Working Party on Rail Transport 76th session

The impact of climate change on the railways: how to protect, adapt and mitigate

1

Intro

2

Climate Change Effects

3

What are we doing?

4

Conclusion


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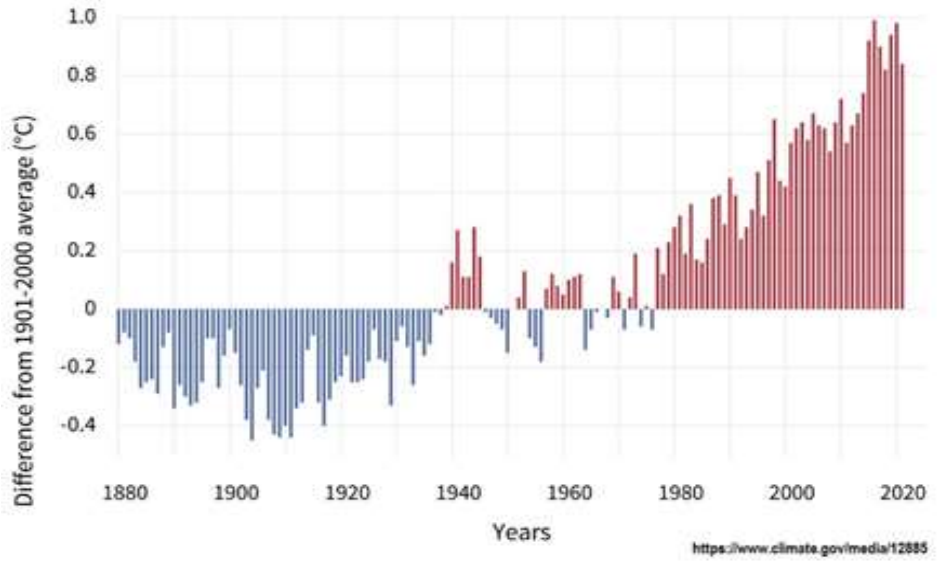
1856
AYDIN

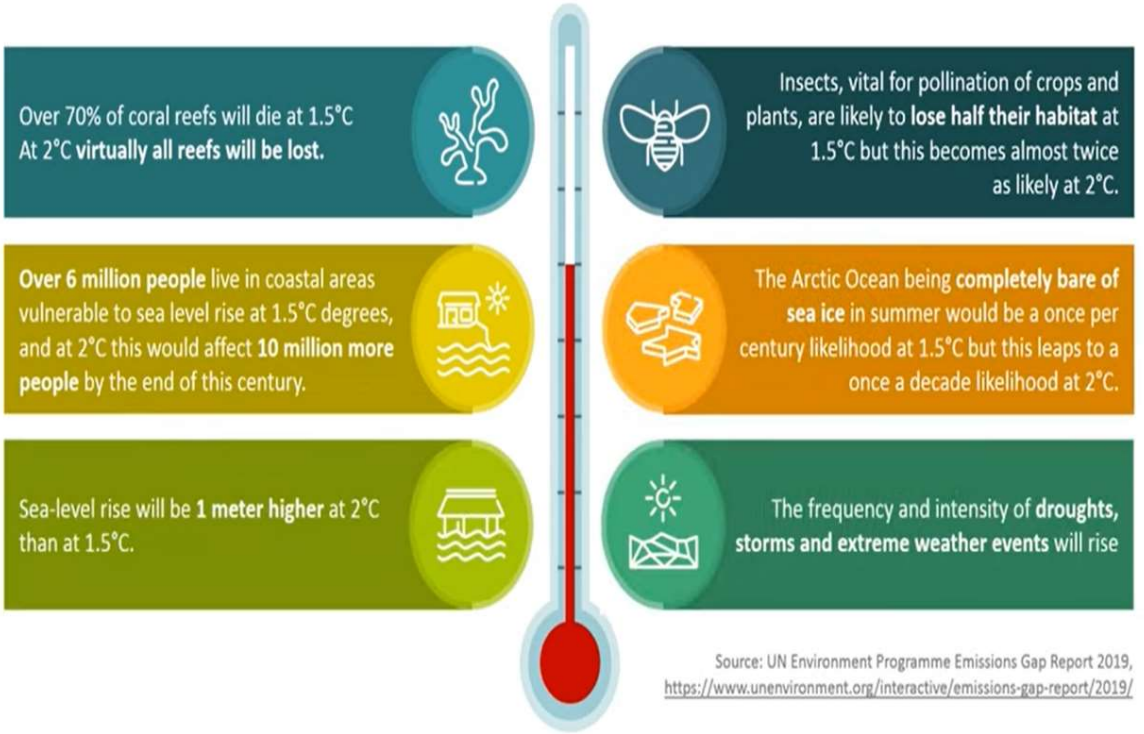

Varda Bridge
Adana, TURKIYE


Varda Bridge
Adana, TURKIYE

Global Average Surface Temperature

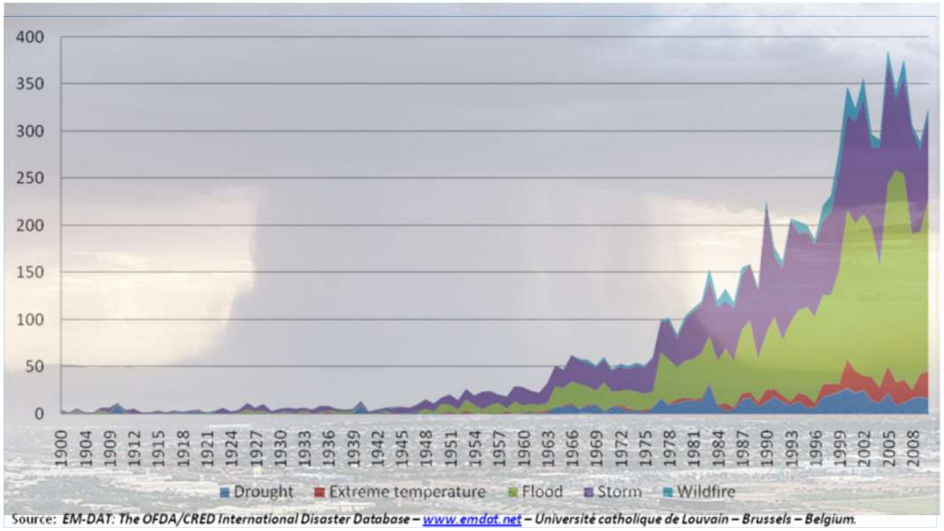


Dangers Beyond 1.5°C Global Planet Temperature Rise



Source: UN Environment Programme Emissions Gap Report 2019, https://www.unenvironment.org/interactive/emissions-gap-report/2019/

Numbers of extreme weather events globally

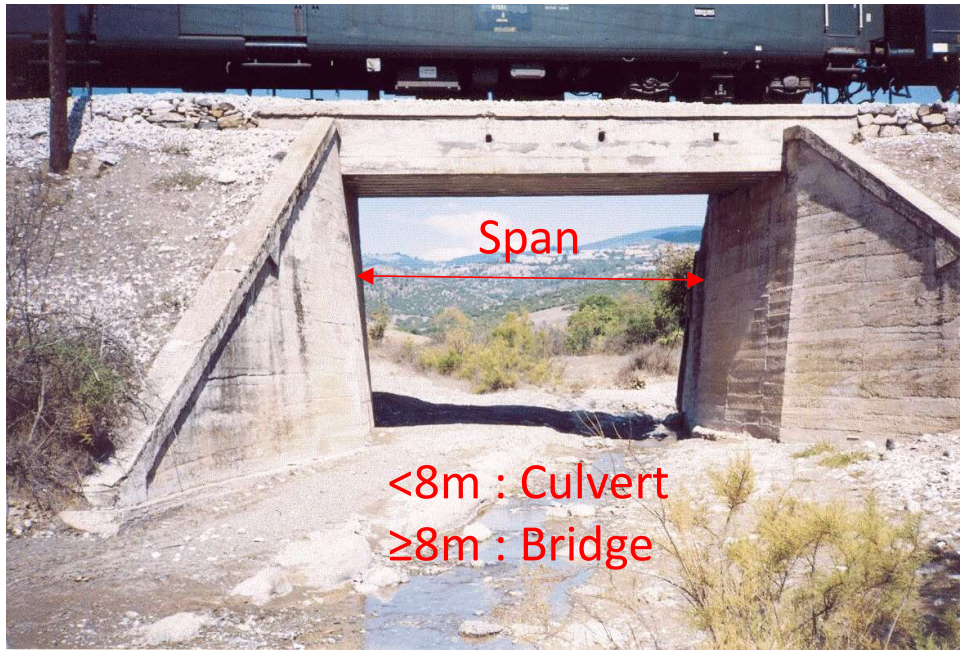


Simpson, Brent & Burpee, Gaye. (2015). Agricultural Extension and Adaptation Under the "New Normal" of Climate Change.

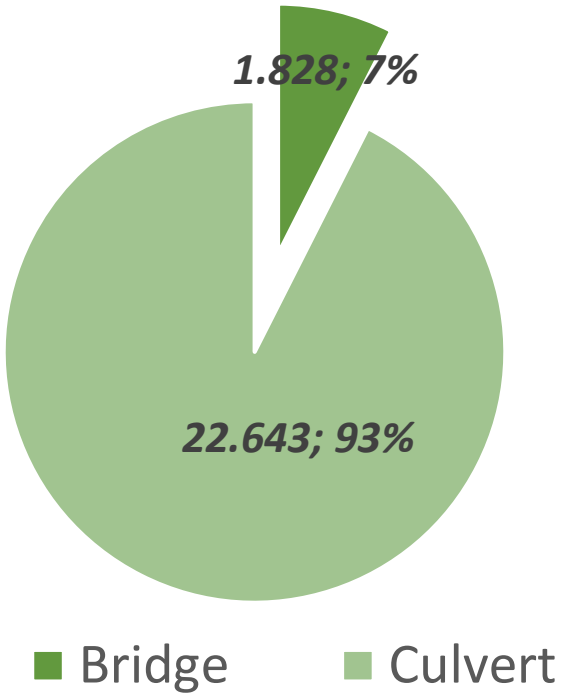
Impact matrix of extreme weather events on assets

					
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	✓		✓		
	✓	✓	✓	✓	✓

Distribution of Culverts and Bridges in Turkiye by Count (HST Lines excluded)



Culvert and Bridge Counts*



Total : 24,471

*Total Count of Culvert & Bridges on Conventional Lines (High Speed Train Lines are excluded)

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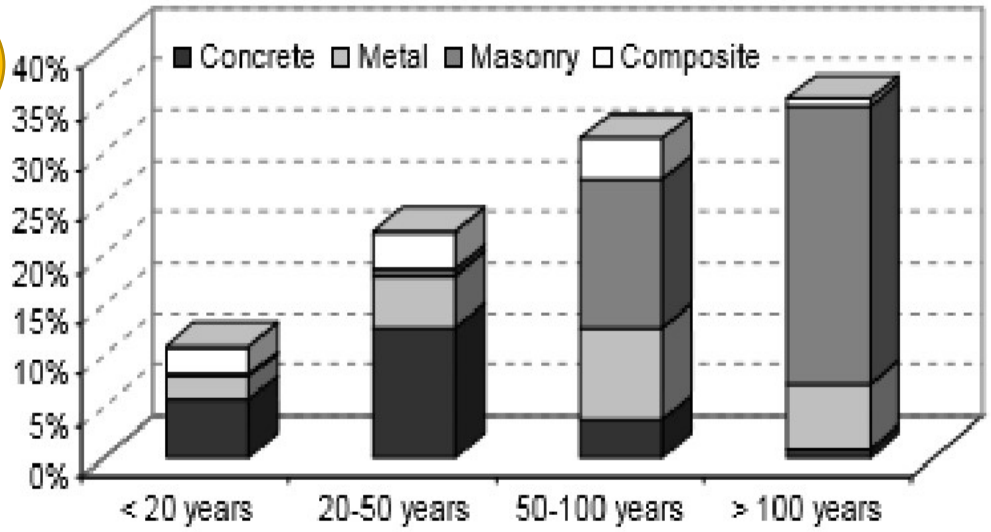
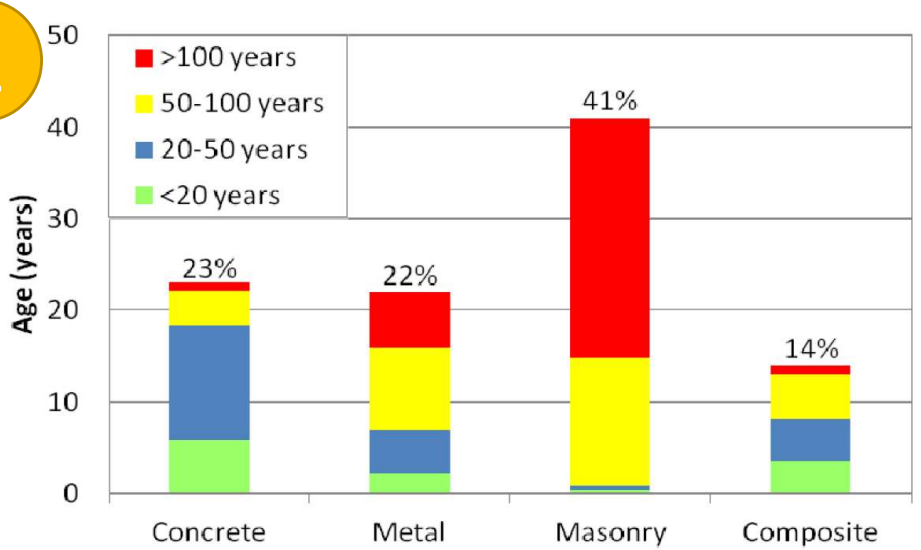
Distribution of Culverts and Bridges in Europe by Age

1



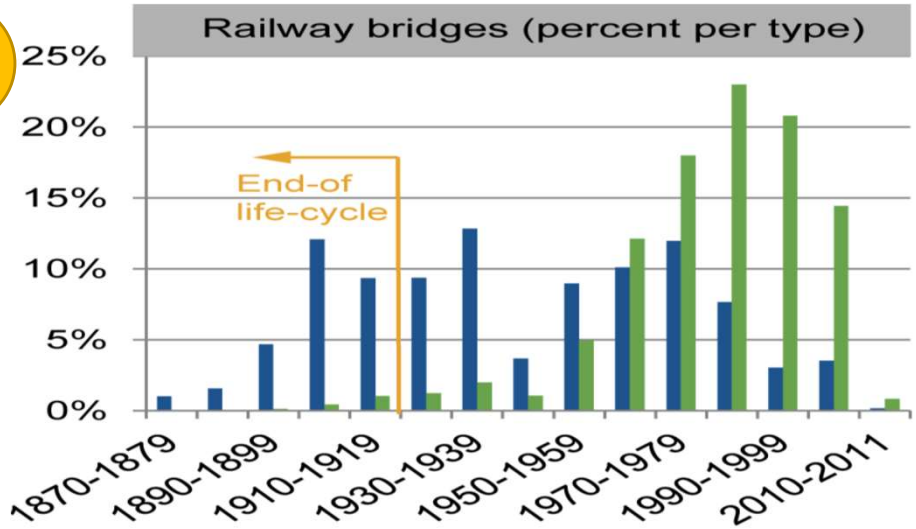
Railway bridge types and age profile in EU

2



Age distribution of European railway bridges depending on the construction materials

3



Age distribution of different bridge types for the railway network

1) A. Dinas, Th.N. Nikolaidis, C.C. Baniotopoulos, Sustainable Restoration Criteria for a Historical Steel Railway Bridge

2) Tomor, Adrienn. (2013). Life-cycle assessment and deterioration models for masonry arch bridges.

3) Ummenhofer, Thomas & Weidner, Philipp & Zinke, Tim. (2013). New And Existing Bridge Constructions - Increase of Fatigue Strength of Welded Joints by High Frequency Mechanical Impact Treatment.

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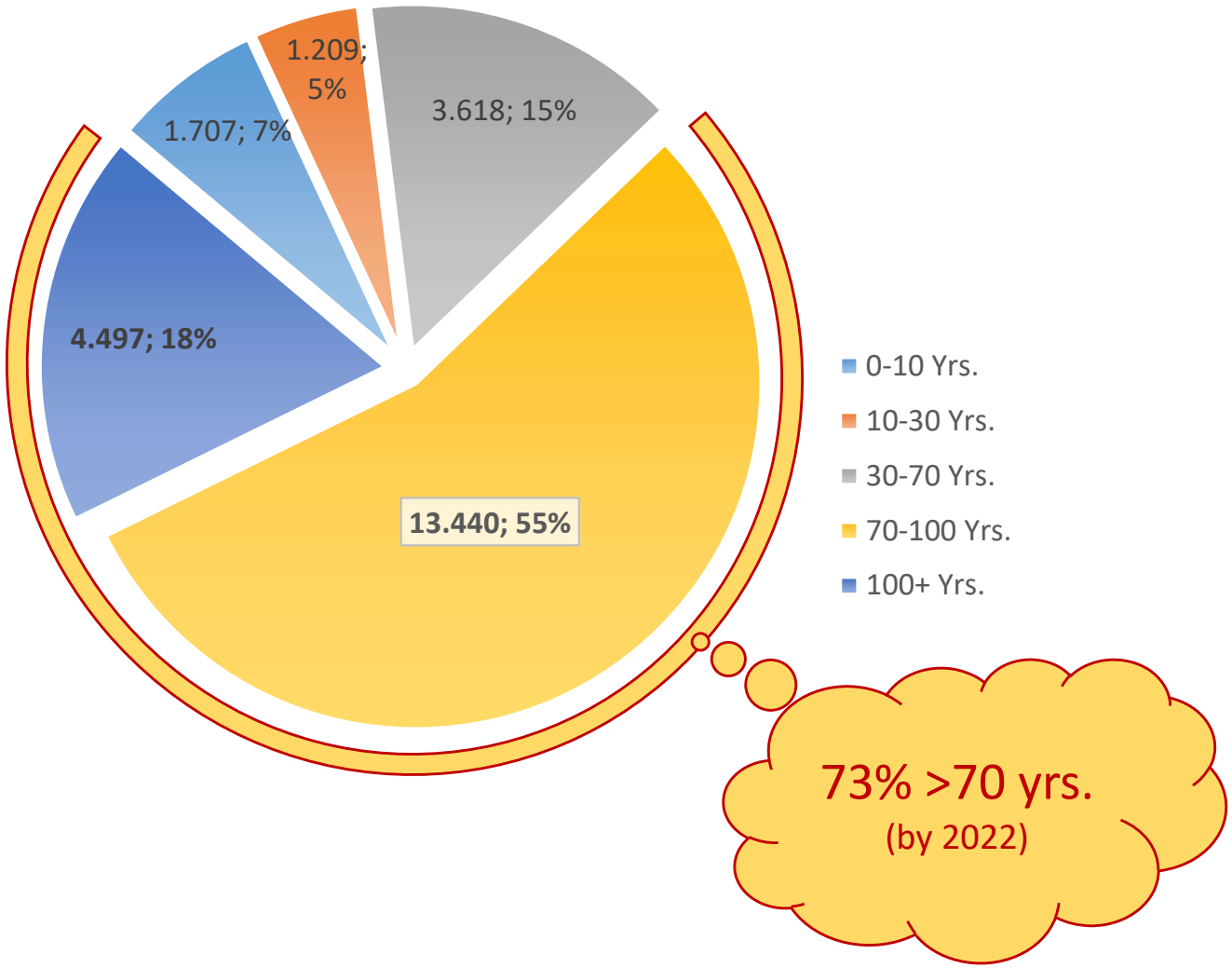
Distribution of Culverts and Bridges in Turkiye by Age (Excluding HST Lines)



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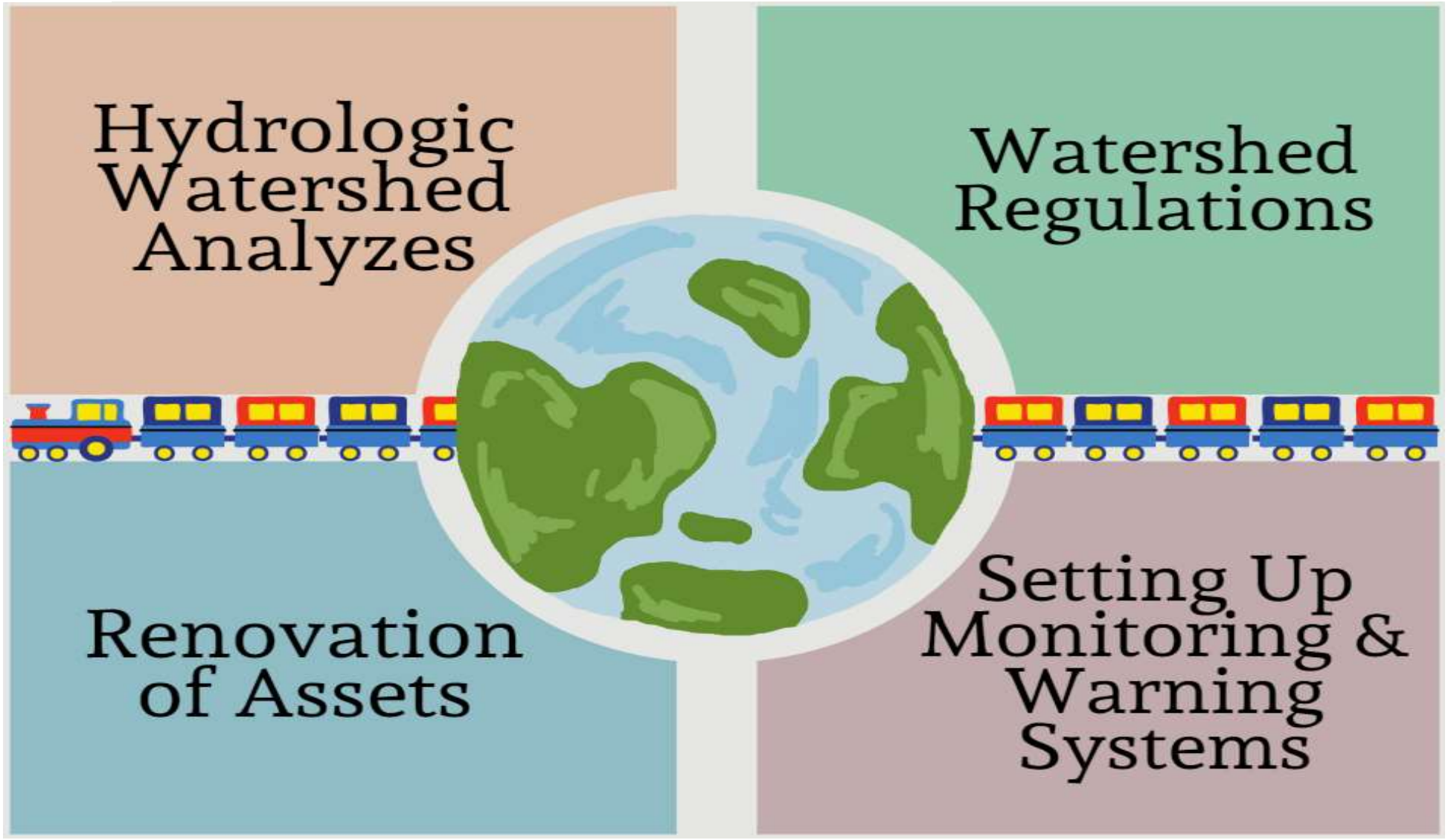
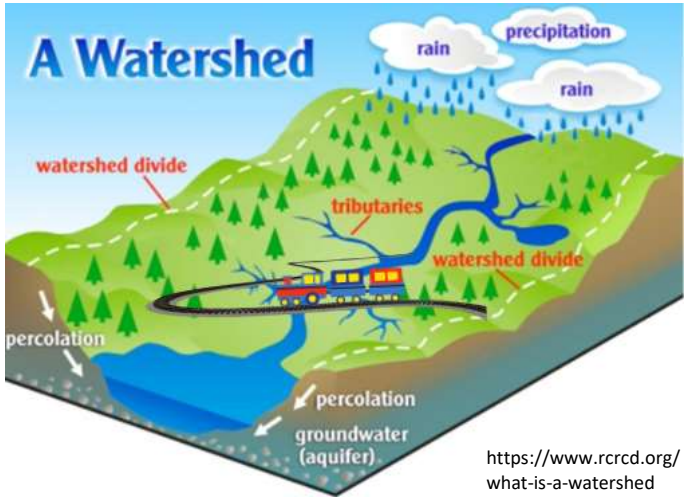
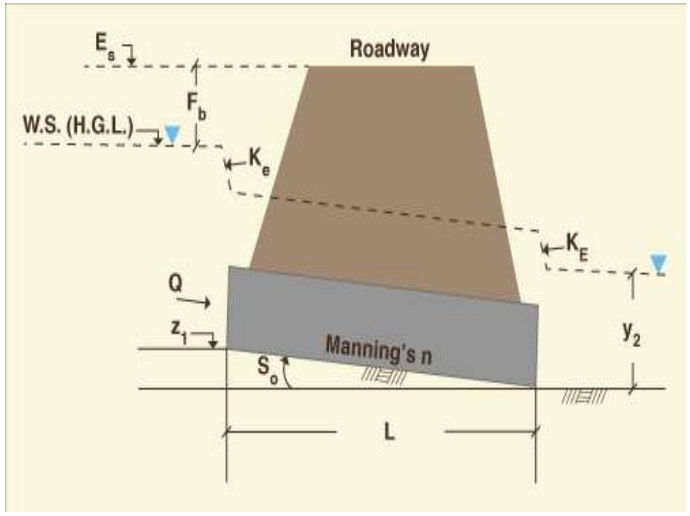
What are we doing?



Watershed Analyzes



https://www.rcrcd.org/what-is-a-watershed



Watershed Analyzes

7 main regions of TCDD

Prioritization according to previous incidents

Hydrology studies

Culvert design flow calculations for 100 to 500 years flow event

Cross section (area) control of culvert
Cross section is

Enough

Structural analyzes

Not enough

Watershed regulations

Increasing the hydraulic capability of the structure

Study for the renovation of assets

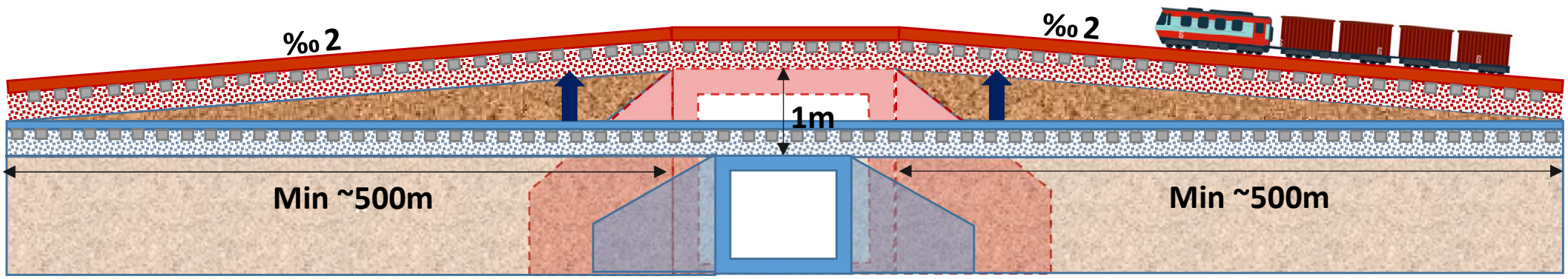
Watershed Regulations

- No train traffic interruption ✓
- Economic ?
- Long – term solutions ✓
- Easy applicable & adaptable ?
- Eco friendly ✓

Increasing the hydraulic capability of the structure (w/o rebuilding)

- No train traffic interruption ?
- Economic ?
- Long – term solutions ✓
- Easy applicable & adaptable ✗
- Eco friendly ✓

Renovation of Assets



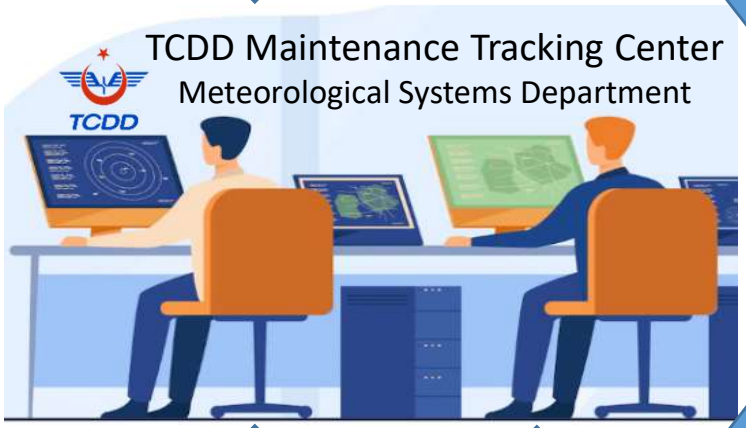
- No train traffic interruption ✗
- Economic ✗
- Long – term solutions ✓
- Easy applicable & adaptable ✗
- Eco friendly ✓

Setting Up Monitoring & Warning Systems

OBSERVATIONS

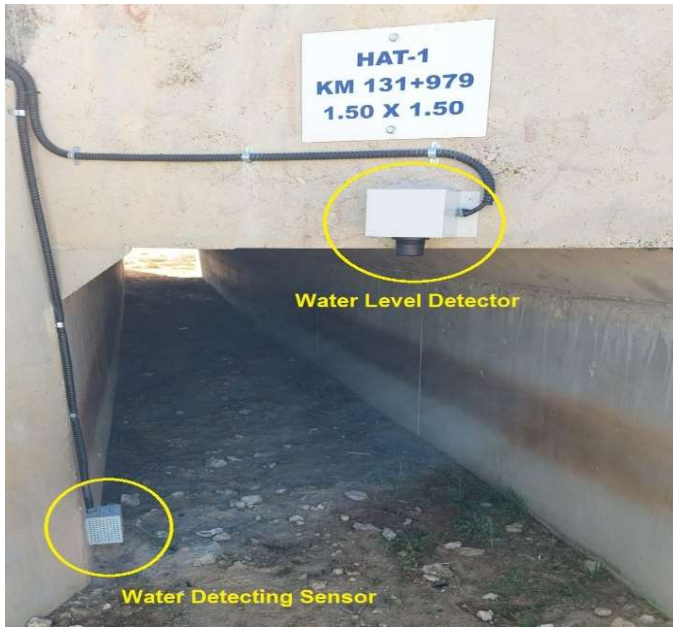
Turkish State Meteorological Service

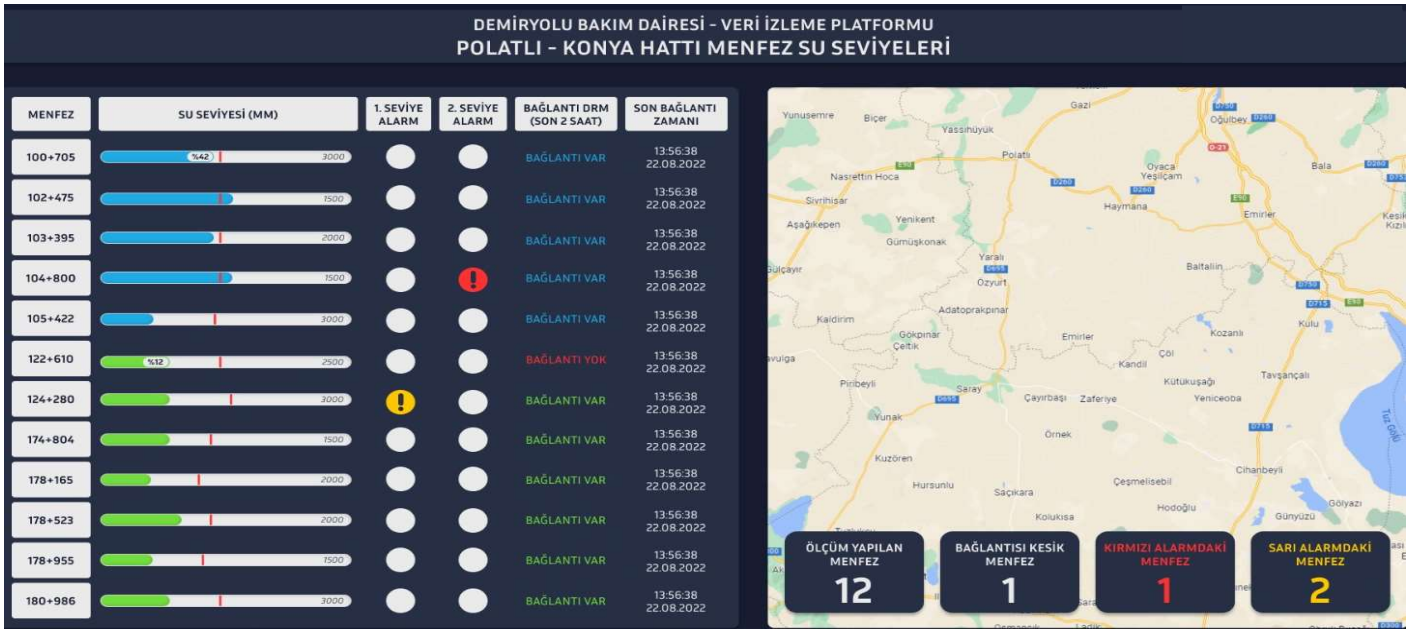
TCDD Maintenance Tracking Center
Meteorological Systems Department

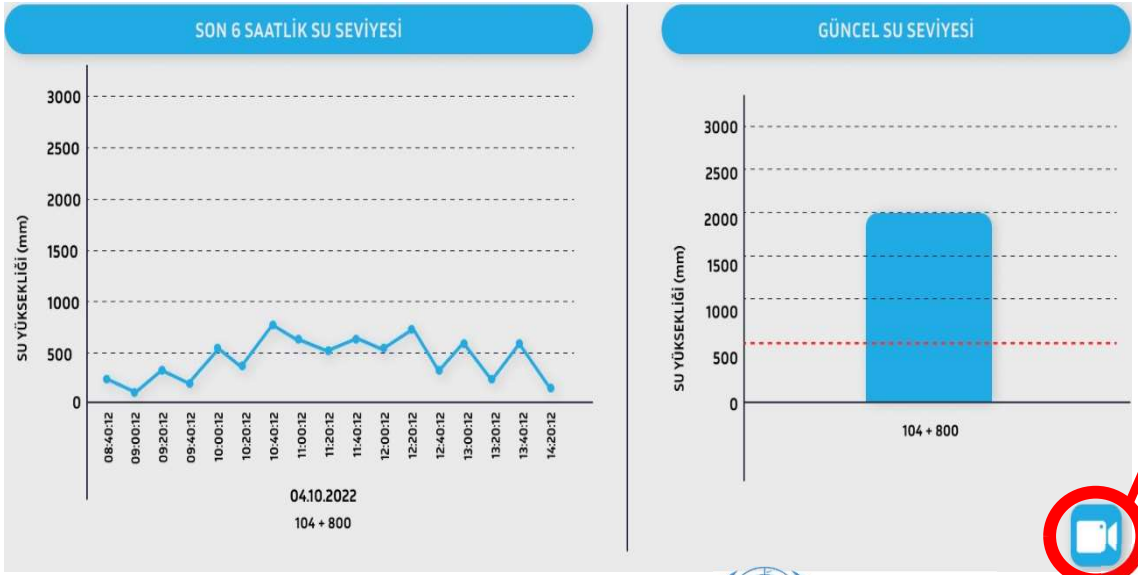


SMS

Setting Up Monitoring & Warning Systems







Setting Up Monitoring & Warning Systems

No train traffic interruption

Economic

Long – term solutions

Easy applicable & adaptable

Eco friendly

CONCLUSION

The impact of climate change on the railways: how to **protect, adapt and mitigate**

to STOP?

Prevention is **Easier & Cheaper & Effective** than action.

Railways unify welfare and prosperity.
Mustafa Kemal ATATÜRK

REPUBLIC OF TURKEY
MINISTRY OF TRANSPORT
AND INFRASTRUCTURE

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