

Climate Risks relevant to steelmaking operations – Water

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Steel Industry Context – Water

Industry context

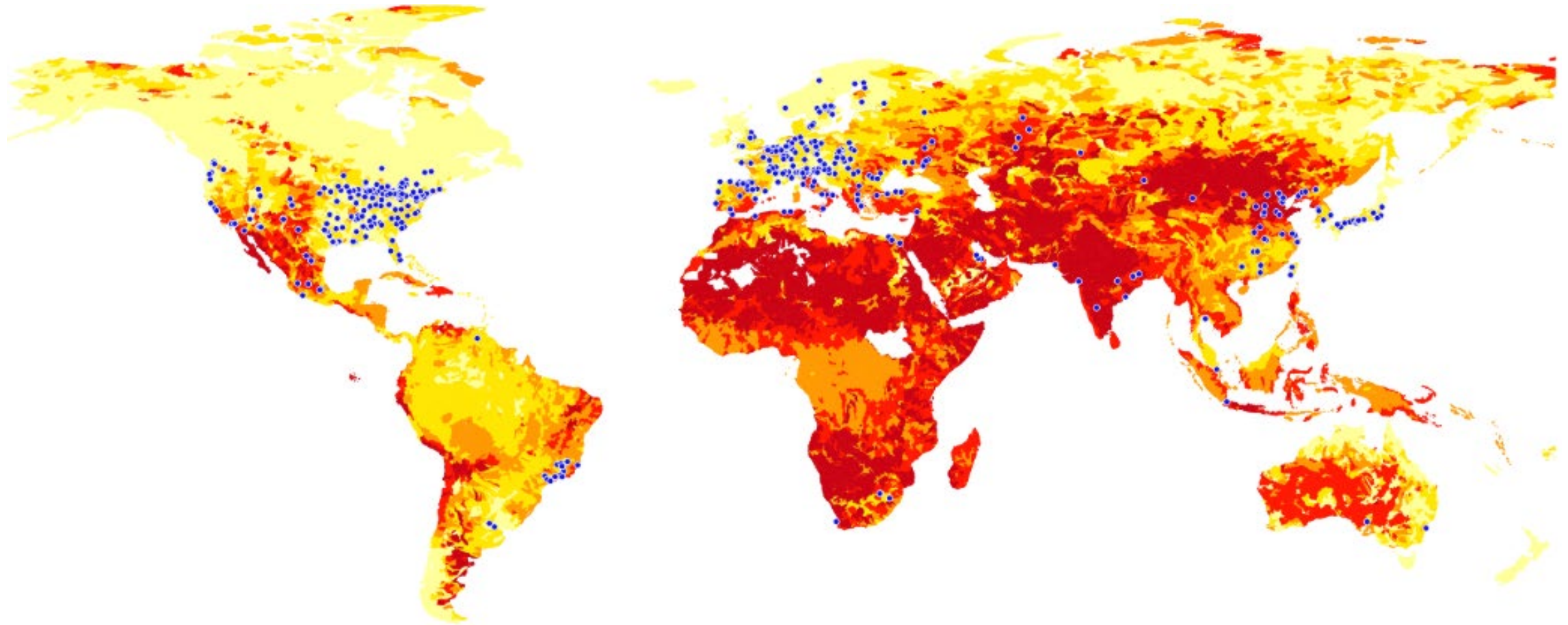
Steel is a water-dependent industry with concentrated physical exposure

- ~ 1.8 – 1.9bn tonnes steel/year globally
- Steel uses ~1.5 – 4 m³ water per tonne

| Production route | Approximate share (global) | Water use (m ³ /t CS) | Relative level |
|------------------|----------------------------|----------------------------------|----------------|
| BF-BOF | 68-70% | 5 – 6 | High |
| EAF | 25-30% | 1 – 2 | Low |
| DRI-EAF | 3-7% | 2 – 3 | Medium |

Steel production is geographically fixed and inherently exposed to climate-driven water constraints.

Water Stress



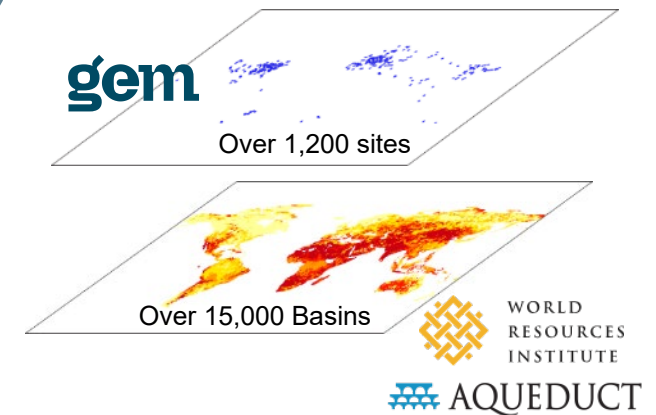
Water stress analysis – Methodology

Asset-level exposure to water stress (WRI-Aqueduct scenario analysis)

- WRI Water Stress indicators mapped to assets (1,200 sites, ~ 1.9Gt)
- Scenario pathways: Baseline, BAU, OPT, PES (2030–2080)
- Risk scale assignment (GIS)
- Capacity-weighted aggregation

Output:

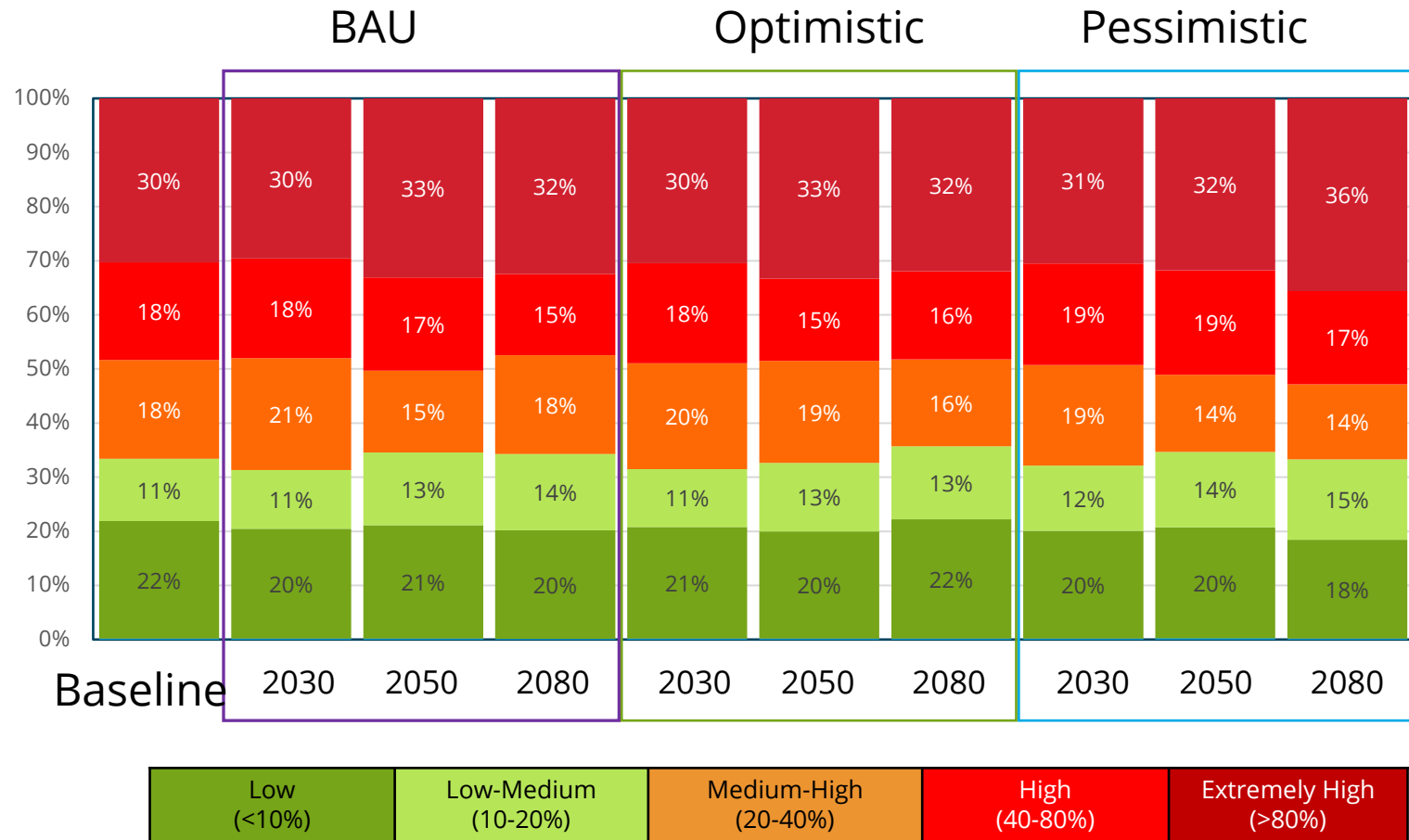
- Exposure distribution shifts over time
- Portfolio concentration in high stress basins



Holding the asset base constant and observing how external hydrological stress evolves over time

Water stress analysis – Results

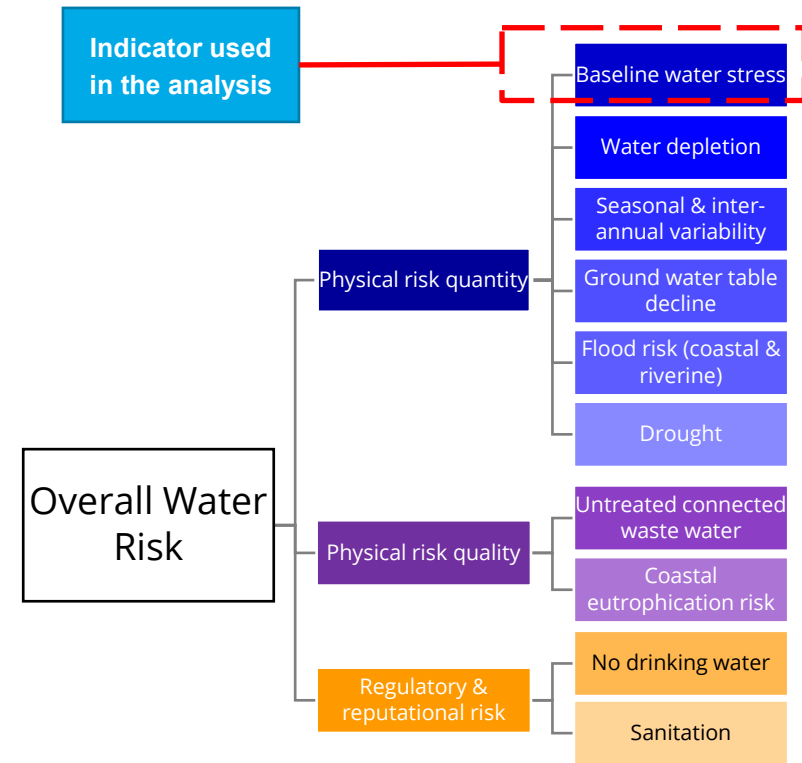
- Movement from mid-risk → high-risk basins
- Concentration in Risk categories **High** to **Extremely High** increases
- Scenario variation affects magnitude, not direction



Water stress intensifies across all pathways.

Water stress analysis – Implications

- Exposure concentration risk could increase over time
- Certain basins will become systemic stress zones
- Asset-level risk assessment is required (based on catchment)



Besides Baseline Water Stress, other risks could be equally or more important in local context

Coastal Flood Risk



Coastal flood methodology

First-order flood exposure model using Site Elevation and coastal proximity

- Weighted exposure index:

$$\text{CEI} = 0.6 * \text{Elevation} + 0.4 * \text{Proximity}$$

- Risk bands (1–5)

Elevation Score

| Elevation (m) | Score |
|---------------|-------|
| < 2 | 5 |
| 2 – 5 | 4 |
| 5 – 10 | 3 |
| 10 – 20 | 2 |
| > 20 | 1 |

Costal Proximity Score

| Distance (km) | Score |
|---------------|-------|
| < 1 | 5 |
| 1 – 5 | 4 |
| 5 – 20 | 3 |
| 20 – 50 | 2 |
| > 50 | 1 |

Relative exposure ranking across assets

Coastal flood risk results

High exposure in Risk 4-5 coastal bands

- High exposure in Risk 4-5 coastal bands:
 - 120 sites, over 330Mt combined capacity
- Strong geographic clustering
- Exposure driven by topography, not operations

| Coastal Exposure Index (CEI) | No. of sites | Total Capacity (kt) |
|------------------------------|--------------|---------------------|
| 1 | 639 | 1,295,370 |
| 2 | 100 | 162,942 |
| 3 | 135 | 407,769 |
| 4 | 83 | 205,710 |
| 5 | 37 | 130,694 |
| Total | 994 | 2,202,485 |

Coastal exposure is structurally embedded in asset geography.

Summary & Conclusions

Combined risk view

Dual hazard exposure: chronic water stress + acute coastal risk

- Water stress = Chronic constraint
- Coastal flood = Acute disruption risk
 - Some assets could be exposed to both risks

Key insight:

- Portfolio risk is multi-dimensional and spatially concentrated.



Interpretation & limitations

Results represent a screening-level physical exposure model

✓ Captures:

- Relative exposure patterns
- Portfolio concentration
- Structural geographic risk

X Does NOT capture:

- Flood depth or probability
- Storm surge modelling
- Adaptation / infrastructure
- Financial loss or pricing

Possible future analyses

- Flood risk modelling (acute risk) (site-level DEM)
- Basin-level water competition (deep GIS)
- BF-BOF vs EAF, Hydrogen based DRI (water use intensity)
- Expected production disruption modelling
- Insurance loss proxy modelling

This is a foundational exposure layer for climate-aligned industrial risk assessment.

Please contact



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