



**WISMUT**

# Post-mining remediation

For people and the environment



## Preface



**The rehabilitation of the regions damaged by uranium ore mining in Saxony and Thuringia has well advanced over the past 30 years. So far, the federally owned company Wismut GmbH has spent almost € 7 billion on remediation activities. Successful completion of the work is not only essential for restoring an environment worth living in, it is also the chance for a new beginning in the affected region.**

# The company

↓ Overview of Wismut GmbH sites



## Responsibility for the region

For more than 40 years, uranium ores were mined in Saxony and Thuringia; a long-kept secret of German post-war history. Immediately after the end of World War Two, the Soviet occupying power started prospecting for uranium in East Germany – and they were successful. Their aim was to produce uranium for the Soviet nuclear weapons program. Employing an enormous workforce, uranium mining rapidly spread across the Ore Mountains and into Eastern Thuringia. The early “wild” years were characterized by poor working conditions and complete disregard for the environmental concerns of the densely populated areas. In 1954 the GDR got a share in the Wismut Company which was converted into a Soviet-German stock company (SDAG) and continued uranium mining operations. As time went on, the focus shifted from temporary exploitation to long-term efficient mining with the workforce





Mine water discharge via the WISMUT-Stolln adit

slimming down to a permanent staff of some 45,000. During its 45 years of existence until 1990, the company produced a total of 216.350 tons of uranium, which ranks the company as number four in global uranium production after the USSR, the United States, and Canada.

With the reunification of Germany, the German federal government took responsibility for the legacies of Soviet-German uranium mining. Among the legacies left behind were some 1,500 km of open underground working, 311 million m<sup>3</sup> of waste rock material, and 160 million m<sup>3</sup> of radioactive sludges deposited in densely populated areas.

Under the provisions of the Wismut Act of December 12, 1991 the mining company was transformed into a company under German corporate law – Wismut GmbH – and put in charge of rehabilitating the uranium mining liabilities. Rehabilitation of the large-size radioactively contaminated sites formerly operated by Wismut is one of the largest ecological and economic challenges facing the reunited Germany.



Lichtenberg open pit mine in 1962



Hammerberg mine dump in Schlema 1991

# Underground Mines

## Closure of underground mines

Safe closeout of the wide network of open underground mine workings of some 1,500 km length was one of the primary tasks on the Wismut GmbH agenda. The mines were to be abandoned and closed in such a way that they will not pose any hazard to humans or the environment.

Activity	Status 2020	
Cleanup/abandonment of mine workings	1,467 km	100 %
Underground barrier construction	197 units	100 %
Backfilling of near-surface mine workings	239,000 m <sup>3</sup>	100 %
Flooding of open mine volumes	65 million m <sup>3</sup>	97 %

↑ Status of underground mine remediation

Flooding of the mines was identified as being the most environmentally friendly, technically safest and low-cost remedial option. The option involves terminating mine water pumping whereby the water rises to its natural level. Flooding is one of the longest and most complicated processes in remediation. The aim is to re-establish a natural groundwater level in all mines as quickly as possible. Each mining site poses its own specific challenges for achieving that. Almost all mine voids are now either completely or almost completely flooded. At the Schlema site, for example, the upper most part of the underground void cannot be

flooded to ensure long term ventilation for managing the local radon situation. As the mine water contains many pollutants it requires treatment before it can be released into nearby rivers and streams. For that purpose, Wismut operates a total six water treatment plants across the region.



End of underground mine remediation: Shaft 208

# Mine dumps

## Landscapes with a new look

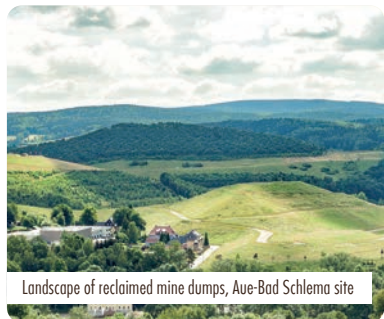
The remediation assignment of Wismut GmbH also includes 48 waste rock piles which were created during the period of active mining operations by stockpiling of waste rock and overburden at numerous Wismut sites.

These waste rock piles could not have been left in their original state. Depending on their location, shape, and contaminant inventory, they present various hazards to humans and the environment.

Activity	Status 2020	
Excavation of waste rock material	167 million m <sup>3</sup>	95 %
Placement of waste rock material	21 million m <sup>3</sup>	96 %
Contouring of waste rock piles	2,2 million m <sup>3</sup>	90 %
Covering of waste rock piles	4,1 million m <sup>3</sup>	97 %
Construction of trails and ditches	179 km	94 %

↑ Status of waste rock pile rehabilitation

Two different remedial options were applied to waste rock pile remediation. At the Ronneburg site, the majority of waste rock piles was excavated and relocated into the worked-out Lichtenberg open pit mine. In cases where relocation was not feasible for technical or economic reasons, Wismut opted for the in situ remediation of the piles. This is particularly true for waste rock piles located in Saxony. At these piles, slopes are reshaped to provide long-term stability and subsequently covered with mineral soil and topsoil. These covers are designed to reduce precipitation infiltrating into the body of the waste rock pile thus minimizing the volume of contaminant-laden seepage. Moreover, the cover reduces radioactive impacts on the environment down to natural background levels.



Landscape of reclaimed mine dumps, Ave-Bad Schlema site

# Open pit



Reclaimed former open pit mine, 2019

## Moving mountains

The Lichtenberg open pit mine was one of the most obvious legacies left behind in Thuringia. Waste rock piles had accumulated around the open pit mine. The remedial concept for the site called for the relocation of virtually all waste rock piles into the worked-out open pit mine. Up to 40,000 m<sup>3</sup> of waste rock were hauled daily.

Activity	Status 2018	
Backfilling of worked-out open pit mine	133 million. m <sup>3</sup>	100 %
Cover placement	1.4 million. m <sup>3</sup>	100 %
Construction of trails and ditches	41 km	100 %

↑ Status of open pit rehabilitation

A total of some 133 million m<sup>3</sup> of material, mainly rock from the ten surrounding mine dumps, was safely deposited inside the former open pit. Subsequently, the filled pit was capped using a landscaped two-layer

cover on parts of which forests were planted. The objective is to arrive at a balanced distribution of habitats in forests and open grassland. The land use concept also addresses relevant aspects of nature conservation. Rehabilitation of the site was completed in 2018.



Walk-in pit lamp on reclaimed open pit mine

# Tailings ponds

## From radioactive tailings deposits to new living environments

Wismut GmbH has responsibility for the rehabilitation of four milled ore deposits, namely the Helmsdorf and Dänkriz I tailings ponds as well as the Culmitzsch and Trünzig deposits. The sludgy residues of uranium processing had been discharged into the tailings ponds by pipeline delivery.

Activity	Status 2020	
Interim cover	7.7 million m <sup>3</sup>	100 %
Contouring	26.7 million m <sup>3</sup>	74 %
Final cover	7.1 million m <sup>3</sup>	61 %

↑ Status of Tailings Ponds Rehabilitation

Covering a total surface of 684 ha and containing sludges in the order of 154 million m<sup>3</sup>, these tailings ponds are the largest of their kind located within densely populated areas. They are rehabilitated in situ. This involves removal of the supernatant pond water, stabilisation of the deposited fine-grained sludges with the help of geotechnical materials and final capping with several layers of mineral soil. Final contouring is currently under way and will continue for some years to come. At the Trünzig site, placement of the final cover was completed in 2013. Remedial work on the Helmsdorf and Dänkriz I tailings ponds will be completed by 2022, the plant Culmitzsch shall be completed by 2028.



Culmitzsch tailings facility in 1991



Culmitzsch tailings facility in 2020

## Long term tasks



Water treatment plant, Ronneburg site

### Ensuring long-term stability

What remains high on the agenda once remediation of the various objects is completed are long-term tasks which are designed to permanently securing the success of the remedial project. Active after-care, monitoring of the former mining and processing sites and water management in particular will be the challenges to be addressed in the two or three decades ahead. These long-term liabilities are part and parcel of the Wismut (environmental restoration) programme and were set out in the 2020 remediation programme. This is no less demanding a task and a challenge that will require full mobilisation of commitment and of competencies as well as the implementation of state-of-the-art know how and most recent expertise. Funding of this undertaking will continue to be provided by the federal government. Efforts and expenditure will be primarily devoted to the collection and treatment of mine and seepage waters. At most sites, long-term treatment of these contaminated waters is mandatory under the terms of radiation protection and water legislation. Duration of such treatment is subject to the pollution potential of the collected waters.



Analysis of samples in the Seelingstädt laboratory



Taking water samples from underground

# Stewardship sites

## **Wismut as executing agency on behalf of the Free State of Saxony**

In accordance with the Wismut Act of 1991, no funds were allocated for remediating all those legacy sites left of the former SAG/SDAG Wismut that were not legally owned by the latter in 1990. In 2003, the Federal Government and the Free State of Saxony signed an initial administrative agreement on the remediation of all such sites located in Saxony running comprising some € 78 million for the period up until 2012.

Reviews in 2012 and 2016 on progress achieved indicated that neither the allocated budget nor the envisaged time frame were sufficient to allow for completing the envisaged tasks. In an effort to not stop halfway and secure complete remediation, both parties concluded two further administrative agreements in 2013 and 2019 providing an additional € 367 million up until 2035.

Between 2003 and the end of 2020, a total of 275 projects were successfully completed spreading over 47 cities and municipalities.



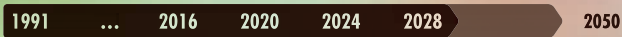
Rehabilitation of a quarry in Annaberg-Buchholz



Sealing a mine shaft

# Outlook

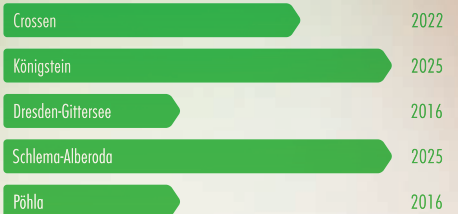
After 30 years of remediation much has been achieved and many things have changed. Most of the underground work has been completed. Remediated sites are now hardly recognizable anymore and blend in perfectly with the green and hilly landscape of the densely populated Erzgebirge (Ore Mountains) and eastern Thuringia. Yet, hidden from the eye, the remediated radioactive dumps, tailings ponds, the filled open pit and other residues of the former uranium mines are still there, covered by their lids. Making sure that these sites stay safe and stable is one of our future long-term missions. It is up to us as Wismut now, as it was 30 years ago, to take responsibility again and design solutions that allow us to leave these sites with a clear conscience to local communities. As in the past, Wismut will fulfill these long-term obligations with the competence and commitment it is known for.



## Thuringia



## Saxony



↖  
End of site-related  
core remediation



# WISMUT

## **Experience unique history first-hand: Wismut from its origins to the present**

The exhibition “Wismut\*Objekt90“ illustrates both the history of the uranium producer and the remove restructuring and evolution into a modern remediation company.

## **WISMUT OBJEKT90**

Exhibition on the history of Wismut

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