Building a Railway Fit for the Future

CIWEM Climate Resilience and Extreme Incidents Conference
30 April 2019

Why is weather resilience important?

Dawlish 2014

- February 2014, stormy seas and waves washed away the sea wall and railway at Dawlish.
- The line was closed for two months blocking rail access to South West England.
- The incident cost Network Rail at least £63m with disruption payments an additional £28m.
- Estimates of the impact on the economy in Cornwall range from £1m per day to £1bn in total

Lamington 2016

- ❿December 2015, Storms Desmond, Eva and Frank, the central pier of Lamington viaduct was partially undermined by a series of high river flows leading to missing masonry, significant cracks, partial collapse, subsidence and serious track deformation.
- The line was closed for over 7 weeks and the delay, repair and strengthening costs were over £46m.
- Disruption payments were an additional £40m

Watford 2016

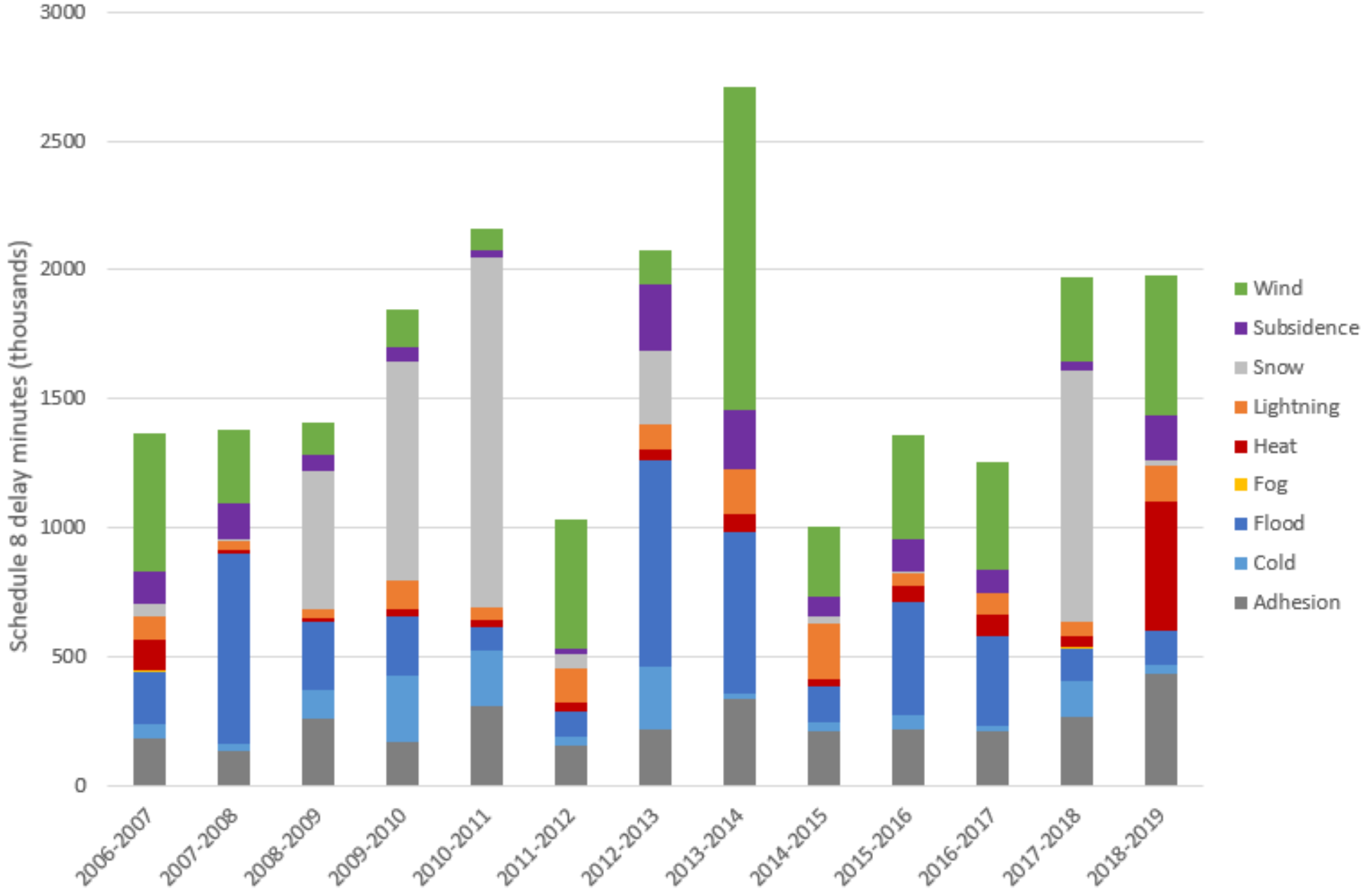
- September 2016 - runoff from neighbouring land caused a landslide at the entrance to Watford Tunnel.
- Train derailed and was "struck a glancing blow" by passing train which sustained "significant damage“ (384 people on the two trains)
- If first train derailed a short distance further to the right, the consequences would have been much more severe

Heatwave 2018

- The prolonged heatwave in Summer 2018 caused 40-50% increase in asset failure rates on hot days compared with normal – this was 80% for early hot days(April-June)
- 4.2% reduction in PPM due to asset failures and heat speeds
- Heat-related disruption payments were £35-40 million up to Period 6 (Aug/Sept),
- Service affecting failures forecast to be ~4% worse than target for year.

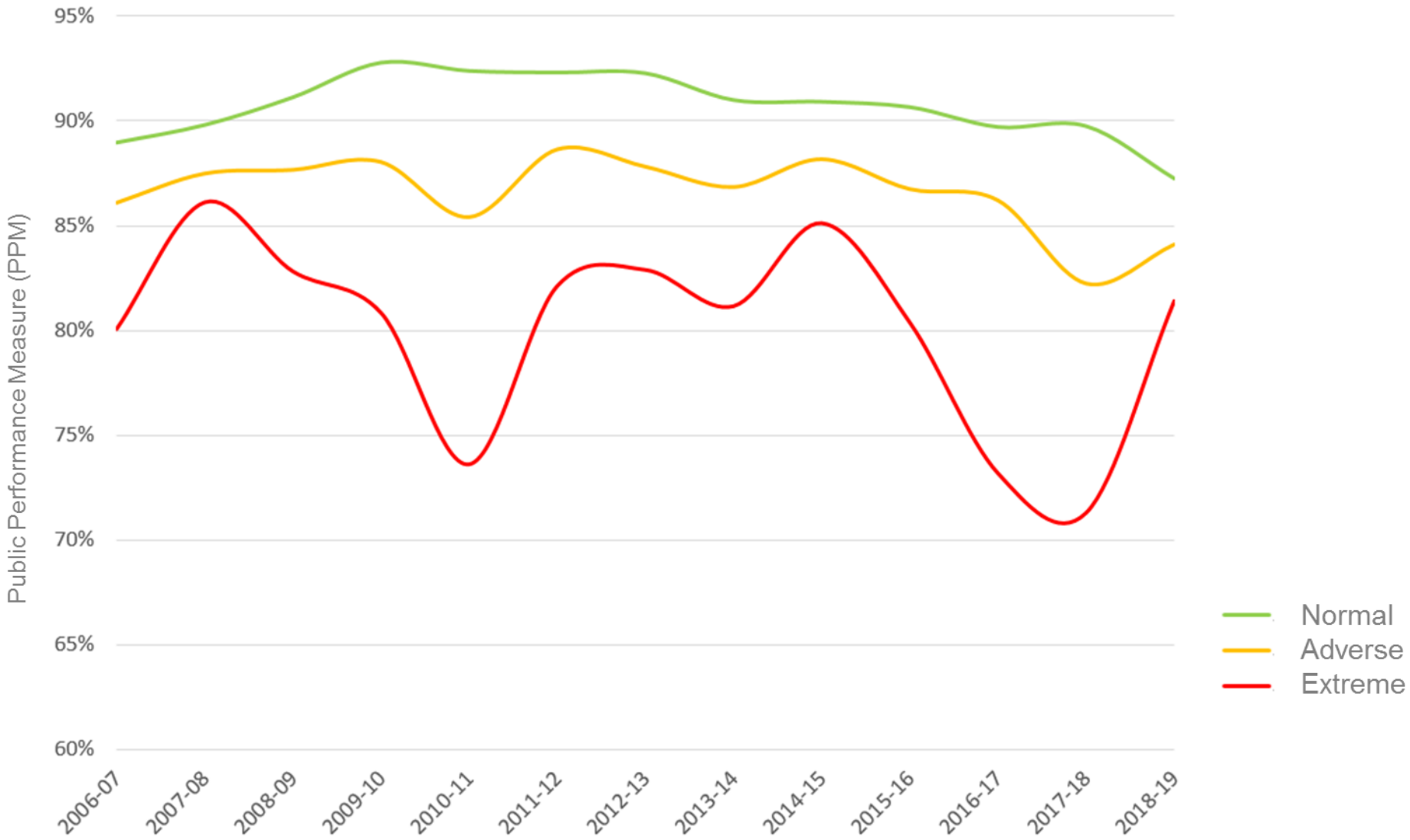
We haven’t had a serious accident with fatalities for over 30 years but have had a number of near misses in recent years. This luck will run out…

Schedule 8 Delay Minutes 2006 - 2019



Current weather impact on performance

2-3% performance drop on adverse weather days



Weather impacts on assets

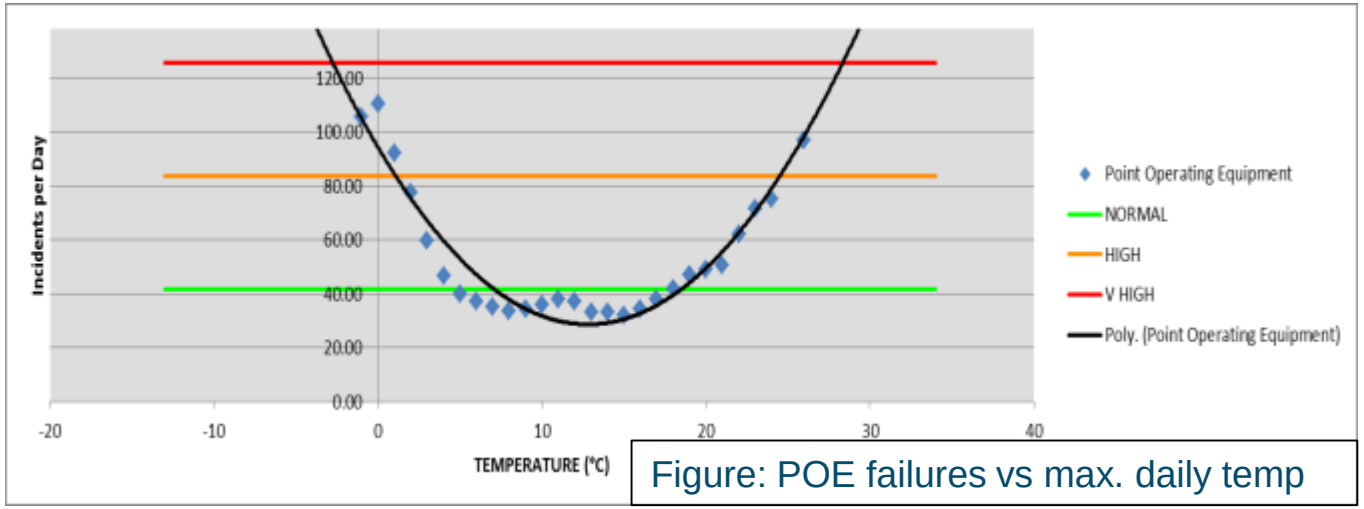


Figure: POE failures vs max. daily temp

Our Victorian railway does not always operate reliably within this climatic envelope…

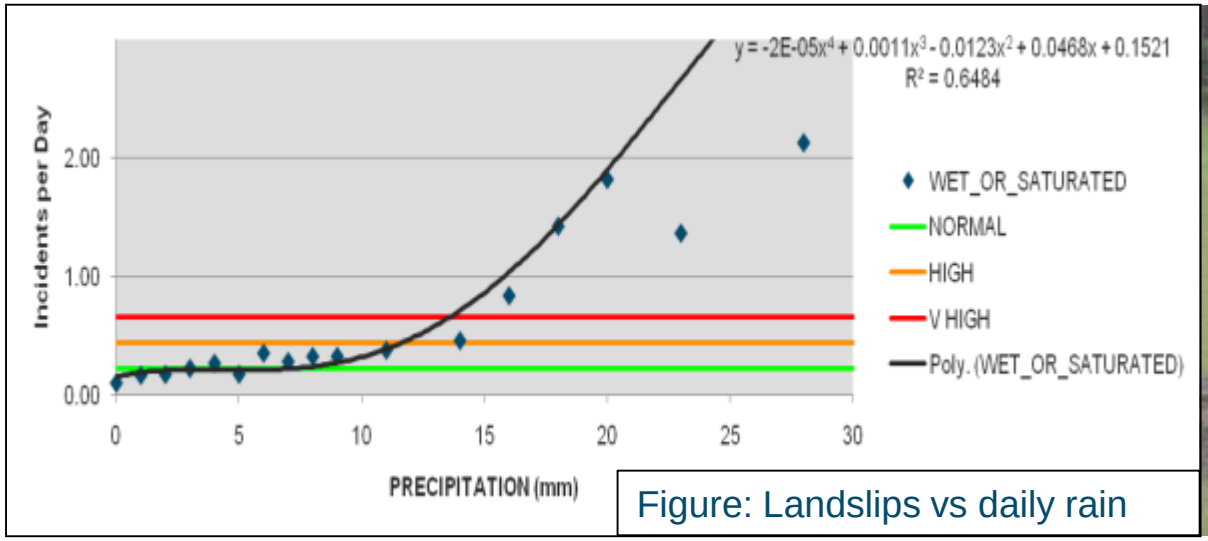


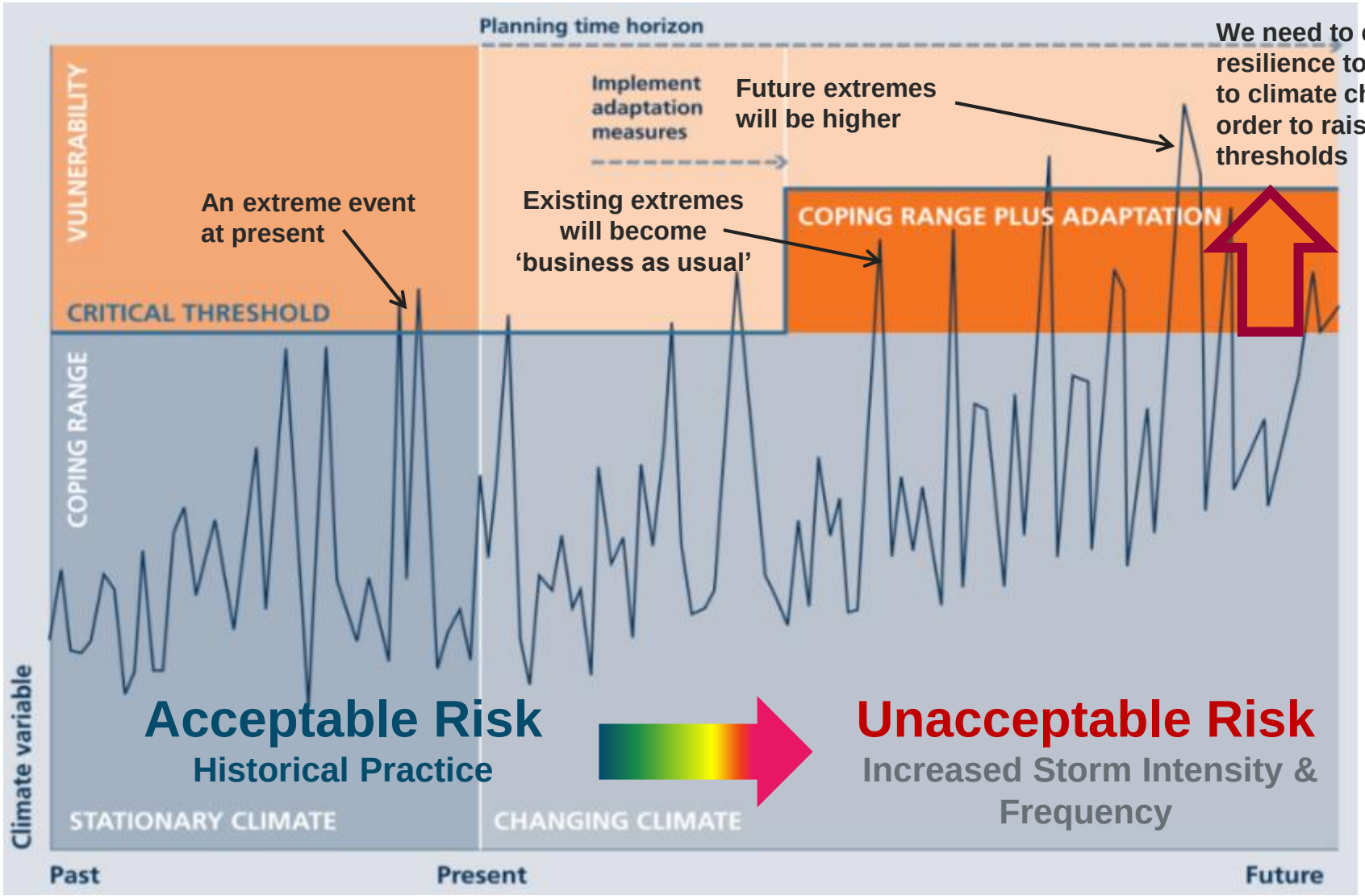
Figure: Landslips vs daily rain

Sensitivity of assets to failure

- Analysis of the weather experienced at the time and location of incident and failure events has provided us with information on the sensitivity of assets to failure under different weather conditions.
  - Green - no clear correlation between failure rates and weather could be derived.
  - Amber - incident rates double relative to the median;
  - Red - incident rates treble.

	Buildings		E&P				Signalling														Telecoms												SE&PT		Track			Earthworks
Weather	Property	Structures	3rd Rail	OLE	Signalling Power	Traction Power	ATP	AWS	Axle Counter	HABD	Interlocking	Level Crossing	Miscellaneous	Monitor	POE	Remote Control	Signalling	Signalling Control	Staff Protection	TPWS	Track Circuit	Unknown	Cable	Concentrator	DOO	Miscellaneous	PABX	PETS	Power	Radio	SCADA	SISS	Telephone	Transmission	Voice Recorder	Cable Route	Lineside Equipment	S&C	Track	Sign	All
Daily Maximum	>22		>29	>24	>27	>21	>20	>25	>24	>25	>24	>31			>24	>22	>27	>27		>22	>21			>25	>21	>26		>25	>24	>27	>22		>29	>29	>29		>34		>25		
(^{O}C)	>27			>30		>24	>21	>31	>30	>30	>30				>29	>27				>27	>26			>30	>25					>34	>27								>29		
Daily Minimum				<-10						<-12		<-15			<-5			<-7																			<-0			
(^{O}C)				<-15											<-10																							<-3			
Diurnal Cycle	>13					>12	>10	>14		>13	>14				>13	>13		>14		>14	>13	>12			>13					>14										
(^{O}C)						>16	>11	>18		>16					>16						>16																			
3 Hour Rainfall		>9	>11		>8																>7		>12														>7		>2
(mm)		>12			>13																>10																	>12		>4
Daily Rainfall		>29			>46									>24							>38																	>44		>11
(mm)		>37												>32							>60																	>66		>16
15 day Rainfall														>112																										>68
(mm)														>137																										>102
Hourly Max Wind Gust				>49	>48	>59			>61			>54		>49							>49								>69									>50		>39
(mph)				>53	>57	>71			>67			>67		>57							>54																	>57		>46
Daily Max Gust				>59	>70							>96		>55							>62								>76									>64		>42
(mph)				>66										>61							>72								>84									>76		>49
Daily Max				>40	>41							>44									>37																	>40		>25
Windspeed (mph)																					>44																	>51		>29

Climate change will amplify risk



WRCCA Strategic Objectives

A railway that is safe and more resilient to the effects of weather, now and in the future

Infrastructure able to withstand the impact of future weather conditions

Rapid recovery from the impacts of adverse and extreme events

STRATEGIC OUTCOMES

Improved performance and safety during adverse and extreme weather conditions

Financial savings through reduced compensation payments and repair costs

Enhanced reputation and trust in the railway's ability to manage weather events.

Adapting the railway to climate change

Infrastructure able to withstand the impact of future weather conditions

WRCCA Policy

Consider how climate change might amplify risk

Adapt at construction and at asset renewal

Replace like for better rather than like for like

Governance and accountability

Region/Route and other stakeholder engagement, share lessons & best practice

Integrate climate change into business as usual

Embed climate change into policies, procedures and standards including asset policies and standards, project planning (e.g. GRIP) etc

Action and Investment

Long term climate change strategy, risk assessment and action plans created by/with Routes and Assets to support climate resilience and strategic business planning and investment

Analysis and reporting

Common understanding of current and future weather risks, impacts on the railway system, existing and future vulnerability, and the economics and benefits of different resilience levels.

Streamline operational weather management

Enhance co-ordinated preparation for, response to and recovery from seasonal and extreme weather events

Track progress & performance

WRCCA in CP6


Integrate CC into BAU
Action and investment
Analysis and reporting
Streamline operational weather management
Clear, robust plans for resilience improvements (developed by Routes and Assets)
Update policies and standards (for asset design, maintenance & operations)
Resilience metrics - develop and monitor leading and lagging indicators
Adaptation Report to Defra 2021 building on Route and Asset WRCCA Plans
Climate Projections & Frequencies Guidance (incl update to UKCP18)
Long term WRCCA strategies developed by Regions and embedded in SBPs
Engage with Govt to determine desired level of resilience and input into CCRA
R&D, analysis and decision support tools (as defined by Regions and Routes)
Rail industry engagement on WRCCA - particularly for Seasonal Planning

Thank you

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