NEC4:
A Collaborative Contract Framework for Weather?

1

Introducing:

Josh Graham,
Founder & CEO

EHAB

Muhammad Atif Shamsi,
Senior Planning Engineer

bam

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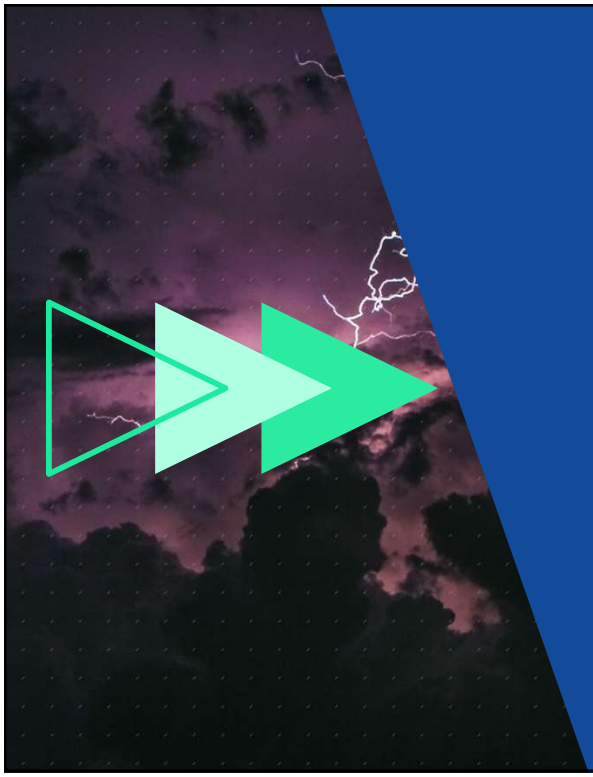
EHAB

Tech startup, founded 2019 and working on weather risk across the built environment

bam

BAM UK & I, large civil and construction contractor operating across the UK and Ireland.

3



What we'll cover:

1. Introduction
2. Weather in NEC
3. How this has been applied
4. Key issues
5. New solutions & approaches
6. Questions

4

60.1 - A compensation event

A compensation event is an event defined in the NEC4 contract that impacts the project and entitles the contractor to:

5

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Weather is a compensation event under the NEC.

8

✅ Weather clause designed to be fair and objective in the contract

9

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✅ within a calendar month 🗓️

10

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- ✅ **before the Completion Date** 🗓️

11

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- ✅ **at the place stated in the Contract Data** 🚩

12

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✅ **the value of which, by comparison with the weather data, is shown to occur on average less frequently than once in ten years** 📈

13

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✅ the value of which, by comparison with the weather data, is shown to occur on average less frequently than once in ten years 📈

✅ **only the difference between the weather measurement and the 1-in-10 weather is taken into account in assessing a compensation event** 🌡️

14

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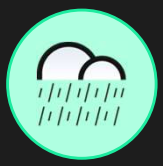
15

✅ Weather clause designed to be fair and objective in the contract

✅ Rain The cumulative rainfall (mm)

✅ Rain The number of days with rainfall more than 5 mm



16

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✅ **Temperature**

The number of days with minimum air temperature less than 0 degrees Celsius

17

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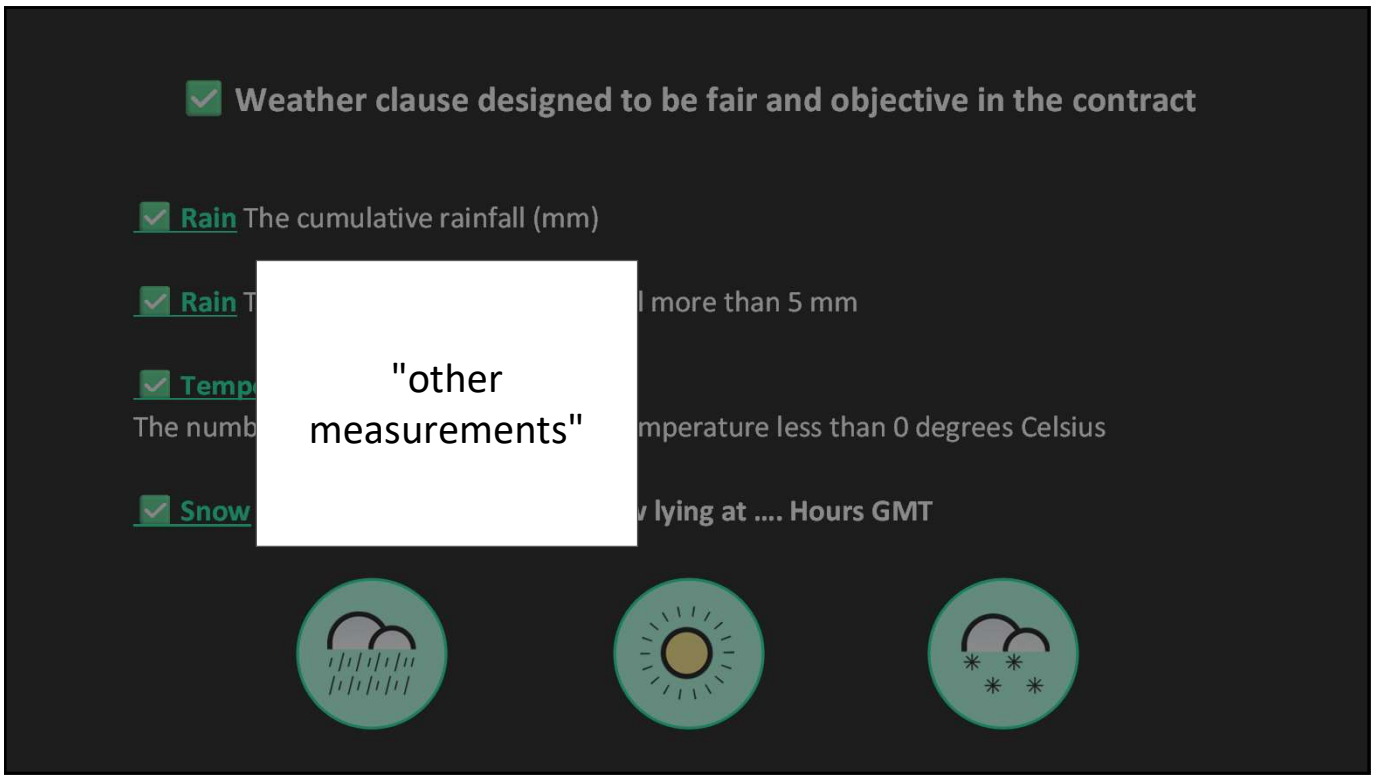
✅ **Temperature**

The number of days with minimum air temperature less than 0 degrees Celsius

✅ **Snow** **The number of days with snow lying at …. Hours GMT**

18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Temp
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Snow
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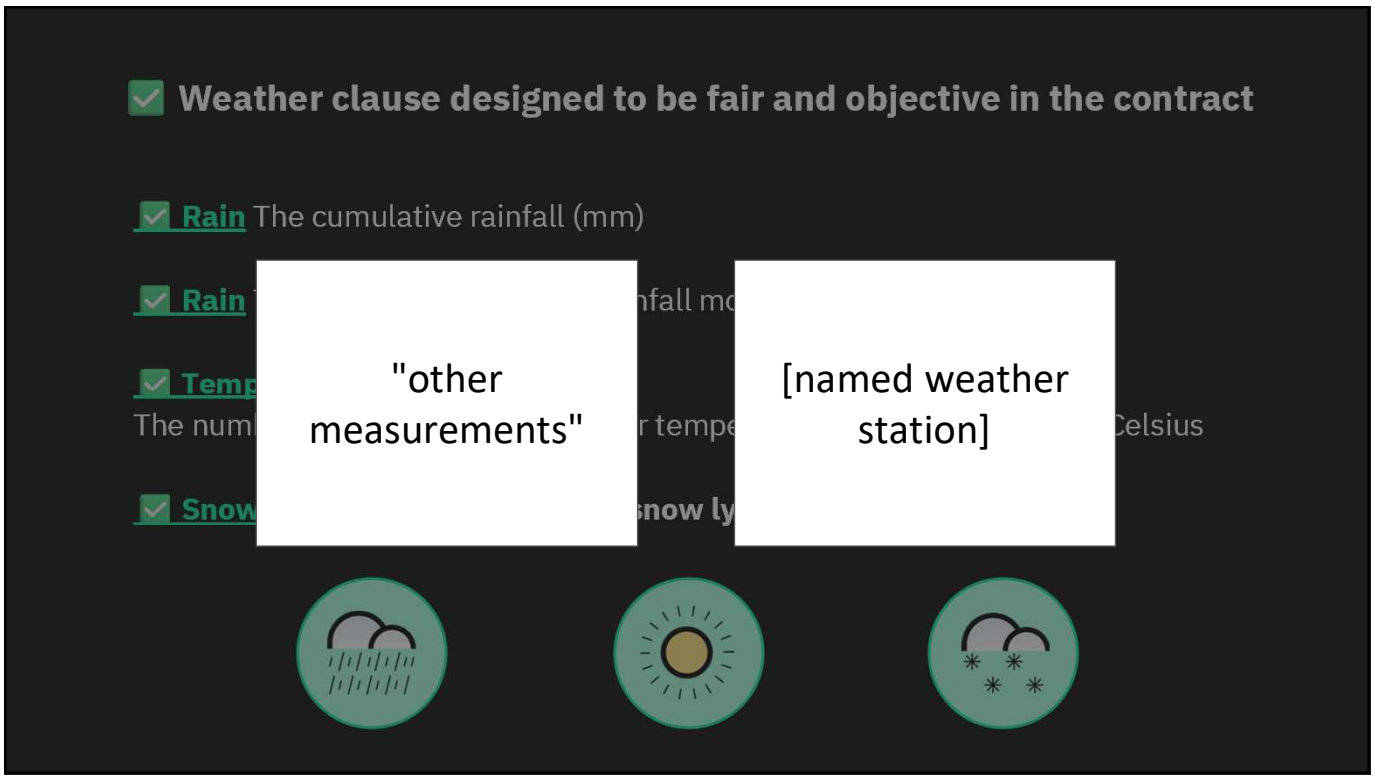
"other measurements"

19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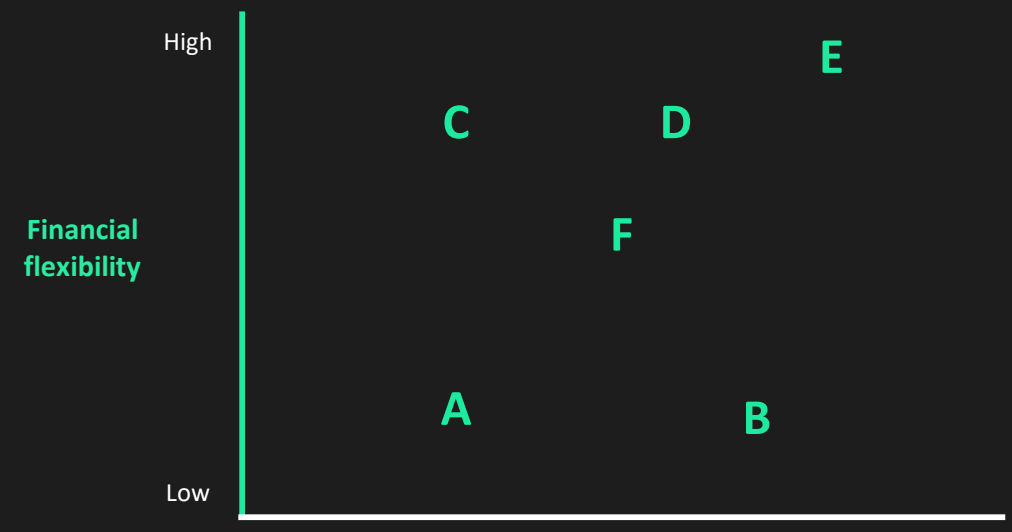
Weather clause options

A B C D E F

21

Weather clause options



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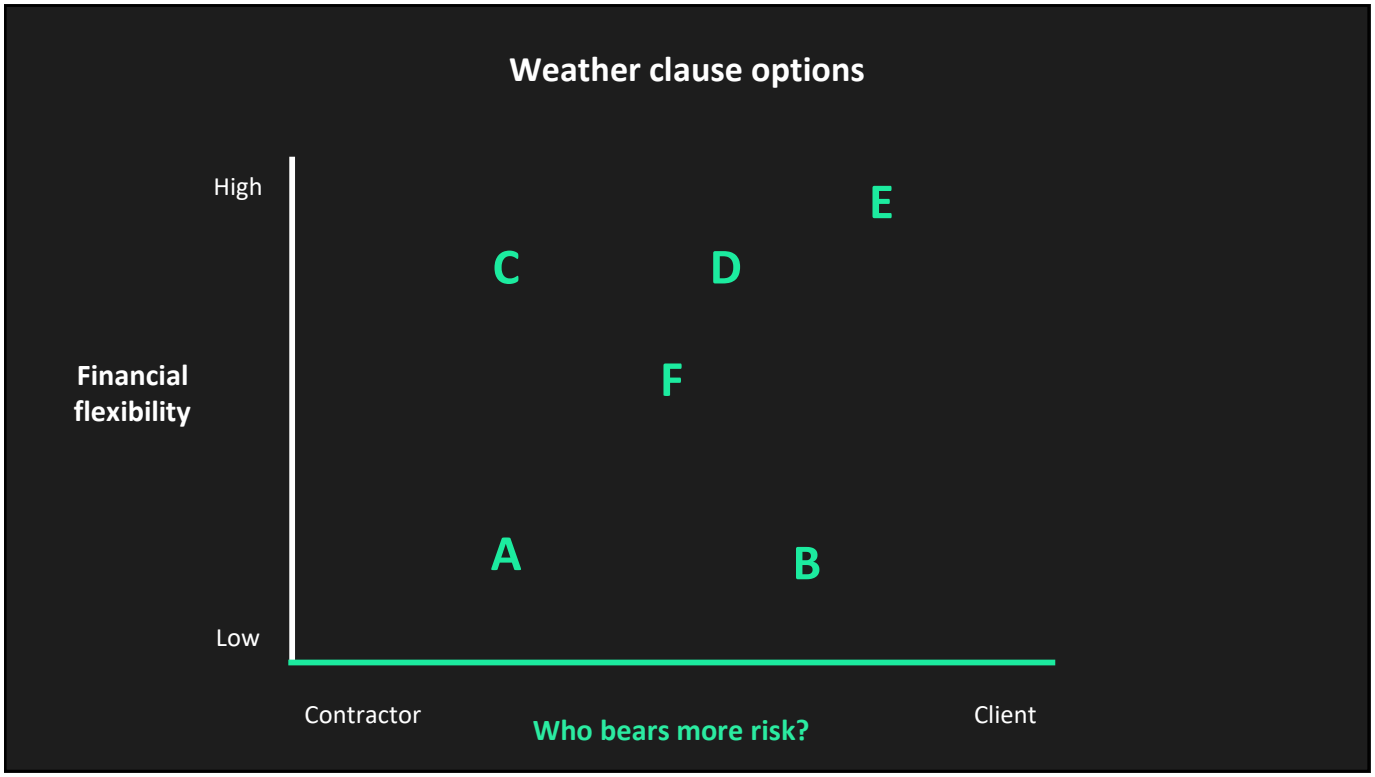
Weather clause options



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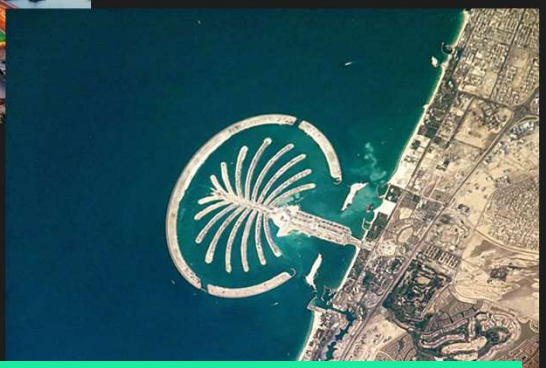
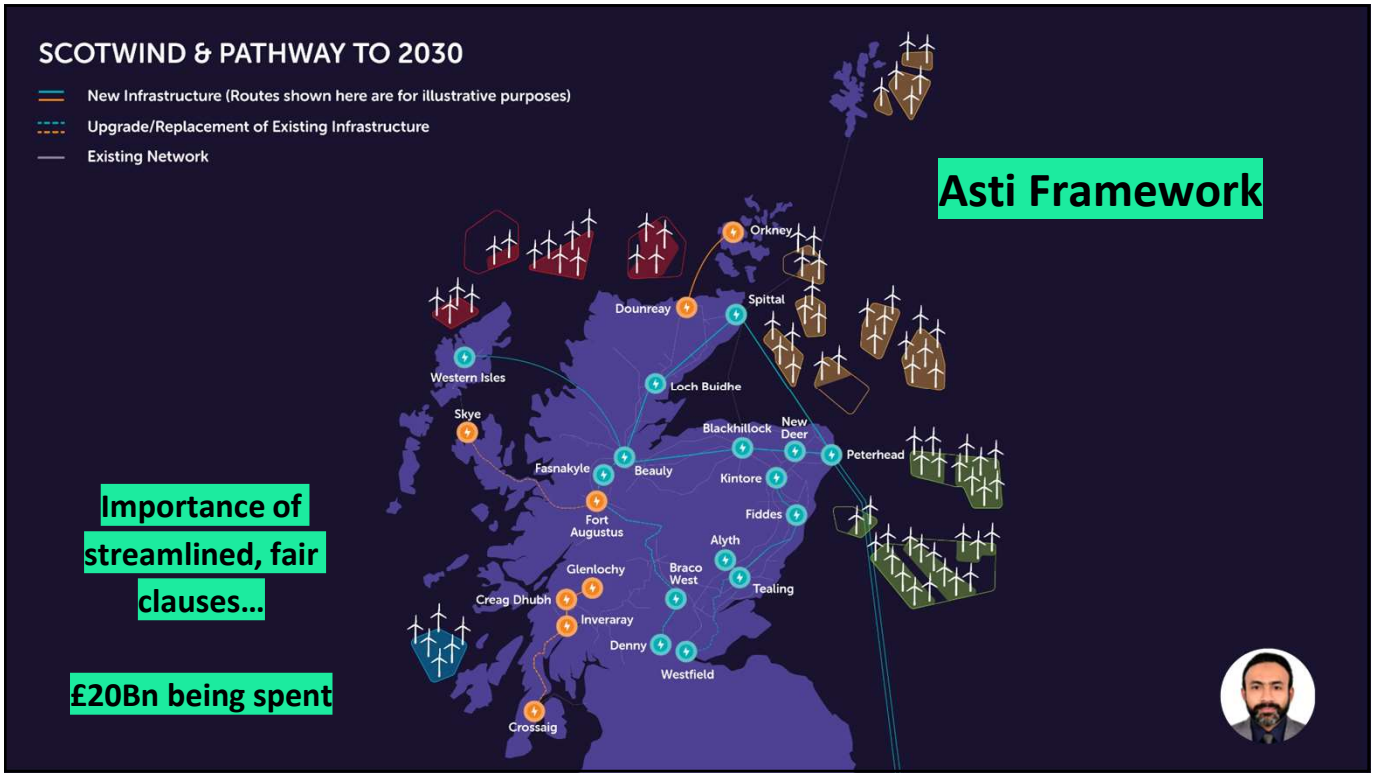


Muhammad's experience of weather abroad

Why did the contract clause lead to so much work / effort to prove?

24



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Importance of Weather Management in Construction Projects

A Planning Engineer's Perspective

Impacts of Adverse Weather on Project Timelines

1. Delay in Construction Projects (Rain and Flooding, Snow, Wind, Extremes Temperatures)
2. Impact on Workforce, Low Productivity, Equipment availability
3. Material Handling and Supply Chain Disruptions
4. Increased Costs (Additional Labor, Equipment and Site Protection, Material Waste)
5. Safety Concerns

26

Weather, an industry wide problem

45% or projects suffer delay due to weather

on average increasing the project by 21%

This means weather costs the industry 9.5%

27

Weather is an underestimated risk…

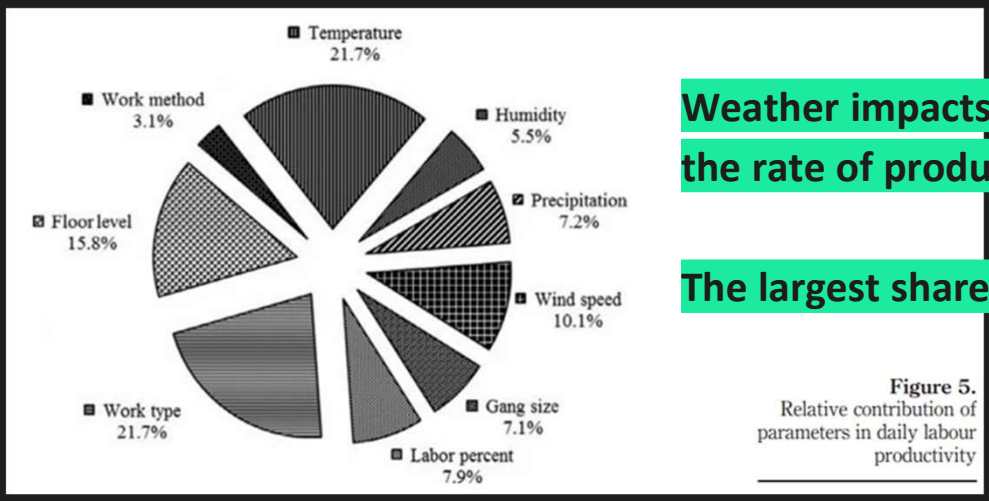
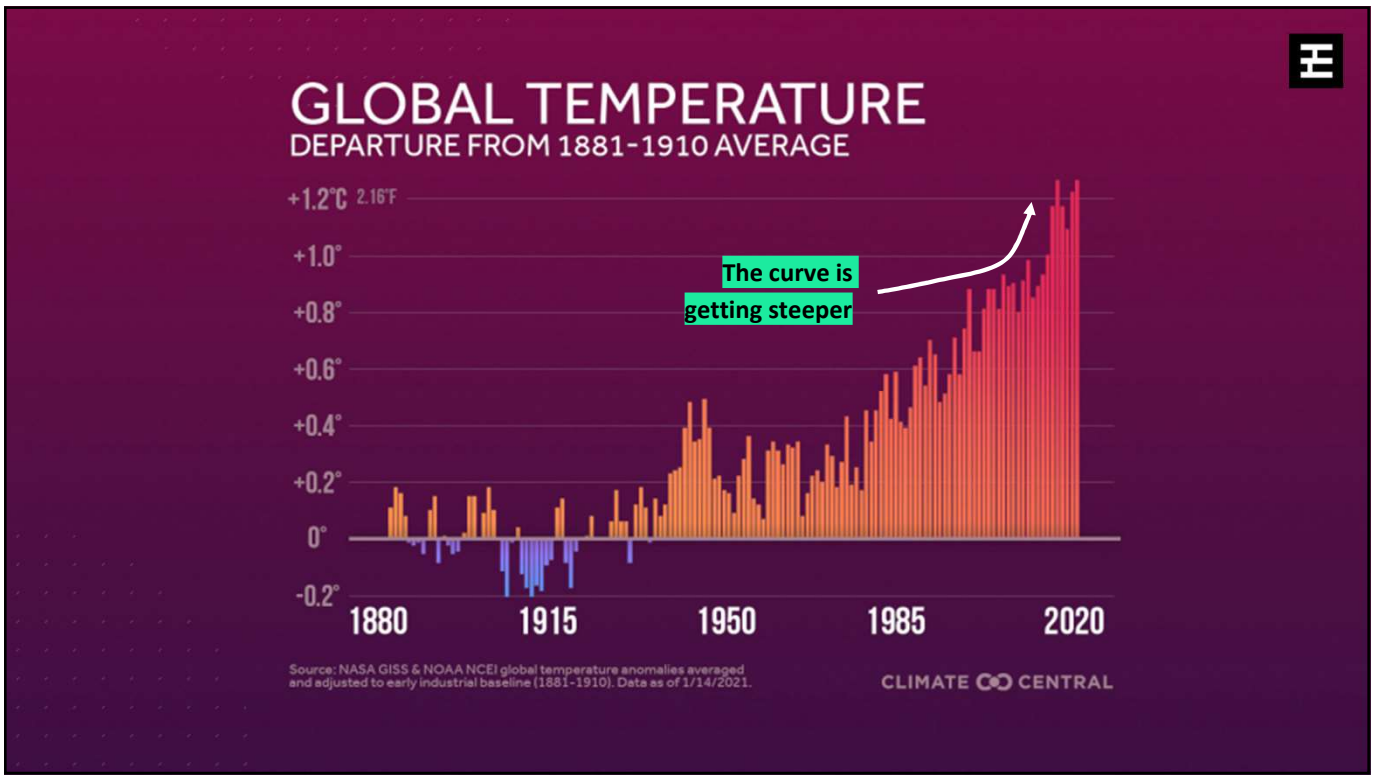


Figure 5.
Relative contribution of parameters in daily labour productivity

Weather impacts 44.5% of the rate of productivity

The largest share.

28


GLOBAL TEMPERATURE
DEPARTURE FROM 1881-1910 AVERAGE
+1.2°C 2.16°F
+1.0°
+0.8°
+0.6°
+0.4°
+0.2°
0°
-0.2°
1880
1915
1950
1985
2020
The curve is getting steeper
Source: NASA GISS & NOAA NCEI global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910). Data as of 1/14/2021.
CLIMATE CENTRAL

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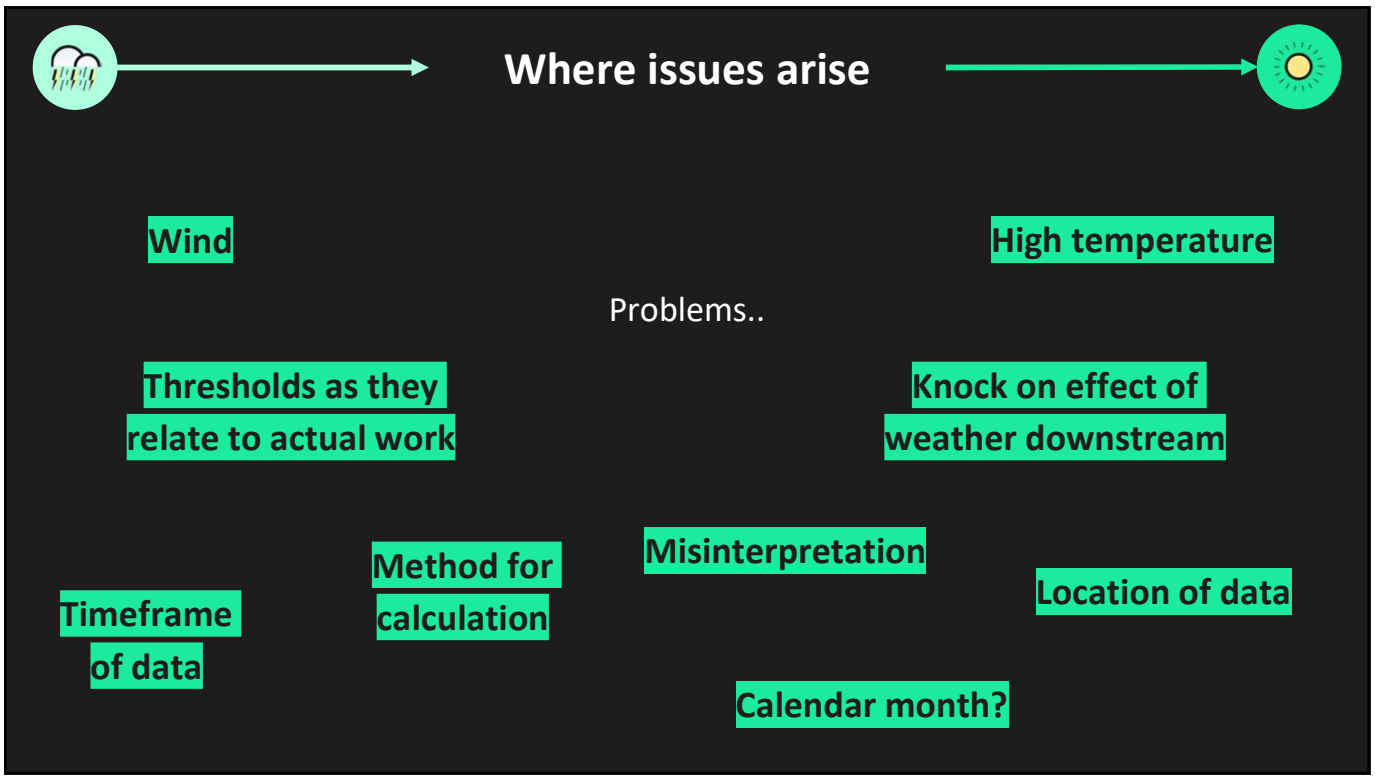
Construction has already faced significant changes
Our analysis compared a project as if conducted in 1990 vs 2020
Change +/-
Expected duration of project (Down days)
+8.4%
Standard deviation of project's duration (Volatility)
+9%
Likelihood of project running 200 days late due to weather (Extreme delay)
1450%
These risks are only set to get worse in the future, and the industry isn't prepared.

30



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Proving that the weather was a CE is not necessarily the problem.

It's the proof of the additional weather on top that is the struggle.

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Met Office

Met Office

Location based planning averages

Prepared for: Example Location Based Planning Averages
Site: Exeter, Postcode EX1 3PB
Weather Data from: Latitude 50.7242, Longitude -3.5047

Issued on Monday 2 March at 12:06:50

Long Term Averages (1981-2010)

Month	Daily Rainfall Total (mm)	Days of Rain > 5mm	Days of Snow	Days with Sno Lying at 0900 U
January	85	6	2	1
February	68	5	3	1
March	61	4	1	0
April	57	4	0	0
May	59	4	0	0
June	50	3	0	0
July	46	3	0	0
August	55	3	0	0
September	59	4	0	0
October	88	6	0	0
November	88	6	0	0
December	94	6	2	1

Month	Minimum Ground	Days of Ground	Minimum Air Temp	Days of Air Frost	Mean Wind Speed (mph)	Sun

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January	149	11	5	4	2
February	137	10	5	3	1
March	100	7	3	1	0
April	93	7	2	0	0
May	104	7	0	0	0
June	97	7	0	0	0
July	79	6	0	0	0
August	102	7	0	0	0
September	114	8	0	0	0
October	141	10	0	0	0
November	135	10	1	0	0
December	156	11	3	2	0

Month	Minimum	Days of	Minimum Air	Days of Air	Mean Wind	Sunshine

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Timeframe of data

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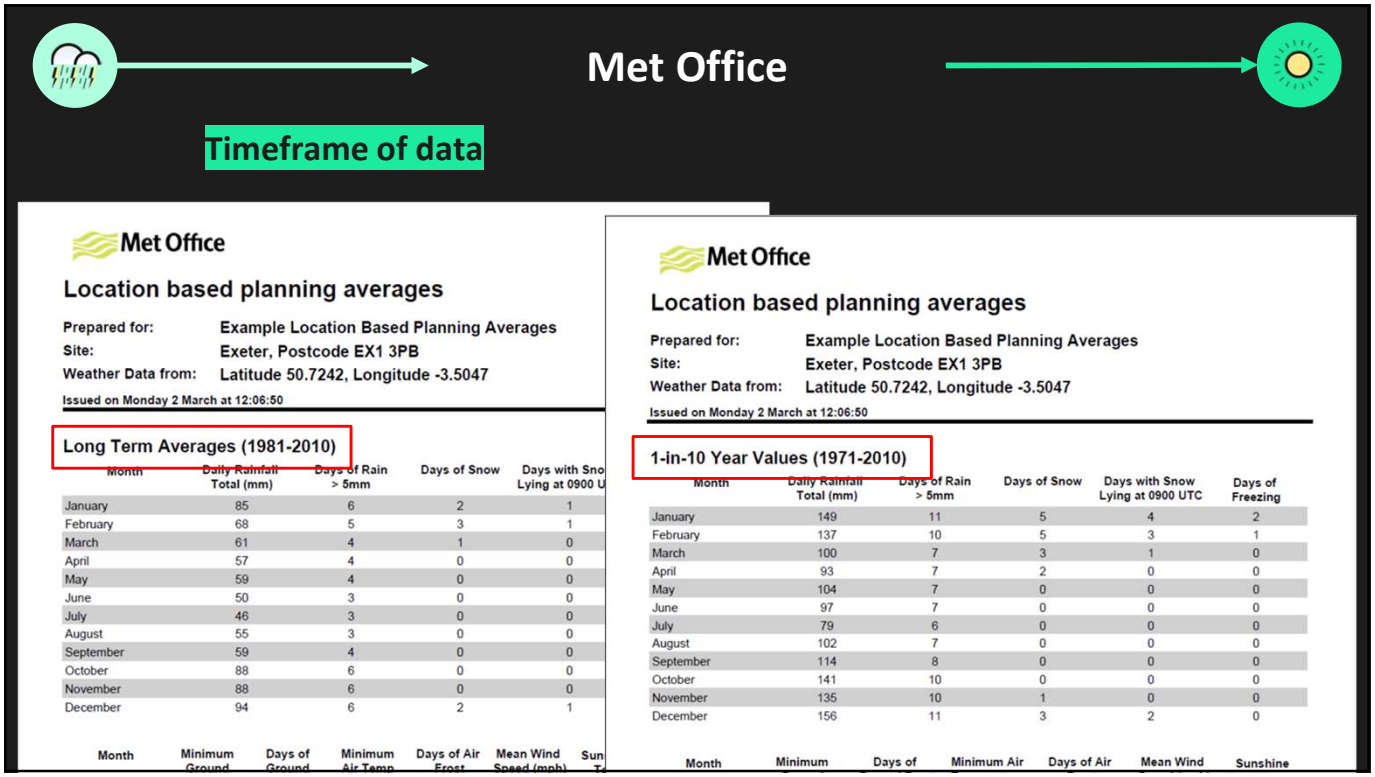
34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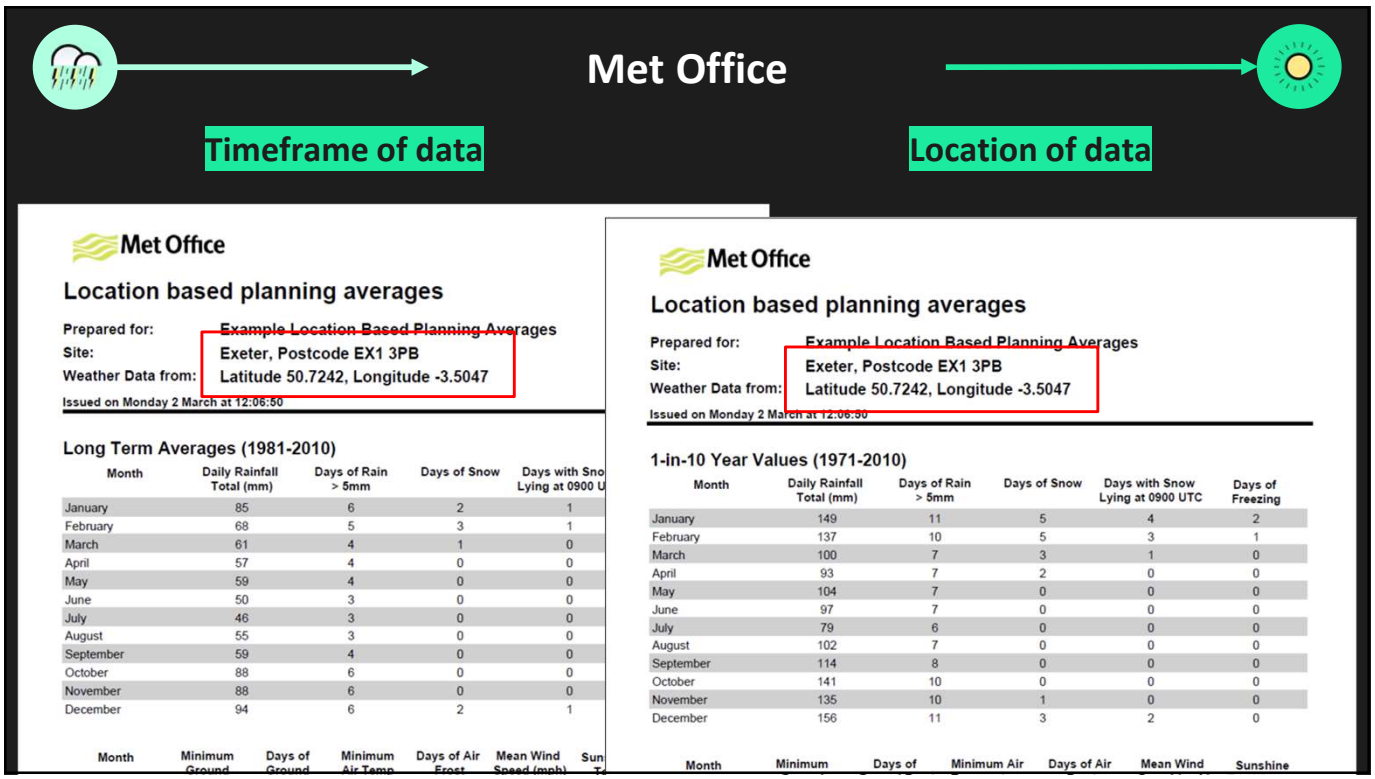
December 156 11 3 2 0
Month | Minimum | Days of | Minimum Air | Days of Air | Mean Wind | Sunshine

35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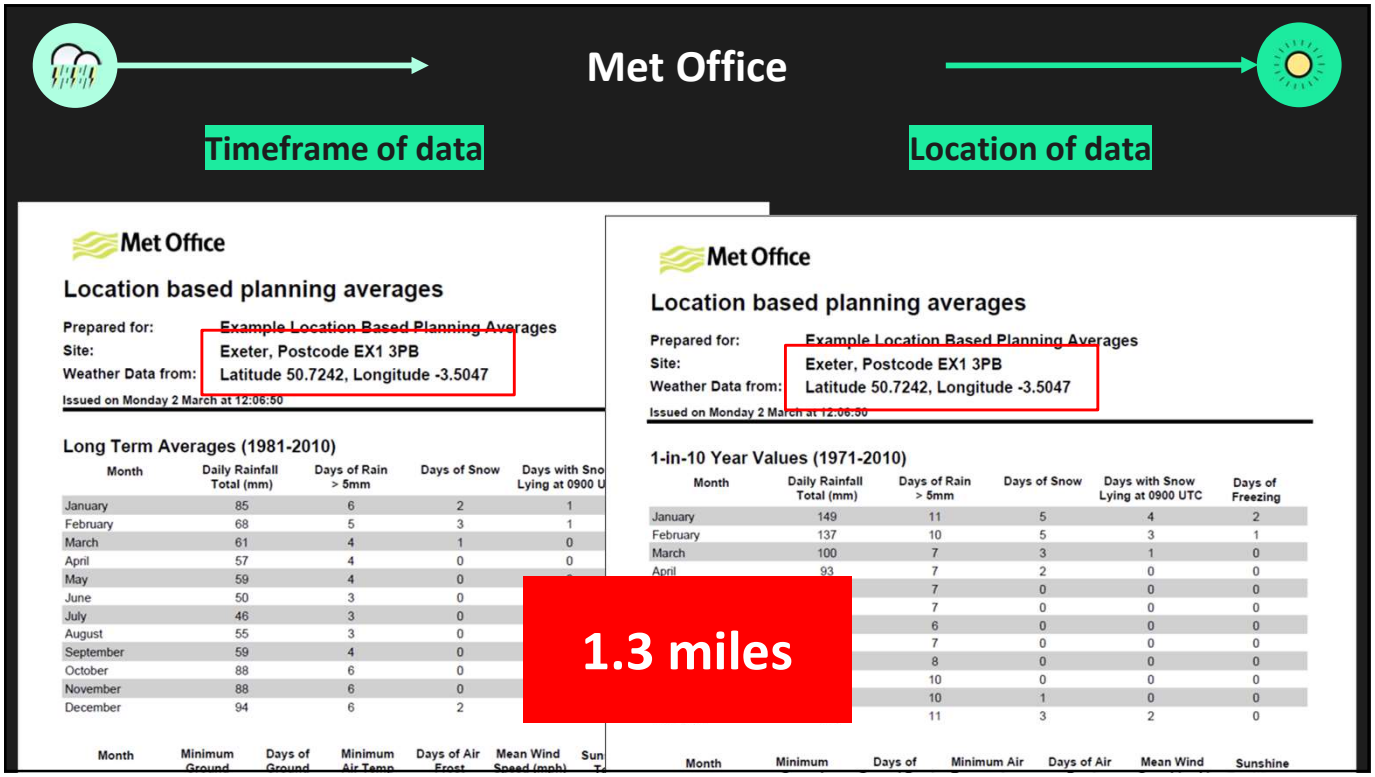
Month | Minimum | Days of | Minimum Air | Days of Air | Mean Wind | Sunshine

36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6 0 0 0
7 0 0 0
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10 0 0 0
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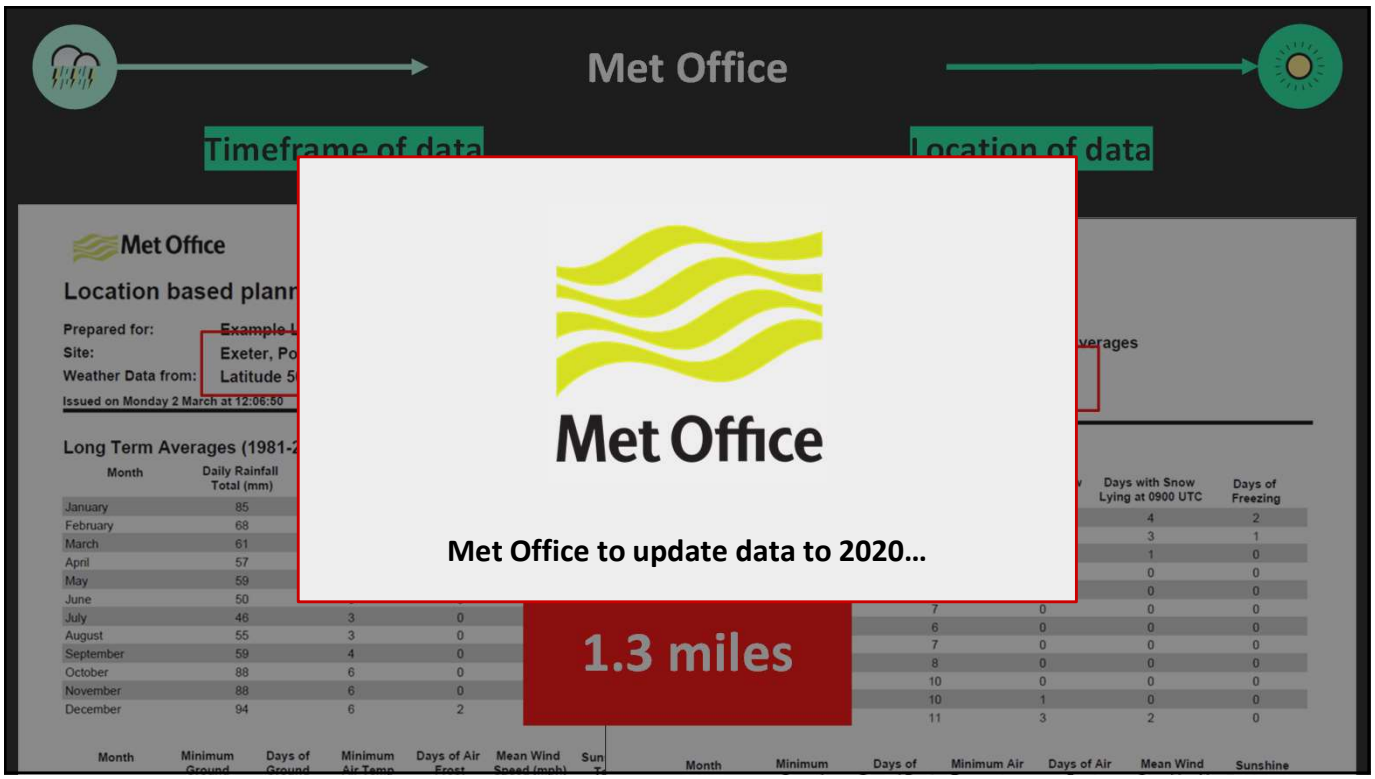
11 3 2 0
Month | Minimum | Days of | Minimum Air | Days of Air | Mean Wind | Sunshine
1.3 miles

37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4 2
3 1
1 0
0 0
0 0
7 0 0 0
6 0 0 0
7 0 0 0
8 0 0 0
10 0 0 0
10 1 0 0
11 3 2 0
Month | Minimum | Days of | Minimum Air | Days of Air | Mean Wind | Sunshine
Met Office
Met Office to update data to 2020…
1.3 miles

38

1 in 10 - Split calendar month

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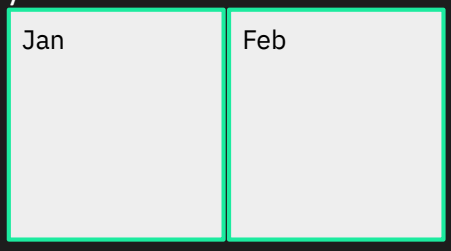
1 in 10 - Split calendar month

NEC contract only tracks by calendar month…



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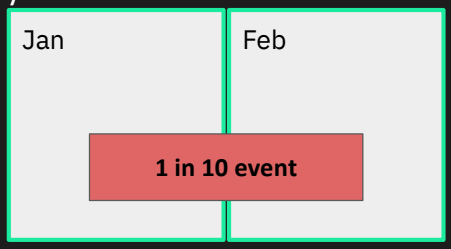
1 in 10 - Split calendar month

NEC contract only tracks by calendar month…



…but this could delay you just as much.

41

Wild Summers - High temperature not included

42

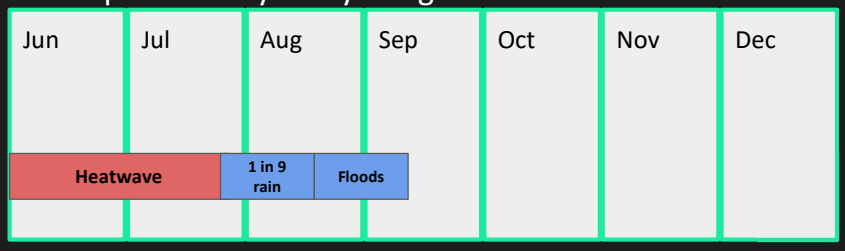
Wild Summers - High temperature not included

Heatwaves reduce productivity & dry the ground…

43

Wild Summers - High temperature not included

Heatwaves reduce productivity & dry the ground…

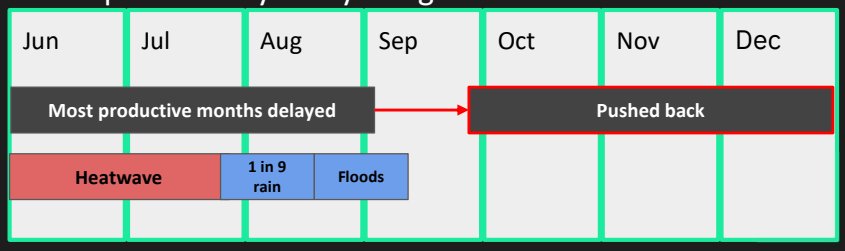


…creating a perfect storm if a flash rain event strikes.

44

Wild Summers - High temperature not included

Heatwaves reduce productivity & dry the ground…



…creating a perfect storm if a flash rain event strikes.

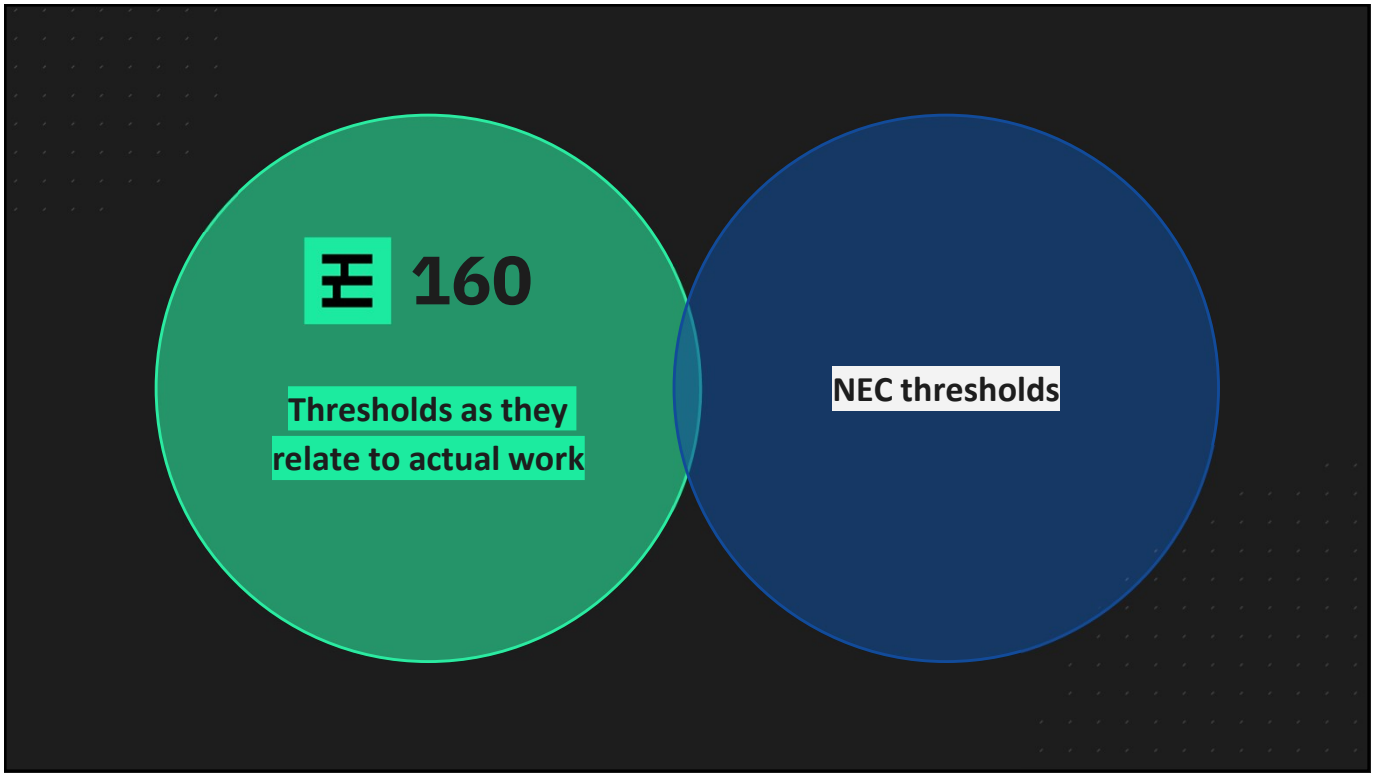
45

Thresholds as they relate to actual work

46

160
Thresholds as they relate to actual work

47


160
Thresholds as they relate to actual work
NEC thresholds

48

The EHAB<>BAM approach for Project Planning

Rescheduling and Adjustments

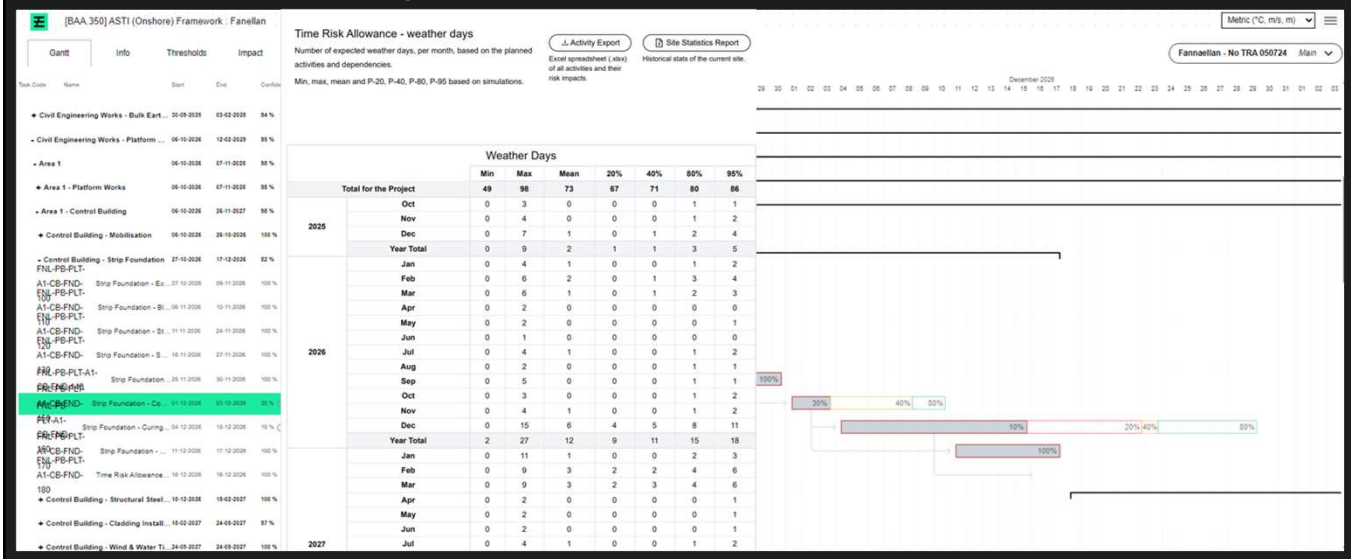
Mitigation Strategies

1. Plan Proactively (Delays due to imprecise Time Risk Allowance in Project Programmes)
2. Identifies Critical Paths and Potential Delays in Schedules
3. Weather Prediction & Analytics
4. Ease of integration (Primavera P6, XML, MPP, etc.)
5. User-Friendly Interface
6. Monitor Continuously
7. Document Rigorously
8. Facilitate Communication

The EHAB<>BAM approach for Project Planning

Traditional Methods Of Weather Planning

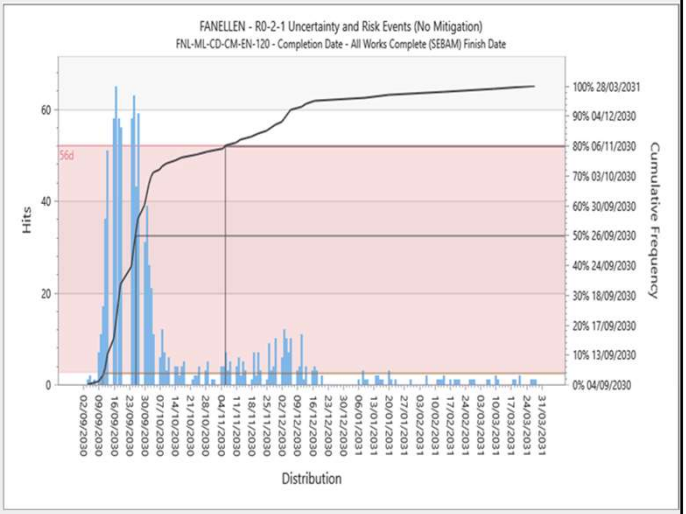
EHAB Methods Of Weather Planning



Distribution Dates

- The deterministic planned completion date of 11/09/30 has a 3.9% likelihood
- P0 (Earliest finish) is 04/09/30
- The Mean result is 11/10/30 (+30 Cal. Days)
- P80 (Target allowance) is 06/11/30 (+56 Cal. Days / 38 W.Days)
- P100 (Worst Case) is 28/03/31 (+198 Cal. days)
- **BAM propose this needs to increase to 38 (working) days to meet the P80 position of 06/11/30**

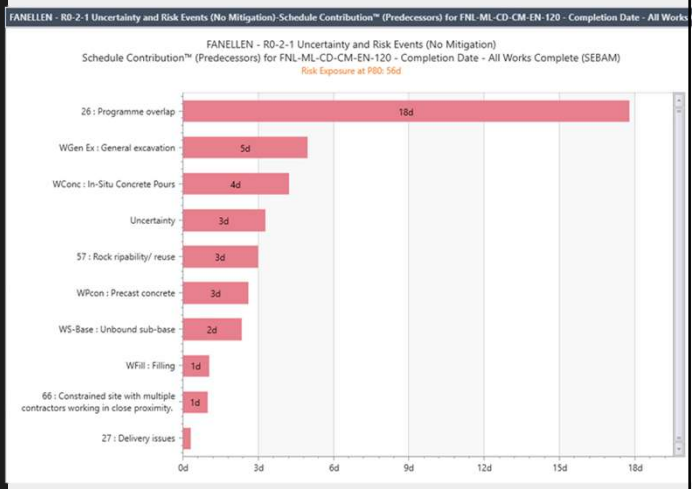
FNL-ML-CD-CM-EN-120: Completion Date - All Works Complete (SEBAM)



Risk Drivers at P80

- 26 : Programme overlap has a total impact of 18 days.
- WGen Ex : Weather Affecting General excavation has a total impact of 5 days.
- WConc : Weather Affecting In-Situ Concrete Pours has a total impact of 4 days.
- Duration Uncertainty has a total impact of 3 days.
- 57 : Rock ripability/ reuse has a total impact of 3 days.

FNL-ML-CD-CM-EN-120: Completion Date - All Works Complete (SEBAM)



Summary of Civils Handover

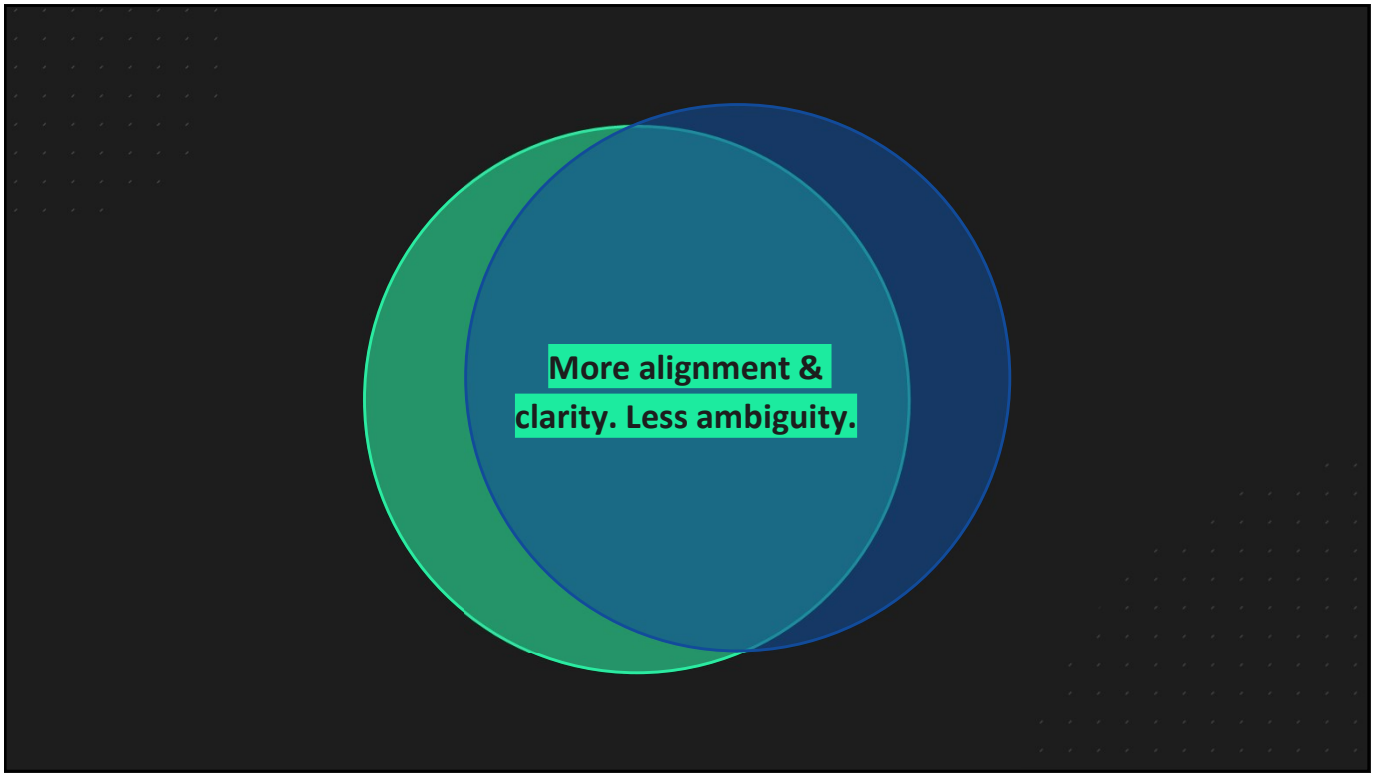
Activity ID	Activity Name	Finish (TRA Removed)	BL Project Finish (TRA inc)	QSRA P80	Diff. P80 Vs Prog with TRA (Col. G-Col. D) (Cal. Days)
BAM Handover Milestones					
AREA 01					
FNL-PB-PLT-A1-CB-HO-LVAC-110	Control Building - LVAC Room Access (TBC)	16-Aug-27	09-Sep-27	15-Sep-27	6
FNL-PB-PLT-A1-CB-HO-RELY-120	Control Building - Relay Room Access (TBC)	23-Aug-27	16-Sep-27	22-Sep-27	6
FNL-PB-PLT-A1-CB-HO-BATT-130	Control Building - Battery Room Access (TBC)	08-Sep-27	06-Oct-27	12-Oct-27	6
FNL-PB-PLT-A1-CB-HO-TELE-140	Control Building - Telecom Room Access (TBC)	15-Sep-27	13-Oct-27	19-Oct-27	6
AREA 02					
FNL-BAM-HO-SIE-A2-100	Area 2 - Handover	16-Aug-27	25-Aug-27	01-Sep-27	7
AREA 03					
FNL-BAM-HO-SIE-A3-100	Area 3 - Handover	25-Aug-27	08-Sep-27	14-Sep-27	6
AREA 04					
FNL-BAM-HO-SIE-A4-100	Area 4 - Handover	05-Aug-27	19-Aug-27	24-Aug-27	5
AREA 05					
FNL-BAM-HO-SIE-A5-100	Area 5 - Handover	23-Jul-27	09-Aug-27	12-Aug-27	3
AREA 06					
FNL-BAM-HO-SIE-A6-100	Area 6 - Handover	11-Oct-28	30-Nov-28	30-Jan-29	61
AREA 07					
FNL-BAM-HO-SIE-A7-100	Area 7 - Handover	04-Oct-28	22-Nov-28	30-Jan-29	69
AREA 08					
FNL-BAM-HO-SIE-A8-100	Area 8 - Handover	29-Nov-28	08-Feb-29	19-Mar-29	39
AREA 09					
FNL-BAM-HO-SIE-A9-100	Area 9 - Handover	23-Nov-28	31-Jan-29	13-Mar-29	41
Substation - Civils Platform Finishes					
FNL-PB-PLT-FIN-GEN-100	Finishes - Completion of All Civils Main Works (Excl Grouting & Chipping works)	06-Jun-29	30-Jul-29	18-Sep-29	50

You can see from the table that the "Estimated TRA" is insufficient in comparison to the "Quantified Schedule Risk", particularly in areas 6-9.

The EHAB<>BAM approach for Project Planning

Benefits for Planning Engineers

- **EHAB Simplifies Weather Risk Management**
- **Provides Precise And Actionable Insights For Planning Engineers**
- **Enhances Programme Clarity And Project Outcomes**
- **Improved Productivity**
- **Reduced Disputes**
- **Focus on ROI: Time and Cost Savings**



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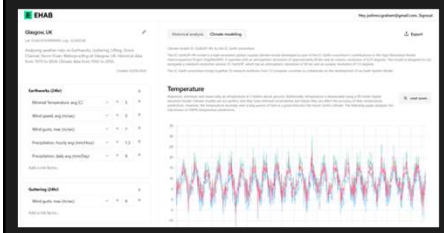
EHAB Platform

Data



Data specific to
your location

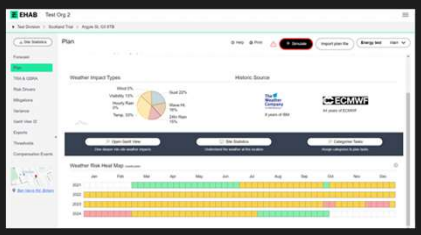
56

EHAB Platform

Data

Data specific to your location

Schedule



Risks associated to each activity type

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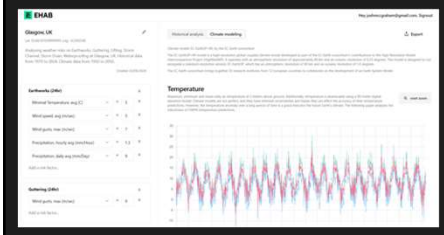
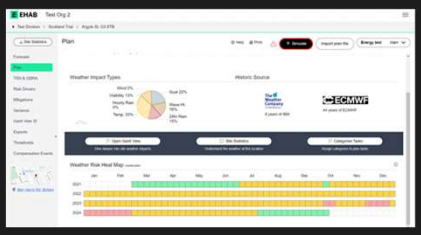
EHAB Platform

Data



Data specific to your location

Schedule



Risks associated to each activity type

Proactive Reports

Early warnings, reports & data

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EHAB
Precision Weather
& Risk Assessment
Forecasts
Questions?
josh.graham@ehab.co