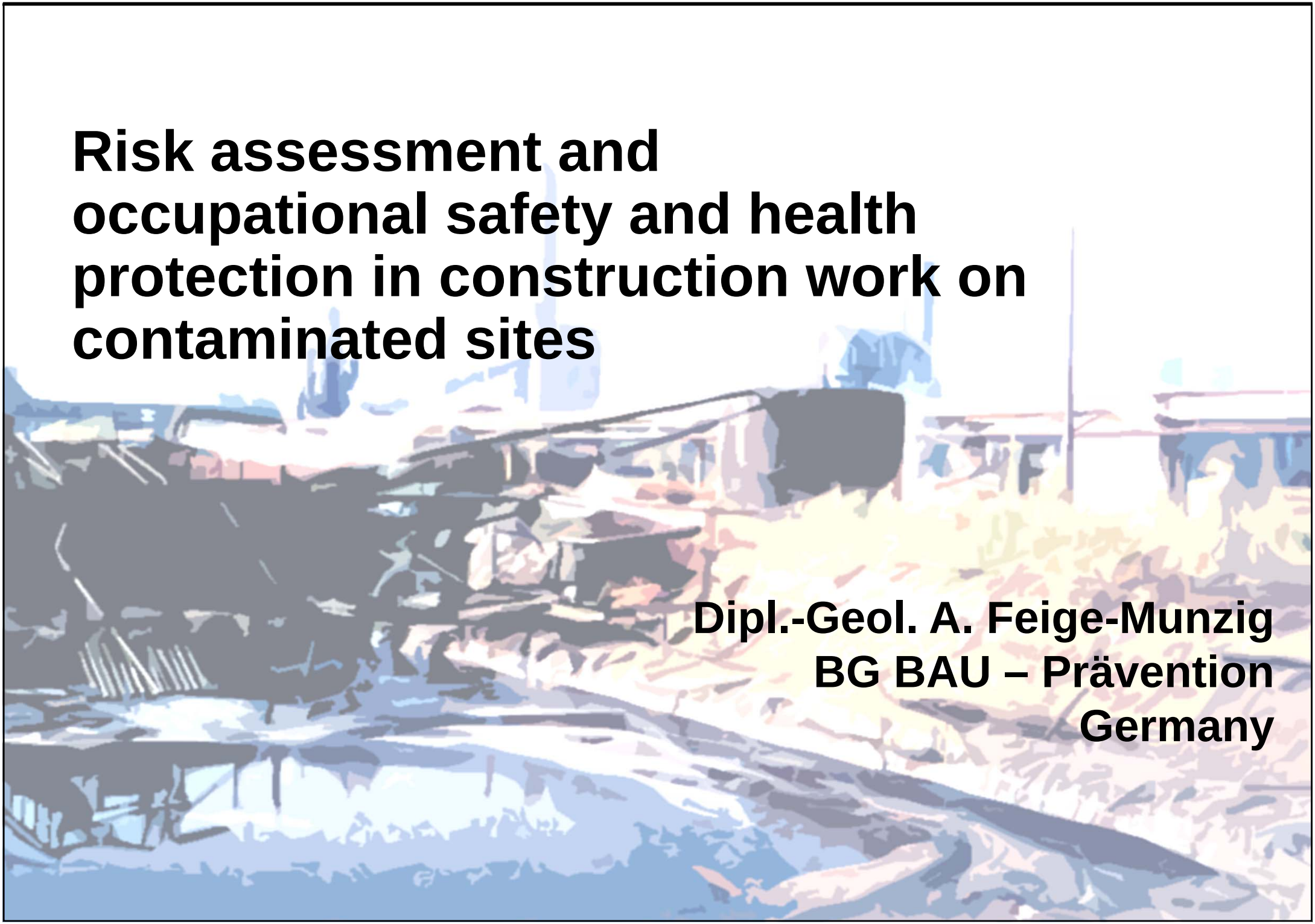
Risk assessment and occupational safety and health protection in construction work on contaminated sites



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PRÄVENTION

Rules for Safety and Health Protection for Working on Contaminated Sites

BG → „Berufsgenossenschaft“ ??

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Statutory Accident Insurance and Prevention Institutions

- Prevention
- Rehabilitation
- Provision of financial benefits

Contaminated construction sites

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Soil remediation by excavating fuel-contaminated soil, which contaminates the groundwater

Contaminated construction sites

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Brownfield remediation by excavating the tar bunker of an ancient gas plant

Contaminated construction sites

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Demolition of buildings or industrial installations, which are polluted with hazardous substances

Contaminated construction sites

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Construction work on/in waste deposits e.g. sanitation of drainage pipes

Contaminated construction sites

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Construction work on/in waste deposits e.g. sanitation of drainage pipes

Contaminated construction sites

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e.g. road construction, where the underground is polluted

Contaminated construction sites

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the **owner‘s / client‘s** duty is to draw up a

Safety and Health Plan
(European Building Site Directive 92/57/EEC)

specification of safety measures taking account of the risks

risk assessment !

Steps to risk assessment

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Hazard analysis

hazardous substances, microorganisms

mobility properties

exposure assessment

„hazardous“ properties

risk assessment

Steps to risk assessment

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Investigation of hazardous substances

1. Historical exploration

- hazardous substances
- subterranean installations
- microbiological agents
- military devices on site

2. Analyses

- amount of **separate substances**

Air Limit Values “BTEX-Group”:

Benzene: **1 ppm, cancerogenic**
Toluen: **50 ppm, non-cancerogenic**

Steps to risk assessment

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Investigation of hazardous substances

1. Historical exploration

- hazardous substances
- subterranean installations
- microbiological agents
- military devices on site

2. Analyses

- amount of **separate substances**
- reaction products, metabolites
- microbiology (only in special cases)

3. Site plan of spatial distribution

- “hot spots”

Hazard Analysis

Hazard Analysis

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Investigation of "Safety Data"

- physical, chemical properties (→ mobility !!)
- physical state and appearance
  (in shape of gas, vapor, dust, lumps, ...)
- hazardous properties (toxic, cancerogenic, inflammable, ...)

appearance ⟷ emission ⟷ risk

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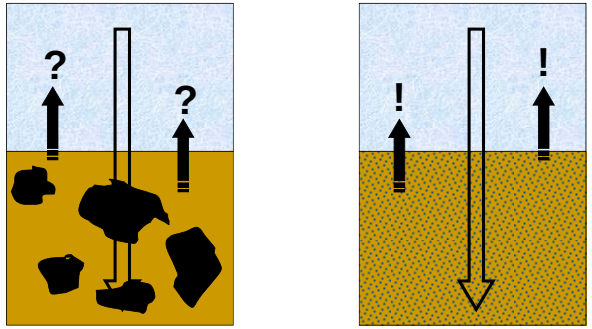

PAH: 2000 mg/kg

PAH: 200 mg/kg

emission / risk ??

) risk !

Hazard Analysis

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Investigation of "Safety Data"

- physical, chemical properties (→ mobility !!)
- physical state and appearance
  (in shape of gas, vapor, dust, lumps, ...)
- hazardous properties (toxic, cancerogenic, inflammable, ...)

mobility, emission behaviour → absorption routes

specification of the substance-specific requirements for safety measures

Steps to risk assessment

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Hazard Analysis

hazardous substances, microorganisms

↓

mobility properties

„hazardous" properties

+

„Working Area Analysis"

1) determination of different working areas (spatial distribution of h. s.)
2) determination of the „activities with exposure"
3) investigation of the working area- and activity-related factors of emission resp. exposure

exposure assessment

risk assessment

Working Area Analysis

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Step 1: determination of working areas, where a health risk has to be assumed (exposure, explosion, …)

brownfield – construction site

location-related criteria:

- spatial subdivision found on the site (buildings, plants, tanks, pipes, waste deposits, ….)
- distribution of hazardous substances

work-related criteria:

- working areas emerging from the work and its conditions (e.g. storage place, processing plants or decontamination equipments for contaminated materials)

Working Area Analysis

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Step 2: identification of the steps and methods of work, the work processes and activities

working area 1: demolition „gas plant“

and so on

Work step dismantling of equipments

- emptying /cleaning
  - opening
  - suction
  - flushing
  - .....
- dismantling
  - detaching by „welding“ by „cutting“
  - liftoff

Work step removal

- removal electrics
  - switch-gear
  - flourescent tubes
  - .....
- removal asbestos
  - removing
  - packing up
  - transport
  - .....

Work step .....

- .....
  - .....
  - .....
- .....
  - .....
  - .....

Working Area Analysis

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Step 3: investigation of the working area- and activity-related factors of emission resp. exposure

- different working areas ?
- sequence of operations ⇒ activities
- working area conditions
- source of emission (e.g. point- or flat-shaped ?)
- spatial relationship between place of work ⇔ source of emission
- duration and frequency of activity

risk assessment

Steps to risk assessment

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Hazard analysis

- hazardous substances, microorganisms
- mobility properties
- „hazardous“ properties

+

„Working area analysis“

1) determination of different working areas (spatial distribution of h. s.)
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exposure assessment

risk assessment

Contaminated construction sites

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Safety measures

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Personal breathing apparatus on earth moving machinery ?

Does the driver see anything ???

→ Equipment for air supply !

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filtering device

compressed air device

Special regulations for

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<u>Construction / Demolition on contaminated sites</u>

method of risk assessment:

BGR 128 - Kontaminierte Bereiche

TRGS 524
Schutzmaßnahmen bei Tätigkeiten in kontaminierten Bereichen

Carrying out these jobs, workers are exposed to hazardous substances

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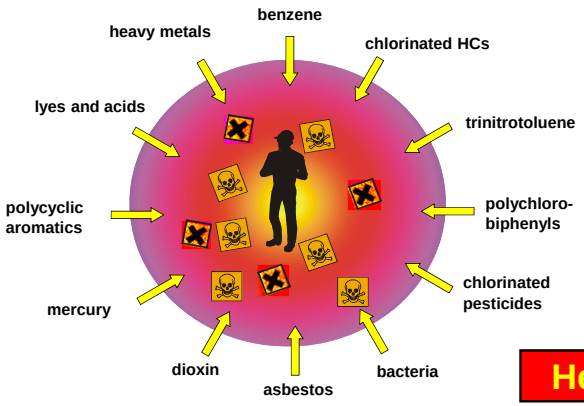

Health risk !

Specifying appropriate safety measures by means of a <u>risk assessment</u>

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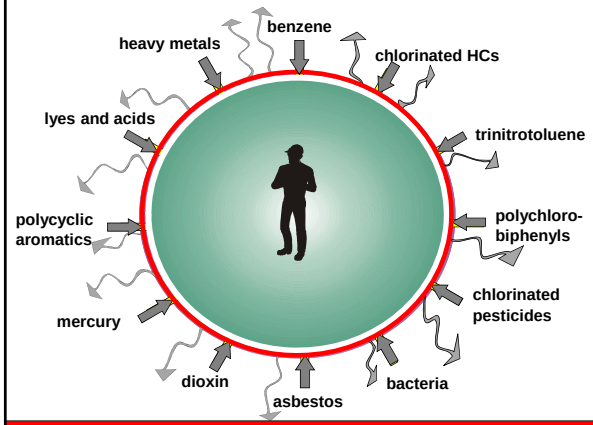

is acceptable for all parties involved and saves costs