German Centre for
Rail Traffic Research at the

Federal Railway Authority

Risk of embankment fires for rail traffic systems in Germany

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LUFTBILD UMWELT PLANUNG

Luftbild Umwelt Planung GmbH, Potsdam

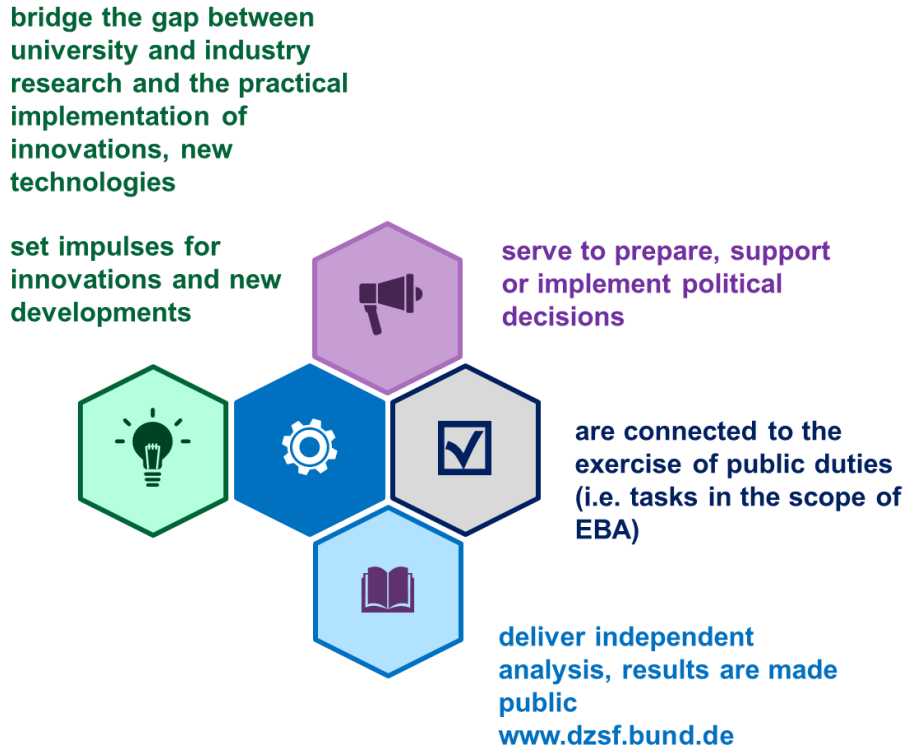
DZSF - The German Centre for Rail Traffic Research

German Centre for Rail Traffic Research at the Federal Railway Authority

- **Independent**, technical-scientific departmental **research facility** of the German Federal Government.
- Established in May **2019** as successor of the research activities of EBA (since 2015/2016)

The main tasks of DZSF

- Launch and accelerate necessary innovation processes in the field of rail transport and rail traffic
- Governmental railway research in a problem-oriented, practical and interdisciplinary way
- Deliver scientific advice & support for the German Federal Ministry of Transport
- Retain and develop know how and expertise within the railway sector



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First attempt to model embankment fire risk on local scale

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Embankement fire events

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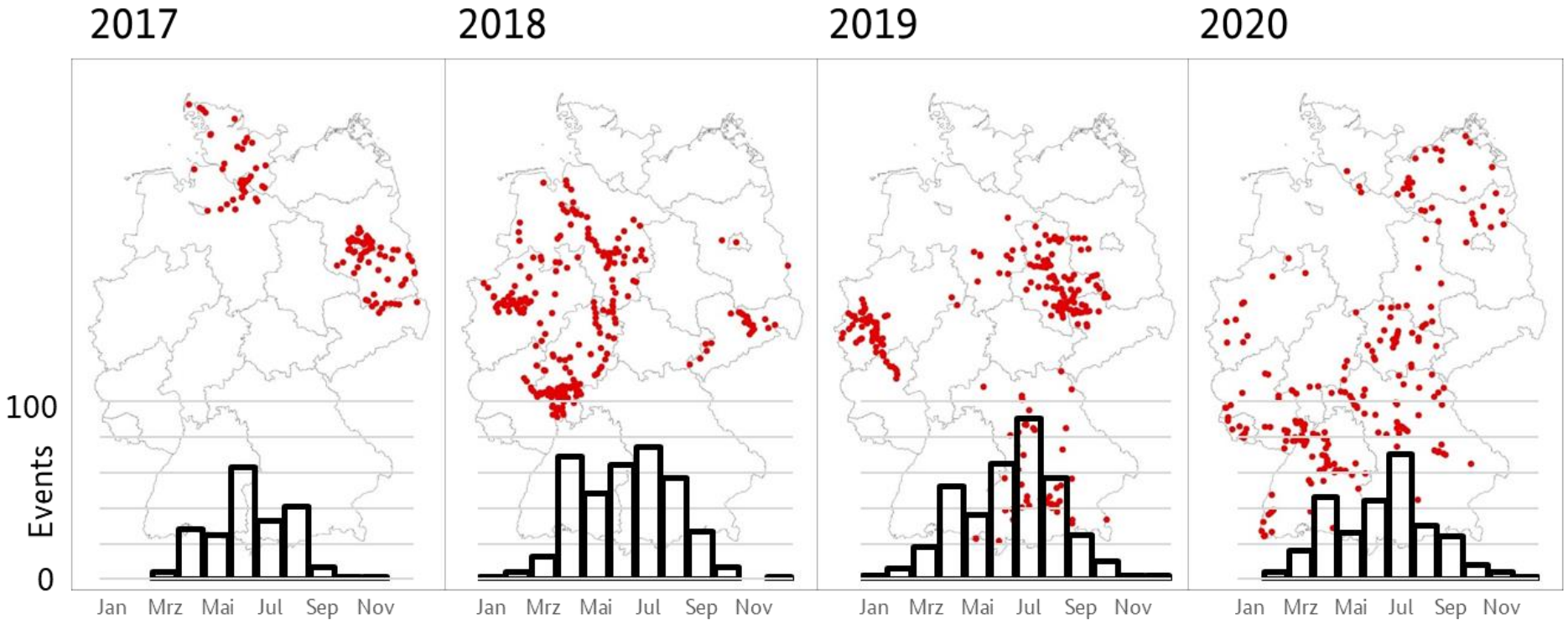
Data (DB Netz AG)

- 1.207 reports on operation disturbance due to embankment fire
- 2017 bis 2020, temporal resol.: minutes (start/end)
- Spatial resol.: rail sections
- Brief description



Input data for risk model
Impact data & drivers

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Impact

- 1207 reported disturbances with localisation to track sections

→**60** reported disturbances with localisation to XY (manually attributed)

Input data for risk model
Impact data & drivers

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Impact

- 1207 reported disturbances with localisation to track sections

→**60** reported disturbances with localisation to XY (manually attributed)

Driver

Category	Variable
Infrastructure	Distance to curves and service
	Distance to settlements
Meteorology	Difference of wind direction angle to rail orientation
	Soil Moisture Index SMI, upper soil, summer average
	Surface temperature by Landsat8 / Sentinel 2
	Average wind
Topography	Angle between aspect of slope and rail orientation
	Aspect (slope)
	Elevation
	Slope (DEM-5m)
Vegetation	FuelMap classification

Model

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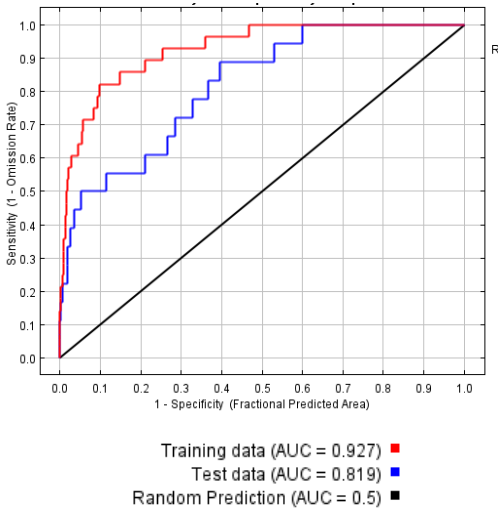
1. Correlation of variables
2. Selection by spatial resolution, number of correlations, representation of category

3. Maximum Entropy Model (Jaynes 1957)
4. AUCROC

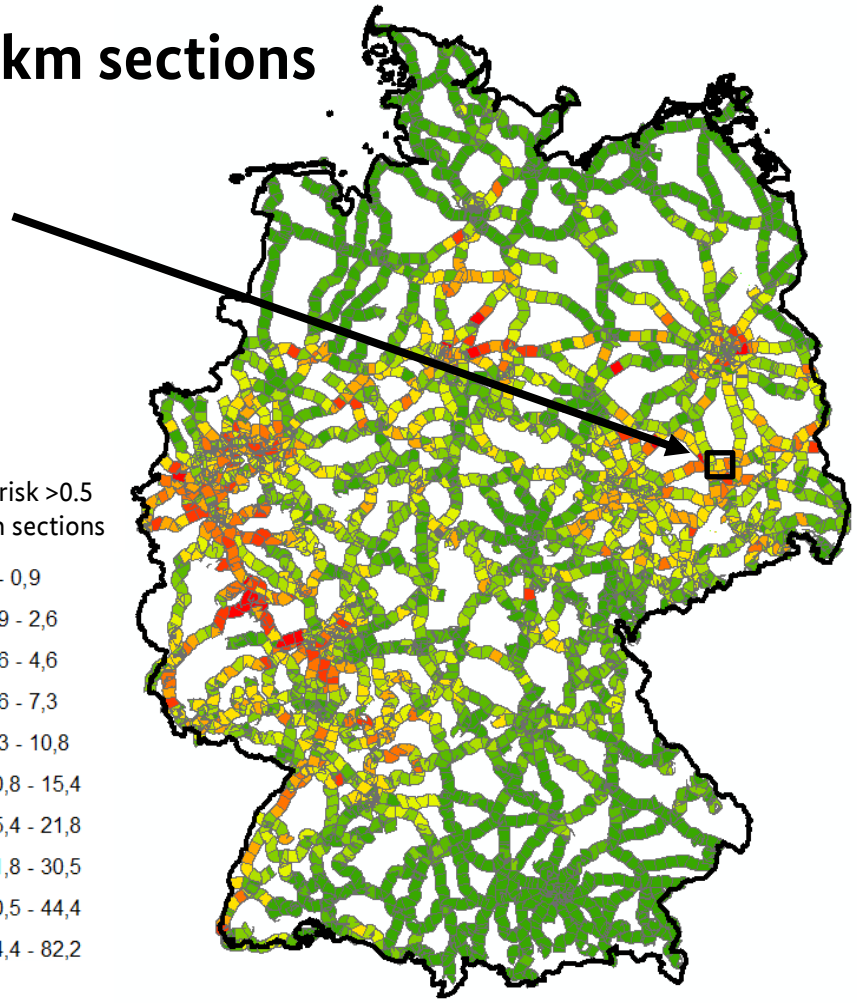


Percent contrib.	Variable	Category
29,2	Slope (DEM-5m)	Topography
17,8	Soil Moisture Index SMI, upper soil, summer average	Meteorology
15,9	Aspect (slope)	Topography
11,6	Distance to settlements	Infrastructure
8,6	Elevation	Topography
7,1	Surface temperature by Landsat8 / Sentinel 2	Meteorology
4	Distance to curves and service	Infrastructure
2,8	FuelMap classification	Vegetation
1,4	Angle between aspect of slope and rail orientation	Topography
0,8	Difference of wind direction angle to rail orientation	Meteorology
0,6	Average wind	Meteorology

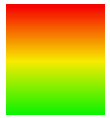
Results:
Multi- scale risk analysis

5m²

5km sections



Risk (likelihood) of embankment fire



Identification of embankment risk

- Identification of drivers of embankment fires
- Risk mapping at multi scales (5m²- 5km sections)
- Evaluation of future embankment fire risk

Results: Future risk

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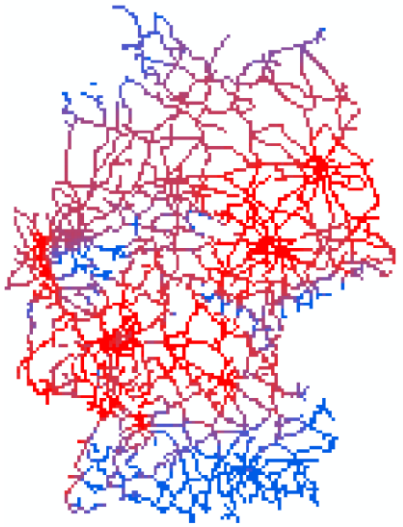
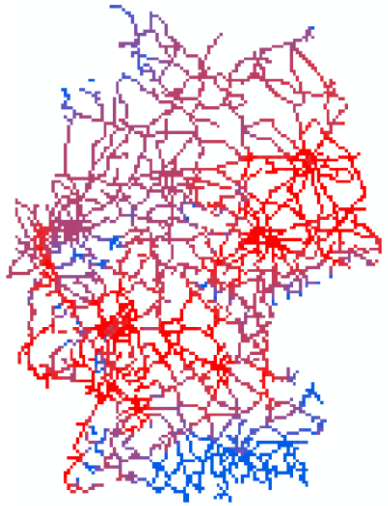
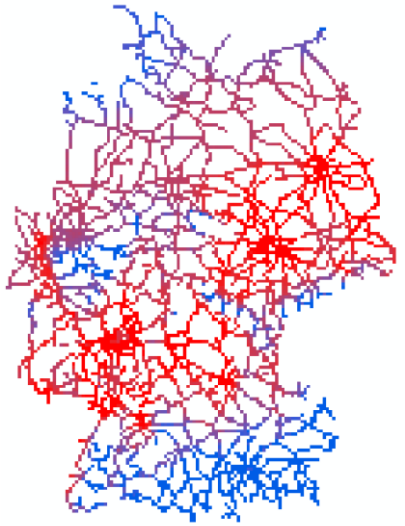
2031 -2060 (RCP26)



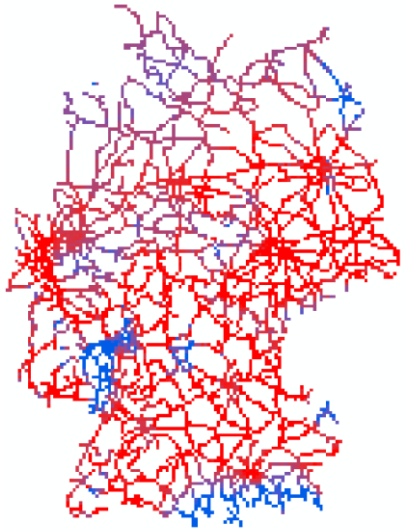
2031 -2060 (RCP85)



2071-2100 (RCP26)



2071-2100 (RCP85)



Gefährdungspotenzial

High : 0,7

Low : 0,3

Deutsches Zentrum für
Schienenverkehrsforschung beim

Eisenbahn-Bundesamt

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