highest-level political leadership, including the prime minister, the cabinet,

and the legislature, as well as behind-the-scenes, powerful individuals who may influence decision making at the highest levels. Tier 1 decisions are typically high-level policy decisions that, in the case of coal sector adjustment, relate to overall energy security, the political economy implications of adjustment given that coal miners often have a strong regional and national political voice, and in more recent times, participation in clean energy accords. Policy decisions regarding the need for coal adjustment, enactment of new laws, establishment of a high-level coal adjustment decision-making body, and the overall budget envelope for coal adjustment (including social mitigation and physical mine closure) are all Tier 1 decisions. They also include the extent to which social support measures for coal adjustment are put in place before layoffs take place and the extent to which these measures go beyond those available to unemployed workers and redundant workers in other sectors.

³¹ **Tier 2: Decision Making by Institutional Leaders** Tier 2 decisions are made by institutional leaders, including ministers and politically appointed agency heads, heads of state-owned coal and power companies, and high-level, decision-making groups or commissions appointed by cabinets for specific purposes. Tier 2 decisions typically determine the instruments through which high-level policy decisions will be implemented. In the case of coal sector adjustment, this includes the specific roles and responsibilities of different ministries and agencies and the budgets they receive; the establishment of any needed new institutions, such as coal mine closure companies or additional agencies on the ground to meet the needs of redundant coal workers in the event that large-scale mine closures take place; procedures for the transfer of social



support and mine closure funds to make sure they reach the intended recipients and are used for the intended purposes; decisions on environmental standards and requirements (including carbon-related taxes); drafting of new legislation; and subsidies for renewables.³

32 Tier 3: Decision Making by Institutions and their Professional Staff and Managers Tier 3 decisions are made by professional staff and managers at all levels within different government in ministries and agencies (and, where relevant, state-owned coal enterprises) who undertake the large bulk of the coal sector adjustment knowledge gathering and preparatory work and then are responsible for and implementing coal sector adjustment measures. Tier 3 decisions are typically decisions taken regarding the detailed design and implementation of specific instruments and measures. Such instruments and measures might include regulations and procedures through which coal sector adjustment takes place, state-owned industries are restructured, and state-owned coal mines are closed. They might also include instruments and measures

that detail how social support measures are provided on the ground to redundant workers in different coal communities and regions and the way in which physical coal mine closure and environmental reclamation take place.

33 Effectiveness The World Development Report 2017 lists commitment, cooperation, and coordination as the three key drivers of governance effectiveness.⁴

- Commitment starts at Tier 1, the most powerful political leadership, and then is taken up by the other two tiers.
- Coordination takes place largely among the Tier 2, institutional leadership, which is where budgets are allocated and coordination among different ministries and agencies is established, overlaps resolved, and gaps filled.
- Cooperation takes place—or does not take place—among different ministries and agencies on an ongoing basis among the Tier 3 professionals.

World Bank Support for Coal Sector Adjustment in Russia, Romania, and Poland

³⁴ Section 2 provides an overview of World Bank support for the coal sector adjustment that took place in Russia, Ukraine, Romania, and Poland in the 1990s, when the move from central planning to market-based economics resulted in large excess coal industry capacity. Section 2 then describes the decline of the coal sectors in those four countries and more detail of the World Bank support for each country. Russia experienced a shock adjustment and then introduced a reform program that brought about the needed closure of mines where production had ceased and ensured that large wage arrears were paid to redundant miners. Ukraine experienced an unmanaged shock adjustment and then introduced a reform program, but program implementation was derailed by large-scale opposition and vested interests. Romania also experienced a shock adjustment for its overall (coal and non-coal) mining sector, following which it prepared a mine closure programs and went through a more managed adjustment. Poland prepared several mine closure programs, undertook considerable engagement with the miners and their communities, and went through a more managed adjustment. The World Bank's work in Russia and Ukraine took no account of the gender aspects of mine sector restructuring, but the work in Poland included a specific gender-sensitive approach, and the restructuring work in Romania then benefited from the gender insights from the work in Poland.



Overview of World Bank Support for

Coal Sector Adjustment in Russia,

Ukraine, Romania, and Poland

35 **Main Roles** Broadly speaking, the World Bank took four main roles in supporting the coal sector adjustment in Russia, Ukraine, Poland, and Romania and can undertake similar roles for countries preparing for or undergoing coal sector adjustment today. These are:

- A diagnostic support role regarding the expected size of needed mine closures, social mitigation measures and state enterprise reform
- A policy and strategy development support role to provide the regulatory basis and institutional capabilities needed to implement the new measures and reforms
- A budget support role (in particular through SECAL lending) for both the physical mine closure work and the social mitigation including new job creation and connectivity initiatives, and
- A technical assistance and project lending and support role to provide the needed capacity and capabilities to implement the needed mine closures, social mitigation measures and reform of state mining companies.

36 **Initial Diagnostic Support** The design and implementation of coal sector adjustment programs cover a broad range of financial, social, environmental, institutional, regulatory, restructuring, and reorganizational issues. The World Bank helped to bring together the wide mix of

skills needed to address this broad range of issues in a well-coordinated manner in the four countries – skills which were not readily available within the four countries. In Russia and Ukraine the World Bank prepared coal sector reform reports which helped improve the preparedness of those governments to prepare their restructuring programs, identify and initiate the key steps that need to be taken, and then to undertake reforms.

37 **Policy and Program Development**

Support Following on from the initial sector diagnostic work, the World Bank supported the governments to prepare coal sector adjustment programs, which included most importantly detailed estimates of the costs and budget needs for both social mitigation and physical mine closure, as well as some needed institutional strengthening and legal/regulatory reforms.

38 **Budget Support** Sector adjustment lending provided budgetary support and underpinned key measures that needed to be undertaken to implement the sector adjustment and related reforms. In Russia, Ukraine, and Poland, SECALs were, for the most part, useful instruments for supporting the implementation of comprehensive sector reform. (The second SECAL for Poland included a monthly scorecard, prepared by every state-owned coal mining company, that proved to be an effective tool for monitoring their performance.)

39 **Project Lending** A variety of project loans were used to support program implementation in Russia (Implementation Assistance Project), Ukraine (Pilot Project), and Poland (Hard Coal Social Mitigation Project and Hard Coal Mine Closure Project). Similar lending (or possibly also reimbursable assistance services) could be undertaken in

future projects to provide focused support for pilot testing, learning, institutional strengthening, stakeholder engagement and communication, and program monitoring and improvement, as well as social mitigation and physical mine closure, if needed.

40 **World Bank Key Value Added** The World Bank played an important role in supporting governments to put in place the necessary interagency and national/subnational cooperation and coordination. Such work brought together a broad range of diverse key stakeholders to focus on, build consensus and resolve important and contentious issues and helped to build broad-based support and society wide acceptance of and support for the programs to be implemented. Bank staff provided important contributions in the four main support roles previously listed by:

- i. Bringing skills that were not be readily available to government;
- ii. Contributing knowledge of experiences regarding mining sector restructuring and social mitigation approaches in other countries;
- iii. Helping governments to identify and focus on high-priority issues;
- iv. Helping to build consensus and resolve conflicts among different ministries;
- v. Developing reform and privatization programs for state mining enterprises;
- vi. Identifying possible restructuring and downsizing program cost savings;
- vii. Supporting local community and subnational government capacity building; and

viii. Placing a strong emphasis on environmental remediation, which may otherwise receive inadequate attention.

41 **Resources Needed** The Bank's operations required significant resources for both preparation and supervision in order to provide in-depth coverage of all the aspects involved (namely social, environmental, technical, financial, managerial, and organizational). Maintaining strong support to implement the programs required:

- i. A strong local presence through field office staff;
- ii. Strong team work and sufficient budget funds to use specialists from several different disciplines and World Bank units (mining specialists, social specialists, environmental specialists, and if needed, financial specialists) to prepare and design projects and loans and supervise their implementation; and
- iii. An intensive supervision schedule.

The Decline of the Coal Sectors in Russia, Ukraine, Poland, and Romania

42 **Declining Coal Use** As Russia, Ukraine, Poland, and Romania transitioned from centrally planned to market-based economies in the 1980s, these countries underwent profound economic reforms. The reforms involved structural changes that had a substantial impact on the energy markets in those countries and, in particular, on the coal sector. Coal was an essential winter heating



fuel for households and municipalities, as well as a key fuel source for heavy industry. Coal consumption and prices were already coming under pressure in the 1980s because of increasing competition from low-cost, less-polluting natural gas and oil.⁵ The macroeconomic reforms of the late 1980s and early 1990s added to the downward pressure on coal consumption and prices, as market-based energy pricing brought more-efficient fuel use by households and communities and as heavy industry contracted and reduced its use of coal.

43 Losses and Subsidies Coal industries were state owned and some of the largest industries in all four countries in the 1980s. However, these state-owned industries were making larger and larger losses and were unable to cover their costs. Instead of downsizing, governments provided subsidies for loss-making operations. The losses then increased and rapidly reached unmanageable proportions. By 1993, the coal industry subsidies had reached more than 1 percent of GDP for Russia and more than 4 percent of GDP for Ukraine. Many of the coal industry's main customers—power stations and the steel industry—were not paying the coal mines. The mines could not meet wage bills, leading to wage arrears of as much as six months. The mining companies were unable to sustain the extensive social assets and facilities attached to the coal industry. The coal industries in Poland and Romania were also loss making and received subsidies, but their situations were not as severe with no wage arrears.

44 Employment In all four countries, the coal industry was one of the largest employers. The coal industry in the early 1990s supported 1 percent of the labor force in Russia and 4 percent in Ukraine. At its peak, the overall mining industry in Romania provided almost

10 percent of total formal employment. In addition to coal mining workers (such as miners and coal-washing-plant workers), coal industry employment included other production workers providing technical services such as mine design, construction, and mechanization and geological research. In Russia and Ukraine, there were also as many coal industry employees who provided social services and operated social assets for mine workers and their families, which included housing, hospitals, schools, kindergartens, summer camps for children, culture houses, rest houses, and sports facilities. The social assets of the coal companies in countries such as Russia and Ukraine were a noncoal part of the coal industry value chain that needed to be separated from the coal companies and placed in other ownership when coal sector adjustment took place.

45 Shock Adjustment For Russia and Ukraine, the coal adjustment that took place in the 1990s was an initial intense and unforeseen “unmanaged shock adjustment,” for which governments, coal industries, and coal-producing regions and communities were completely unprepared. In Romania, where the World Bank assistance was for the overall mining sector, not just coal, the initial shock adjustment moved into a “managed shock adjustment,” which then evolved later into more of a “slow burn” with a steady progression of mine closures over time. However, in the case of Poland, where a comprehensive hard coal sector restructuring program was approved in 1998 before any coal sector adjustment took place, adjustment could be characterized as more of a “managed shock adjustment.”

46 Declining Production For all four countries, coal sector adjustment was inevitable and largely for the same drivers—in particular,

competition from cheaper and cleaner fuels, energy efficiency improvements, and the shift away from central planning to market pricing of energy led to a decrease in coal usage in the 1990s when coal production declined from 503 million tons in the four countries in 1993 to 365 million tons in 2000.

- a) The Ukrainian coal industry had a similar number of mines to Russia (276 mines) plus 64 coal-washing plants, which in the late 1980s produced just over 150 million tons of coal; that figure fell to about 76 million tons in 1994. This almost 50-percent decrease in Ukrainian production was attributable to declining domestic demand, a collapse in exports (from about 20 million tons in 1990 to only 2 million tons in 1995), and competition from lower-cost coal imports. Coal industry employment in Ukraine fell from 920,000 in 1994 to 684,000 in 1996.
- b) In Romania, coal sector restructuring was part of a restructuring of the overall mining sector, and without any government intervention or support, uneconomic mineral production declined so much that overall mining sector employment fell from a peak of over 300,000 in 1989 to less than 200,000 by the mid-1990s.
- c) In Poland, production and employment decreased from 147 million tons and 380,000 employees in 1990 to 102 million tons and 155,000 employees in 2000.

47 **Political Economy** Coal miners in the former Soviet Union were a social elite who received some of the highest salaries among industrial employees and received preferential treatment and benefits above those available to the rest of society, including vacation and other social facilities run by the coal companies. The elite status of the coal miners was based in large

part on the importance of coal for providing home and district heating and power for municipalities and businesses during the very cold Russian winters with many small, remote communities depending on coal for their survival through the winter. Coal miners were also some of the best-organized workers and wielded considerable political influence. At their peak, more people were employed by the coal industry social assets in Russia than were directly engaged in coal mining. Notwithstanding large wage arrears in Russia and Ukraine, coal miners remained politically influential in the regions of Russia where coal production was concentrated (including the Urals, Kuznetsk Basin [Kuzbass], Eastern Siberia and Kansk-Achinsk, and Yakutia and Primorsky Krai) in the far east in Russia, the Donbass in Ukraine, and Silesia in Poland. Thus, the effectiveness of stakeholder engagement, for better or worse, often had political ramifications. For example, Ukraine presidential and parliamentary elections of 1994 were scheduled one year ahead of time in response to demands made by striking coal miners. There were also other stakeholders with vested interests (such as coal traders in Ukraine and Rosugol which was the state-owned coal producing company in Russia) who sought and succeeded in capturing a share of the large coal industry subsidies in those countries.

World Bank Support for Coal

Sector Adjustment: Russia

48 **Drivers of Change and Government Response** The main drivers of change (Table 2) were declining energy demand, as Russia undertook transition from central planning to a market economy, and competition from oil and gas. The initial government response was to



Table 2

Drivers of Change for Coal Sector Adjustment and Government Response in Russia, Late 1980s Onwards

	Late 1980s–1993	1994–98	1999–2002	2003 Onwards
Drivers	Coal demand declines as economy contracts; state-owned coal mines cannot cover costs, and workers are not paid; budget subsidies reach unmanageable levels	Distressed coal communities need urgent assistance; redundant miners need alternative employment	Economywide privatization process under way; coal companies operating lower cost mines are able to survive	Low production costs make Russian coal production internationally competitive; growing coal exports
Government Response	Centrally planned energy policy protects loss-making state monopoly coal production with large financial subsidies; no support for workers exiting the coal industry	IAC established; World Bank assistance obtained; coal reform program approved; mines closed; industry demonopolized; subsidies reduced; social assistance provided	Coal industry privatized	Policy largely unchanged

Source: authors.

protect the industry, but as losses increased to unmanageable levels, the government leadership established the Inter-Agency Commission for Socio-Economic Problems of Coal-Producing Regions (IAC) in mid-1993 to advise the government on coal industry restructuring. The IAC included key government agencies, regional governments in the coal-producing areas, the management of Rosugol, and representatives of the two main coal labor unions. The Coal Department of the Ministry of Economy acted as the secretariat for the IAC. The IAC oversaw the design and implementation of the adjustment program.

49 **Coal Sector Work** In response to a government request for support, the World Bank started work on the coal sector in 1993. This was uncharted territory both for the government and the World Bank, which prepared an in-depth, multifaceted coal sector report (Russian Federation—Restructuring the Coal Industry: Putting People First [Report 13187-RU]), which was issued in December 1994⁶ with five main themes:

- a) Restructuring and downsizing the coal industry in line with the demand for coal by closing uneconomic coal mines and downsizing the industry employment;
- b) Setting the economically viable portion of the coal industry on a sound financial and commercial basis with increased productivity and efficiency leading to lower costs, increased competitiveness, and long-term financial viability;
- c) Reforming coal industry subsidies, including (i) in the short term (one to two years), reducing subsidies from fiscally unmanageable levels and shifting subsidies away from covering operational losses and toward covering wage arrears, severance payments, social support programs, and physical mine closures; and (ii) in the medium term (three to five years), continuing to reduce and eventually eliminate the fiscal burden imposed by coal sector subsidies;

- d) Putting in place urgently needed social support measures to cushion the impact of the restructuring on coal miners, their families, and affected communities, including (i) paying wage arrears; (ii) providing severance payments for workers losing employment; and (iii) providing social support measures for communities affected by mine closures, including funding for social assets and services that could no longer be managed and provided by the mining companies;
- e) Introducing deep-rooted institutional reforms, including (i) strengthening intergovernmental coordination and decision making; (ii) demonopolizing the Russian coal industry and removing it from the control of Rosugol; and (iii) corporatizing and privatizing the coal industry.

50 **Russian Coal Reform Program** The policy recommendations of the World Bank report were discussed at great length with Russian government counterparts and became the basis for the Russian government's coal restructuring program, *Basic Trends for Coal Restructuring*, approved in July 1995. The main levels and targets of the government's long-term strategy were as follows:

- a) *Mine Closures*. At least 90 loss-making mines were to be closed.
- b) *Workforce Reductions*. Closure of loss-making companies and modernization of remaining mines resulting in a coal mine workforce reduction of 100,000 people, with a further reduction of 175,000 other employees as social activities were divested.
- c) *Subsidies*. Subsidies to loss-making mines

were to be gradually withdrawn. Alternative funding was to be found to sustain social assets and increase expenditures on social programs for coal restructuring.

- d) *Social Protection*. Redundant coal workers were to be provided with transitional income and employment assistance in parallel with job creation programs.
- e) *Commercialization and Demonopolization*. Federal and regional authorities, together with Rosugol and local coal companies, would restructure state support and management of the coal industry. The coal industry would be transformed into independent, self-financing, competing coal companies. Rosugol would be transformed into a joint stock company supporting coal sector restructuring.
- f) *Investment*. Modernization, rehabilitation, and expansion would rely on internal financing, loans, and direct private investment, not state support.

51 **World Bank Loans** The restructuring program was then implemented with support from three World Bank loans in 1996 and 1997: two sector adjustment loans (SECALs), which provided large-scale budgetary support to help reduce the fiscal gap and fund the reform and restructuring costs (especially for social support), and an implementation assistance loan (Table 3).

52 **Lending Objectives** The main objectives of the Russia SECALs were to help the government institute a consistent policy and institutional framework for the continuous and socially sustainable restructuring of the coal sector and provide assistance in initial implementation of the overall restructuring program. As a companion project to the



Table 3

World Bank Coal Sector Lending to Russia, 1996–97

Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Russia	Coal sector adjustment loan (SECAL)	500	June 1996	December 1997
Russia	Coal sector restructuring implementation assistance project (IAP)	25	June 1996	December 2003
Russia	Coal sector adjustment loan (SECAL)	800	December 1997	December 2001

Source: authors.

proposed SECALs, the main objective of the Coal Sector Restructuring Implementation Assistance Project (IAP) loan was to provide implementation assistance to (a) help key stakeholders improve the management of the restructuring process, including subsidy management and social support, through increased participation by stakeholders and enhanced transparency and openness; and (b) build capacity and fill critical skill gaps in key areas for effective program implementation for both social and physical mine closure aspects of the program.

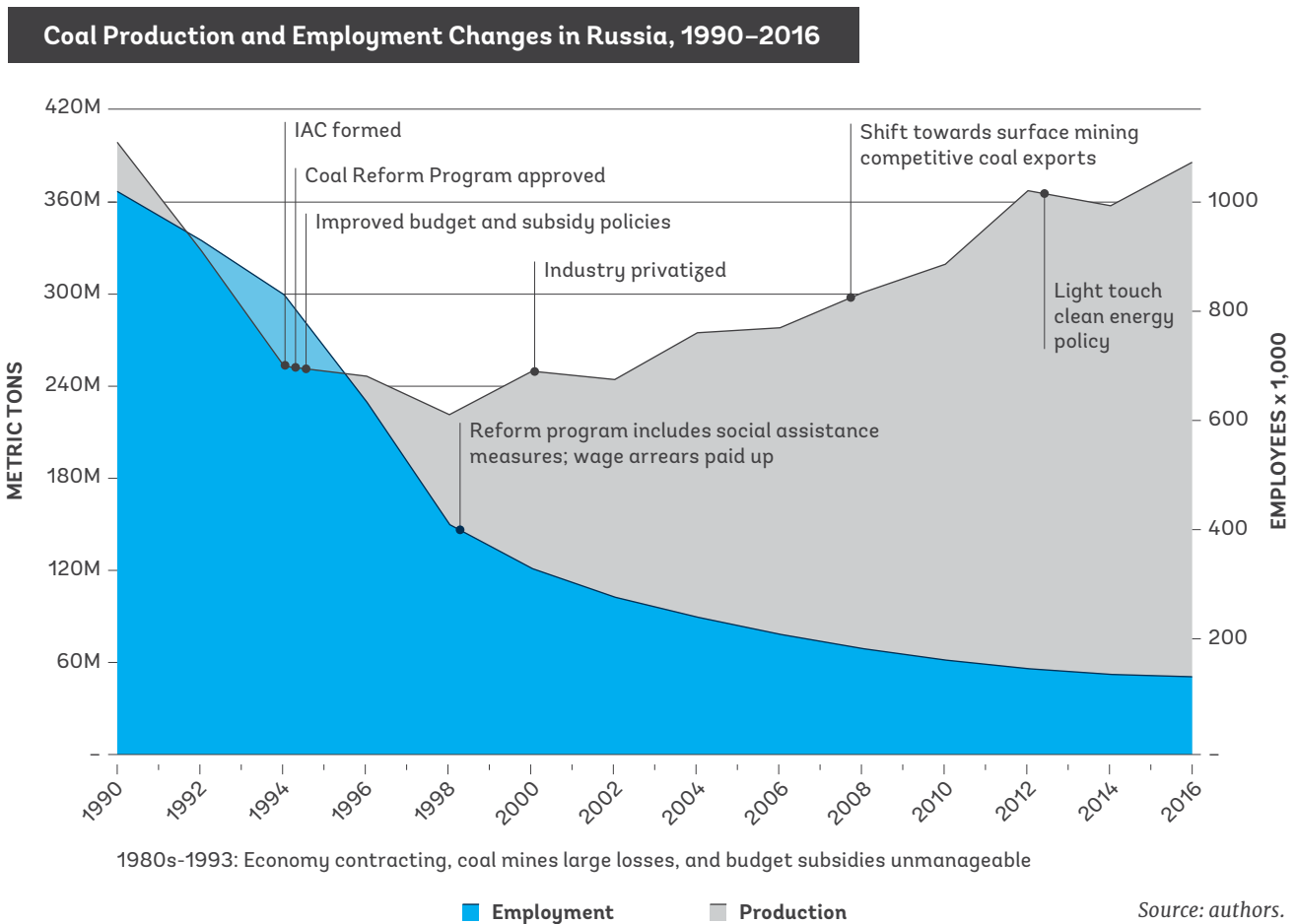
53 **Stakeholder Engagement** Stakeholders' participatory activities (largely supported by the IAP) included support for local coal mining trade unions and for the association of mining cities as they came to grips with the far-reaching impacts of coal industry restructuring. Coal regional and local subnational governments became engaged, and oversight committees were established at local levels. Mine workers and communities accepted the restructuring program as better than no program, especially once wage arrears started to be reduced.

54 **Russia Production and Employment Outcomes** Coal sector adjustment started in the late 1980s and continued in the 1990s. The changes in coal production and total

coal industry employment from 1990 to 2016 are shown in Figure 2. Production declined sharply from 1990 to 1994 and then more modestly to 1998. A rapid privatization of the Russian coal sector took place starting in the late 1990s, and the share of the coal production by the private sector reached nearly 80 percent by 2001. The Russian coal industry's financial performance significantly improved following privatization. Production started to increase from 1998—2000 and then increased steadily from 2002 to the present day. Total coal industry employment continued to decline even after production started to increase. Employment dropped by nearly 60 percent from about 1 million in 1990 to just over 400,000 in 1998. Total coal employment leveled out in the very early 2000s but has since continued to decline.

55 **Subsidies** Subsidies were reduced by nearly 40 percent in real terms from 1996 to 2001 and were realigned to support the restructuring process rather than to keep loss-making mines operating. Subsidies to cover loss-making production were eliminated by 2001 when the industry was largely privatized. But some important tasks, such as environmental mitigation works, repair of houses damaged by mining subsidence, and repair of overall social infrastructure, received little financing.

Figure 2



56 **Institutional Measures** The coal monopoly Rosugol was disbanded with responsibilities being shared between a newly formed Ministry of Energy and the IAC. The government expanded the number of ministries and agencies engaged in the development of the coal sector restructuring strategy to ensure appropriate expertise from a variety of specialists. Although much was accomplished in the mid- and late 1990s, the coal reform program effectively came to an end between August 2000 and mid-2001, when the IAC was disbanded and the deputy minister for coal dismissed, with no immediate replacement named.

57 **Mine Closure and Environmental Protection** While 153 mine closures took place in Russia

by 2001, there was no agency responsible for physical mine closure. Physical mine closure was greatly constrained by a general lack of institutional capabilities, insufficient attention to mine closure design, limited funding, and a lack of attention to environmental protection. The World Bank undertook an extensive review of the environmental problems of the Russian coal industry in preparing the 1994 sector report and proposed improvements in mining practices to reduce the environmental damage. Environmental audits were undertaken during the reform program at all closing mines and, on a voluntary basis, at some of the operating mines. However, little improvement actually took place in practice regarding environmental protection and

mitigation. A plan to improve mining safety was developed but not implemented.

58 **Social Support** Following the subsidy reforms, wage arrears were cleared, severance payments were made to redundant mine workers, disabled coal workers received disability payments, and social support systems were established in Russia. However, in the coal mining area in the far north of Russia, a two-year gap occurred after Rosugol ceased to provide relocation funds to employees and before the new mechanisms were in place for channeling severance funds and social support measures to miners and communities, which caused considerable hardship and resentment against the program. Local development and job-creation programs created nearly 20,000 jobs in 22 coal regions between 1998 and 2000, but this number was minimal compared with the over 600,000 coal industry jobs lost from 1990 to 1998. Efforts such as retraining and small business support were constrained by insufficient financing and capacity. Also, provision of free coal to workers and coal industry pensioners proved to be much less reliable after privatization.

59 **Social Assets** Social assets such as housing and sports and holiday facilities were an important part of the coal industry's labor package, but there was inadequate provision of funding to maintain the social services after mines were closed. In addition, little headway was made in important activities such as social infrastructure repair and relocation of homes damaged by mining. By 1996, about 70 percent of the coal industry's social assets had been transferred to regional or local governments and municipalities, but because of a shortfall of budget transfers, funding of operating costs of social assets collapsed in practically all coal communities where assets were transferred.

World Bank Support for Coal

Sector Adjustment: Ukraine

60 **Drivers of Change** Coal sector adjustment also started in Ukraine in the late 1980s. Similar to Russia, in Ukraine the main drivers of change (Table 4) were declining energy demand as the transition from central planning to a market economy took place and increased competition from oil and gas. Loss-making coal mines were protected by central planning and heavily subsidized. Coal was sold by the mining companies at prices fixed by the government, but many customers did not pay for the coal and a large barter trade developed. The coal industry was unable to pay wages; hundreds of thousands of workers left the industry because they received no pay; and many coal communities were in great social and economic distress. Unlike in Russia, the industry remained state owned and has struggled to be competitive and profitable through to the present time.

61 **New Institutions** The Ukraine government established the Ministry of the Coal Industry in late 1994 as the key government agency for the coal sector, taking over the responsibilities of the former State Coal Committee. The Program for the Development of the Coal Mining Industry of Ukraine and Its Social Sphere up to the Year 2005 was approved by the Cabinet of Ministers in 1994 but never implemented. In addition, a dedicated mine closure company—Ukrainian State Company for Coal Mine Closures (UDKR)—was established to undertake physical mine closures and process wage arrears, severance, and other payments.

62 **Coal Sector Work** In response to a government request, the World Bank prepared an in-depth

Table 4

Drivers of Change for Coal Sector Adjustment and Government Response in Ukraine, 1980s Onwards

	Late 1980s–1993	1994–99	2000–04	2005 Onwards
Drivers	Coal demand declines as economy contracts; state-owned coal mines cannot cover costs, and workers are not paid; budget subsidies reach unmanageable levels	Coal workers, managers, and traders push back strongly against deep-rooted employment downsizing and capacity closures; extensive barter trade results in mining companies not being paid and becoming cash-starved.	State-owned coal sector struggles to be competitive and profitable	State-owned coal sector continues to struggle to be competitive and profitable
Government Response	Centrally planned energy policy protected loss-making coal production	Ministry of the Coal Industry established; coal reform program approved; subsidy policies improved; social assistance provided, but implementation somewhat modest; a dedicated mine closure company—UDKR—established	Limited reform efforts; UDKR performs well	Policy largely unchanged

Source: authors.

coal sector report for Ukraine: the Ukraine Coal Industry Restructuring Report (Report No. 15056-UA),⁷ which was issued in March 1996. Similar to the Russia coal sector report, the Ukraine report emphasized:

- a) Restructuring and downsizing the coal industry mining capacity and employment in line with the demand for coal;
- b) Setting the economically viable portion of the coal industry on a sound financial and commercial basis;
- c) Reforming coal industry subsidies and shifting them away from covering operational losses and toward covering wage arrears, severance payments, social support programs, and physical mine closures;
- d) Putting in place urgently needed social

support measures to cushion the impact of the restructuring on coal miners, their families, and affected communities; and

- e) Introducing deep-rooted institutional reforms to strengthen intergovernmental coordination and decision making and corporatize and privatize the Ukrainian coal industry.

⁶³ **Policy Dialogue** The policy recommendations of the World Bank reports were discussed at great length with Ukrainian government representatives and became the basis for a Ukrainian presidential decree on coal reform issued in February 1996 with the following key components.

- a) *Closure of Unviable Mines and Mitigation of Social and Environmental Costs.* Each year, 20 mines would be closed in an environmentally sound manner.



- b) *Redirection and Reduction of Subsidies.* The government's 1996–97 coal sector budget would focus on supporting the restructuring process rather than loss-making operations, with a multiyear framework for the phasing out mining sector operating subsidies.
- c) *Social Mitigation.* Mine closures would be phased to spread the social costs over time and minimize the risk of political upheaval that might undermine the overall sector restructuring program. Statutory minimum severance pay would be provided and wage arrears eliminated. Government-funded social mitigation programs to provide social support measures and promote employment creation would be established in all coal mining areas. Social assets were to be transferred to municipal administrations, with government budgetary support if needed, or privatized. Social impact monitoring and extensive public consultation would be implemented.
- d) *Market Liberalization.* Cross-subsidies between mines would be eliminated, and mines would be allowed to sell coal in the domestic market and export coal at market-based prices without going through the state coal marketing company.
- e) *Restructuring and Privatization.* Mines were divided into four categories, with the most viable (category 1) to be corporatized under state-owned holding companies for future possible privatization and the least viable (category 4) to be transferred to UDKR for closure. Employment contracts for mine managers would be introduced with performance-related remuneration. Most noncore productive activities were to be divested and privatized or liquidated by the end of 1997.
- f) *Investment in Viable Mines.* The government would provide investment funds in the form of loans, not grants, to the most viable mines until private capital was forthcoming.
- 64 **Lending** The reform program was then implemented with support from two World Bank loans in 1996: a SECAL and a pilot project loan (Table 5).
- 65 **Loan Objectives** The first loan to Ukraine was the Ukraine pilot project loan, the objective of which was to demonstrate the feasibility of mitigating the social and environmental consequences of the mine closure process by supporting three pilot mine closures. The main objective of the second loan (the SECAL) was to support the government in implementing its coal sector restructuring program to close uneconomic mines in a socially acceptable manner and transform the coal sector into a financially viable sector able to fund itself.

Table 5

World Bank Coal Sector Lending to Ukraine, 1996				
Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Ukraine	Coal pilot project loan	15.8	May 1996	December 2000
Ukraine	Coal sector adjustment loan (SECAL)	300	December 1996	December 2000

Source: authors.

- 66 **Outcomes** Employment was reduced by 24 percent from 1995–99, and production fell 3 percent, yielding a productivity increase of 27 percent. The industry remained financially precarious, and most Ukrainian coal mines continued to make losses. Although coal export restrictions were removed and price controls abolished, the full potential benefits were not realized because of the rampant barter trade and nonpayment for coal. Nonpayment (and noncash payment) by customers left Ukrainian mines with insufficient funds even to pay wages. Alleged high dealer profits and corruption in an opaque, economically inefficient barter trade added to the coal industry’s financial difficulties. Increases in coal industry net payables acted as an extra, hidden subsidy equal to about half of the budget subsidies. A system of repayable bank loans for investments in category 1 mines was announced but not implemented. Most investment continued to be financed by grants, and government-funded investments were made in category 2 and 3 mines that should not have taken place.
- 67 **Subsidies** Indirect subsidies were eliminated and restrictions imposed on less-efficient mines to limit wage increases and new worker recruitment as a condition for receiving operating subsidies. Unlike Russia, the Ukrainian government lacked the political will to implement deep-rooted subsidy reform and coal industry financial improvement measures; coal miners and managers blocked some key measures designed to rationalize production and employment practices. Direct budgetary subsidies declined between 1996 and 2000 but were still about 1.8 percent of GDP in 2000. Coal sector budget targets were met, but more funding was used for operating subsidies and investments than for restructuring and closures. Because of political and social

concerns, the government continued to grant production subsidies that prioritized wage payments to practically all mines.

- 68 **Stakeholder Engagement** There had been little public dialogue about the need for coal industry restructuring, but the government reached out to other stakeholders in the early to mid-1990s. A national dialogue was established, and the coal reform program was presented and discussed at a widely publicized conference on the Ukrainian coal industry in April 1996. Central and local government officials, labor unions, mine management, and international organizations participated. However, the government’s public information effort weakened thereafter as opposition to the program increased, which created a perception of an incoherent adjustment policy which then favored political opposition to coal industry restructuring.
- 69 **Physical Mine Closure** The UDKR generally executed its tasks in closing 70 mines in a competent and successful manner, but a number of factors hindered fast and efficient mine closures. The Ministry of Construction and Industry did not always give priority to UDKR’s funding, and established mine closure regulations and procedures that often proved to be too general, ambiguous, and in some cases, contradictory. In addition, the Ukraine Mine Design Institutes, which played a key role in closure preparation and supervision, often exercised bureaucratic power (for example using centrally prescribed standards sometimes without field inspection) with a negative impact on the time and costs needed for closure. UDKR received only 10 percent of the amount stipulated for environmental rehabilitation in the mine closure programs, most of which was allocated for the installation of new water pumps in closed underground mines to mitigate mine flooding.



70 **Social Response** The UDKR was responsible for administering social support payments to redundant mine workers. UDKR undertook this role very effectively and ensured that benefits did not go astray and that redundant workers received the full benefits to which they were entitled (two years of unemployment insurance payments plus a free coal allowance). Two social surveys, carried out at mid-term and toward the end of the World Bank loans, confirmed that unemployed former miners and mine pensioners generally received unemployment benefits and pensions on time and in full. The Ukrainian SECAL supported a municipal energy efficiency credit line that provided substantial cost savings for municipal governments of more than one-third on energy bills when mini boilers were introduced to replace district heating systems. Benefits from the installation of heat, water, and electricity meters were also significant. But little progress was made in creating new jobs and alternative employment for redundant coal miners. A commercial credit line to support small and medium business development was established, but it was extremely slow to take off and be used.

71 **Social Assets** Good progress was made in transferring social assets to municipalities under the pilot project, but a lack of funding meant that this did not translate thereafter into an industrywide transfer of the social assets of operating mines to municipal governments. UDKR received only 10 percent of the amount budgeted for rehabilitation of the social infrastructure that was due to be provided to municipal governments. Municipalities refused to take over social assets if they were not provided with the budget needed to manage and operate those assets.

72 **Background** Hard coal⁸ provided over 60 percent of total primary energy consumption in Poland and about two-thirds of power sector fuel supplies, accounting for almost 4 percent of GDP. As in Russia and Ukraine, the Polish coal industry sustained large and increasing losses during the 1990s, when production capacity and employment failed to adjust to shrinking domestic demand and sharply declining export sales and prices. The sector was also a major polluter that failed to pay its environmental fees and fines. Losses reached the equivalent of US\$1.2 billion in 1998 and were a severe drain on the government budget. But there were no wage arrears.

73 **Drivers of Change** The main drivers of change in Poland were similar to those in Russia and Ukraine: central planning protecting an uneconomic, loss-making, state-owned coal industry, but competition from lower cost, cleaner fuels was not as severe since oil and gas had to be imported into Poland. To stop coal mining company losses and prepare the sector for European Union (EU) competition, the Polish government made coal industry reform one of its highest priorities. Coal sector adjustment started in the early 1990s, with the government preparing and approving coal reform programs for 1993, 1993–94, 1994–95, and 1996–98. But the coal mine trade unions opposed proposed mine closures with strikes, and industrial action which resulted in very little implementation of the early reform programs. However, one important accomplishment was that the coal industry was restructured into seven joint stock companies with newly appointed boards

of directors, which considerably improved government oversight of the industry.

74 **Trade Union Engagement** After several strife filled years in the early to mid-1990s, the government more actively engaged with the unions to build their understanding for the need for reform and to obtain their support for coal sector reform. The government then prepared the 1998 Coal Sector Restructuring Program, which offered a package of generous early retirement and pension provisions and severance payments for underground miners along with measures to encourage the development of new employment activities outside the mining industry focused on Silesia, where most coal mining took place. This package led to the trade unions' acceptance of the program.

75 **1998 Coal Restructuring Program** In June 1998, the government approved the 1998–2002 Hard Coal Sector Restructuring Program. The 1998 Program was a comprehensive program that provided for closure of about 19 percent (25.5 million tons per year) of coal mining production capacity and a reduction of about 43 percent of the workforce (105,000 persons) from 1999 to 2002. The Polish government leaders also established a high-level, decision-making body, the Inter-Ministerial Coal Steering Committee (IMCSC), to oversee the implementation of the 1998 reform program. The drivers of change and government response in Poland are presented in Table 6.

76 **Miners Social Package** The social support measures to support workers to leave the industry in the 1998 restructuring program included a miners social package (MSP),

Table 6

Drivers of Change for Coal Sector Adjustment and Government Response in Poland, 1980 Onwards

	1980s–1996	1997–2000	2000s	2010 Onwards
Drivers	Economy contracting; coal mines experiencing increasing financial losses; coal mine subsidies strain state budget; coal production important to energy security; coal mining causing environmental harm	Least-efficient mines closed without strong protests	Coal industry environmental harm reduced; coal mining privatization strategy largely rejected in 2003 because of public opposition	Little other domestic energy production; coal remains central to energy security; considerable air pollution in Polish cities
Government Response	Subsidized loss-making mines and protected coal industry; 1990s early reform programs approved; industry restructured into seven joint stock companies	Effective dialogue with trade unions resulted in acceptance of 1998 Reform Program; Inter-Ministerial Coal Steering Committee formed 1998; reform program approved with generous retirement and severance provisions; improved budget subsidies and policies; coal mine closure companies established	Sector environmental assessment (SEA); reform program updated; coal industry remained largely state owned with one mine privatized in 2009	One joint stock company privatized in 2011; energy security emphasized; light-touch clean energy policy; coal mines merged with power plants to improve the coal company finances

which consisted of (i) a severance package of up to five years of salary/wages to encourage voluntary early retirement of underground miners and coal-washing-plant workers; (ii) a social allowance package of a free training or retraining course, job search assistance, and a two-year wage allowance that would be paid to workers interested in reemployment outside the mining sector; and (iii) an unconditional lump sum departure incentive, which was a one-time payment to workers willing to leave their mining jobs. The 1998–2002 cash costs of the MSP were estimated at about US\$2 billion. A greater-than-expected decline in coal demand resulted in sustained high coal sector losses in 1999. As a result, the government revised the program in December 1999, with even more attractive MSP benefits to support deeper reforms in employment and increased coal production capacity reduction to reduce costs and address the supply–demand imbalance.

77 **World Bank Loans 1999–2001** Having prepared the 1998 Coal Sector Restructuring Program, the Polish government sought World Bank assistance to implement the program. A first round of lending took place in 1999–2001 (Table 7). The World Bank’s assistance was focused more on program implementation than program design (as in Russia and Ukraine), although the World Bank support contributed to some improvements in the program as it was being implemented.

78 **Lending Objectives** The main objective of the two Poland SECALs was to support implementation of the government’s 1998 and 1999 Restructuring Programs. SECAL I supported the government to (i) implement socially acceptable and effective employment restructuring; and (ii) improve the efficiency and financial performance of the mining companies. SECAL II supported the government’s implementation of the revised 1999 Restructuring Program. This contained more extensive mine closures and employment reduction than the 1998 Program, with new measures to (i) improve the industry payment of taxes and fees to government; (ii) improve environmental performance; and (iii) help prepare for possible privatization. Both loans helped to finance redundancy packages. The Poland loans both supported a top-down approach to mine closure, with mines being transferred for physical liquidation and reclamation to central mine closure companies. The Poland loans also followed a top-down approach to social mitigation by funding redundancy packages.

79 **Restructuring Program Outcomes 1998–2002** The main outcomes of the support provided to Poland by the first round of SECALs were:

- a) Employment was reduced by 67,000 (from 208,000 to 141,000) from 1998 to 2002, without major social conflict and supported

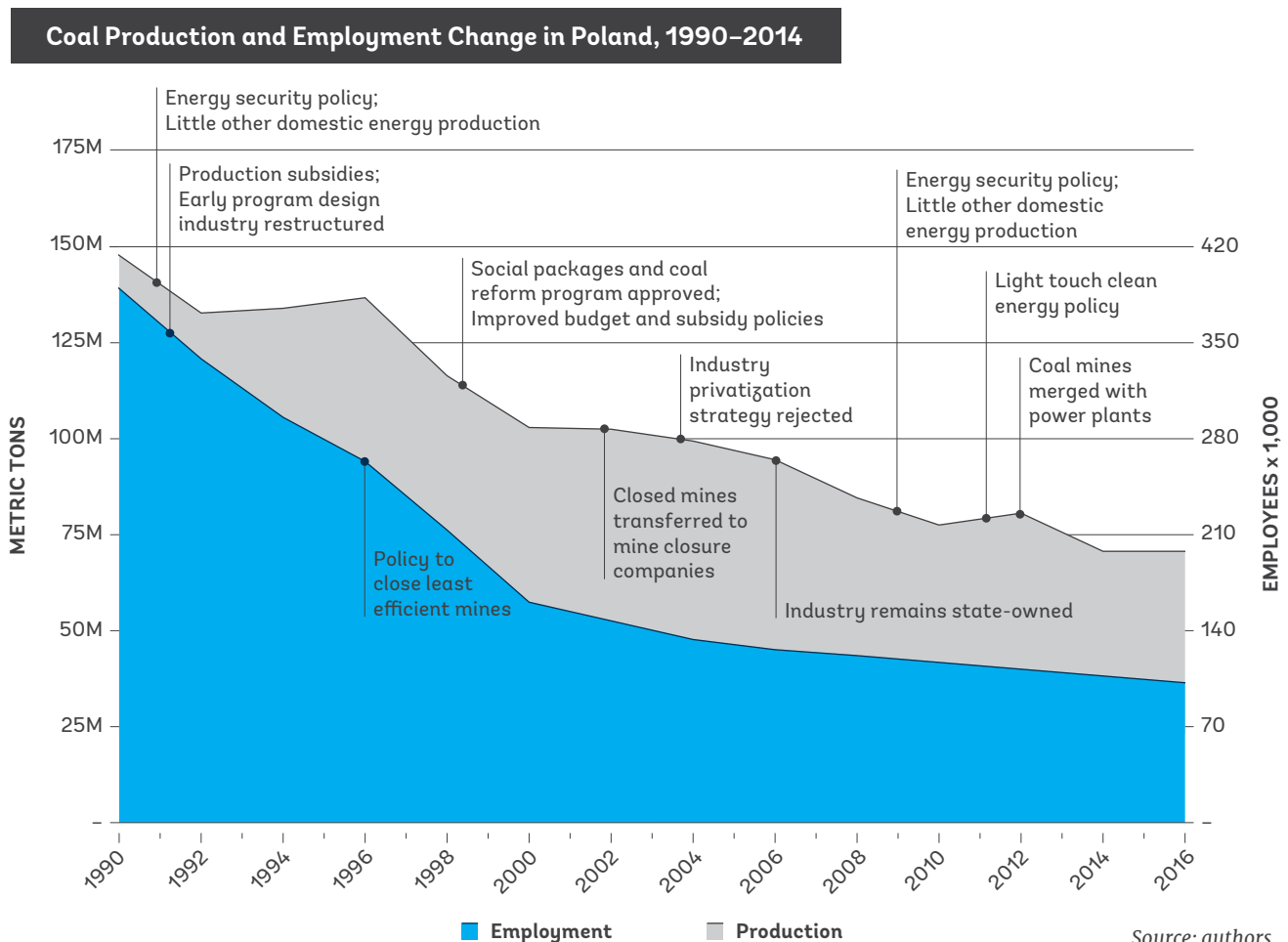
Table 7

World Bank Coal Sector Lending to Poland, 1999 and 2001				
Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Poland	Hard coal sector adjustment loan (SECAL I)	300	June 1999	September 2000
Poland	Hard coal sector adjustment loan (SECAL II)	100	August 2001	December 2001

Source: World Bank.

- by an extensive dialogue with trade unions.
 - b) Two coal mine closure companies were established and did competent work in taking over and physically closing 13 mines (reducing the number of operating mines from 54 to 41).
 - c) Production was reduced by 14 million tons per year (from 116 to 102 million tons per year).
 - d) Financial losses of about US\$2 billion per year were improved to a net income of US\$0.5 billion per year but in large part occurred because of a significant 2001 increase in market-based coal prices.
 - e) Post closure mine monitoring and maintenance were introduced, including preparation and implementation of a 2005–25 dewatering master plan.
 - f) A new Coal Act was enacted in November 1998 and further revised in February 2001.
- 80 **Long-term Outcomes** Figure 3 shows the relative declines in production and employment from 1990–2014. Hard coal production declined from 147 million tons to 102 million tons from 1990–2000 and then further declined to 70 million tons in 2015. Employment declined from 388,000 to 155,000 from 1990–2000 and then further declined to about 100,000 in 2015. These changes

Figure 3



resulted in a significant improvement in labor productivity and cost savings from 1990–2000 but only a modest improvement from 2000–15.

- 81 **Coal Industry Management** Strengthening management of the coal companies was a key aspect of the Polish program. Accountability by the management of the state-owned coal mining companies was improved through the introduction of commercial company business plans and annual operating plans. Management performance also improved through the use of incentives in management contracts that were consistent with the program objectives. The supervisory board of each of the three main state-owned mining companies was reconstituted on January 1, 2000, to include the appointment of one full-time supervisory board member for each company.
- 82 **Poland Stakeholder Dialogue** The extensive dialogue with the trade unions provided the basis on which the employment restructuring and mine closures could be effectively and successfully implemented from 1998–2002. The engagement broadened over time to include other stakeholders. Major consultations with mining community representatives, companies, and government officials, along with the workers and trade unions, took place in June 2003 and May 2004. Capacity and employment restructuring were addressed as dominant issues, and this resulted in inputs to the modifications included in the revised 2004–06 Restructuring Program.
- 83 **Privatization** Although mine closures and reductions in environmental impact and pollution were successful, a coal industry privatization strategy was prepared but not implemented because of great public opposition in the early 2000s. However, one large mine (Bogdanka) was privatized in 2009, and one company (JSW) was listed on the Warsaw stock exchange in 2011. The rest of the industry has continued to be state owned and has incurred further large losses, resulting in large debts today. The government’s light-touch, clean energy policy favors energy security and coal.
- 84 **Alternative Employment** The government provided employment counseling, job placement, and retraining services to assist workers in finding new employment. Retraining included equipping former miners with the specific skills and licenses required for new employment in areas such as warehousing, driving, and security. According to surveys of miners and their families, about 60 percent of the miners viewed the MSPs positively, but for most of the other 40 percent, a lack of alternative employment opportunities caused a negative assessment. Of those seeking to return to the workforce, 52 percent were successful. Most beneficiaries of MSPs (approximately 85 percent) advised they had sufficient funds to support their families. However, for the region as a whole, the loss of jobs exceeded new jobs created.
- 85 **Environmental Mitigation** A sector environmental assessment was undertaken, which led to the preparation and implementation of mine-by-mine environmental management plans by Polish mining companies, which substantially reduced coal mine environmental harm and pollution. Pollution from saline water discharges and dumping of waste were substantially reduced.⁹ The Ministry of Environment became an active partner in the IMCSC.
- 86 **Poland 2003 Restructuring Program** The Polish government prepared and implemented a follow-on 2003–06 Hard Coal Mining Sector Restructuring Program

in 2003, which continued the multifaceted approach of the 1998 and 1999 Programs in covering employment restructuring, capacity closure, and financial restructuring. Because of a sharp increase in the export price of coal in early 2004, the financial position of the mining companies improved significantly. Because of this, the 2003–06 Hard Coal Mining Sector Restructuring Program was modified in early 2004 and resulted in a 2004–06 Revised Restructuring Program.

improved financial position of the mining companies in 2004 resulted in a need for more workers to maintain production, and fewer workers were then interested in the voluntary packages to retire early or leave the industry for employment in other sectors. However, retirements increased significantly when changes were made to the pension law to allow miners with 20 years or more of underground work to retire at 45 years of age.

87 **Lending 2004** The Polish government requested further World Bank lending, and a second round of lending was provided in 2004 through two investment-type loans, which supported implementation of the 2003 and 2004 programs (Table 8).

88 **Poland Hard Coal Social Mitigation Project (HCSM) Loan** The 2004 HCSM loan supported the government in implementing employment restructuring. The three components were support for funding (i) severance payments for underground workers under the 2003–06 Program; (ii) severance payments, retraining, and reemployment for surface workers under the 2003–06 Program; and (iii) severance payment commitments under the 1998–2002 Program. The HCSM loan supported the government to further downsize coal industry employment from 133,000 at the end of 2001 to 119,000 at the end of 2006. The

89 **Poland Hard Coal Mine Closure Project (HCMC) Loan**

This loan supported the financial strengthening of the mining companies and provided funding for physical closure and safe rendering of potentially unsafe closed mining sites, including:

- a) Preparation of environmental management plans, mine closure plans, and engineering design studies and documentation reviews to obtain approvals for work to be undertaken;
- b) Closure of underground workings and shafts, including removing equipment and securing underground areas;
- c) Demolishing and clearing surface structures, buildings, plants, and equipment;
- d) Land reclamation, including cleanup, ground leveling, and revegetation and cultivation, and making reclaimed land available to

Table 8

World Bank Coal Sector Lending to Poland, 2004

Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Poland	Hard Coal Social Mitigation (HCSM) Project	200	March 2004	December 2006
Poland	Hard Coal Mine Closure (HCMC) Project	100	July 2004	July 2007

Source: World Bank.



local municipalities for other community uses or commercial development;

- e) Stabilization of any waste dumps, as needed;
- f) Preparation of a comprehensive 2005–25 dewatering master plan to protect adjacent ongoing mining operations from possible inflows of water from nearby closed mining operations; and
- g) Introduction of post closure mine monitoring and maintenance, with particular regard for post closure dewatering requirements, as needed.

90 All of the work undertaken was subject to prevailing environmental and safety requirements in line with EU requirements.

91 **Present Poland Coal Industry** Poland remains one of the countries with the greatest dependence on coal for power generation, with about 60 percent of Poland’s power generation fueled by hard coal. Although hard coal production and employment have been declining for many years, Poland is the second-largest producer of coal in the European Union, with a production of just about 70 million tons per year and employment of just under 100,000 workers. The state-owned Kompania Weglowa SA (KW) is the largest coal company in Europe and accounts for just under half of Poland’s coal production, with a mining employment of 47,000 workers producing mostly thermal coal for power generation. Polish coal had declined since 2011, affected by a fall in world thermal coal export prices from over US\$120 per ton in 2011 to US\$60 per ton in 2016. In 2016, KW was operating 13 mines, four of which accounted for about 80 percent of KW’s losses (€192 million of about €240 million in 2014). After

nearly entering into bankruptcy in late 2014, and following two restructuring programs proposed by the government in the first half of 2015 but rejected by the trade unions with forceful strikes and protests, these four loss-making mines remained in production. Coal use in Poland had been declining steadily, largely a result of competition from other less-expensive fuels, including lower-priced coal imports, which reached 17 percent of the domestic market in 2014.

92 **Recent Analytical Work** In 2017, the World Bank piloted analytical work to enable the government to develop an understanding of which mines would be candidates for closure, taking into account both energy production costs and carbon emissions. The analysis required (i) an assessment of the overall energy market in terms of potential supply and cost of competing fuels, such as lignite, natural gas, solar, wind, nuclear, and biomass, while also taking into account a range of possible emissions targets; and (ii) a financial analysis of each mine, taking into account remaining coal reserves (“mineability”), production costs, employment, emissions control options and costs, and transport costs to power plants and district heating units. The analysis took account of both the costs of delivered energy and an assessment of the potential hardships that would result from mine closures and impacts on employees and their communities. Data requirements can be quite demanding because the overall energy and the power markets must be considered as well as the hard coal industry. This Poland case study demonstrates an ability to support evidence-based decision making, within a data-intensive approach, to inform a broad stakeholder group on the many complex factors across coal mining (and coal mine closure) and links with the downstream energy sector.

- 93 **Romania Loss-Making Mines** In Romania, government subsidies were needed to cover losses at both coal and metallic mineral mines, and World Bank support covered overall mining sector adjustment including closure of both coal and noncoal mines. There had been considerable uneconomic mineral development by state-owned mines in Romania, and by the late 1980s, mining accounted for almost 10 percent of total formal sector employment, much larger than was economically justified. Loss-making mines received over US\$0.5 billion per year in budgetary support in the early 1990s. Even so, many of the mines were small mines spread around the country, and they ceased production when money ran out. There were no wage arrears but workers lost their employment and income when production and sales ceased. Employment declined from over 300,000 to less than 200,000 by the mid-1990s as mine workers left the industry without any government support or intervention.
- 94 **Romania Initial Restructuring** In 1996, the government took some key steps to manage the adjustment that was taking place. The government took high level decisions and prepared a strategy to (i) stop all mining activities in mines that operated in dangerous working conditions or where reserves were close to being exhausted; (ii) increase investments to modernize production in mines that potentially could be profitable; and (iii) prepare and introduce a voluntary lump-sum redundancy package to reduce the mining industry labor force. In 1997, the government established the National Agency for Development and Implementation
- of the Programs for Reconstruction of the Mining Regions (NAD) to oversee and implement the social mitigation and local development aspects of the strategy, and in 1998, the Central Group for Mine Closures was established to be responsible for the physical mine closure and environmental reclamation aspects of the strategy.
- 95 **1998 Restructuring Program** Following on from the 1996 high level decisions, the government issued an initial comprehensive program in 1998 for restructuring the mining sector. This program included:
- a) Putting the mining industry on sound commercial footing;
 - b) Phasing out the government's direct involvement in mineral exploration and production;
 - c) Privatizing the national mining companies and seeking private sector investment;
 - d) Ensuring that mining activities were carried out in an environmentally sustainable manner; and
 - e) Providing comprehensive support to mitigate the social hardships caused by the closure of uneconomic mines and revitalize the economies of the mining regions.
- 96 **Employment Reduction** The Ministry of Economy and Commerce took the lead in the implementation of the mining industry program. The implementation was done in consultation with and participation by other relevant national and local authorities and the mining companies, as well as by civil society, including local communities, nongovernmental organizations (NGOs), and disadvantaged groups. By December 1998,

about 83,000 of the country's approximately 173,000 miners had left the industry, with about 84 percent accepting the voluntary lump-sum redundancy package. Production was stopped at 160 mines, but only about 35 of the remaining mines were considered to be economically viable, so many more mine closures were needed.

97 **Redundant Worker Unrest** The layoff of so many workers precipitated a sharp decline in general economic activity in the mining regions, adding to the existing hardships from the earlier closure of other mines in the early to mid-1990s. But the initial efforts to mitigate the social hardships of layoffs¹⁰ and stimulate the economies of the mining regions were inadequate, partly because many workers quickly used up their lump-sum payments and could not find new employment. In January 1999, labor unions began to foster serious unrest and marched on Bucharest.

98 **Lending** The government then sought World Bank assistance to implement the 1998 program and address the needs of the redundant workers, and a Mine Closure and Social Mitigation (MCSM) loan was made in 1999 (Table 9).

99 **MCSM Loan Objectives** The main objectives of the Romanian MCSM loan were to support the government to implement its mine restructuring program by (i) developing effective mine closure procedures and helping

to fund 29 mine closures; (ii) mitigating the social hardships resulting from the sector restructuring and helping to create new employment opportunities for redundant workers; and (iii) introducing a modern mining licensing system. The loan helped finance physical mine closure works and a broad range of local level social mitigation and socioeconomic regeneration activities. The MCSM loan supported a top-down approach to mine closure, with mines being closed by a central type mine closure company, but more of a bottom-up approach to social support, with activities focused largely at the local community level. This supported the Romanian government's approach to socioeconomic regeneration of the mining regions, which was based on strong community-level stakeholder involvement using a community-based development approach.

100 **Outcomes** The main results of the support provided to Romania by the MCSM loan were:

- a) Mining sector employment was reduced by 32,000 from 90,000 in 1989 to 58,000 in 2004;
- b) About 25,000 jobs were created by 2005 through a range of job creation measures;
- c) From 2001–05, a redundant worker's income increased from about 16 percent to about 50 percent of the average monthly income in the mining areas;

Table 9

World Bank Coal Sector Lending to Romania, 1999				
Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Romania	Mine Closure and Social Mitigation (MCSM)	44.5	August 1999	October 2006

Source: World Bank.

- d) Mining operational subsidies were steadily reduced from US\$144 million in 1999 to US\$80 million in 2005. Subsidy support was shifted from loss-making mines to social programs and initiatives, physical mine closures, and environmental remediation; and
- e) A new mining law was enacted and the mining licensing system modernized with a modern, computer-based mining cadastre and title registry.

¹⁰¹ **Mine Closures** A key aspect of the Romanian program was sound mine closures. A mine closure manual, based on good international practice, was prepared and issued by ministerial order in 2001. The legal framework for management and implementation of mine closure was strengthened by putting in place 98 legal codicils specific to mining activities and mine closures, three laws, two emergency government ordinances, and two other government ordinances. The mine closure manual helped ensure that closures were accomplished with extensive community consultation, which helped promote social sustainability. In addition, inspection capabilities were strengthened. All these measures helped to shift the state's role away from management and toward regulation of the sector.

¹⁰² **Environmental Mitigation** In Romania, a mining sector environmental assessment (SEA) was conducted in 2001 and extended and updated in 2003. The SEA (i) reviewed the status of the existing environmental legal, regulatory, and institutional frameworks and recommended actions for improvement; (ii) undertook an analysis of the impacts of sector activities on the environment and the communities; (iii) estimated the costs of environmental

rehabilitation of areas in which mines would be closed; and (iv) established appropriate environmental policies and monitoring procedures. The SEA supported preparation of environmental protection manuals and monitoring guidelines, and an environmental management plan was piloted in one of the largest mining areas (the Jiu Valley) following the recommendations of the SEA.

¹⁰³ **Romania Participatory Processes** In Romania, participatory processes were built into project activities from the start of the MCSM loan and included the participation of key stakeholders along the three dimensions of participation: namely, information sharing, consultation, and collaboration. Before and during the mine closure process, meetings were held regularly with the neighboring communities to keep them informed and solicit feedback and inputs.

¹⁰⁴ **Outreach** Feedback received from beneficiary surveys confirmed that the Romanian social mitigation measures helped reduce the poverty levels in the mining regions through employment creation and income generation. Although about 25,000 new jobs were created, this was equivalent to only about 20 percent of the total number of miners who left the industry from 1998–2004. NAD undertook proactive community outreach and social dialogue. Social Dialogue and Public Information Centers were established to ensure that redundant workers and communities were well informed about social support programs. All regional offices of NAD had information technology equipment that could connect to a central database so that data were collected at the local level by the regional offices and submitted to the central level. However, although much was accomplished, NAD underwent six internal reorganizations between its establishment in 1997 and 2004 and did not develop into a strong, well-established agency.



¹⁰⁵ **Social Recovery** A poverty and social impact analysis (PSIA) identified that although households headed by laid-off miners experienced the largest immediate decline in household welfare, those employed from other sectors in mining localities also faced significant decline in household welfare. However, redundant employees in related sectors did not receive the generous severance benefits that mine workers received and thus were even worse off than the mine workers. Based on the PSIA, the target group was broadened midway during the MCSM implementation. Although progress was slow, the financial status of laid-off workers improved. By 2005, a redundant person earned 50 percent of the average monthly income and his or her household income had increased to 64 percent of the average. Social capital is an indication of the social cohesion of the community and has been shown to have positive outcomes for health, political participation, educational achievement, and crime. After the initial shock of the mine restructuring process, there was a sharp decline in social capital between 2001–2004. However, from 2004 onward, there was a revival of social capital that helped bring about greater cohesion and trust across the mining communities.

¹⁰⁶ **Romania 2004–10 Mining Sector Strategy** In April 2004, the Romanian government approved a new 2004–10 Mining Sector Strategy. This strategy sought to further reform the sector to meet EU accession rules that required the government to eliminate subsidies for metallic minerals mines by 2007 and coal mines by 2010. This required additional downsizing of the mining sector, from 57,738 workers in January 2004 to 26,650 workers in 2007, and imposed hard budget constraints on mining companies. The 2004–10 Romanian strategy centered around four main objectives:

- a) Facilitating a commercial approach to the mining industry;
- b) Reducing direct involvement of the government and attracting private capital, both local and foreign, into the mining industry;
- c) Identifying and mitigating environmental impacts of the mining sector and promoting responsible environmental management; and
- d) Mitigating social problems caused by the closure of nonviable mines and revitalizing the economy in the affected mining regions.

¹⁰⁷ **Romania – Follow-up Loan** The government requested a second loan in 2004 to support implementation of the 2004–10 strategy (Table 10).

¹⁰⁸ **Romania Mine Closure, Environmental and Socio-Economic Regeneration Project (MCESR) Loan** The 2004 MCESR loan built on the work of the first MCSM loan. It focused on strengthening the government mining sector reform activities by (i) building capacity of the Mine Closure Agency to close uneconomic mining enterprises through support for closing complex mines and ancillary enterprises in an environmentally sustainable manner; (ii) financing the closure and environmental rehabilitation of an additional 20 mine sites; (iii) starting implementation of the recommendations of the SEA; and (iv) providing support to the NAD (renamed AZM), local communities, and other agencies for community-based planning and socioeconomic regeneration of the mining regions. The MCESR loan continued and enhanced the social mitigation work started under the first loan and expanded the social support and regeneration measures to include local development

Table 10

World Bank Coal Sector Lending to Romania, 2004

Country	Loan	Amount (US\$, Millions)	Date Opened	Date Closed
Romania	Mine Closure, Environmental and Socio-Economic Regeneration Project (MCESR)	120	December 2004	December 2012

Source: World Bank.

activities. These included municipal infrastructure development, social development schemes for the mining communities, community capacity-building initiatives, and a small grants scheme that aimed to improve the welfare of vulnerable groups, especially women, youth, children, and the elderly.

109 Mine Closure The 2004 Romania MCESR supported the closure and environmental remediation of another 23 mines, including more-complex metallic mines that had ceased operations. It also supported the reclamation and rehabilitation of 497 hectares of land that was then transferred by mining companies to other parties for new uses.

110 Romania Community Support Measures The Romania MCESR project helped finance the following key measures to support the socioeconomic recovery of communities in the mining regions where mines were closed:

- a) Employment Training Incentive Scheme (ETIS) with subsidies to underwrite the costs of on-the-job training for workers obtaining new jobs;
- b) Subsidies for local businesses to increase the demand for labor along with business incubation centers, including converting 10 mining company buildings into work space centers to support the start-up of new businesses;

- c) Financing for both municipal and community infrastructure;
- d) Microcredit funding for small businesses;
- e) Small grants and other support programs for particularly vulnerable groups; and
- f) Community capacity building (CCB), which promoted community dialogue and participation.

111 Subsidies The level of mining sector subsidies in Romania was further reduced from US\$80 million in 2005 to US\$54 million in 2012 (excluding payments for voluntary redundancies). Subsidies were shifted away from loss-making mines and instead supported social programs and initiatives, physical mine closures, and environmental remediation. An important initiative was that the MCESR loan also supported local public authorities to prepare strategic development plans in a participatory manner and identify related funding sources for the plans, which resulted in municipalities generating additional revenues for their local budgets.

112 Employment Training Incentive Scheme A 2011 assessment found that approximately 70 percent of ETIS beneficiaries thought ETIS was highly important for their families, and 50 percent of employers subsidized by ETIS mentioned that it had



contributed significantly to the development of their businesses. Many thought it was a motivating factor in running their businesses effectively. The assessment also found that some 160 communities were assisted through the small grant scheme, with their combined populations totaling over 1 million inhabitants. An important accomplishment was the provision of facilities, such as parks, playgrounds, kindergartens, and community centers, for community members.

¹¹³ **Community Capacity Building** According to the assessment, the CCB scheme largely fulfilled its proposed goals and objectives and had a positive impact on the local mining-based communities. The CCB scheme was instrumental in building institutional capacity and community participatory capacity in areas that featured a challenging socioeconomic situation. It led to positive outcomes in health, educational achievement, crime prevention, community participation, and citizen empowerment in the context of local economic development. This engagement with the communities ensured their approval and support, created a strong sense of ownership, and significantly contributed to improving their living conditions. Furthermore, there was significant community participation in the choice of supplementary civil works connected to mine closure and infrastructure works.

¹¹⁴ **Community Consensus Building** Along with community capacity building, consensus building is also very important if projects are going to be implemented and improvements made. Community meetings were held regularly to obtain consensus regarding local infrastructure improvements, which included road and bridge rehabilitation (71 subprojects), water supply (14 subprojects), community center rehabilitation (13 subprojects), playgrounds (four subprojects), and

rehabilitation of buildings (80 projects focused on community centers and apartment houses).

Gender Perspectives in

World Bank-Supported Coal

Sector Adjustments

¹¹⁵ **Women in the Workforce** Restructuring of a mining sector affects the welfare of women in multiple ways—through loss of coal industry employment, increased burden of domestic responsibilities when husbands lose their employment, intrahousehold tensions, and the impact on families of migration induced by mine closures. Redundancies also tended to be greater for women workers in the mining industry. When mining sector restructuring commenced in 1997 in Romania, women were 16 percent of the workforce; by 2004, their proportion had declined to 7 percent. In some of the areas in Poland where mine closures occurred, some low-wage jobs were available, but redundant miners were unwilling to take them because they considered them to be inferior and poorly compensated compared with their jobs in the mines. Instead, redundant female workers and the wives of redundant miners took such jobs to provide a family income. For the miners' wives who took the lower paying jobs while still carrying all of their household responsibilities, the household situation was sometimes made more difficult because their husbands, redundant mine workers, remained home without work or other activity.

¹¹⁶ **Poland: Access to Severance Payments** The work in Russia and Ukraine took no account of the gender aspects of mine sector restructuring, but the World Bank's work in

Poland included a specific gender-sensitive approach, which was introduced by the World Bank's mining specialists based on their engagement with women's groups in Silesia.¹¹ The initial severance packages had been made available only to underground workers and coal-washing-plant workers, all of whom were men. An important improvement was the introduction of a new MSP of 3.6 months' severance payments for surface workers, most of whom were women. This was a major improvement regarding gender equality and responded to a concern raised by NGOs at a World Bank-organized Stakeholder Workshop in May 2001.

¹¹⁷ **Poland: Women Nonprofit Organizations**

Given modest support and encouragement, women's nonprofit organizations in the Silesia coal industry region in Poland played a significant role in supporting individuals, families, and communities to respond to the coal sector downsizing and layoffs by providing help, counseling, and shelter for those in need and by addressing domestic violence, alcohol, and substance abuse issues, which increased due to the layoffs. Women's groups also provided support to women seeking employment or those creating their own businesses through help with resume

writing and job applications and by identifying training courses, accessing micro credits for women's new businesses, and helping prepare business plans for small businesses.

¹¹⁸ **Romania: Support for Women** Restructuring work in Romania benefited from the gender insights from the work in Poland, although gender-related initiatives were not introduced until the 2004 MCESR.¹² In preparation for the 2004 MCESR, the Women in Mining workshop was held to gather the views of women, and a study was undertaken to develop an understanding of the low involvement of women in development activities in mining communities to better encourage their participation. One of the project's subcomponents, the small grants scheme, was designed to focus specifically on women and youth. NAD field staff reached out specifically to women, and the small grants scheme focused on several areas of concern to mothers, including child protection, access to child care so that mothers might work, and kindergarten facilities. The 2004 MCESR had an increased emphasis on reaching women and addressing their needs. Of the 654,766 direct beneficiaries of the socioeconomic regeneration component between 2005 and 2012, 325,424 (49.7 percent) were women.



Main Lessons Learned

¹¹¹ Section 3 outlines seven main lessons learned regarding coal sector adjustment and then provides a series of 23 detailed lessons based on these seven main lessons. The seven main lessons are: coal sector adjustment was inevitable in the past and will be inevitable in the future; it is challenging but achievable; countries that undertook early preparation and strategically planned their coal sector adjustment and downsizing were more efficient and better able to manage the negative impacts than were those that took an ad hoc approach; redundancies happen immediately whereas social mitigation and social support are slow to be accomplished; employment downsizing is driven not only by mine closures but also by mining mechanization; social mitigation and rebuilding the economic base of mono-industry regions and communities are difficult and costly and the results may be modest relative to job losses; and physical mine closure and post closure monitoring and maintenance are demanding but can be accomplished in a timely and efficient manner. Both the main lessons and the detailed lessons may help governments prepare for the future and avoid possible unmanaged, shock-driven adjustments.

Overall Program Lessons Learned

¹²⁰ There are a range of different lessons learned. Seven main overall program lessons are as follows.

- i. Coal sector adjustment was inevitable in the past because of market forces and pollution reduction needs and will be inevitable in the future, largely for the same reasons plus the need for lower-carbon development;
- ii. Employment downsizing and adjustment is driven not only by mine closures but also by mining mechanization and by the shift from smaller less efficient to larger more efficient mining operations;
- iii. Large-scale coal sector adjustment can be accomplished, but it is a challenging process that will likely take decades rather than years and cost much more than initially expected;
- iv. Countries that undertook early preparation and strategically planned their coal sector adjustment and downsizing were more efficient and better able to manage the negative impacts of large-scale mine closures than were those that took an ad hoc approach;
- v. Irrespective of the country, mine closures and job losses were immediate, whereas creating alternative employment opportunities, sustaining social assets, and building community-level capacity are activities that can take many years and even decades;
- vi. Social mitigation and rebuilding the economic base of mono-industry regions and communities, especially those that are not well connected to other areas with strong economic activity, are difficult

and costly and the results may be modest relative to job losses, with the result that decades later many previously coal-dependent communities still lag socially and economically behind other areas of the country; and

- vii. Physical mine closure and post closure monitoring and maintenance are demanding but can be accomplished in a timely and efficient manner if updated mine closure requirements, good institutional capacity, an adequate regulatory framework and strong planning are in place. Governments also need to ensure that the necessary and often very substantial funding is in place.

¹²¹ A number of “how to” more detailed lessons can be learned from the coal sector adjustment that took place in Russia, Ukraine, Poland, and Romania, where the World Bank was involved, which may help governments prepare for the future and avoid possible unmanaged, shock-driven coal sector adjustment. Given the size, immediacy and severity of impacts on workers and their communities, nearly half of the lessons learned relate to social mitigation and alternative employment creation for people and communities. The “how to” detailed lessons are presented according to the Three Pillars and further organized in terms of those that relate primarily to policy and/or rules and those that relate to institutions.

Pillar 1: Coal Sector Policy and

Strategy Detailed Lessons Learned

Policy/Rules

- 1) Social support and mitigation programs and physical mine closures are expensive,



and significant budgetary outlays within a sustained programmatic approach are needed if they are to be done well.

¹²² Total subsidies for the Polish coal industry were US\$3.5 billion from 1998–2006 (in 2005 terms), with about three-quarters for social mitigation and one-quarter for physical mine closure.¹³ Physical mine closure and post closure environmental protection costs can also be significant but generally are much less than the costs of social support measures and active labor market measures. For countries where state-owned mines are being closed or private sector mines have become the responsibility of the government, it may be necessary for the government to take over abandoned mines and bear the costs of other liabilities of failed state-owned and bankrupt private mining companies, including unfunded pension and health care costs.

2) Coal mining laws and regulations need to be modernized.

¹²³ Outdated mining laws and regulations, including for mine closure regulations and procedures, can become barriers to implementing reform and undertaking physical mine closures in an efficient and effective manner. They are also important if state companies are to be privatized and if the government seeks to attract private sector mining investment. Poland and Romania updated their mining laws, and Romania introduced a modern mining licensing system and mining cadastre.

Institutions

3) Comprehensive adjustment programs need to be prepared and put in place before coal sector adjustment occurs for adjustment to

take place efficiently and effectively.

¹²⁴ Russia, Ukraine, Poland, and Romania each developed clearly defined comprehensive restructuring/reform programs. The reform programs in Poland were prepared in advance of employment and capacity downsizing with the reform programs evolving over time and being formally updated several times. In the case of Russia, Ukraine, and Romania, the reform programs were developed midprocess. The Russian program was effectively implemented, and the Romanian program was largely implemented, whereas the Ukrainian program was only partially implemented because of strong opposition and resistance from politically influential groups.

4) Strong government commitment and political will are also indispensable for adjustment programs to be implemented efficiently and effectively.

¹²⁵ The implementation of the reform programs in Poland and Russia were a result of strong commitment and political will at the highest level of government. In contrast, Ukraine is a key example of a country in which the government lacked the political will to overcome deep-rooted, strong opposition to subsidy reform and downsizing. This opposition came from mine workers and managers seeking to protect their jobs and from vested interests seeking to protect their profits from barter trade in coal.

5) New institutional structures may be needed to fill gaps.

¹²⁶ Strong intergovernmental collaboration and cooperation and the establishment of new government decision-making bodies

were also essential to restructuring and the implementation of reforms in Russia and Poland. With regard to coal reform program decision making and implementation, the establishment of the IAC in Russia and the IMCSC in Poland were fundamental to developing the interministerial cooperation needed for reforms to be implemented. At the sector level, the establishment of the coal mine closure companies in Ukraine, Poland, and Romania was crucial to effective and efficient physical mine closure in those countries. In contrast, mine closures in Russia, which did not have a mine closure agency, were much less organized and effective.

- 6) Effective, well-prepared, and genuine stakeholder engagement and participation are also indispensable for obtaining the buy-in of affected stakeholders for adjustment programs to be implemented.

¹²⁷ There were a number of forceful miners' protests in Poland as the coal reform program commenced, but the government undertook an extensive dialogue with the trade unions, which led to acceptance of the need for the program and helped facilitate its effective and successful implementation. In Russia, the government engaged extensively with the Association of Mining Cities to explain the need for adjustment. The on-the-ground delivery of adequate social support measures (such as severance payments and payments for wage arrears) greatly helped workers and communities accept that the mine closures were unavoidable.

- 7) Engagement with women's groups can lead to important program improvements.

¹²⁸ Engagement with women's groups in Poland brought to light the need for specific

measures to identify and mitigate the harmful effects for women surface workers who were excluded from receiving the miners' social packages. The engagement with women's groups in both Poland and Romania also demonstrated that women's groups can play a key role in social mitigation activities when given support and opportunity. In Romania, women's groups helped to design community-based social initiatives, and in Poland, women's groups took initiatives to help meet the needs of the neediest; to reduce and mitigate domestic violence and abuse that often accompany large-scale redundancies; and to help women find employment, including creating new small businesses.

Pillar 2: Support for People and

Communities Detailed Lessons Learned

Policy/Rules

- 1) Comprehensive social support measures, including short-term income support, accompanied by redeployment or retirement assistance and related funding and institutional capacity should be created before—not after—mine closures take place.
- ¹²⁹ Rapid mine closure creates considerable immediate social stress. Irrespective of the country, mine closures and job losses were immediate, whereas creating alternative employment opportunities, sustaining social assets, and building community-level capacity are activities that can take many years and even decades. The necessary strategy, funding, institutional capabilities, and physical mine closure and social mitigation measures—including



prelayoff planning, prelayoff assistance, and postlayoff services, such as income support packages, labor redeployment services, relocation services, ALPs, social assistance, and local economic development support—all need to be put in place before, not after, closures and redundancies take place. But even then, in every country where coal restructuring has taken place, these activities have produced only modest results compared with the needs of workers who have lost their coal industry jobs and the needs of mining communities where coal industry employment has contracted or ended completely. Even in the Netherlands, it was several years before job-creation measures became fully effective.

- 2) Unemployment support and redundancy payments above and beyond normally available provisions may be needed for mine workers and for workers in related sectors that depend on the mining industry for their livelihoods.

¹³⁰ Because of underground mining's difficult and dangerous working conditions, underground workers have a strong identity and typically are eligible to receive pensions after a given number of years' service, not at a certain retirement age. Many countries offered large lump sums or early pensions to underground workers along with other provisions over and above the general unemployment support. The unemployment support should be accompanied by active labor market measures to support reemployment, as outlined in the next lesson learned.

¹³¹ Workers in related sectors, such as industries that supply goods and services to coal mines and industries that transport

or use coal, may be disadvantaged in coal mining areas because they face difficult conditions for finding alternative employment compared with noncoal mining areas. In Romania, measures were needed to address not only the needs of redundant miners but also workers in the secondary industries that depended on mining. Although households headed by laid-off miners experienced the largest immediate decline in household welfare, household heads employed by other sectors in mining localities also faced significant decline in household welfare. However, employees of secondary industries did not receive the generous severance benefits that mine workers were given and were not considered the primary target of social mitigation programs, which in effect left them even worse off. Program design should ensure that employees of secondary industries also receive severance benefits and are eligible for all active labor market programs.

- 3) Regulatory reforms may be needed to put the necessary rules and procedures in place, especially for subsidy allocation.

¹³² The experience of almost all countries demonstrates that outdated laws need to be modernized and that well-structured rules, procedures, monitoring, and accountability mechanisms are essential, especially for the management and distribution of pension, redundancy, and payments of other social support measures. The introduction of good practice for subsidy and social support measures payment procedures in Russia helped ensure that the subsidies reached the intended recipients and accomplished key objectives instead of going astray as had happened under the coal monopoly Rosugol. In Ukraine, payment responsibilities were allocated to the UDKR, which ensured

that social payments reached intended recipients, and in Poland and Romania, strong oversight ensured payments also reached intended recipients.

- 4) Careful consideration is needed to select a package of the most-effective active labor market measures to support redundant working age workers finding new employment.

¹³³ The selection of active labor market measures, which can include training, placement services, and incentives for new business start-ups and for businesses to create new jobs, is a key activity. Transferring redundant mine workers to other mining operations was successful in the United Kingdom so long as openings existed, but such transfers were no longer possible once large-scale mine closures took place. Mine closure work provided some temporary employment for some workers but only for a limited time and achieved only slow, modest results. In Russia and Ukraine, active labor measures replaced only 10 percent of the lost jobs, and the surge of redundant mine workers into the local labor market took employment opportunities away from other work seekers, including young people entering the labor market for the first time. In Romania, socioeconomic regeneration was more effective when initiatives to improve the business environment, strengthen links between mining communities and local government agencies, and rehabilitate local infrastructure and social services were included.

- 5) Under some circumstances, time-based income support packages may be superior to lump sum packages, which can be rapidly used up by recipients who, in the

absence of new employment, will then seek more assistance.

¹³⁴ Miners in Ukraine and Romania who received one-time, lump sum packages rapidly used them and then sought new assistance. However, women workers did a better job of using their lump sum packages as a step toward new employment in Poland. Time-based, income-support payments provided more time to find new employment. Miners who were able to retire with pensions and those who took long-term disability were assured of future income, unlike lump sum recipients.

Institutions

- 6) Adequate provisions need to be made for the transfer of social assets, land, and other useful assets from coal companies to local government or other parties who would then manage and operate them.

¹³⁵ Many state-owned mining companies own and operate social assets that provide services directly to coal workers, their families, and their communities. In the case of Russia and Ukraine, the social assets and social services were extensive and included housing, hospitals, schools, kindergartens, culture houses, rest houses, sports facilities, and summer camps for children. Plans were made to transfer these assets and services to local authorities, with funding for their maintenance and operation to be provided by the state budget. However, in Russia and Ukraine, the funding did not materialize, the assets fell into a state of disrepair, and communities lost key services at the time they needed them most. Although little repurposing took place in the 1990s and 2000s, the repurposing of land and other



useful productive assets and infrastructure is now recognized as an important part of the physical mine closure process.

- 7) Community-level capacity building and mobilizing and involving key stakeholders are essential if communities are to achieve better community outcomes and respond to and eventually recover from the contraction of mine production and mine closures.

¹³⁶ Communities in all of the countries, and especially mining communities that were built around the operation of the mines, were poorly prepared to deal with mine closure when it occurred. The communities were faced with a two-edged sword of declining income and increased need for community services. Most importantly, the success of socioeconomic regeneration for community recovery after the restructuring programs depended largely on the institutions engaging with local communities to facilitate their involvement and endorsement of the socioeconomic regeneration measures. Romania and, in later decades, the United Kingdom are good examples of communities receiving and benefiting from a wide range of regeneration measures.

- 8) Mobilization of a range of different institutions, according to the comparative advantages of each, preferably with one lead institution, is required to link economic recovery to other regional development initiatives.

¹³⁷ In addition to the work that was undertaken by NAD in Romania, policy decisions resulted in the Social Development Scheme for Mining Regions being implemented by the Romanian Social Development Fund, the microcredit program administered by

NGOs, and prelayoff and retraining services being provided by the National Employment Agency. These different institutions all provided important services to the coal mining communities but were not always well coordinated because of the lack of one lead institution.

- 9) A bottom-up approach is needed to tailor socioeconomic regeneration measures to the specific needs of different regions and communities.

¹³⁸ The formally approved restructuring and reform programs were mostly top-down, from national to the regional and subnational levels, whereas the needs for assistance were specific to regions and communities. Romania used a bottom-up approach to good effect with several community-specific initiatives that had positive results for the targeted communities. Poland focused its efforts with some success on Silesia, where the coal mines were concentrated. But in Russia, the impacts of the downsizing of the coal industry were most severe for small, mono-industry coal mining towns in remote parts of the country that received little support.

- 10) Socioeconomic regeneration schemes and strategic planning assistance that induce a sense of ownership in the community can enable communities to reestablish themselves, find new income sources, and better meet the needs of the most vulnerable in the community.

¹³⁹ The loans to Romania included support to help local public authorities prepare strategic development plans in a participatory manner and identify related funding sources for the plans. This resulted in a significant increase in municipalities

generating revenues for their local budgets. Also, in Romania, the small grant schemes responded to priority needs for the most vulnerable being identified by the communities. These included providing facilities for elderly people, providing equipment for children’s playgrounds, and rehabilitating buildings for social purposes. These activities were greatly appreciated and consequently were well implemented and benefited from significant beneficiary (both financial and in-kind) contributions. Institutions can enhance program implementation by sharing responsibilities for the design and implementation of social schemes with local stakeholders.

- 11) Support for workers to relocate to places with a broad (not narrow) economic base can enable them to move to places where jobs are more readily available and/or can be more easily created.
- 140 Another key active labor market measure is mobility assistance for workers to relocate to areas where jobs are more readily available. But a striking feature of the social mitigation measures in the restructuring programs and in the World Bank loans analyzed in this report is that there was little or no consideration of outward migration of coal workers from communities where coal mines were closing to communities with better employment prospects, except in the case of Romania. In Romania, 16 percent of the workforce left the mining regions, even though no support was provided for out-migration. In contrast, a 2003 World Bank Policy Research Working Paper¹⁴ that examined the impacts of mine closures on communities in Romania, Russia, and Ukraine gave considerable attention to out-migration. That working paper reported that 37 percent of the population of two

mining towns in Ukraine was absent for an extended period in connection with employment elsewhere. The report noted that there are social and economic gains to be had through strengthening local capacity to provide migration support to interested households and recommended that efforts be strengthened to remove barriers to migration, such as housing or transportation.

Pillar 3: Physical Mine Closure

and Environmental Reclamation

Detailed Lessons Learned

Policy/Rules

- 1) Modern mine closure regulations and standards are needed if mine closure is to take place efficiently and effectively.
- 141 Despite a strong and efficient mine closure company in Ukraine, outdated mine closure regulations and procedures slowed closures. By comparison, modern mine closure regulations facilitated efficient and timely mine closures by the mine closure company in Romania.
- 2) Mine closure can also involve long-term, post closure environmental legacy issues that require careful monitoring and maintenance including water management and reducing methane emissions at closed underground mines.
- 142 Mine closure can also involve long-term post closure maintenance, such as pumping water from closed underground mines near operating mines or operating water



treatment facilities at closed hard rock mines to prevent water contamination by heavy metals and acid. There is considerable very long-term post closure maintenance for closed coal mines in Poland because there is a long-term post closure need for water monitoring and pumping at closed mines to protect nearby operating mines.

Institutions

- 3) Physical mine closure is demanding but can take place in a timely and efficient manner if there are competent institutions, adequate funding, and good practice procedures.

¹⁴³ The establishment of the coal mine closure companies in Ukraine, Poland, and Romania was crucial to effective and efficient physical mine closure in those

countries, but adequate funding and sound procedures were also essential. Environmental reclamation was poorly done in Russia and Ukraine because of a lack of budgetary funding.

- 4) Coal mine adjustment can contribute to an overall upgrading of coal industry environmental practices and performance.

¹⁴⁴ Restructuring work in Poland and Romania included preparation of sector environmental assessments, which contributed to an overall upgrading of environmental practices and performance in the coal mining industry in Poland and the mining industry in Romania. The Annex provides a summary of useful toolkits and guidelines for physical mine closure and environmental reclamation work.

Coal Sector Adjustment in the United Kingdom, The Netherlands, The United States, and China

¹⁴⁵ Section 4 briefly considers the coal sector adjustment that has taken place in the United Kingdom and the Netherlands since the 1960s, in the United States since the 1980s, and is now under way in China. The adjustment in the United Kingdom in the 1960s and 1970s was largely unplanned and ad hoc and led to many lengthy strikes and civil strife. Social support efforts were finally introduced in the 1980s, but the main coal mining areas today still have higher unemployment than other areas. The adjustment in the Netherlands was well planned, with substantial support for workers losing their jobs, was supported by the trade unions, and for the most part went smoothly. Coal sector adjustment in the United States took place with little planning or preparation and has greatly contributed to unemployment in coal mining regions, especially Appalachia, which has impoverished areas. In China, coal sector adjustment has been taken place in a planned manner, and support for redundant workers has been put in place. Even so, it has resulted in significant economic and unemployment challenges, especially in predominantly coal mining areas.



United Kingdom Coal Sector

Adjustment 1960 Onwards¹⁵

¹⁴⁶ U.K. Coal Sector Adjustment was inevitable

Coal sector adjustment in the United Kingdom started as an “unmanaged shock adjustment” in the 1960s and 1970s and then evolved into more of a “slow burn,” with steady and progressive adjustment and downsizing taking place from the 1980s onwards. Table 11 presents the drivers of change for coal sector adjustment and government response. Coal sector adjustment started in the United Kingdom in the 1960s, when both the power industry and the coal industry were state owned. The main drivers of change, which caused adjustment to be inevitable, were (i) severe outdoor (smog) and indoor air pollution in London and other large cities caused by

burning coal, and (ii) competition from the expanded availability of relatively low-cost oil and natural gas. The initial government response was ad hoc with modest social mitigation measures being built around early retirement for eligible miners and transfer of other working-age redundant miners to other mines. The 1973–74 Organization of the Petroleum Exporting Countries (OPEC) oil embargo brought a respite for the coal industry adjustment, but renewed competition from oil and natural gas caused further substantial adjustment in the 1980s. Competition from renewables has caused further adjustment over the past decade.

¹⁴⁷ **Adjustment took place but it took several decades and was later linked to mechanization.** Figure 4 shows the relative declines in production and employment from 1960–2015. The inroads of gas into coal power

Table 11

United Kingdom Drivers of Change for Coal Sector Adjustment and Government Response, 1960 Onwards

	1960s	1970s	1980s	1990s	2000s	2010s
Drivers	Air pollution (smog prevention); competition from plentiful oil imports from the Middle East and Africa	Early 1970s, OPEC oil embargo with oil and gas shortages; Further oil and gas shortages in late 1970s	Competition from increased cheap North Sea oil/gas production and from nuclear power generation.	EU regulation allows electricity generation from gas; “Dash to gas”; former coal communities needed assistance	Competition from gas for electricity generation; former coal communities are still slow to recover from closures	Strong move to clean energy; competition from cheaper coal imports; former coal communities remained socially and economically disadvantaged
Government response	The most labor-intensive mines were closed; alternative jobs available at operating mines	Declining wages led to miners striking for higher wages; industrial relations deteriorated	Unions opposed further mine closure, yearlong 1984–85 strike; Coalfield Communities Campaign established	1990 Power sector privatization; 1994 Coal Act; U.K. Coal Authority created; Coal mines privatized	Coalfield Regeneration Trust established in 1999	Carbon tax; subsidized renewables
Government response	Largely unmanaged	Largely unmanaged	Largely unmanaged	More managed	More managed	Managed

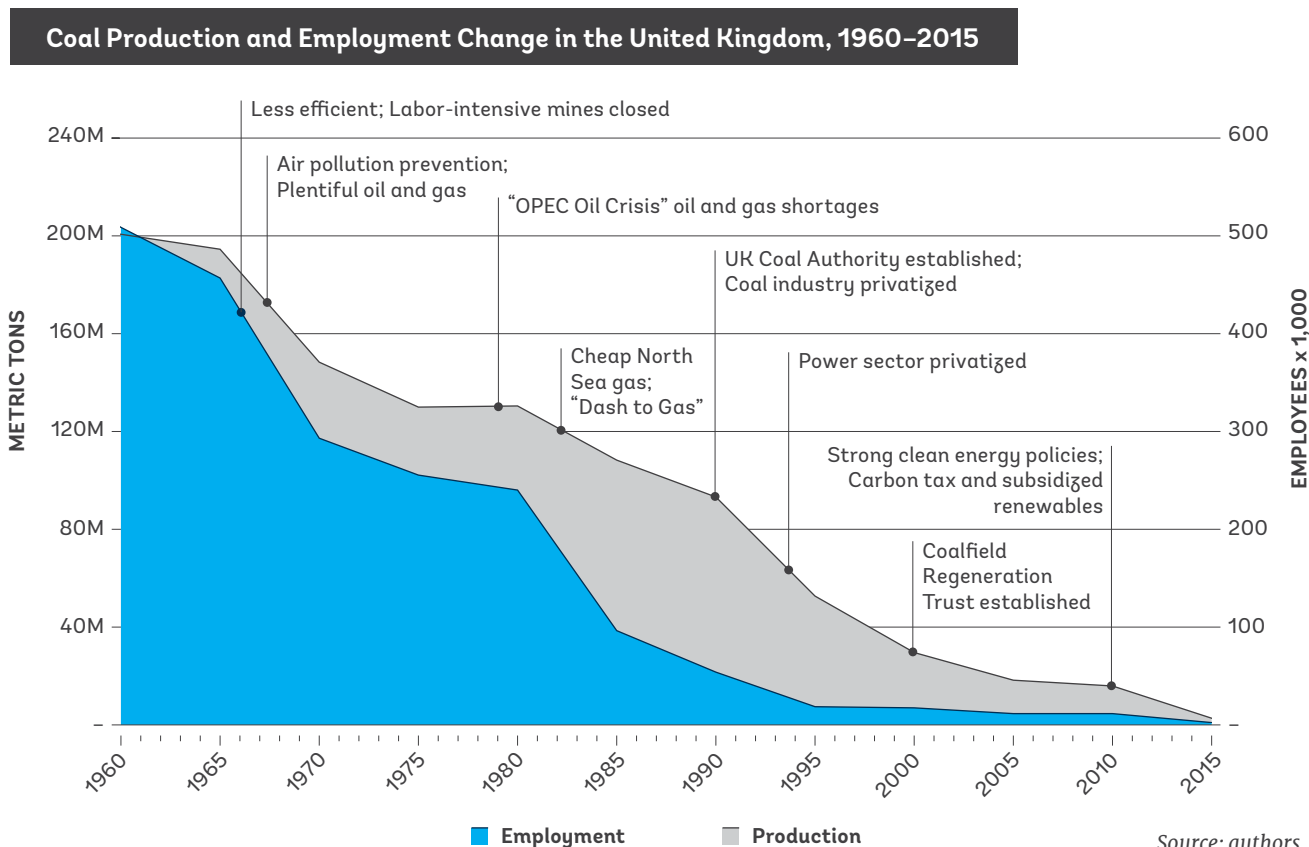
Source: authors.

generation increased substantially after the British power industry was privatized in 1990, which led to a “dash to gas,” and gas-fired power generation increased from 1 percent in 1990 to 23 percent in 1996. Coal fired power generation has dropped to only 8 percent of power generation in 2016. Largely as a result, U.K. coal production declined from 198 million tons in 1960 to 9 million tons in 2015. In comparison, total coal consumption was 38 million tons in 2015 (of which 29 million tons was for power generation) with 29 million tons of imports. Coal industry employment declined from 607,000 to 2,000 from 1990–2015. Job losses were immediate. The least-efficient, most-labor-intensive mines were closed first, and in the first decade of adjustment, employment fell by 52 percent compared with only a 26 percent decline in coal production. Employment has

since declined not only because of declining production but also because of a shift toward more mechanized surface mines employing less labor.

14.8 New job creation and regeneration initiatives were slow It was not until 1985 that a Coalfield Communities Campaign (CCC) was introduced to promote the economic, social, and environmental renewal of areas affected by mining job losses. In 1997, the government created a Coalfields Task Force, focused on increasing economic regeneration in former coal mining areas, and in 1999, established the Coalfield Regeneration Trust, a government-funded registered charity that has provided over £150 million in community grants to former coalfield communities. Four of the more important coalfield regeneration measures used since the 1990s were:

Figure 4



- a) Colliery site reclamation, which involved more than £800 million in public funding and over £2 billion in private sector investment at 107 previous coal mine sites;
- b) EU structural funds, which helped finance economic regeneration schemes;
- c) Assisted area status, which the national and subnational administrations, working within EU state aid rules, used to attract new business investments by providing financial support; and
- d) Infrastructure investment, which included government-funded investment in new roads and new commercial and industrial sites in former mining areas.

¹⁴⁹ **Coalfield Areas Remain Economically Disadvantaged** The loss of some 600,000 coal mining jobs over the past 50 years, most in areas where coal was the dominant employer, has caused great distress for coal mining communities. The large numbers of jobs lost in the main coal mining areas created job shortages that persist through today. Many of the workers who could not find new jobs stayed outside the labor markets through early retirement and pensions and long-term redundancy benefits, including “incapacity” benefits. Furthermore, when former miners found new jobs, this took away employment opportunities from other residents, and thus the burden of unemployment was shifted from the mine workers to others in the community. Miners were concerned that employment opportunities for their children and the next generation were greatly diminished. “The ex-miner may find new work, but if there are not enough jobs in total he will often do so at the expense of another local jobseeker, thereby transferring unemployment from

one individual to another.”¹⁶ Coal industry employment declined by about 225,000 jobs between 1981–2008. By comparison, regeneration efforts resulted in about 180,000 new jobs being created in other sectors in the coal mining areas but at a much later time. However, the new jobs were generally less well-paid and often less secure than mining jobs. Median earnings in the U.K. former coalfields are, on average, 7 to 8 percent lower than the national average. The coal mining regions continue to have higher-than-average unemployment and have failed to grow fast enough to provide jobs for all the new entrants in the labor market. Across the U.K. coal mining areas, in 2012 there were just 50 jobs for every 100 residents of working age.

The Netherlands Coal Sector

Adjustment 1960-90¹⁷

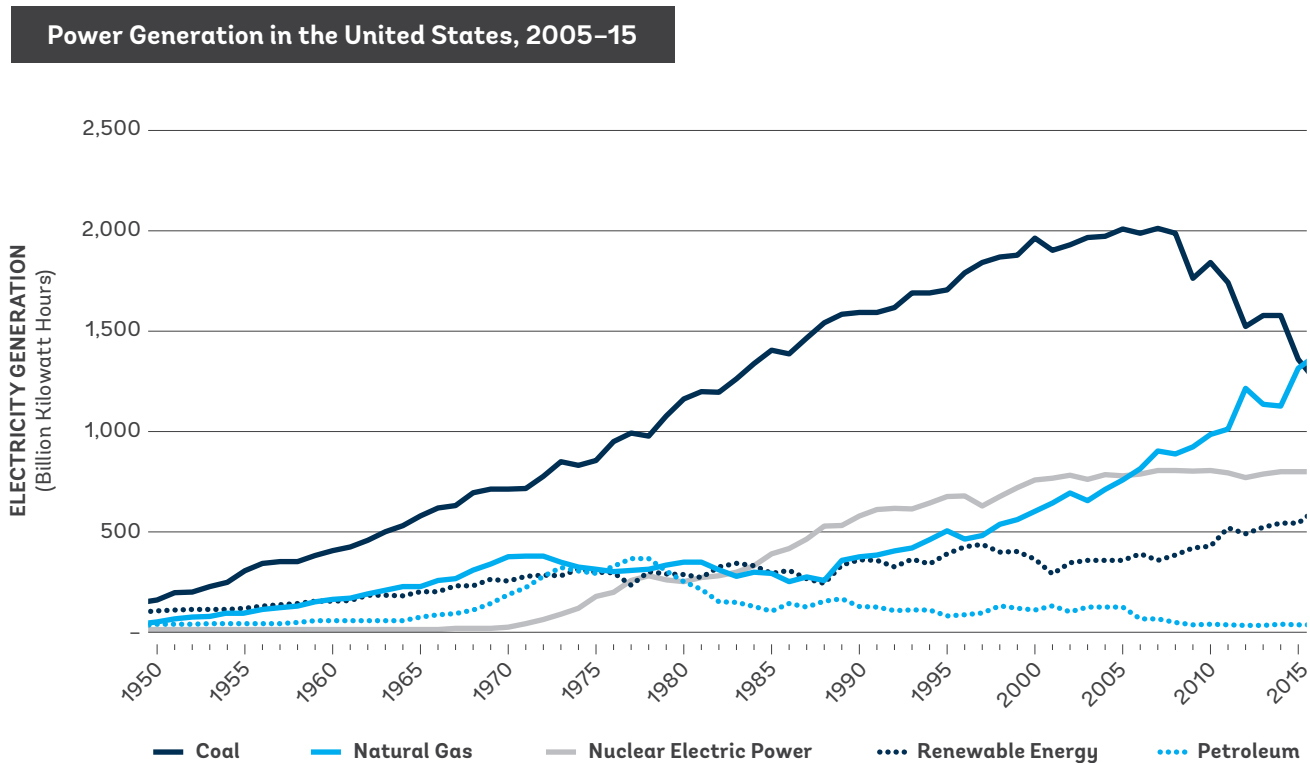
¹⁵⁰ Adjustment was inevitable Coal sector adjustment in the Netherlands was a largely well-managed adjustment that took place over a decade from the mid-1960s to mid-1970s. With the increasing availability of oil at low prices and especially the domestic discovery of Europe’s largest natural gas field, adjustment was inevitable, and the Netherlands started a rapid transition away from coal during the mid-1960s. In 1965, the government prepared a master plan for the closure of the domestic coal mine collieries. The Netherlands had a relatively small coal industry that consisted of both a state coal mining company and private mining companies. Most were situated in the region of Limburg. Coal production was progressively reduced and ended almost 10 years later in December 1974, although the Dutch State coal mine company reinvented itself and continued life as a chemical company.

151 Employment Impacts The preparation of the Master Plan enabled the government to be well prepared to undertake the adjustment process. The coal industry had about 75,000 workers when the adjustment began. Two-thirds (about 50,000) received government support. Of these, 39 percent found new employment outside the coal industry; 33 percent retired with pensions or disability payments; 13 percent found jobs in noncoal activities (mostly chemical related) of the state coal company; 9 percent were foreign workers who repatriated to their home countries; and 6 percent went to “social workshops.” The other 25,000 coal mining employees were not compensated. The early stages of the Netherlands coal sector adjustment took place in an orderly, well-managed, and socially acceptable manner in the late 1960s. The labor market was strong,

and the sector restructuring was generally supported by coal workers and their unions. However, the early 1970s was more difficult because the domestic labor market softened.

152 Subsidies and Social Mitigation From 1965–1990, the Dutch coal industry received nearly €4 billion⁴(in 1980 terms) of state subsidies, of which 37 percent supported mining production from 1965–1974 and 67 percent provided social support for redundant workers, including redundancy payments and new job creation activities. An estimated 17,100 new, lasting jobs were created, at an estimated cost per job of €416,000 (in 1980 terms) between 1965–1977 and at an estimated cost of €310,000 per job (in 1980 terms) between 1978–1990. Even so, recovery from coal mine closures was a lengthy process for the former coal mining communities, and

Figure 5



Source: U.S. Energy Information Administration 2017. https://www.eia.gov/totalenergy/data/monthly/pdf/sec7_4.pdf

re-employment and job creation lagged well behind the layoffs. Some early successes did not last and had a negative impact upon trust between the government and the coal mining areas. During the 1970s and 1980s, former coal mining areas had higher unemployment and higher “worklessness” (workers prematurely retired on pensions or disability) than other areas. By 1990, these areas had economically caught up with the rest of the country, but the unemployment and disability rates increased again after the mid-1990s.

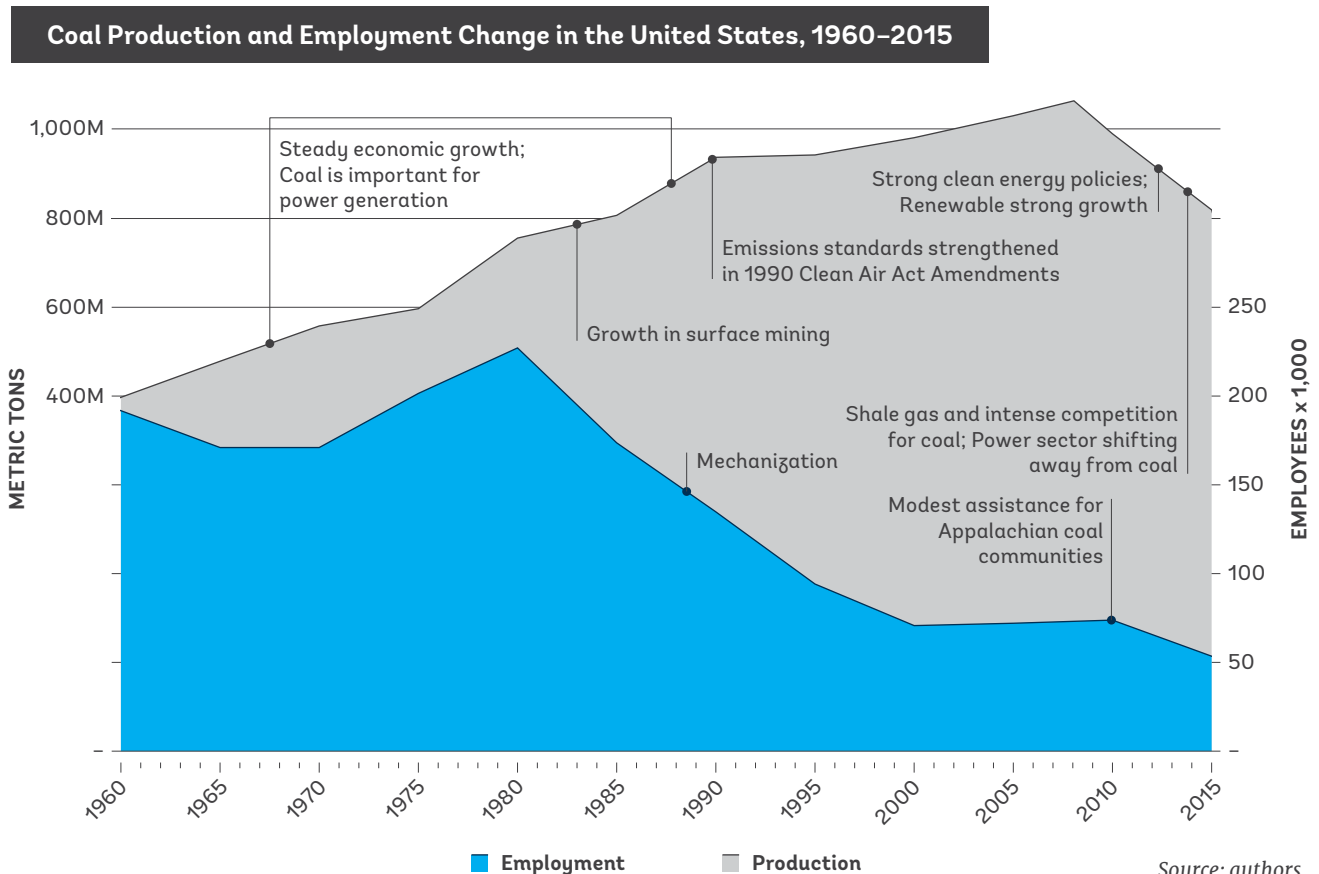
declining employment in the 1980s and 1990s at a time when production was growing strongly. It then became an “unmanaged shock adjustment” when production declined by nearly 30 percent in the 2010s after peaking in 2008. On the production side, the main driver of change from the 1960s to the early 2000s was overall economic growth, which led to steady growth in power demand where coal was economically competitive. However, there was an inevitable shock adjustment when competition from shale gas and renewables for power generation resulted in coal’s share of power generation decreasing from 40 to 33 percent from 2008–2016. On the employment side, coal sector adjustment started in the very late 1970s, when employment started to decline while production continued to increase. The two main drivers of change that made the

The United States Coal Sector

Adjustment 1980 Onwards¹⁸

153 **Background** Coal sector adjustment in the United States started as a “slow burn” of

Figure 6



reduction of coal employment inevitable in the 1980s and 1990s were: first, a technology- and efficiency-driven mechanization of underground mines resulted in higher productivity and the need for fewer workers; and, second, a shift towards surface mining which required much less labor than underground mining.

¹⁵⁴ **Production and Employment** Figure 6 shows the coal industry production and employment from 1990–2016. Coal production increased steadily from about 394 million tons¹⁹ in 1960 to a peak of 1,063 million tons in 2008, after which it declined to 662 million tons in 2016. It recovered modestly to about 715 million tons in 2017, largely because of increased coal exports. By comparison, coal industry employment increased modestly from 190,000 employees in 1960 to 225,000 employees in 1980 but has steadily declined since then to 55,168 average for the year in 2017.²⁰

¹⁵⁵ **Company Bankruptcies** For many decades, the response to adjustment was an ad hoc response by mining companies. As coal sales decreased, coal mining companies came under increasing financial pressures, made even more difficult in 2015 by a sharp drop in domestic and international coal prices. With large financial obligations for employee pensions, health services, environmental cleanup and reclamation, many U.S. coal producers faced large losses, and 25 publicly listed coal companies, including several of the largest U.S. coal producers, filed for bankruptcy in 2015 and 2016. For the most part, the government provided little support for the coal industry as it went through a significant adjustment.

¹⁵⁶ **Appalachian Regional Commission.** The Appalachian region is the main coal mining region in the eastern United States. The region includes all of the state of West Virginia, and

parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. With a long history of job losses over many decades, 42% of the Region's population is rural, compared with 20% of the national population. The Appalachian Regional Commission (ARC) was established in 1965 by an act of Congress in response to the region's economic hardships, and has been funded on an annual basis by Congress with funds in the federal budget each year. The ARC's programs address five goals identified in the Commission's 2016–2020 strategic plan, including: 1) investing in entrepreneurial and business development strategies that strengthen Appalachia's economy; 2) improving the education, knowledge, skills, and health of residents to work and succeed in Appalachia; 3) investing in critical infrastructure—especially broadband, transportation, including the Appalachian Development Highway System, and water/wastewater systems; 4) strengthening Appalachia's community and economic development potential by leveraging the Region's natural and cultural heritage assets; and 5) building the capacity and skills of current and next-generation leaders and organizations to innovate, collaborate, and advance community and economic development. In its fiscal year 2018, the ARC supported 522 projects for US\$125.6 million; and in fiscal year 2019, the ARC approved \$176.8 million in funding for 482 development projects. For the upcoming fiscal year 2021, the ARC requests \$165 million to fund its development activities.²¹

¹⁵⁷ **A More Comprehensive Approach** In 2016, the federal government finally initiated programmatic support for Appalachia when it established the 2016 Power Plus Plan, which offered a comprehensive plan to address



lost coal mining jobs and other legacy costs. This plan proposed: (i) funds for economic diversification, job creation, and employment in other sectors; (ii) investments in mine workers' health and pension funds; and (iii) cleanup costs for abandoned mines. Growth of solar and wind jobs could absorb coal layoffs and offer long-term employment in a low-carbon economy. But there is a potential disconnect between needy workers located in the eastern states and the areas where the solar and wind jobs are to be found. The 2017 federal budget allocated US\$75 million for retraining costs and investments in pension funds of laid-off workers in Appalachia; but this is a small amount in comparison to overall needs.

¹⁵⁸ **Appalachian Coal Region Poverty** There is still considerable poverty in the neediest areas, and current efforts remain modest in comparison to overall needs. Increases in health-related concerns are closely related to the loss of coal mining jobs, and the average life-span in coal counties in eastern Kentucky is six years shorter than the national average. In addition, poverty rates have worsened considerably, and in Beattyville, Kentucky, the poverty rate is 44 percent higher than the national average, with more than half of households living below the poverty line.

¹⁵⁹ **Community Unrest** For many years, the federal government provided little support to coal mining communities in states such as West Virginia, Kentucky, and Pennsylvania, which have many coal mines and the worst coal mine community conditions. This resulted in deep resentment and local views that carbon-based environmental requirements led to coal mine closures and a reversal of such rules would allow coal production to increase and unemployed workers to be rehired. But this is unlikely because the reality is that

competition from lower-cost other fuels and energy efficiency improvements—much more than environmental regulations—have caused the demise of the coal industry. However, little attempt has been made on the part of government authorities to present the facts to distressed mining communities, where economic diversification is critical to generating the new jobs and revenue streams needed to overcome deep-rooted societal and health issues, and sustain livelihoods for many who can no longer be supported by coal industry employment.

China Coal Sector Adjustment

2014 Onwards

¹⁶⁰ **Coal Sector Growth and Adjustment** In the case of China, two rounds of planned adjustment (i.e. capacity downsizing) were needed: first from the mid-1990s–2001; and second, from 2012–2017 due to government policies resulting in production capacity greatly exceeding demand. However, in the past, further adjustment had become inevitable due to severe air pollution problems from coal in some of the largest Chinese cities. China has accomplished each round of adjustment in a decade, but the overall adjustment process is now in its fourth decade.

¹⁶¹ **Early 1980s to mid-1990s: Rapid Growth** China's coal industry benefited greatly from the economic reforms and opening of the economy in 1978. Since then, the rapid development of China's economy has been driving a rapid growth of demand for coal. In 1983, the *Report on 8 Measures to Promote Small Coal Mines* was released by the Ministry of the Coal Industry (abolished in 1998) and encouraged development of small-

and medium-size coal mines. China's coal industry experienced more than a decade of rapid growth from 1980 to the mid-1990s, with coal production reaching 1.40 billion tons in 1996, an increase of well over double the level of the early 1980s.

162 Mid-1990s–2001: First Adjustment Period

The economic slowdown and financial crisis of the mid- to late 1990s in Asia led to a coal industry recession in China, with two years of coal industry contraction in 1997 and 1998 and large financial losses for the coal industry in 1998 and 1999. Government responded to this first round of adjustment with policies to promote a balance between production and demand through a range of measures that included reorganizing small- and medium-size coal mines operated by towns, merging state-owned coal companies, delegating regulation to local governments, shutting down small, inefficient mines to cut production, making arrangements to assist laid-off workers, and other related measures. The 1998 reforms resulted in many thousands of small coal mines with about 0.5 billion tons annual production capacity being closed by the end of 2000²². By 2001, the supply and demand of coal were back in balance.

163 2014–17: A Second Adjustment Period

The rapid year-on-year economic growth in China from 2002–12 resulted in a period of extremely strong growth for the Chinese coal industry with large increases in both coal production and coal prices. Raw coal production increased from about 2.2 billion tons in 2000 to 3.5 billion tons in 2011 and reached almost 4 billion tons in 2013. But coal consumption declined substantially from 2014–17 reflecting, first, the Chinese economy slowing from very high levels of

economic growth, and second, the Chinese economy maturing and shifting from infrastructure growth, which is energy (and thus coal) intensive, to a more service-based growth model, which is less energy (and coal) intensive. In addition, Chinese energy policy now is to diversify the Chinese energy mix and push for a more-efficient and lower-carbon use of energy. Coal production increased to a peak of 3.97 billion tons in 2013 and then declined to 3.27 billion tons in 2017 as the second adjustment took place.

164 Future Planned Adjustment Away from Coal and Support Measures

The government has announced a series of steps to move toward a lower-carbon development pathway, resulting in a strong increase for the growth of alternative sources of power generation. In March 2016, the National People's Congress ratified the 13th Five-Year Plan (FYP) for 2016–20, which established energy and carbon dioxide emissions intensity reduction targets and an energy cap in an effort to improve energy efficiency and lower emissions. The 13th FYP estimated that the total number of coal mines in China will decline from 9,700 at the end of 2012 to 6,000 by the end of 2020. It was estimated that approximately 1.3 million coal industry employees (approximately 30 percent of the total), would be made redundant, and that by 2020, the coal sector will employ fewer than three million people, down from 5.3 million in 2013. In May 2016, the Ministry of Finance created the Industrial Special Fund of US\$14.5 billion (¥100 billion) to support overcapacity reduction and affected worker resettlement in the coal and steel sectors. In June 2016, the first batch of US\$4.2 billion (¥27.6 billion) was distributed to subsidize provincial coal mining companies for managing employment issues resulting from coal capacity reduction.



Guidelines for Preparing and Implementing a Coal Sector Adjustment Strategy

¹⁶⁵ Section 5 presents a set of guidelines for governments for preparing and managing coal sector adjustment based on the World Bank's more than two decades of experience in coal sector adjustment across Europe and Central Asia. The guidelines are organized into three stages as follows: Stage 1: Planning and establishing a knowledge base; Stage 2: Preparation of the adjustment program; and Stage 3: Implementation of the adjustment program. Each stage is then also organized according to the Three Pillars and the three tiers of government decision making and responsibilities. The guidelines are designed to support governments to prepare for and implement coal sector downsizing and adjustment tailored to individual country and local circumstances. The importance of the first two stages is paramount. A government that is well prepared for sector adjustment will undertake actions in a phased and integrated manner and at an early stage will initiate stakeholder engagement, update laws and regulations, and ensure the needed institutional capacity, capabilities, procedures, and coordination are in place so that a successful transition can be achieved.

Preparing and Implementing

a Coal Sector Adjustment

Program—Introduction

As noted in paragraphs 27–31 the report uses the following three-pillar approach for assessing coal sector adjustment

- **Pillar 1** is the coal sector policy and strategy pillar
- **Pillar 2** is the support for people and communities pillar
- **Pillar 3** is the environment and land pillar

and the following three-tier structure for government policy and decision making:

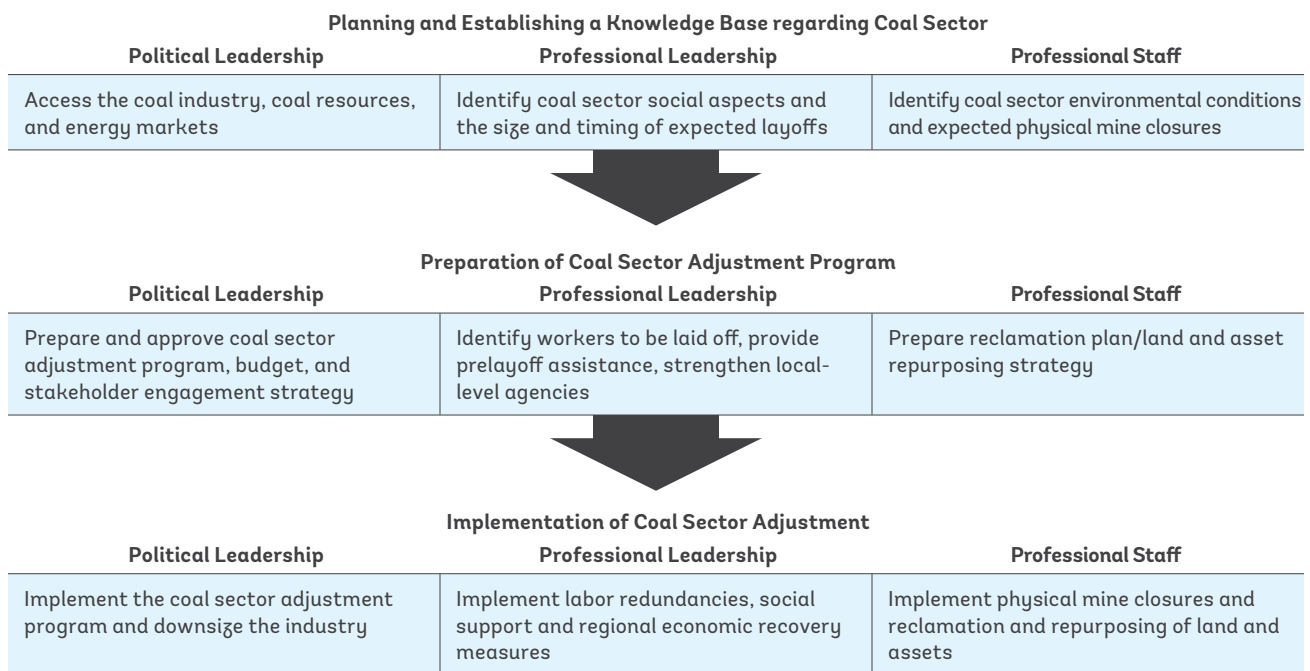
- **Tier 1:** Policy and Decision Making by the Political Leadership
- **Tier 2:** Decision Making by Institutional Leaders
- **Tier 3:** Decision Making by Institutions and their Professional Staff and Managers

¹⁶⁶ **Three Stages** There are three major stages involved in the three tiers of government policy and decision-making, namely:

- *Stage 1:* Planning and establishing a knowledge base;
- *Stage 2:* Preparation of the adjustment program; and
- *Stage 3:* Implementation of the adjustment program.

Figure 7

Three Stages of Coal Sector Adjustment



Source: authors.



¹⁶⁷ **First Two Stages** The importance of the first two stages—planning and establishing a knowledge base and preparation of the adjustment program—is paramount. A government that is well prepared for sector adjustment will use an “adaptive management approach” and undertake actions in a phased and integrated manner, as shown in Figure 7. But in a “shock adjustment” situation, industry downsizing and state-owned industry restructuring will take place with little planning or preparation, as happened in the case of countries such as Russia and the United Kingdom, when key steps such as stakeholder engagement and updating laws and regulations took place many years after mines were already closed, and institutional strengthening, such as establishing a mine closure company, did not take place at all.

¹⁶⁸ **Budgetary Envelope** The government’s high-level political leadership will make key policy decisions, one of the most important being to set the overall budgetary envelope for implementing the adjustment and also determining how much of the needed funding will be available to the government institutions each year. Budgetary and financial administration will be the responsibility of the financial or treasury ministry and its budget office. Different institutions will need to estimate and request needed funds according to their functions. However, the overall budget envelope likely will need to be determined by the political leadership, which will also decide how much of the needed funding will be available to the government institutions each year.

¹⁶⁹ **Social Support Budgetary Needs** Social Support Budgetary Needs. Social protection and support will be motivated both by equity considerations (that is, the need to protect the well-being of affected people and communities including the mining workforce) and the

economic policy argument that mitigation and recovery will crucially depend on making best use of affected-people’s productive potential.²³ Specific budgetary needs for social protection and support will include government responsibilities for unemployment and redundancy payments, health costs, costs of support to alternative employment creation, relocation costs, and regional and community support costs, including any related infrastructure investments. They may also include possible funding needs if coal SOEs are affected by the adjustment process, which may again relate to covering workers’ redundancy, pension, health-related payments etc.

¹⁷⁰ **Physical Mine Closure Budgetary Needs** Depending on country circumstances, part or all of the coal physical mine closure and environmental reclamation budgetary needs, including post closure needs, may fall on the government. Such costs will include those from abandoned mines and/or mines owned by SOEs or bankrupt companies or from mine legacy issues (as has been the case in the United Kingdom). It is also becoming recognized that costs will be needed to capture methane emission for safety and climate needs and put them to productive uses. There may also be stranded assets, such as mines and coal-fired power plants that are no longer economically and financially viable, that fall into government ownership.

¹⁷¹ **Funding Private Sector Liabilities** Governments may also be faced with taking over part or all of the liabilities of private sector companies that enter bankruptcy proceedings or that go bankrupt and close. These can also include workers’ redundancy, pension, and health-related payments and other worker-related liabilities, as well as the physical mine closure and environmental reclamation and long-term environmental

protection costs of private sector coal mining companies that go bankrupt.

172 Industry Ownership World Bank support for coal sector adjustment has largely focused on countries with state-owned coal mining industries. However, the role of government will differ depending on whether the coal industry is state owned or privately owned. A state-owned coal industry is generally more complicated and difficult to reform than a privately-owned coal industry. Reform of a state-owned industry involves the government closing mines and determining whether state owned companies will be closed or privatized, or survive under state ownership. It also results in government bearing the costs of mine closures and employee redundancy payments and

pensions, as well as taking over any financial liabilities that state companies cannot fund. In comparison, if it is a private sector coal industry, the private sector companies—not the government—should undertake closure of their mines and bear the costs of redundancy, pension, and health costs of workers, providing the private companies do not go bankrupt or close.

173 A government’s key roles and responsibilities for reform of state-owned and privately-owned coal industries are summarized in Table 12.

174 Starting Point The starting point to prepare a coal sector adjustment program will be for the cabinet to recognize the need for adjustment to take place and establish a

Table 12

Government Roles and Responsibilities for Coal Industry Restructuring according to Coal Industry Ownership

Government Roles and Responsibilities for all companies

- Establish high-level decision-making authority
- Prepare a coal sector adjustment program
- Prepare an assessment of the future prospects of the industry and scope and timing of expected downsizing
- Ensure extensive stakeholder dialogue takes place
- Ensure there are modern mine closure regulations and standards
- Ensure that there are income support and social programs in place with the necessary capabilities on the ground to meet the needs of redundant workers and communities

State-Owned Coal Enterprises (SOEs)

- Set up a coal sector adjustment budget, which includes funding SOE liabilities, including mine closures and redundancy costs, income support, and social programs for redundant workers and communities
- Establish and fund a dedicated mine closure company (MCC)
- Transfer closed SOE mines to the MCC, which closes mines and takes over long-term liabilities and legacy issues
- Otherwise, SOEs close mines themselves
- Implement SOE reform program, including management and governance improvements

Privately Owned Coal Companies

- Require that private sector companies set aside funds for closure and post closure liabilities during the operating life of mines
- Oversee private sector companies as they close mines
- Oversee management of long-term health, pension, and environmental liabilities by surviving companies
- Close mines of any bankrupt companies
- Take over long-term post closure health, pension, and environmental liabilities of all closed companies

Source: authors.



high-level oversight and decision-making committee. The committee will then appoint a lead ministry/agency for each pillar. For Pillars 1 and 3 the lead ministry/agency will likely be, respectively, the energy or coal ministry/department and the ministry/department of environment or environmental protection agency. However, for Pillar 2, there may not be a readily identifiable lead institution to provide support to people and communities where job losses will take place. So, it will be especially important to designate a Pillar 2 lead ministry/agency and ensure strong collaboration and coordination with other relevant social support and economic development ministries/agencies at the national, sub regional, and local levels. The key actions and decisions to be taken by the different tiers of government for the three stages of coal sector adjustment (previously shown in Figure 7) are presented in the following sections for each of the three pillars.

¹⁷⁵ **Key Policies** The coal sector adjustment program will be built on key policies taken by the Tier 1 highest-level political leadership, which include (i) social policies relating to providing unemployment benefits and social mitigation measures for coal industry and dependent industry workers and their communities; and (ii) energy and power development policies and environmental policies (including any low-carbon development policies, along with any clean energy international targets or agreements in which the country participates or is a signatory). The country's political leadership will be the final arbiter of what trade-offs will be made between energy security concerns that support domestic coal production and a clean energy policy that requires reducing coal production. Any trade-off will take into account political economy impacts and the need, to the extent possible, to minimize,

manage, and mitigate political shocks associated with coal sector adjustment, including opposition from those who would be disadvantaged by coal sector adjustment.

¹⁷⁶ **Stakeholder Engagement** Stakeholder engagement is crucial and should be an essential part of the preparation process. It should start at the beginning—when planning and establishing a knowledge base begins to take place. The highest-level political leadership (including parliamentary leaders) engages with high-level, influential stakeholders and the political/economic/social elite to gain their support for all three pillars of the program. The institutional leaders should engage with regional leaders and trade union leaders regarding program design and implementation. The managers and professional staff in institutions and SOEs should engage with workers, communities, and other stakeholders and local groups regarding program design and implementation. Well-designed stakeholder engagement will provide for engaging with vulnerable groups and community women and their representatives and organizations separately from men.

Preparing and Implementing

a Coal Sector Adjustment Program:

Pillar 1 Coal Sector Policy

and Strategy

¹⁷⁷ **Stage 1: Planning and Establishing a Knowledge Base** Stage 1 involves planning and establishing a knowledge base regarding the structure of the sector. The amount of time and level of effort needed will depend in part

on the present knowledge and expertise of the different ministries and agencies regarding the coal sector as well as the size of the sector and the size of expected adjustments. The highest-level political leadership initiates the preparatory work by giving instructions to the institutional leaders to undertake the work and by making key high-level policy decisions needed for the adjustment program. The leaders of the different institutions—typically ministers, deputy ministers, and agency and SOE heads and deputy heads—supervise and guide the work of the managers and professional staff in institutions and SOEs. The planning is undertaken and the knowledge base regarding the structure of the sector is prepared by the managers and professional staff in institutions and, if needed, SOEs, who prepare assessments of

- the structure and characteristics of the industry;
- the expected coal sector adjustment;
- relevant energy and coal-related policies, laws and regulations;
- key ministries and agencies and their roles, responsibilities and capabilities; and
- key coal industry stakeholders and their concerns —the key stakeholders being those who will be affected by the proposed coal sector adjustment.

¹⁷⁸ **Stage 2: Preparation of the Program** Stage 2 is the program preparation. Based on the planning and knowledge base, the managers and professional staff in institutions and, if needed, SOEs prepare the coal sector adjustment program, under the supervision of the institutional leaders, which will be the basis for downsizing the coal industry

and will include a coal sector adjustment governance and institutional framework. For countries with SOEs, an SOE reform program will also be prepared. Pillar 1 also involves the preparation of a stakeholder engagement strategy for each of the pillars. The three key outputs for the preparation phase of Pillar 1, which are submitted to the institutional leaders for approval, are

- i. **Coal Sector Adjustment Program** (including a coal sector adjustment governance and institutional framework) that identifies the key drivers of coal sector change and the need for the program; presents baseline conditions and the expected scale and impacts of closures throughout the coal value chain; identifies budgetary needs and commitments; outlines needed legal/regulatory reforms; and proposes key institutional roles, responsibilities, and authorities along with interagency coordination and collaboration.
- ii. **State-owned Mining Companies (SOEs) Reform Program** (if needed) that presents baseline conditions and the expected scale and impacts of closures and identifies financial implications for the SOEs, including any needed budgetary funds for coal mine closures or workers' retirement payments or pensions.
- iii. **Stakeholder Engagement Strategy** for each of the Pillars that identifies the key stakeholders at the national, regional, and local levels and their key concerns and sets out a strategy for addressing those concerns for each tier of government, with a strong emphasis on identifying women's issues and addressing them with women's representatives separately from men.

¹⁷⁹ After approval by the institutional leaders, the



coal sector adjustment program will also be submitted to the high-level decision-making authority for approval along with any required policy and legislative changes.

¹⁸⁰ **Stage 3 Program Implementation** The main role of the high-level decision-making authority is to demonstrate strong government commitment and political will regarding program implementation and ensure that it is implemented in a timely and effective manner with adequate budget allocations and any needed legal/regulatory improvements. The institutional leaders oversee the activities of the managers and professional staff in implementing the adjustment program and approve new regulations, distribute budget funds among different ministries and agencies, and oversee drafting of revised laws and implementation of any SOE reform (as applicable). They also strengthen institutions and resolve any duplication or overlaps among key institutions and fill any gaps, including with new institutional structures, if needed. The managers and professional staff in institutions and SOEs prepare any needed regulations or legal reforms, implement the coal sector adjustment program, including overseeing implementation of planned industry downsizing and restructuring and related mine closures in line with the coal sector adjustment program and the coal sector adjustment governance and institutional framework. They regulate the sector and enforce laws and regulations and (if needed) implement the SOE reform program. All three tiers of government implement the stakeholder engagement plan for Pillar 1, which as noted previously, should include engaging with vulnerable groups, community women, their representatives, and organizations separately from men.

Preparing and Implementing

a Coal Sector Adjustment Program:

Pillar 2 Support for People

and Communities

¹⁸¹ Rapid mine closure creates considerable immediate social stress. Comprehensive social safety nets and related funding and institutional capacity should be created before—not after—mine closures take place.

¹⁸² **Stage 1: Planning and Establishing a Knowledge Base** Stage 1 involves planning and establishing a knowledge base regarding the coal sector workforce, communities, and regions. The amount of time and level of effort needed will depend in part on the present knowledge and expertise of the different ministries and agencies regarding the coal sector as well as the size of the sector and the size of expected layoffs. The highest-level political leadership sets the social policies for coal sector adjustment and determines whether coal workers will receive unemployment and other assistance over and above what is available for other sectors in the economy. The leaders of the different institutions supervise and guide the work of the managers and professional staff in institutions and SOEs and establish new implementing agencies, if needed. As with Pillar 1, the planning is undertaken and the knowledge base regarding the impacts on people and communities is prepared by the managers and professional staff in institutions, who prepare assessments of:

- the size and timing of expected overall layoffs throughout the coal industry chain;

- relevant labor regulations and social-support-related policies;
- prelayoff planning needs;
- prelayoff assistance needs;
- postlayoff assistance needs;
- key ministries and agencies and their roles and responsibilities for social protection, social support, and economic regeneration of coal-dependent communities and regions; and
- any regional planning and development initiatives being undertaken by different agencies.

¹⁸³ **Stage 2: Program Preparation** Based on the Stage 1 planning and knowledge base, the managers and professional staff in institutions prepare, under the supervision of the institutional leaders, an institutional framework for social support, identifying coal industry workers who will lose their jobs and categorizing them according to age range and skill level and preparing a package of labor redundancies and social support measures for the workers, taking into account the institutional framework. The managers and professional staff in institutions also prepare a regional economic development plan (or plans if more than one region is affected). The three key outputs for the preparation phase of Pillar 2, which are submitted to the institutional leaders for approval, are

- a) **An Institutional Framework for Social Support** that provides recommendations for updating social protection policies, laws, and procedures and an institutional needs assessment for social support delivery and coordination;

- b) **A Package of Labor Redundancies and Social Support Measures** that takes into account the number and characteristics of workers losing their jobs and includes prelayoff planning social support measures (identifying the workers who will lose their jobs and their key characteristics in terms of age, experience, and skills), prelayoff assistance (including informing workers of available assistance and providing initial service), and postlayoff assistance measures (such as income support, active labor market measures, auxiliary services, and social mobility measures for workers to relocate to locations with a broad economic base where jobs are more readily available);

- c) **Regional Economic Development Plan** for each region that identifies specific potential economic transition projects and potential partnerships for the main coal region(s); identifies a lead institution; mobilizes a range of different institutions, according to the comparative advantages of each; and provides community-led capacity-building measures based on a bottom-up approach that tailors socioeconomic regeneration measures to the specific needs of different regions and communities.

¹⁸⁴ After approval by the institutional leaders, the institutional framework for social support will be submitted to the high-level decision-making authority for approval along with any required policy and legislative changes.

¹⁸⁵ **Stage 3: Program Implementation** The high-level decision-making authority ensures that the needed budgets are available and measures related to social protection, labor and support to job creation and community economic recovery are implemented with high priority in a timely and effective



manner, including updating relevant policies and laws, as needed. The institutional leaders initiate the layoff process and ensure that the recommendations of the institutional framework for social support are implemented, including any updated social protection policies, laws, and procedures. They also ensure that new implementing mechanisms, if needed, are put in place and any needed strengthening of social support delivery institutions takes place along with interagency coordination to support workers to transition from coal sector employment. The managers and professional staff in institutions and SOEs implement social support measures, including implementing a package of social support measures for the workers, which include:

- a) Prelayoff assistance (informing workers of assistance options, beginning provision of needed services, and working with potential partners for service delivery); and
- b) Postlayoff assistance (providing temporary income support and pension payments, implementing active labor market policies and social mobility measures to achieve a just transition, and providing support to workers in secondary industries).

¹⁸⁶ They also implement the regional economic development plan(s) with potential public and/or private partnerships. All three tiers of government implement the stakeholder engagement plan for Pillar 2, which should include engaging with community women separately from men.

Preparing and Implementing a Coal Sector Adjustment Program: Pillar 3 Physical Mine Closure, Environmental Protection, and Repurposing

¹⁸⁷ There are two sets of key entities involved in physical mine closure. The first set is the coal mining companies who operate and close the coal mines and repurpose the land and assets they own. The second set is the government agencies that oversee and regulate the coal mine closure and environmental reclamation work—unless a stand-alone dedicated coal mine closure company is established.

¹⁸⁸ **Stage 1: Planning and Establishing a Knowledge Base** Stage 1 involves planning and establishing a knowledge base regarding the environmental and physical aspects of the coal mines and related facilities and infrastructure. The amount of time and level of effort needed will depend in part on the present knowledge and expertise of the different ministries and agencies regarding the coal sector as well as the physical size of the coal mines, waste dumps, and related facilities and infrastructure, including water and air (including methane) impacts. The highest-level political leadership ensures that preparation for coal sector physical mine closure, environmental protection, and repurposing is undertaken in an effective and timely manner. The leaders of the different institutions supervise and guide the work of the managers and professional staff in institutions and SOEs and determine if a SEA is to be undertaken. As with Pillars 1 and 2, the first round of work involves the managers and professional

staff in institutions and SOEs undertaking planning and establishing a knowledge base regarding the environmental aspects of the coal sector and includes preparing assessments of regulatory requirements, institutional capabilities, financial surety requirements, financial sureties that are in place, environmental characteristics of mines that are expected to be closed, existing mine closure plans, repurposing possibilities, and potential legacy issues.

¹⁸⁹ **Stage 2: Program Preparation** Based on the planning and knowledge base, Stage 2 involves preparing a governance and institutional framework for environmental protection and repurposing. Taking into account the described framework, the managers and professional staff of institutions prepare a combined reclamation plan and land and asset repurposing strategy, which includes the environmental characteristics of mines and related facilities that are expected to be closed or of any abandoned mines. Program preparation would also include, if approved by the institutional leaders, terms of reference for and identification of potential funding for a coal SEA. The three key outputs for the preparation phase of Pillar 3, which are submitted to the institutional leaders for approval, are:

- a) **Governance and Institutional Framework for Environmental Protection and Repurposing**, which provides modern mine closure regulations and procedures, specifies financial surety requirements, provides a modern legal basis for repurposing possibilities, and identifies and addresses long-term legacy issues;
- b) **Environmental Protection and Reclamation Plan and Land and Asset Repurposing Strategy**, which covers all mines to be

closed, as well as any abandoned mines, including funding responsibilities and any related financial sureties; and

- c) **Terms of Reference for a Coal Sector Environmental Assessment** to contribute to upgrading not only mine closures but also overall coal industry environmental performance. The SEA addresses environmental protection requirements throughout the mine life, including exploration, planning for mining, mineral processing and other related operations and infrastructure; all operational activities, including waste management and disposal, water use, and water and air protection (including methane capture and use); planning for mine closure, mine closure and environmental reclamation, and repurposing of land and assets; and post closure environmental monitoring and management. The SEA would also include estimates of coal mine methane emissions and abandoned mine methane emission and measures for reducing emissions and using the methane for productive purposes.

¹⁹⁰ **Approvals** After approval by the institutional leaders, the institutional framework for environmental protection and repurposing will be submitted to the high-level decision-making authority for approval along with any required policy and legislative changes.

¹⁹¹ **Mine-by-Mine Closure, Reclamation, and Repurposing Plans** In addition, mining company managers and staff prepare mine-by-mine closure, reclamation, and repurposing plans for the mines and related facilities and infrastructure in accordance with the regulatory requirements and the reclamation plan and land and asset repurposing strategy, with updated budgets, and submit them to the appropriate

government agency for approval. In the case of state-owned mines, closure plans may be prepared by a dedicated mine closure company if one is established.

¹⁹² **Stage 3: Program Implementation** The high-level decision-making authority ensures that the needed budgets are available and the physical mine closures, environmental reclamation, and repurposing of useful land and assets are implemented with high priority in a timely and effective manner, including updating mine closure and environmental protection policies and laws, as needed. The senior management of the companies/entities operating the coal mines and related facilities and infrastructure (or the dedicated mine closure entity if one is established) are responsible for making sure that the coal mine closure plans are fully funded and implemented in an efficient and effective manner, and, if needed to produce a satisfactory outcome, modifications are introduced. Institutional leaders ensure that the managers and professional staff of institutions oversee the physical mine closure process, environmental reclamation, and repurposing in a fully effective manner.

¹⁹³ **New Implementing Mechanisms** The high-level decision-making authority also needs to ensure that new implementing mechanisms, including a possible stand-alone, dedicated mine closure company or agency for state-owned mines, are put in place and that any needed strengthening of environmental oversight institutions takes place along with strong interagency coordination to ensure that environmental oversight is fully adequate, environmental legacy issues are identified, and effective management and monitoring are put in place. The managers and staff of the institutions implement the governance and institutional framework for environmental

protection and regulate and oversee the physical mine closure and related activities of companies/entities operating the coal mine and related facilities and infrastructure.

¹⁹⁴ **Abandoned Mines.** Abandoned mines need special attention because they often cause substantial environmental, safety and health challenges which, in the most severe cases, may last for many decades after production ends. Addressing these challenges can require large amounts of money to clean up pollutants and reclaim and repurpose land for productive uses. To the extent that (a) there are any abandoned mines that need to be properly closed; or (b) in the event that any of the mining companies go out of business without completing the required mine closure work, the government will need to ensure that sufficient funds are available for reclamation and repurposing. The physical mine closure work would then need to be undertaken by the managers and staff of the institutions or the dedicated mine closure company. In the United States, the 1977 Surface Mine Control and Reclamation Act established an Abandoned Mine Land fund, financed by a tax of about US\$0.30 per ton of coal mined, to fund reclamation of coal mines that were abandoned before 1977.

Implementation Periods,

Institutional Roles, and

Stakeholder Engagement

¹⁹⁵ **Implementation Periods Can Vary Widely Across the Three Pillars** Policy revision, industry downsizing, and the restructuring strategy under Pillar 1 can generally be accomplished within a one- to two-year time period. Workforce redundancies under Pillar 2

typically take place immediately, whereas new job creation and community recovery may take one to two decades or more to accomplish—and for some remote communities may never be accomplished. Physical mine closures under Pillar 3 can generally be accomplished within a one- to two-year time period, reclamation and repurposing may take one to five years, and mine closure legacy issues may require monitoring and managing over many decades. These time periods are summarized in Table 13.

196 Institutional Roles and Responsibilities

There are a broad range of institutional roles and institutions that will be involved in coal sector adjustment, as shown below. These will require considerable coordination and collaboration.

A. Overall Governance

- i. A high-level coal sector adjustment decision-making body should be established to oversee coal sector adjustment activities.
- ii. Budgetary and financial matters will be the responsibility of the financial or treasury ministry and its budget office.

B. Coal Industry Oversight

- i. Coal sector administration and oversight and preparation of updated coal sector laws and regulations will be the responsibility of the ministry of coal or, if there is not one, the coal department of the ministry of energy.
- ii. Power sector oversight will be the responsibility of the ministry of power or, if there is not one, the power department of the ministry of energy.
- iii. State-owned coal mines will be operated by the state coal mining company.
- iv. The ownership role of the state mining company may be with the ministry of finance, the ministry of energy or mines, or some other ministry or combination of ministries.
- v. State-owned power plants will be operated by the state power company or the state power authority.

Table 13

Range of Time Periods for Main Activities		
Pillar	Main Activity	Time Required
Pillar 1	Policy revision and industry downsizing and restructuring strategy	1–2 years
Pillar 2	Workforce redundancies	Immediate
	New job creation	1 decade or more
	Community economic recovery	1–2 decades, sometimes never
Pillar 3	Physical mine closures	1–2 years
	Reclamation and repurposing	1–5 years
	Monitoring and managing environmental legacy issues	Many decades

Source: authors.

C. Social Mitigation

- i. The design of social mitigation and social support measures and employment services, including active labor market programs, will be the responsibility of a national social agency/ministry or similar entity.
- ii. Provision of social mitigation and employment services, including active labor market programs, generally will be the responsibility of local labor offices. However, given that coal mine closure can involve a large number of workers, but for a limited time period, the management and distribution of income support, pensions, and redundancy payments for redundant coal workers, which may include measures specific to the coal sector, may need to be with another authority—preferably one that has some responsibility for the final outcomes.
- iii. While integrated delivery and supervision of social protection and labor measures is desired, the design and provision of social services for the neediest groups, such as women and children, the disabled, and the elderly, may also involve specific agencies responsible for services to each of those groups.
- iv. Regional development and recovery plans likely will be the responsibility of regional economic authorities.
- ii. Environmental oversight will be the responsibility of the environmental protection agency or, if there is not one, the ministry of environment.
- iii. Large-scale physical mine closure and environmental reclamation may be best undertaken by one or more separate government-owned, purpose-established institutions or companies.
- iv. Oversight of mine closure by both private and state mining companies will be with both mining authorities and environmental authorities.
- v. The control and allocation for new uses of restored coal mining lands likely will be the responsibility of local authorities.

D. Coal Physical Mine Closure and Environmental Reclamation

- i. Environmental policy and preparation of updated environmental sector laws, regulations, and emissions standards will be the responsibility of the ministry of environment.

¹⁹⁷ **Procedures and Rules** For institutions to fulfill their roles in the program, there may be a need for new, updated, and modern legal and regulatory procedures and processes in many different areas of work. Depending on how modern or outdated the overall legal framework is, there may be a need for some updating and modernization of coal sector or other laws and regulations. There will also likely be a need for new rules, regulations, and procedures regarding budget management and support; industry restructuring and, if needed, privatization; social mitigation and income support; and physical mine closure.

¹⁹⁸ **Stakeholders** Stakeholders are any individual, group, institution, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project. In coal sector restructuring, underground and surface workers and workers in support industries may be affected by the restructuring, as well as families of those workers and the surrounding communities.

Institutions such as companies providing services to the mines, schools, and hospitals may also be affected.

inclusive process that encompasses all parties and should occur throughout the life of the mine;

199 Stakeholder Concerns Different stakeholders will have different concerns and issues that need to be addressed. Retired workers will have different concerns than youth who may live in the area or who come from families supported by workers who may be affected by the restructuring. Both will have specific vulnerabilities that will be different than the issues faced by mine workers facing retrenchment. Owners of local real estate may find the value of their assets significantly affected by a mine closure. Although stakeholders' concerns and needs are often based on age or economic situation, gender and the concerns of women are key issues that must be addressed when working with stakeholders. Women can bring an important new perspective that is not well appreciated by men. However, women will often not speak up in meetings when men are present—or in the most extreme cases may not be permitted to speak. It is important, therefore, to have meetings with women, their representatives, and their organizations that are separate from ones attended by men. But in doing so, efforts should ensure that all of the community women are given a voice, especially the most vulnerable, and that the proceedings are not dominated by the wealthy women in the community.

- *Principle 3:* A targeted communication strategy is required that should reflect the needs of the stakeholder groups and interested parties;
- *Principle 4:* Adequate resources should be allocated to ensure the effectiveness of the engagement process; and
- *Principle 5:* Wherever practical, the work to manage the potential impacts of mine closure and issues after closure should be undertaken closely with communities.

201 Engagement with Regions and Communities

Stakeholder engagement and communication includes direct dialogue among key stakeholders (for instance, the government, enterprise management, workers, and community leaders) before, during, and after the adjustment process of all three pillars. Strong communication will be needed with regions and communities where the bulk of the closures will take place to explain the need for adjustment, gain their support, and help them sustain their economic base and identity during a difficult time. Engagement will give these regions and communities the opportunity to help design a sustainable future so that they are able to survive the large changes facing them and take ownership of local-level impacts. Institutions such as the ministry of mines, regional development authorities, employment offices, or the ministry of environment will need to undertake stakeholder engagement regarding the impacts on mining companies and their workers, social mitigation and support for coal regions and their communities, and impacts regarding environmental cleanup, postmining landforms, and legacy management.

200 Principles of Stakeholder Engagement

Five key principles of stakeholder engagement proposed by the Department of Mines and Petroleum of the Government of Western Australia²⁴ are

- *Principle 1:* Identify stakeholders and interested parties;
- *Principle 2:* Effective engagement is an



Four Toolkits which Address Physical Mine Closure, Environmental Rehabilitation and Stakeholder Engagement

²⁰² Four important toolkits/guidelines²⁵ provide guidance on physical mine closure, environmental rehabilitation, stakeholder engagement and financial assurance for the mine closure process and, where necessary, legacy issues and post closure monitoring and maintenance of potentially hazardous sites. This Annex provides a summary of their recommendations.

Mine Sector Adjustment Program

and Regulatory Framework

²⁰³ The World Bank Towards Sustainable Decommissioning and Closure of Oil Fields and Mines toolkit and the Western Australia Guidelines for Preparing Mine Closure Plans outline the key levels of a good practice mine sector adjustment program and regulatory framework for governments in terms of the following three-step approach:

- *Step 1:* Preparing and adopting a mine sector adjustment program.
- *Step 2:* Defining detailed institutional roles and responsibilities.
- *Step 3:* Putting in place the necessary regulatory framework for mine closure planning and implementation and, if needed, post closure monitoring and maintenance along with ensuring that the necessary funding is in place through fiscal assurance provisions.

²⁰⁴ A fundamental point is that the regulatory framework needs to establish the criteria for

- The mine closure process to be certified as complete, and
- Approval to be granted for the mining company/operator to be permitted to relinquish the mining right and to hand the license area back to the government, after which the operator has no further legal responsibilities or obligations for the license area.

²⁰⁵ However, if there are potential legacy issues, it may also be necessary for the mine operator to

have continuing responsibility for maintenance and monitoring of residual structures, such as waste dumps or impoundments.

Step 1:

Prepare and Adopt a Mine Sector Adjustment Program

²⁰⁶ As part of Pillar 1, good practice would be for the government to prepare and approve a mine sector adjustment program. This should be developed through a consultative process involving the government and key stakeholders, namely mine operators, mine workers, secondary industries that supply the mining industry, mining communities, and NGOs that may support mining communities.

Step 2:

Define Detailed Mine Closure Institutional Roles and Responsibilities

²⁰⁷ The mine sector adjustment program will need to define the detailed roles, responsibilities, and authorities for the government institutions noted in the following. The program will also need to clearly define the roles, rights, and obligations of the mining operator, any contractors implementing closure activities, and (if applicable) the parent company of the mining operator. Several different key government ministries and agencies will need to be involved, including in particular:

- i. The mining authority, which is responsible for and has authority to issue mineral (that is, exploration and mining) rights and approve relinquishment of mineral rights. It also has oversight of mining methods, which largely determine the amount of mine closure and rehabilitation work needed at the end of mine life and is responsible for ensuring that third parties verify the



adequacy of mine closure cost estimates prepared by the operator. The mining authority, together with the environmental authority, will also consider the need for any post closure monitoring and maintenance.

- ii. The environmental authority, which is responsible for and has authority over compliance with environmental requirements for (a) mining operations (which influence the amount of environmental rehabilitation work needed at mine closure), (b) the closure process, and (c) any needed post closure monitoring and maintenance.
- iii. Land or land use agencies if they have any responsibility for and authority over land access or land use for exploration and mining activities.
- iv. Authorities responsible for basic income support, social mitigation, provision of social services, local economic development, and ALPs. These include local labor offices, which can provide important support for alternative employment creation and capacity building to support regions and communities to prepare for the potentially harmful impacts of employment and income loss in mining areas and regions when mine closure takes place.
- v. The ministry of finance, which is responsible for and has authority over the management and control of mine closure financial assurance instruments. The government bears the potential risk of having to fund mine closures if operators default on their mine closure and financial assurance responsibilities.
- vi. The budget authority, which is responsible for funding government-financed income

support for redundant workers, social mitigation activities, and ALPs.

- vii. The fiscal authority, which will need to address the deductibility of mine closure funds and expenditures for income tax purposes.
 - Subnational government authorities, including local labor offices, which are responsible for the delivery of social services before, during, and after mine closure and for consultation with affected communities and regions.
 - Regional authorities, which can oversee the integration of mining operations into regional economies and thereby help ease the economic hardships brought about by mine closure.

Step 3:

Put in Place the Necessary Legislative Framework

²⁰⁸ A key activity in developing a mine sector adjustment program is putting in place the necessary legislative framework, which includes the laws, regulations, and procedures necessary for mine closure planning, implementation, and if needed, post closure monitoring and maintenance along with fiscal assurance provisions.

²⁰⁹ **Legal Provisions** Laws, regulations, and procedures need to contain provisions regarding the detailed roles, responsibilities, and authorities of the government ministries and agencies noted, as well as the detailed rights and obligations of the mine operator/license holder. The legal provisions also need to cover the procedures for mine closure planning and implementation and, if needed, post closure monitoring and maintenance.

²¹⁰ **Key Issues** Two key issues are (i) determining what provisions will be placed in the mining law and its regulations, and what will be placed in environmental, water, social, land, fiscal, and any other relevant laws, regulations, and procedures; and (ii) ensuring that there are no overlaps or gaps. This is a major legislative task and will depend more on country-specific circumstances than a one-size-fits-all approach. In addition to the laws, regulations, and procedures, detailed closure and cleanup standards will need to be established and placed in the legal or contractual regime. There should be an applicable regulatory regime that applies to all operations, but there may also be site-specific details for which site-specific agreements may be needed.

²¹¹ **Regulatory Regime** Key aspects of the regulatory regime for mine closure include rules, regulations, and procedures as needed for:

- i. Preparation and approval of an initial mine closure plan (including detailed cost estimates) for each operating mine and subsequent updating and approval, on a regular basis, with a final mine closure plan to be prepared and approved one to two years before production ceases;
- ii. Oversight, management, and control of mine closure financial assurance funds to ensure that the necessary funds are in place to fund mine closures when they take place;
- iii. Possible deductibility of mine closure funds and expenditures for income tax purposes, noting that most expenditures will take place after revenues cease;
- iv. Provisions for the unanticipated closure of mines where production has been suspended because of technical or financial difficulties;

- v. Identification of any potential legacy issues for post closure monitoring and maintenance that will be the continued responsibility of the mine operator;
- vi. The criteria by which the mining company/operator will be permitted to relinquish the mining rights on the successful completion of mine closure activities;
- vii. Mine closure environmental standards and protections against risks of hazardous materials;
- viii. Social mitigation measures, including social services and support packages/programs;
- ix. Delivery of health, education, and other essential social services before, during, and after mine closure in affected communities and regions; and
- x. Documents maintenance and storage and issues related to public availability and accessibility.

Mine Closure Planning:

Stakeholder Engagement

²¹² **Stakeholder Engagement Strategy**

Stakeholder engagement should begin at the exploration/prefeasibility stage and continue through closure and post closure, but this has not been the case in many countries. As mine closure approaches, an effective engagement strategy should be put in place that addresses the concerns of affected stakeholders, who should be given an opportunity to provide feedback on proposed actions to address their interests and concerns, particularly when determining postmining land use, closure

objectives, and outcomes. Good practice is for the operator to prepare a stakeholder engagement strategy and maintain a stakeholder engagement register, which should include written summaries of all stakeholder engagement activities and how the operator is responding to stakeholder inputs.

213 Managing Different Views It is important to recognize that initially participants in closure planning may hold different views on what can and cannot be achieved in closure, and that expectations may vary among stakeholders. A fundamental aspect of closure planning is understanding these views and expectations (which may change over time) and, together with stakeholders, formulating a balanced, realistic, and achievable closure outcome that can be funded and supported by the relevant parties. These balanced closure outcomes, if arrived at by participants during closure planning, help create stakeholder ownership of the closure outcomes and ultimately help ensure successful closure.

214 Communication Strategy The government and the operator need to develop a good understanding of the stakeholder landscape and identify the main stakeholders and interested parties. Useful tools for community engagement include social impact assessment, community profiling and mapping, gap analyses, active listening, risk communication, partnerships, and facilitation. The engagement process should include a targeted communication strategy that ensures that all of the stakeholder groups and interested parties are well informed about the mine closure planning process. Adequate resources will need to be allocated to ensure the effectiveness of the engagement process. On its own side, the government needs to organize itself and put in place good internal coordination among the different government

authorities involved in mine closure, with the mining authority generally taking the lead.

215 Benefits Stakeholder engagement, dialogue, and participatory engagement not only allow the community and other stakeholders to be involved in shaping how the mine closure takes place and what the post closure scenario may look like but also provide a process for addressing concerns about—and even opposition to—mine closures from mine workers at the local, regional, and sometimes national levels.

Outline of a Good Practice

Mine Closure Plan

216 Four important points for a good practice mine closure plan are:

- i. The mine closure plan needs to cover all of the mining domain (that is, infrastructure, waste storage facilities, transport routes, and ports).
- ii. Mine closure plans are of course site specific. Some issues will warrant much greater attention than others, according to the specifics of the site, and not all of the following details may be relevant.
- iii. Mine closure planning needs to address not only environmental issues but also the potentially harmful socioeconomic impacts for affected communities and should include proactive stakeholder engagement starting at the planning stage.
- iv. Setting closure goals and site relinquishment criteria is one of the most important levels of the mine closure plan.

Closure goals and site relinquishment criteria should be as specific as possible and must have buy-in from the local community and the government.

²¹⁷ The following is a proposed outline of a mine closure plan based on the materials reviewed:

- a. Scope and purpose of mine closure plan
- b. Applicable standards, regulations, and policies
- c. Preconstruction baseline conditions and aspects requiring protection/enhancement
- d. Mine closure measures adopted during construction phase and operations phases
- e. Locality and physical aspects at time of mine closure
- f. Closure obligations and commitments
- g. Closure objectives
- h. Integrated post closure vision/goals/target post closure conditions
- i. Proposed mine closure completion criteria
- j. Proposed site relinquishment criteria
- k. Main closure activities and estimated costs
- l. Closure funding provisions
- m. Communities affected by cessation of production and mine closure
- n. Stakeholder involvement in preparing and updating the mine closure plan
- o. Early closure contingency plan

- p. Identification and management of main closure issues and risks
 - i. Landforms and dispersive and sodic materials risks
 - ii. Water resources risks
 - iii. Hazardous materials and radiation-type risks
 - iv. Air quality risks
 - v. Social mitigation measures, including social support packages/programs
 - vi. Community livelihoods, income, health, education, and other service-related risks
- q. Management of information and data roles and responsibilities
- r. Post closure planning, monitoring, and maintenance

²¹⁸ **Progressive Plans** Good practice is for an initial conceptual mine closure plan to be started at the prefeasibility stage. The plan then is progressively developed through the feasibility, mine design, and construction stages to help inform decisions and guide the direction of both construction and the plans for operating activities. The conceptual plan should be approved before project approval and construction start-up. The risk assessment process in a conceptual closure plan should identify the most serious potential risks and present broad strategies and approaches for the control of each risk. The initial conceptual mine closure plan should be updated on a regular basis until a final mine closure plan is prepared and approved shortly before production ceases. The final mine closure plan will need to



include decommissioning and post closure aspects and address community impacts and sustainability, including socioeconomic challenges during and after mine closure and company exit. Monitoring, documentation, and continuous improvement should cover the entire life of the mine and include closure reviews and audits, and there should be subsequent implementation of any needed corrective and preventive actions.

219 Continuous Process Although a mine closure plan sets out the final mine closure process, mine closure should be viewed as a continuous process linked to operational activities. One of the most important aspects in this regard is for the mine plan and operation to include progressive rehabilitation of areas disturbed during mine exploration, construction, and operation as soon as these areas become available, instead of waiting to undertake all the large-scale rehabilitation works at the end of planned exploration and/or mining activities. Progressive rehabilitation is a key component of mine closure implementation and has many benefits, including reduced financial liability as rehabilitation progresses. Topsoil retention for later use is also an essential measure for restoration of areas that are not subject to progressive rehabilitation.

220 Good practice Good practice environmental protection and rehabilitation will include:

- i. Environmental management systems;
- ii. Securing, removal, or conversion of plant, equipment, and infrastructure for beneficial use;
- iii. Environmental reclamation and restoration;

iv. Waste dump and water impoundment stabilization/removal;

v. Biodiversity offsets; and

vi. Carbon-neutral decommissioning.

221 Closure Activities There will also be removal of plant and equipment, transfer of useful assets to the local community, securing the stability of remaining waste dumps and impoundments, water management and surface stability at closed underground mines, and monitoring and managing any post closure environmental impacts, including any legacy issues, such as water protection and management of mine pit lakes.

222 Four Key Environmental Challenges

Four of the more difficult environmental closure issues that need careful attention are:

i. Acid and metalliferous drainage (AMD), which can cause ongoing pollution lasting for centuries;

ii. Dispersive and sodic materials, which can help prevent tunnel erosion and protect landform stability and rehabilitation;

iii. Radiation management, to ensure that there is no unacceptable health risk to people, both now and in the future, and no long-term unacceptable detriment to the environment; and

iv. Management of mine pit lakes, which can form after the mine closes and allow the closed mine voids to fill with groundwater.

223 Financial Assurance Mine closure and post closure work can have substantial funding requirements and it cannot be emphasized enough that some type of financial assurance

is needed to ensure that the needed funds are available at the time of mine closure. Different types of financial surety instruments include trust funds, insurance policies, third party guarantees, letters of credit, cash deposits, and “soft options,” such as company guarantees, pledged assets, and sinking funds. It is essential that the mine closure plan demonstrates that the needed funds or third-party financial assurance have been put in place and are sufficient not only to pay for final closure but also to pay for a fully responsible mine closure and decommissioning in the event that a situation should arise in which a company is not in a position financially to carry out any of the planned rehabilitation. This could occur, for example, if there is an unplanned, premature mine closure caused by a company becoming bankrupt and abandoning or

walking away from its mining operations. Some mine sites and/or related areas may also require funds to pay for post closure monitoring and maintenance and, when required, remedial action. These funds can form part of the financial surety or a separate, self-perpetuating fund. It is critical that the financial surety is used only for the purpose for which it was designed and not viewed as a general source of funds by any of the parties involved.

²²⁴ **Post Closure** Depending on the nature of the environmental impacts that need to be managed post closure, such as pumping water from closed underground workings or managing acid rock drainage issues from hard rock mines, a separate and stand-alone decommissioning and post closure plan may also be needed.



Footnotes

- 1 For the purpose of this article, “coal” includes anthracite and “lignite” includes brown coal. All units, including for the United States, are in metric tons with 1 metric ton equal to 1,000 kg and 2,204.6 pounds.
- 2 Enerdata, “Global Energy Statistical Yearbook,” <https://www.enerdata.net/>. <https://yearbook.enerdata.net/total-energy/world-energy-production.html>. 2017.
- 3 For state-owned power and coal mining companies, Tier 2 decisions would include decisions on baseload power generation and coal industry restructuring.
- 4 World Bank, *World Development Report 2017: Governance and the Law* (Washington: World Bank, 2017) doi:10.1596/978-1-4648-0950-7.
- 5 It should be noted that European countries such as the United Kingdom, Germany, and France also went through a substantial downsizing of their coal industries in the 1980s and 1990s due to competition from oil and natural gas and a shift away from coal due to severe air pollution, especially in London and other U.K. cities.
- 6 Available at <http://documents.worldbank.org/curated/en/283901468777597730/pdf/multi-page.pdf>
- 7 Available at <http://documents.worldbank.org/curated/en/179841468778209054/pdf/multiopage.pdf>
- 8 In Poland, “hard coal” refers to the production of bituminous coal. Poland also produces lower-grade brown coal and lignite.
- 9 In June 2001, SECAL I was one of only five projects across the entire World Bank in that fiscal year to receive a World Bank Green Award for its environmental achievements.
- 10 Data are not available for 1999, but 2001 data show a redundant person’s income in the mining areas was only 16 percent of the average monthly income, whereas the household income of a redundant person was only 27 percent of the average. Source MCSM Implementation Completion and Results Report, World Bank, June 2007, page 15.
- 11 In 2007, the World Bank mining team received the Silver Rose Prize, given annually by the Silesian Voivodeship for the promotion of women’s rights in the voivodeship.
- 12 A poverty and social impact analysis (PSIA) carried out in 2005 concluded that the measures introduced under the MCSM loan were gender blind and were not reaching women equitably or effectively.
- 13 Wojciech Suwala, *Lessons Learned from the Restructuring of Poland’s Coal-mining Industry* (Geneva: International Institute for Sustainable Development 2010).
- 14 Michael Haney and Maria Shkaratan, *Mine Closure and its Impact on the Community—Five Years After Mine Closure in Romania, Russia and Ukraine* (Washington: The World Bank, June 2003).
- 15 The section on the United Kingdom is taken largely from and includes quoted material from Steve Fothergill, *Coal Transition in the United Kingdom* (Paris: IDDRI and Climate Strategies 2017).
- 16 As quoted in Steve Fothergill, *Coal Transition in the United Kingdom* (Paris: IDDRI and Climate Strategies 2017).
- 17 Material on the Netherlands is taken largely from and includes quoted material from Ben Gales and Rick Hölsgens, *Coal Transition in the Netherlands* (IDDRI and Climate Strategies 2017).
- 18 The section on the United States is taken almost entirely from and includes quoted material Irem Kok, *Coal Transition in the United States* (IDDRI and Climate Strategies 2017).
- 19 Figures in the text are in metric tons, not short tons.
- 20 Mine Injury and Worktime, Quarterly January 1, 2017–December 31, 2017 FINAL US Department of Labor



- 21 The Appalachian Regional Commission.
<https://www.arc.gov/index.asp>
- 22 China: Competing in the Global Economy
Wanda Teng and Markus Rodlauer
- 23 An in-depth look at mining and human rights is provided in Margaret Wachenfeld, *Extracting Good Practices: A Guide for Governments and Partners to Integrate Environment and Human Rights into the Governance of the Mining Sector* (United Nations Development Programme [UNDP] 2018).
- 24 Department of Mines and Petroleum, *Guidelines for Preparing Mine Closure Plans* (Perth: Government of Western Australia 2017).
- 25 The four toolkits/guidelines are: (i) International Council on Mining & Metals, *Planning for Integrated Mine Closure: Toolkit* (London: International Council on Mining & Metals 2008) available at <http://archive.resourcegovernance.org/sites/default/files/Planning-for-Integrated-Closure-Toolkit---Final.pdf>; (ii) World Bank, *Towards Sustainable Decommissioning and Closure of Oil Fields and Mines: A Toolkit to Assist Government Agencies* (Washington: The World Bank 2010) available at http://siteresources.worldbank.org/EXTOGMC/Resources/336929-1258667423902/decommission_toolkit3_full.pdf; (iii) Department of Mines and Petroleum, *Guidelines for Preparing Mine Closure Plans* (Perth: Government of Western Australia 2015) available at <http://dmp.wa.gov.au/Documents/Environment/ENV-MEB-121.pdf>; and (iv) Anglo American PLC, *Mine Closure Toolbox* (London: Anglo Operations Proprietary Limited 2013), available at <http://www.angloamerican.com/~media/Files/A/Anglo-American-Plc/pdf/development/toolbox/toolbox-main-brochure-lr.PDF>

