The impact of EXtreme weather events on MINing operations

TEXMIN

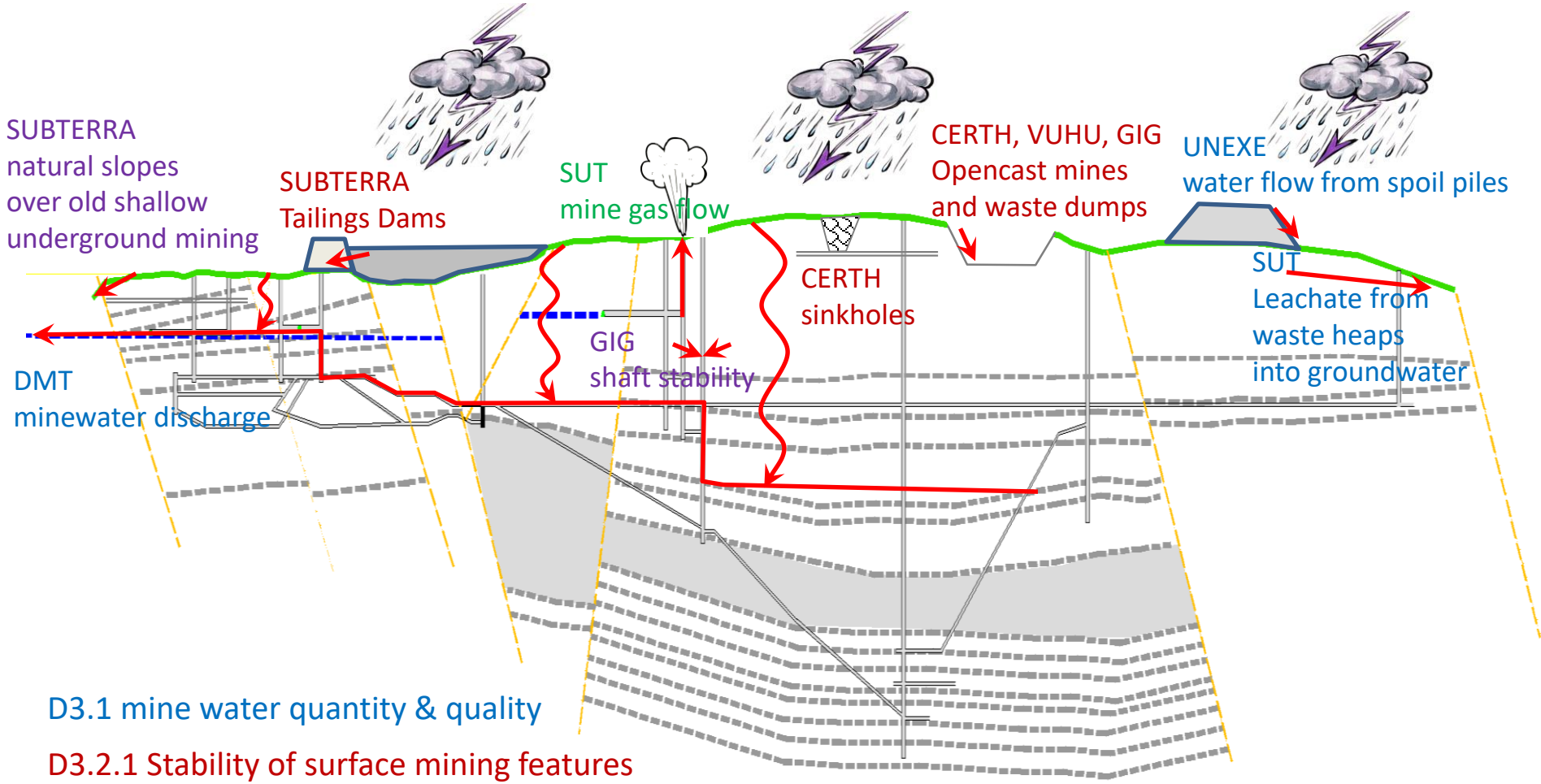
European Commission

Research Fund for Coal & Steel

Summary of impacts & synthesis of modelling undertaken in TEXMIN project (WP3)

Final Conference, 4th of October 2022

Overview of considered topics



D3.1 mine water quantity & quality

D3.2.1 Stability of surface mining features

D3.2.2 Stability of surface features impacted by underground mine workings

D3.3 environmental impacts on mine gases

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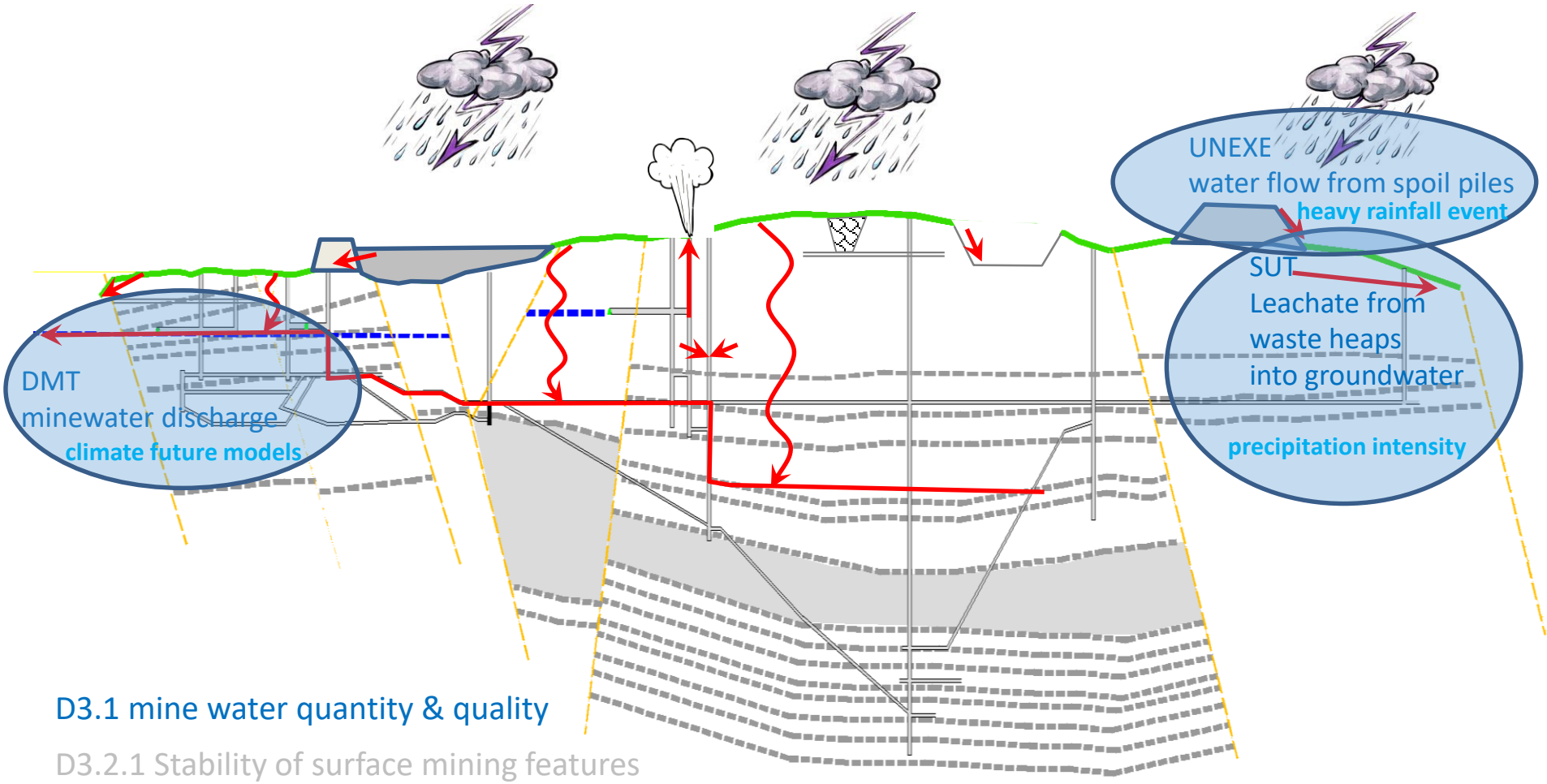

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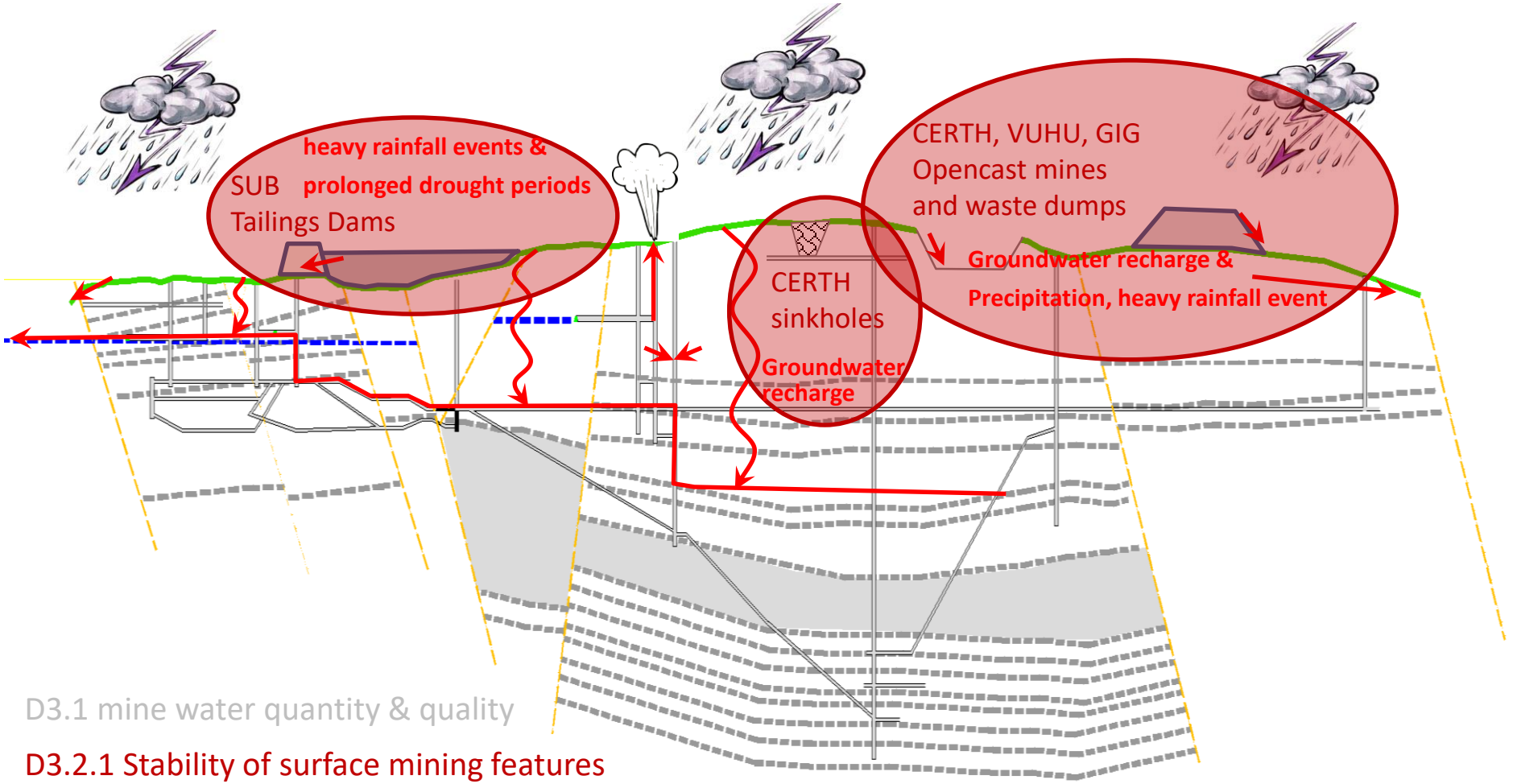

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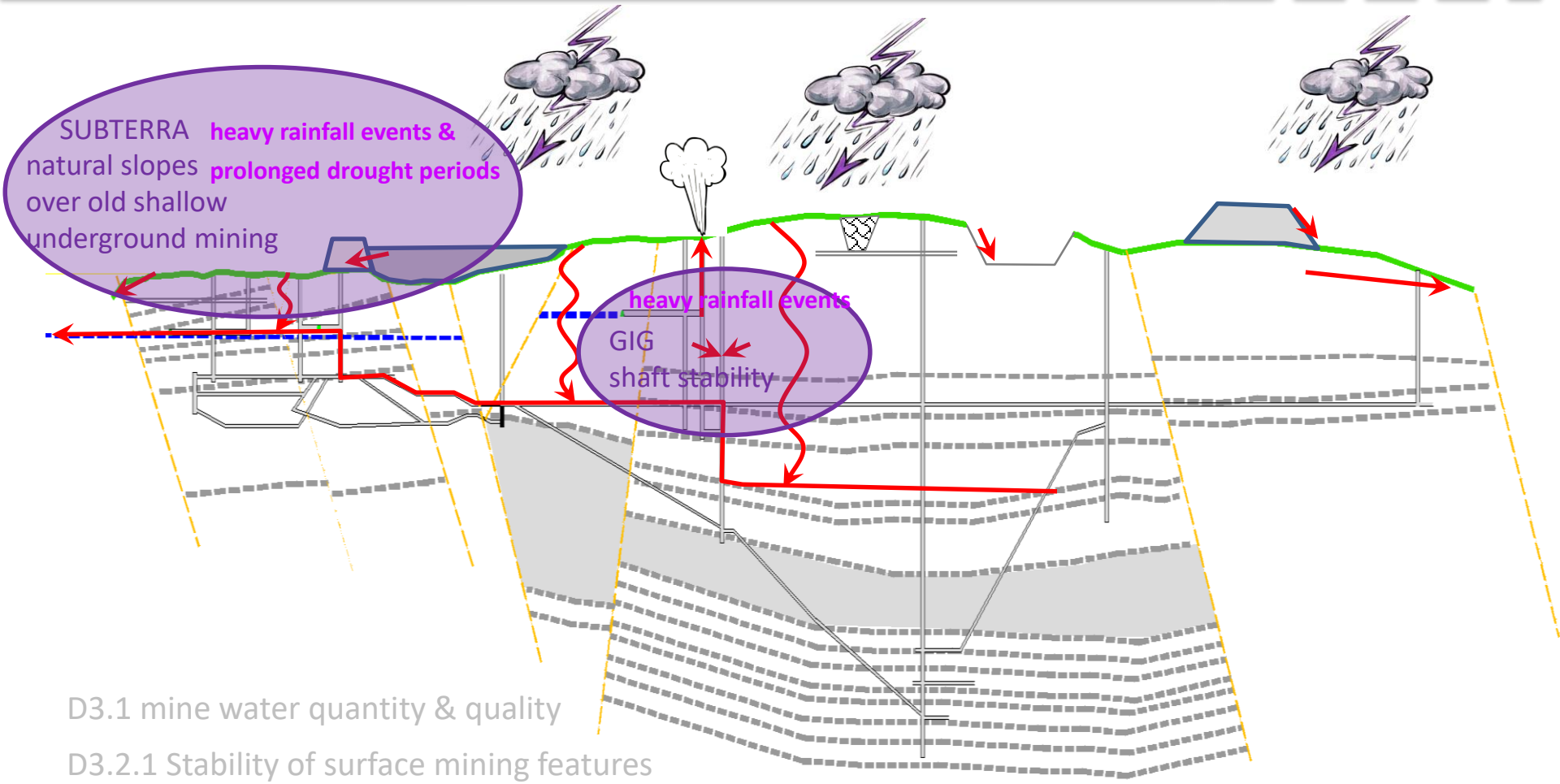

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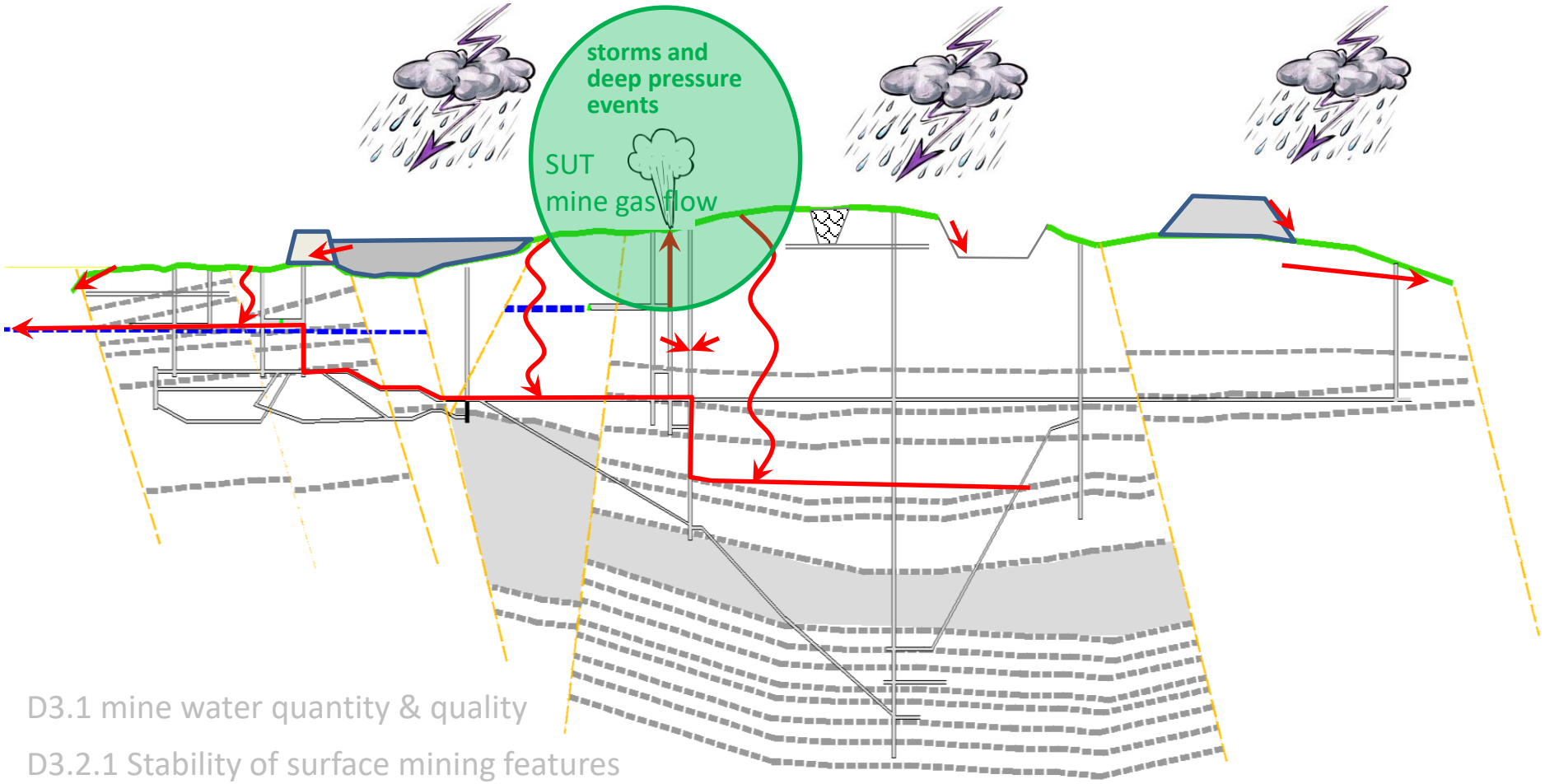

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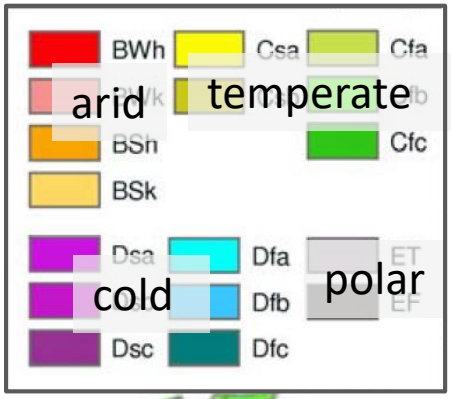
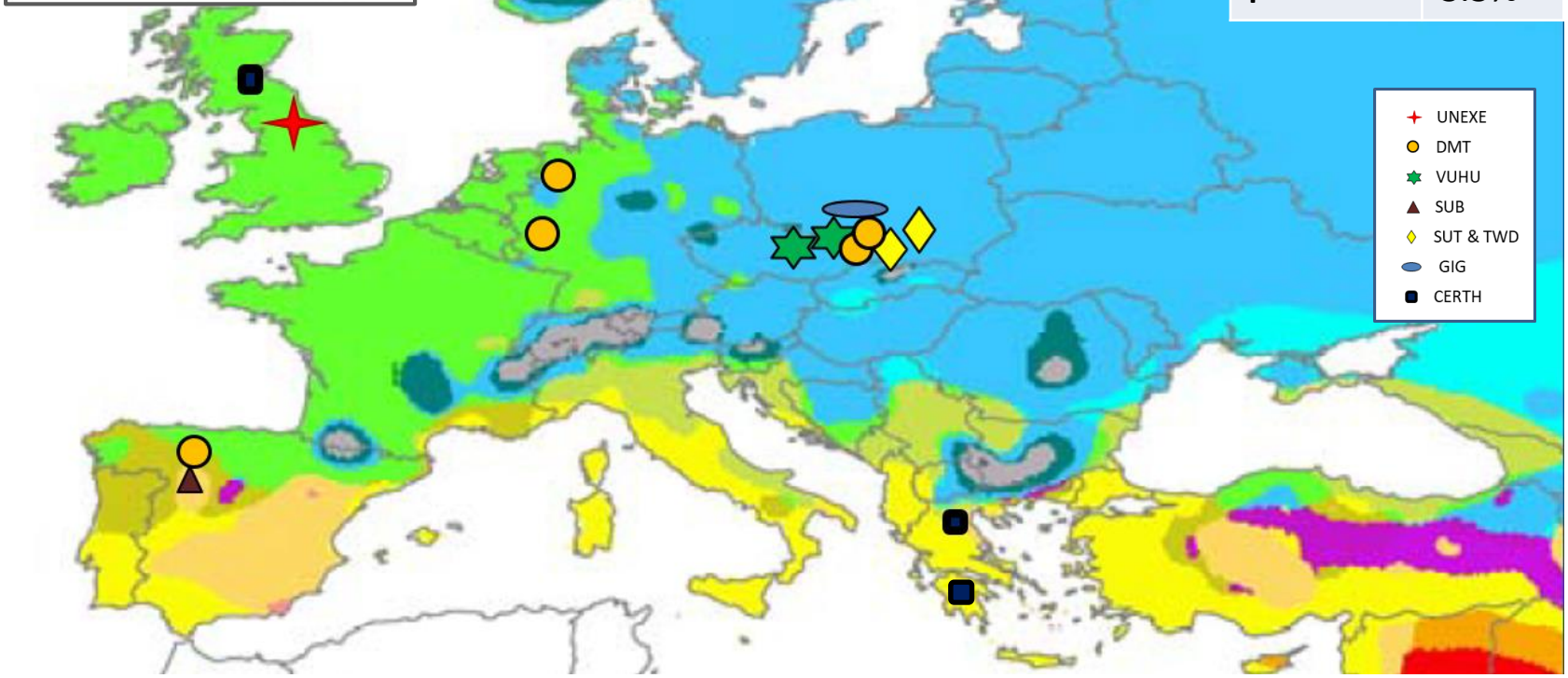
Investigated test site locations

Climate classification of the test site locations

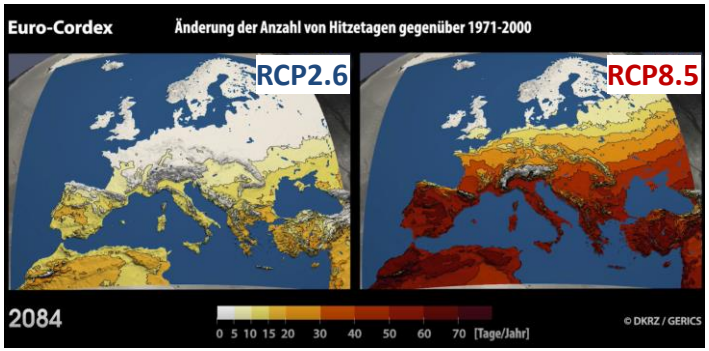


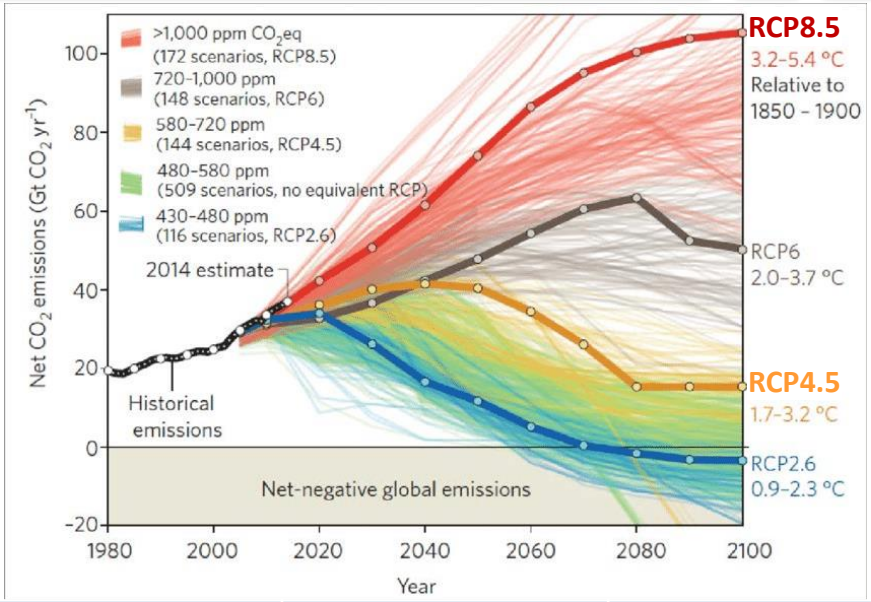
Area share of Europe	
arid	2.8%
temperate	25.9%
cold	67.8%
polar	3.5%



Climate models

EURO-CORDEX
Coordinated Downscaling
Experiment - European Domain



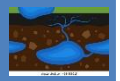


climate projections	CNRM	EC-Earth	HadGEM	NorESM1
SUT (Evapotranspiration)	**4.5**, **8.5**: 2046-2050	**4.5**, **8.5**: 2046-2050	**4.5**, **8.5**: 2046-2050	**4.5**, **8.5**: 2046-2050
UNEXE (Precipitation)	**4.5**, **8.5**: 2046-2050	**4.5**, **8.5**: 2046-2050	**4.5**, **8.5**: 2046-2050	--
DMT (Precipitation, vapour pressure, temperature etc)	**4.5**, **8.5**: 2022-2050	**4.5**, **8.5**: 2022-2050	--	--

Climatic events

Project partner	Heavy Rainfall 
GIG & TWD	high intensity of rainfall over a short period of time
DMT	recent heavy rainfall event
UNEXE	one extreme rainfall event identified by climate modelling
SUT & TWD	Precipitation event
VUHU	historical rainfall events
GIG & SRK	Precipitation event
CERTH	parametric analysis, extreme rainfall

Project partner	Extreme droughts 
SUB	Combination of heavy rainfall events with prolonged drought periods

Project partner	Groundwater formation/recharge 
SUT	multi-year groundwater monitoring (January 2004 to June 2020)
DMT	GW-recharge calculation and transfer to mine water discharge

Project partner	Low pressure systems 
SUT	Pressure drops up to 4hPa/1h or even 5hPa/1h once every 2 years

Anticipated Risks and Mitigation

Possible anticipated risks, mitigation is possible

- no significant changes are to be expected
- increase of the effects appears rather unlikely
- effect of climate change not clear, mitigation is possible

High anticipated risks, mitigation is possible

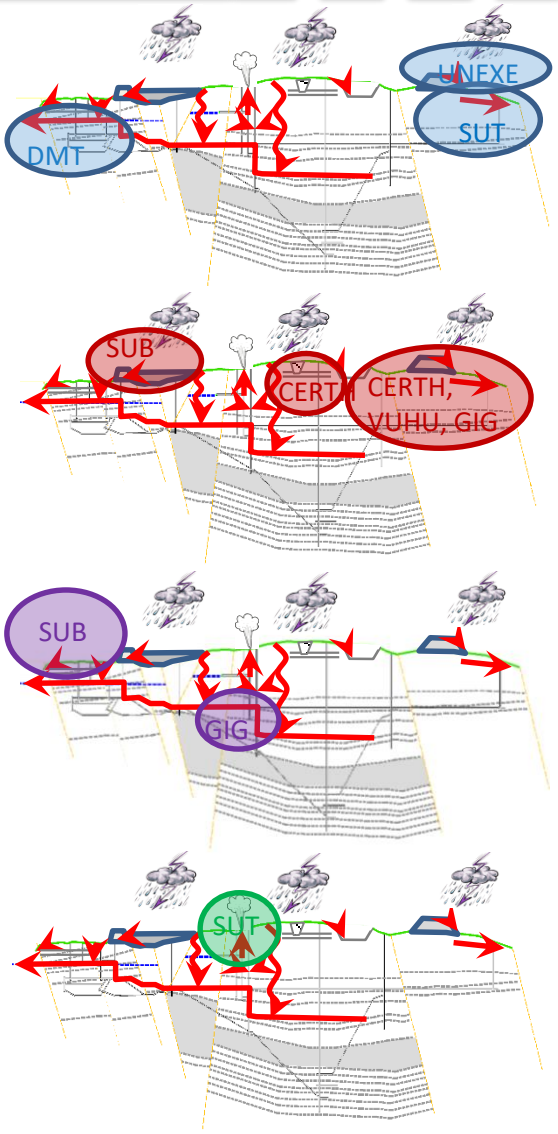
- roof stability was noticeably deteriorated
- significant impact on erosion
- significant impact on slope stability

Moderate anticipated risks, mitigation is possible

- horizontal landslides are minimal
- no increases in minimum displacements
- worst case: destruction of an isolating dam and inrush of filling material

High anticipated risks, mitigation is possible

- increased concentration of emitted gases
- gases are transported further away from the emission source
- dilution in the atmospheric air is expected



Conclusions

- **Evaluation and quantification** of the key physical relating to several areas of interest resulting from **changes in climatic conditions**
- Main climatic influenced element in most cases is **water** in the form of **precipitation**
- **Ambient (atmospheric) pressure** as key element for gas emissions
- All investigated sites in areas with **warm or hot summers**
- **Several Risks** to be expected
- **Mitigation** concepts available in most cases

Outlook

- climate zones with cold summers
- climate zones outside of Europe

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DMT

Christoph Klinger
Nele Pollmann
and all other project participants in WP3