

# The District of Goslar

**One the world's most important mining areas in former times and a severe ecological burden today;  
How can the competent authority cope with such a heritage?**



Juergen Bauer  
Environmental authority; District of Goslar

# The District of Goslar

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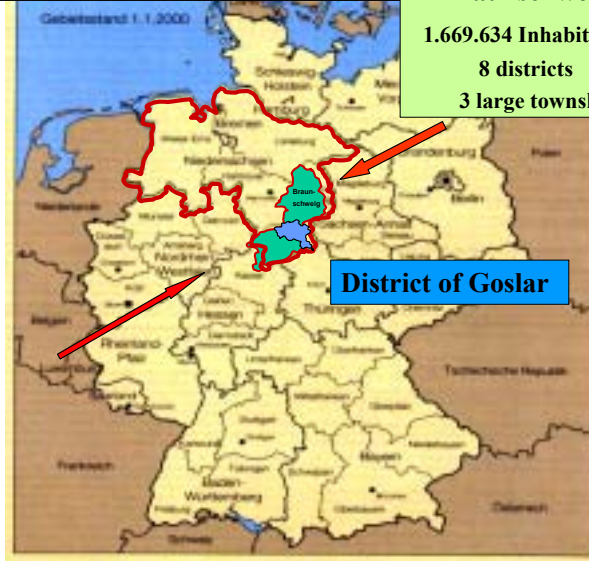
# The District of Goslar

## Federal Republic of Germany

**County of Braunschweig**  
1.669.634 Inhabitants  
8 districts  
3 large townships

**2001:**  
**82,440,300 inhabitants**  
**323 districts**  
**117 large townships**

**Lower Saxony**  
7.980.472 inhabitants  
(31.12.2002)  
38 districts  
9 large townships

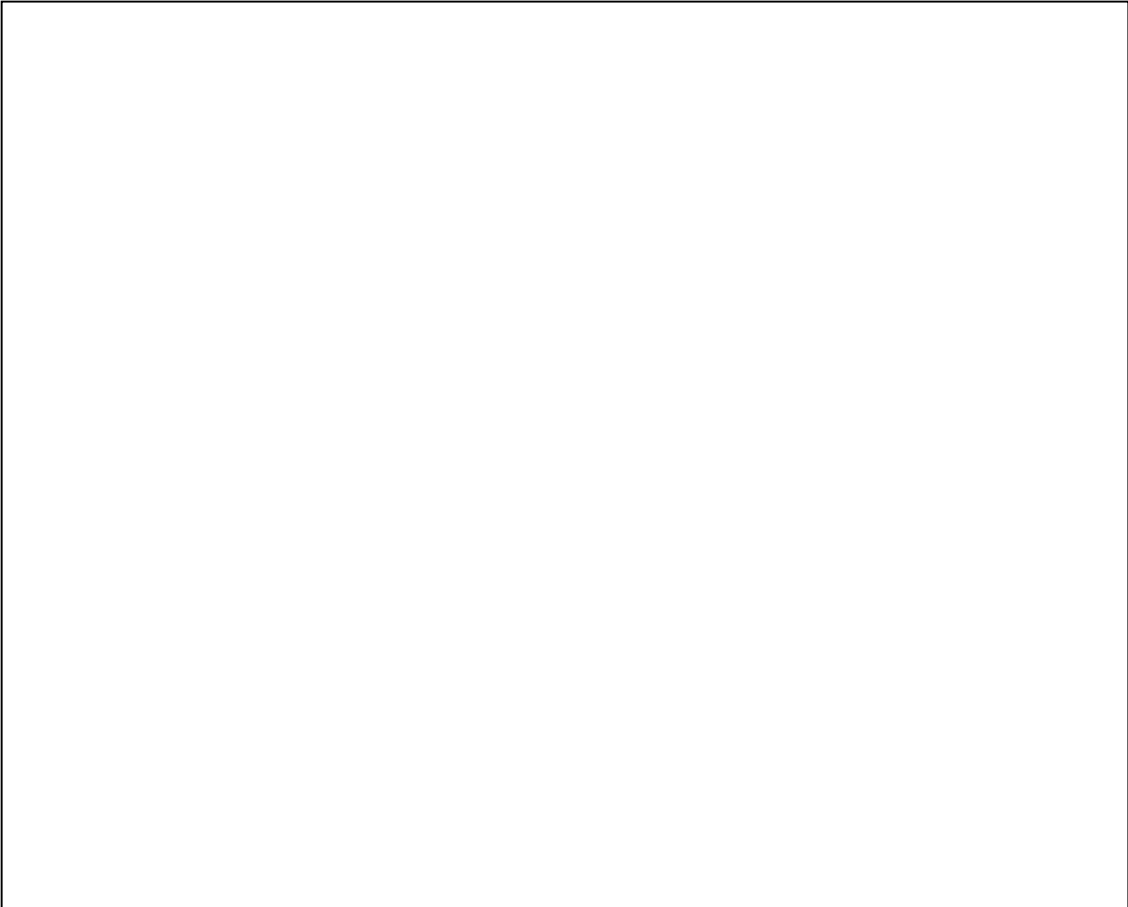


# The District of Goslar



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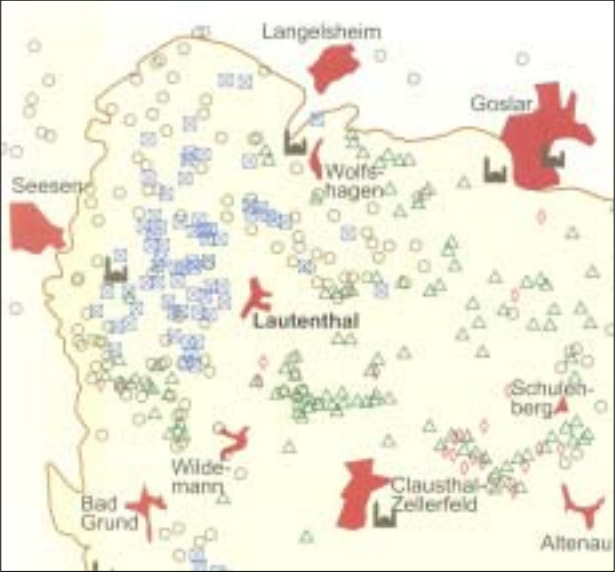


## The District of Goslar - In the Beginning

The process of mining ore began 3,000 years ago  
in the Harz Mountains



deposits of slags



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## The District of Goslar - In the Beginning

**Rammelsberg Mountain near the city of Goslar was discovered in 968**

**one of the oldest and largest ore deposits of the world**



**28 million tons of lead, zinc, and copper ores**



## The District of Goslar - In the Beginning

The mines in the Upper Harz Mountains extracted 40 million tons of ore in the last 400 years



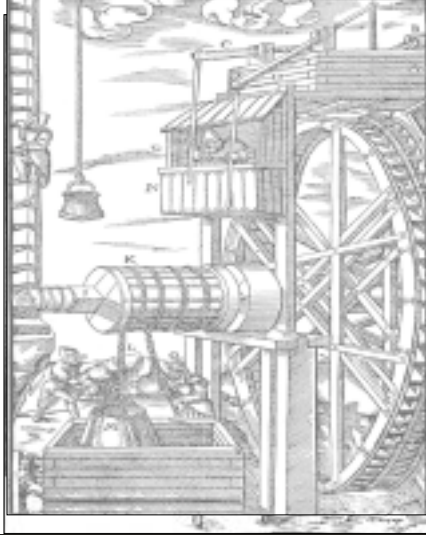
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## The District of Goslar - In the Beginning

At the beginning of the 16th Century, the depositing the  
Middle Ages the area soil for the first great smelting works



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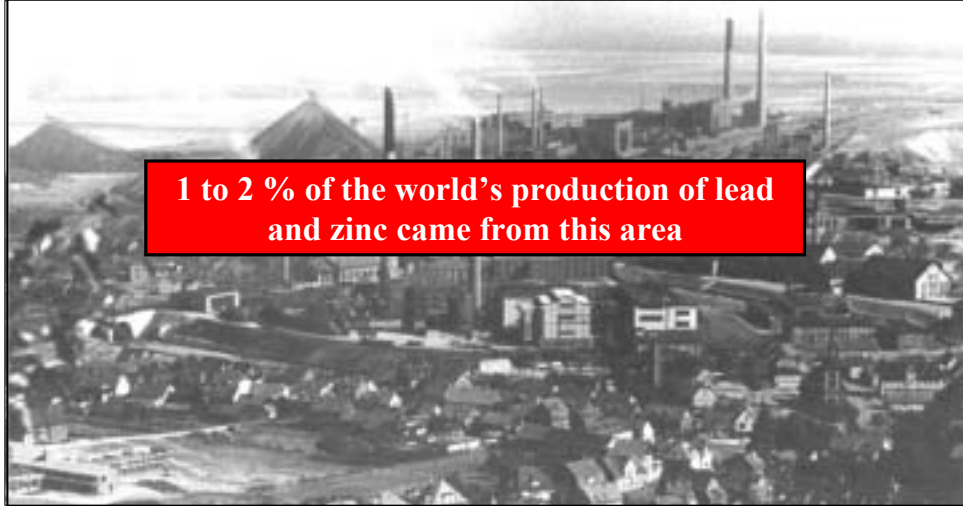




## The District of Goslar - In the Beginning

The next industrial boom between the 18<sup>th</sup> and 20<sup>th</sup> century

a multitude of mines existed within the District of Goslar  
Chemical factories using the wastes from the smelting works  
three big plants for ore preparation



1 to 2 % of the world's production of lead  
and zinc came from this area

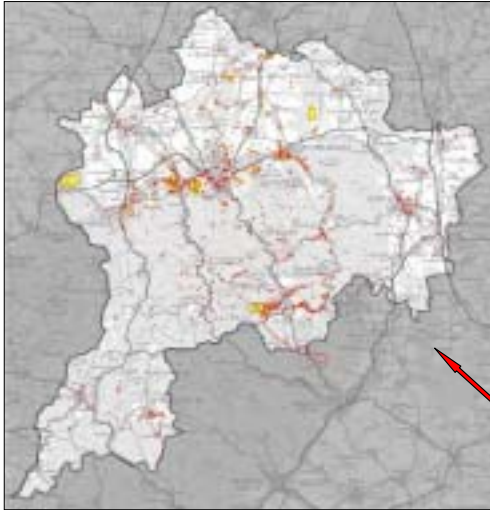
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## The District of Goslar - The Effects

just alone in the lead smelting factory in the town of Clausthal **150,000** tons of lead dust was emitted into the atmosphere



**8 km<sup>2</sup> or 6 % of the residential area of the District of Goslar, are contaminated sites**

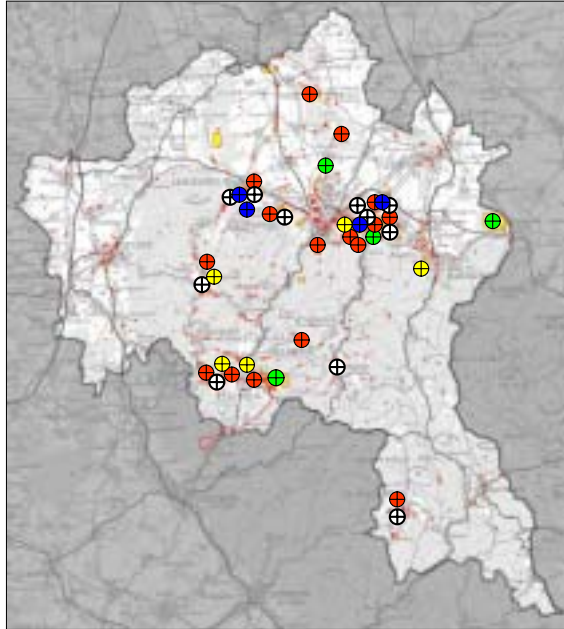
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## The District of Goslar - The Effects

- ⊕ large slag or ore dump  
Volume > 500.000m<sup>3</sup>
- ⊕ large smeltery  
work
- ⊕ large chemical  
work
- ⊕ large dump or site with  
haevy metal contamination
- ⊕ other large waste deposit  
or contaminated site

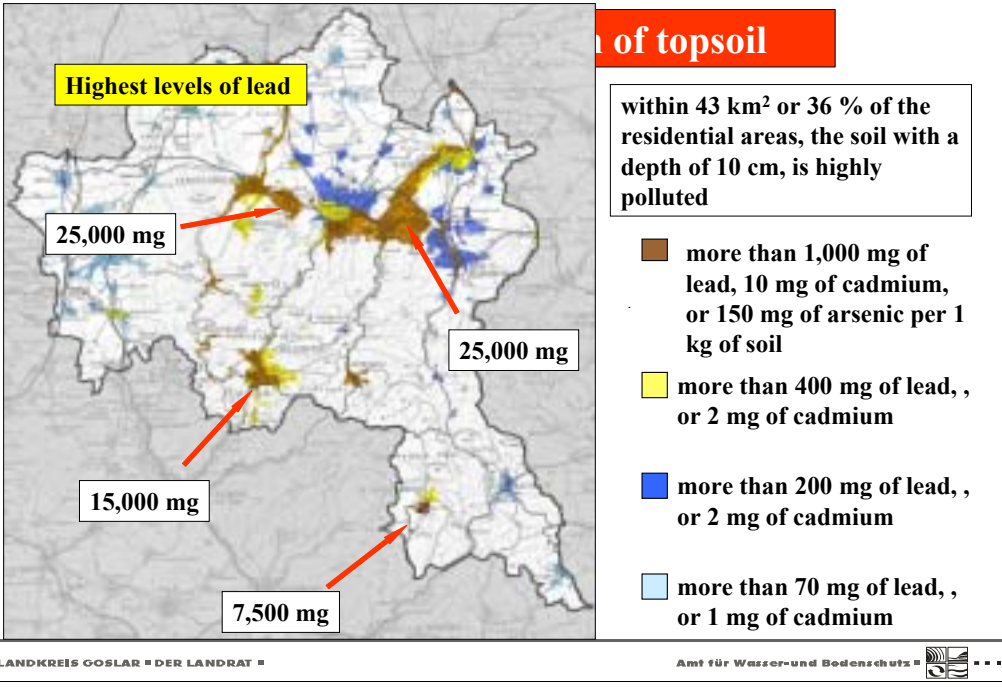


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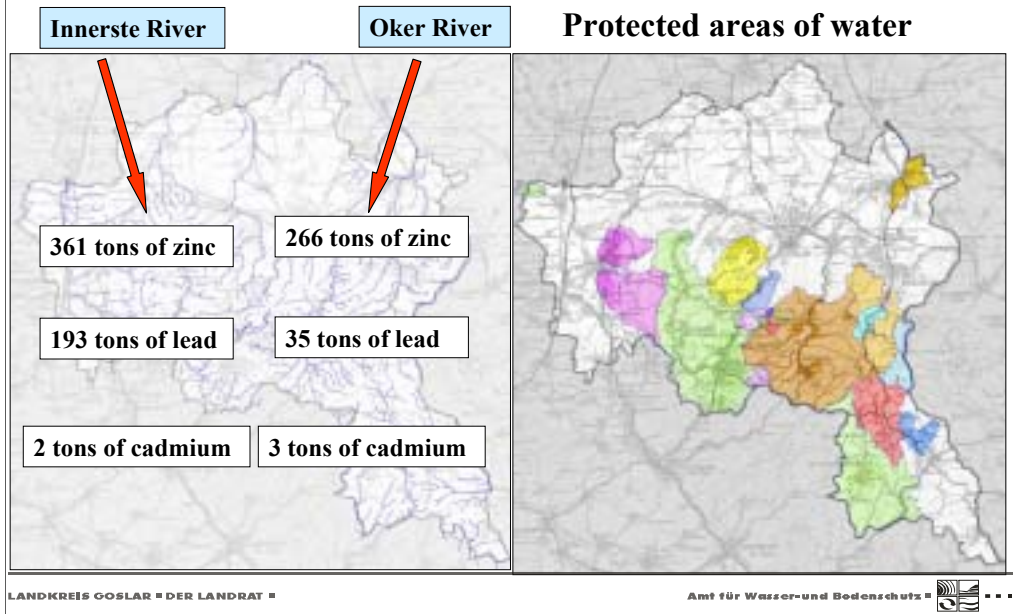


# The District of Goslar - The Effects



# The District of Goslar - The Effects

## Heavy Metals transported in 1994



# The District of Goslar - The Laws

**The Federal Soil Protection Act**

*Federal Soil Protection and Contaminated Sites Ordinance*

Environmental authority  
District of Goslar

**European Water Framework Directive**



**Act on the Regulation of Matters Pertaining to Water**

**Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal**

## The District of Goslar - The Transformation

### Problems:

- difficulties to obtain the necessary funds to control and eliminate pollution problems
- financial struggles
- companies have gone bankrupt

The environmental problems from the soil damage or contaminated sites have forced those who caused a harmful soil changes or contaminated site, land and lease owners, and the environmental authorities to cooperate together

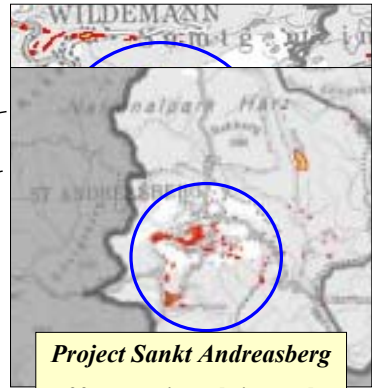
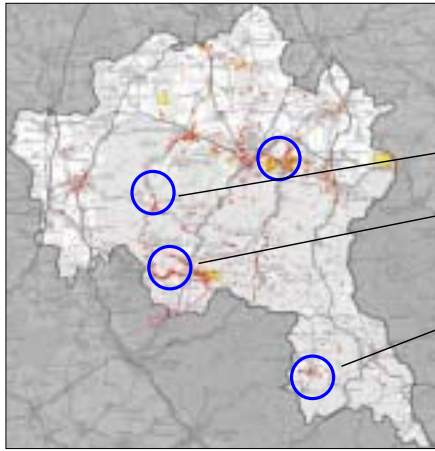
### Solutions:

- environmental authorities institute practical and innovative ways
- realistic timeframes for involvement need to be implemented
- the authorities need to ensure that these laws are executed



# The District of Goslar - The Transformation

Evaluation of whole Areas with contaminated Sites and Waste Deposits



*Project Sankt Andreasberg*  
22 contaminated sites and  
dumps of slags or mine waste



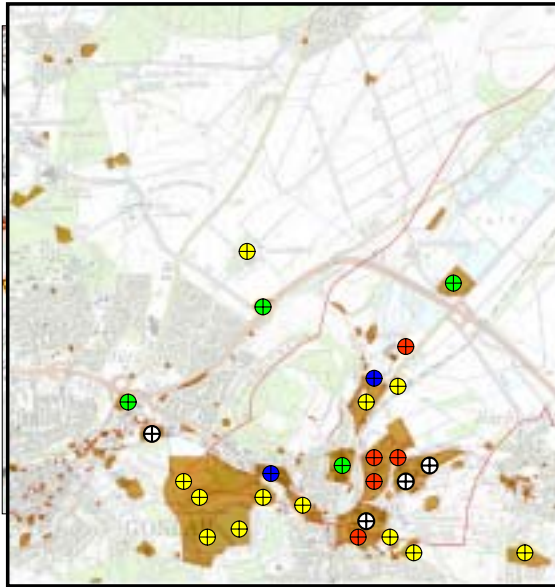


# The District of Goslar - The Transformation

## Example – Project Region Oker

Project Oker – Investigation  
Remediation  
Development

- ⊕ large slag dump
- ⊕ large smeltery works
- ⊕ large chemical works
- ⊕ large dump or sites with heavy metal contamination
- ⊕ other large contaminated sites



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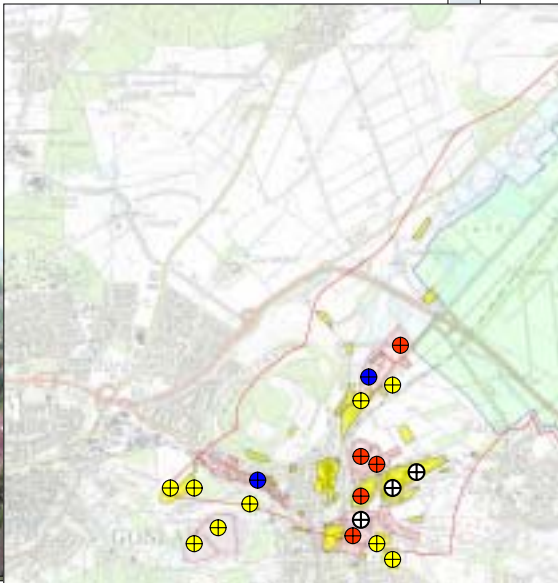
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# The District of Goslar - The Transformation

Example – Project Region Oker

- ⊕ large slag dump
- ⊕ large smeltery work
- ⊕ large chemical work
- ⊕ large dump ore site with heavy metal contamination
- ⊕ other large contaminated site



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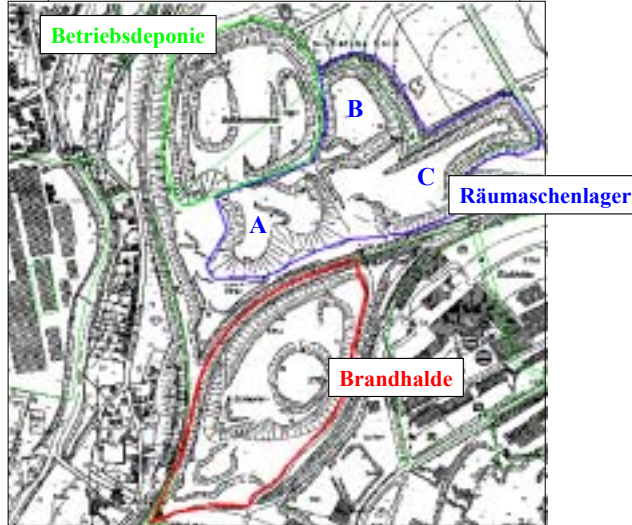
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# The District of Goslar - The Transformation

## Example – Project Region Oker

Dumps of waste from the smeltery works  
with approximately 4 million tons of slag



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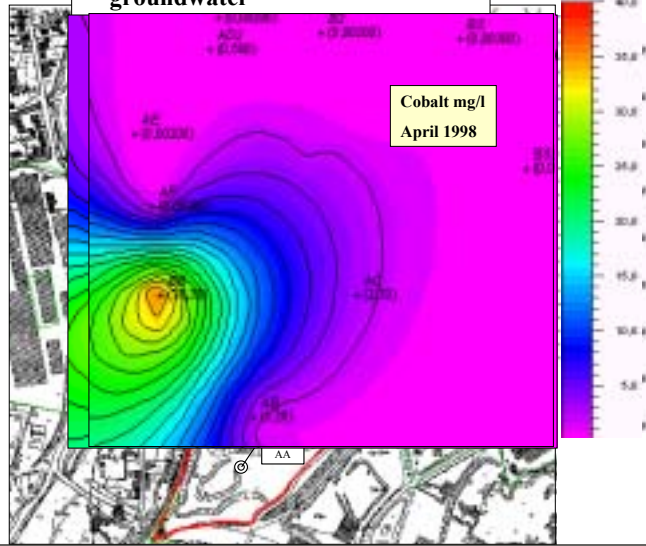
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# The District of Goslar - The Transformation

## Example – Project Region Oker

Chosen measurement points for groundwater



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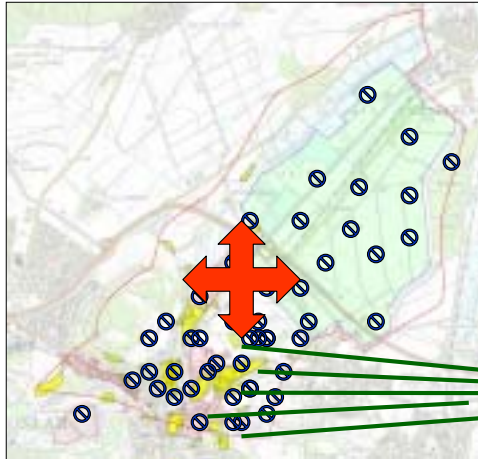
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# The District of Goslar - The Transformation

## Example – Project Region Oker

### Results of the investigation of groundwater with heavy metals and other harmful substance



To investigate and assess large groups of contaminated sites and waste dumps at one time

Measurement of groundwater in the whole territory

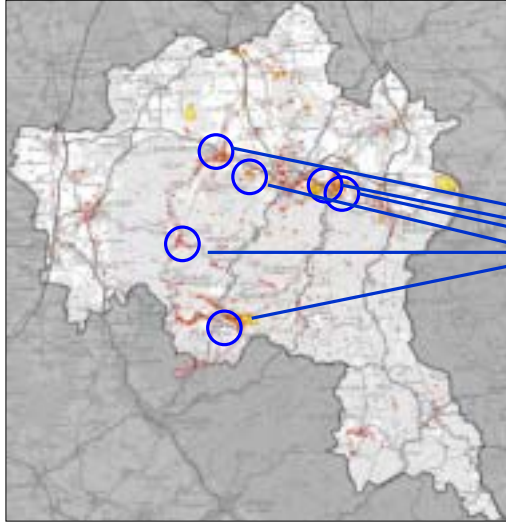
Assessment of transfer harmful substances

Decisions about steps for remediation for each contaminated sites or waste dumps



# The District of Goslar - The Transformation

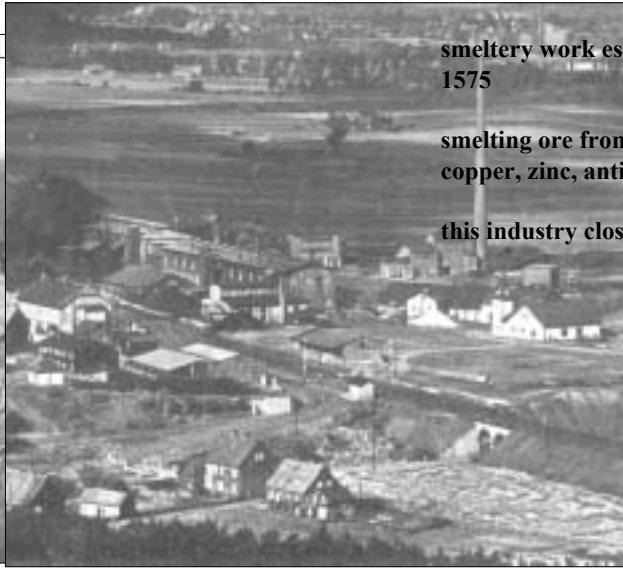
Combining Remediation Projects with the Development of new Areas



**Large remediation projects in the District of Goslar**

# The District of Goslar - The Transformation

Combining Remediation of a Smeltery Factory with the Development of this Area



smeltery work established in 1575

smelting ore from silver, lead, copper, zinc, antimony

this industry closed in 1969

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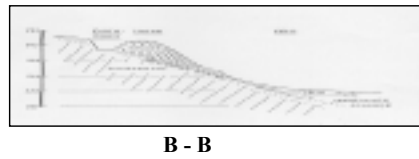
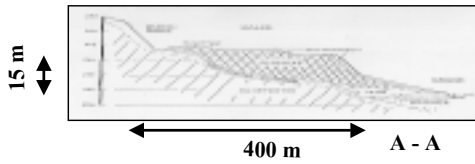
# The District of Goslar - The Transformation

Combining Remediation of a Smeltery Factory with the Development of this Area



Today approximately  
**1 Million tons of  
 slags contain**  
**Zn 3 - 23 %**  
**Pb 03, - 8 %**  
**Cu 0,5 - 1 %**  
**S 11 - 45 %**

■ Cover with asphalt   
 ■ New buildings from a chemical company   
 ■ New highway



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# The District of Goslar - The Transformation

Combining Remediation of a Smeltery Factory with the Development of this Area



View of highway under construction



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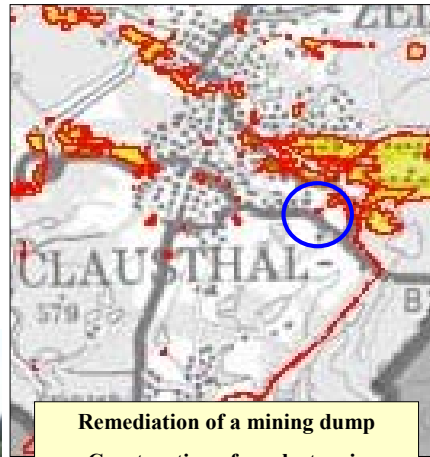


# The District of Goslar - The Transformation

Combining Remediation Projects with the Development of new Areas



**Former condition**



**Remediation of a mining dump**  
**Construction of an electronic company**



**Under construction**

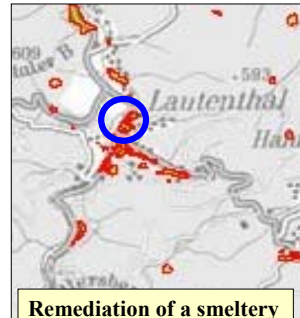


# The District of Goslar - The Transformation

Combining Remediation Projects with the Development of new Areas



In the beginning of the 20<sup>th</sup> Century



Remediation of a smeltery work



During remediation



Development of an area for relaxation

Today

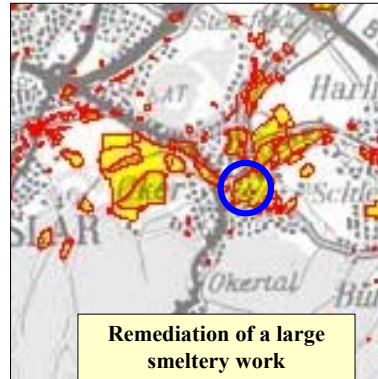


# The District of Goslar - The Transformation

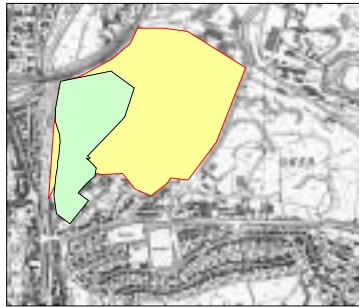
Combining Remediation Projects with the Development of new Areas



Today



Remediation of a large smeltery work  
Development of a land for commercial purposes



Plan of action for development



# The District of Goslar - The Transformation

Combining Remediation Projects with the Development of new Areas

company for recycling



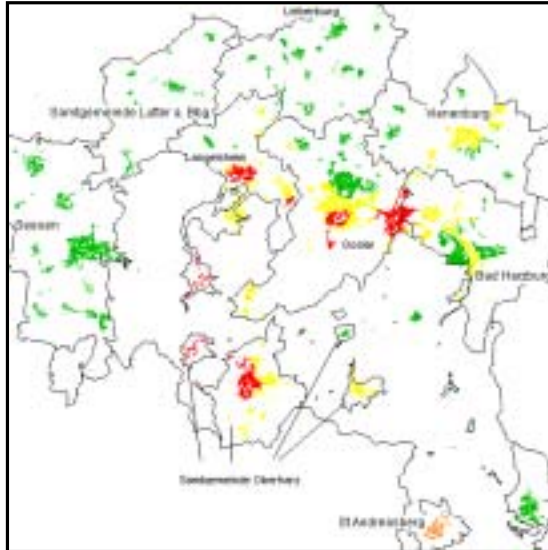
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# The District of Goslar - The Transformation Plans for Soil Areas

## Contaminated Areas outside of contaminated Sites



- Heavy metal concentration in soil > trigger value residential areas (for lead)
- Heavy metal concentration in soil > 5- times trigger value residential areas (for lead)
- Heavy metal concentration in soil > 5- times trigger value residential areas (for arsenic)
- Heavy metal concentration in soil > precautionary value (for lead)





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# The District of Goslar - The Transformation Plans for Soil Areas

## Trigger value of the Federal Soil Protection and Conatminated Sites Ordinance List of harmful substances

	<b>Playgrounds</b>	<b>arsenic</b> 25 mg/kg	<b>lead</b> 200 mg/kg	<b>cadmium</b> 10 mg/kg
	<b>Residential areas</b>	<b>arsenic</b> 50 mg/kg	<b>lead</b> 400 mg/kg	<b>cadmium</b> 20 mg/kg
	<b>Parks and recreational facilities</b>	<b>arsenic</b> 125 mg/kg	<b>lead</b> 1000 mg/kg	<b>cadmium</b> 50 mg/kg
	<b>Land used for industrial and commercial purposes</b>	<b>arsenic</b> 140 mg/kg	<b>lead</b> 2000 mg/kg	<b>cadmium</b> 60 mg/kg

# The District of Goslar - The Transformation

## Plans for Soil Areas

### Criterion of area parts

#### Area Part One

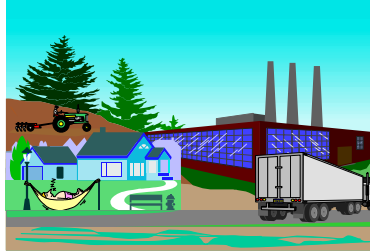
concentration of lead in soil > 5- times trigger value residential areas (for lead)

#### Area Part Two

concentration of arsenic in soil > 5- times trigger value residential areas (for arsenic)

#### Area Part Three

concentration of lead in soil > trigger value residential areas (for lead)



#### Area Part Four

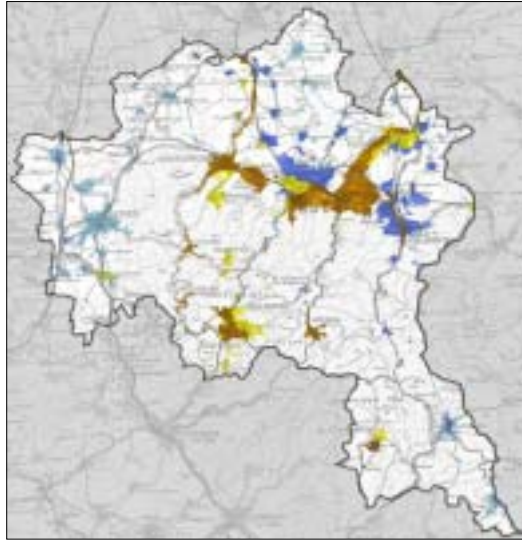
concentration of lead in soil > trigger value playgrounds (for lead)









# The District of Goslar - The Transformation

## Plans for Soil Areas



### The result:

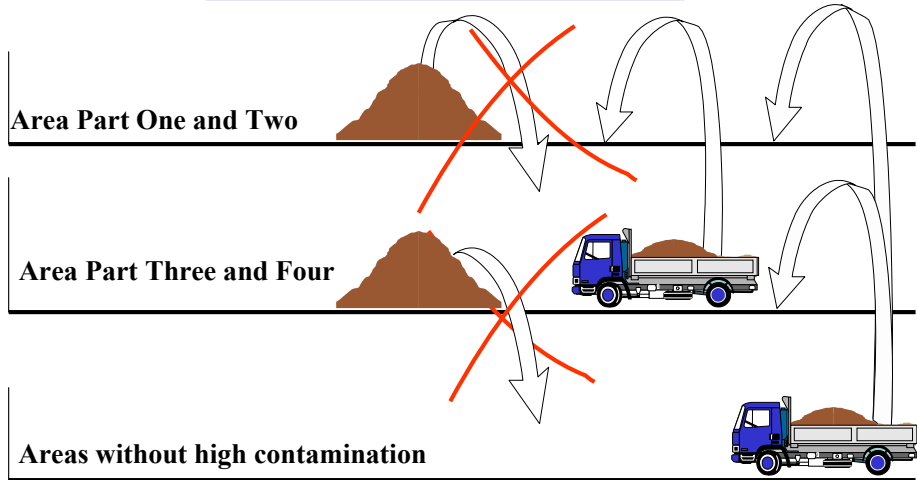
creation and development  
of a map for designated  
soil areas

-  Area Part One and Two
-  Area Part Three
-  Area Part Four
-  Areas without high contamination



# The District of Goslar - The Transformation Plans for Soil Areas

## Goal of Soil Management



# The District of Goslar - The Transformation Plans for Soil Areas

## Remediation of Playgrounds

**Area Part One and Two** cover up or change soil



### Area Part Three

**public playgrounds:** cover up or change soil

**other playgrounds:** cover up or change soil or  
large quantities of vegetation

### Area Part Three

**public playgrounds:** cover up or change soil

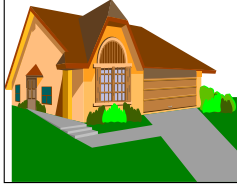
**other playgrounds:** cover up or change soil or  
large quantities of vegetation



# The District of Goslar - The Transformation

Plans for Soil Areas

## Remediation of Residential Areas



### Area Part One and Two

cover up with soil of lower contamination level  
or change soil or large quantities of vegetation

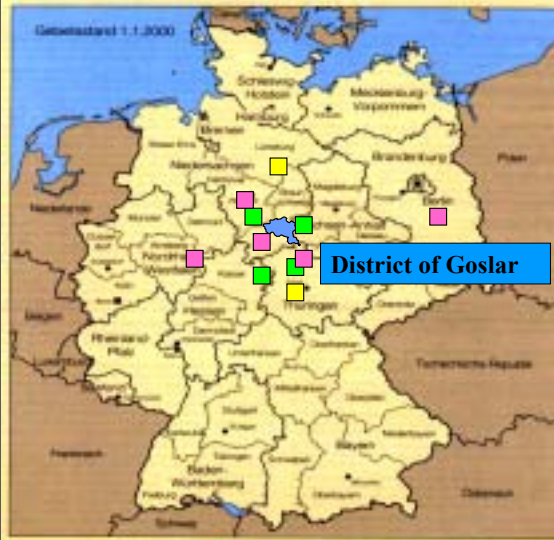
### Area Part Three

cover up with soil of lower contamination level  
or change soil or large quantities of vegetation



# The District of Goslar - The transformation

## Collaborations with Technical Universities, Colleges, and other Institutions



### Goals:

- to gain scientific knowledge
- to develop pragmatic, alternative, and innovative methods of investigation and planning for remediation

### Position of collaboration

- Technical universities
- Technical colleges
- Scientific institutes

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## The District of Goslar - The transformation Public Relations made by Environmental Authorities

- discuss and explain steps of remediation with general public and local politicians
- work together with media
- creat and puplish our own environmental magazine



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**The District of Goslar**  
**The End**

**Thank You**

