

A whole-railway reliability approach to planning for things that will probably never happen

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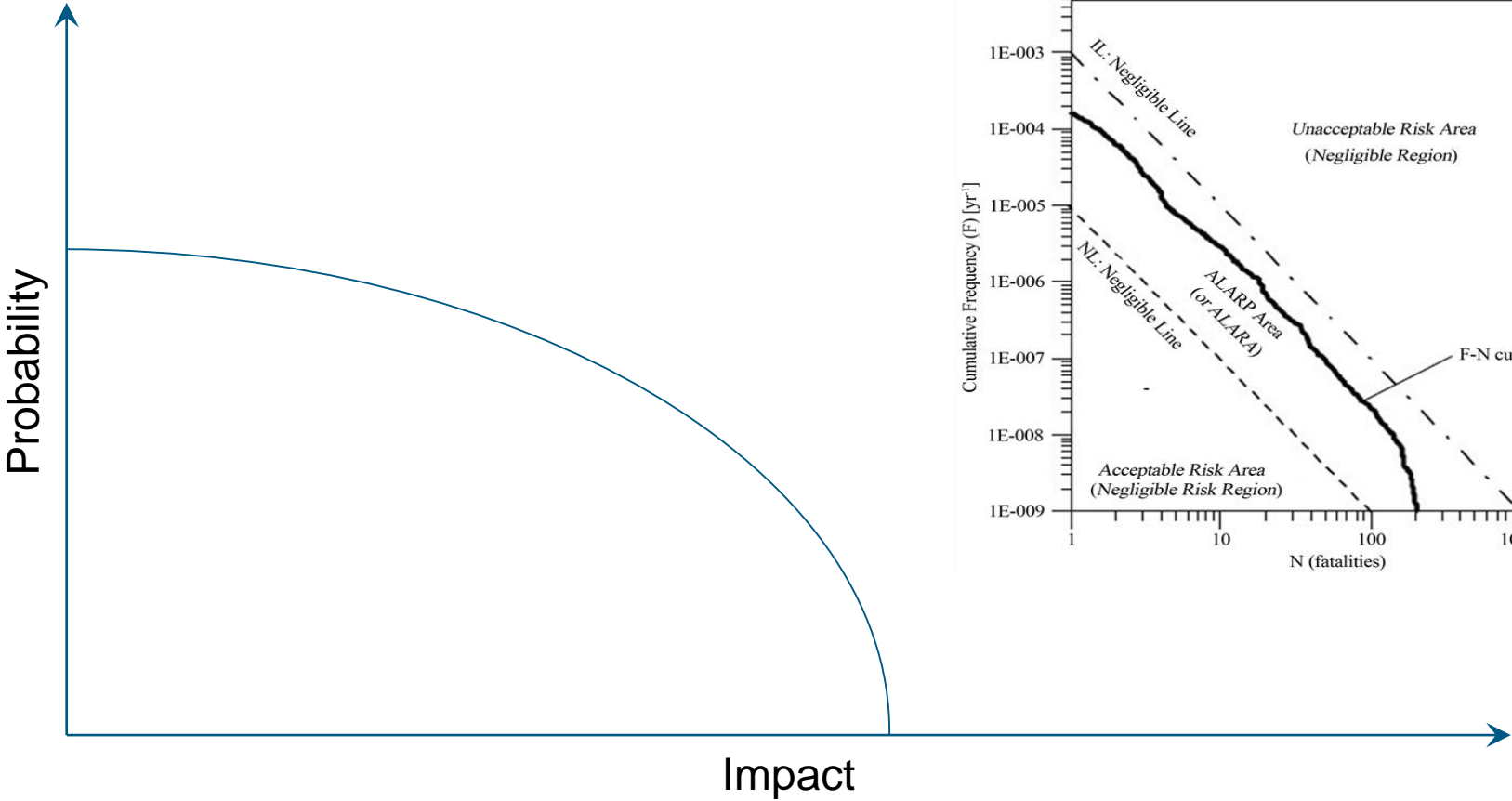
Things that will probably never happen...



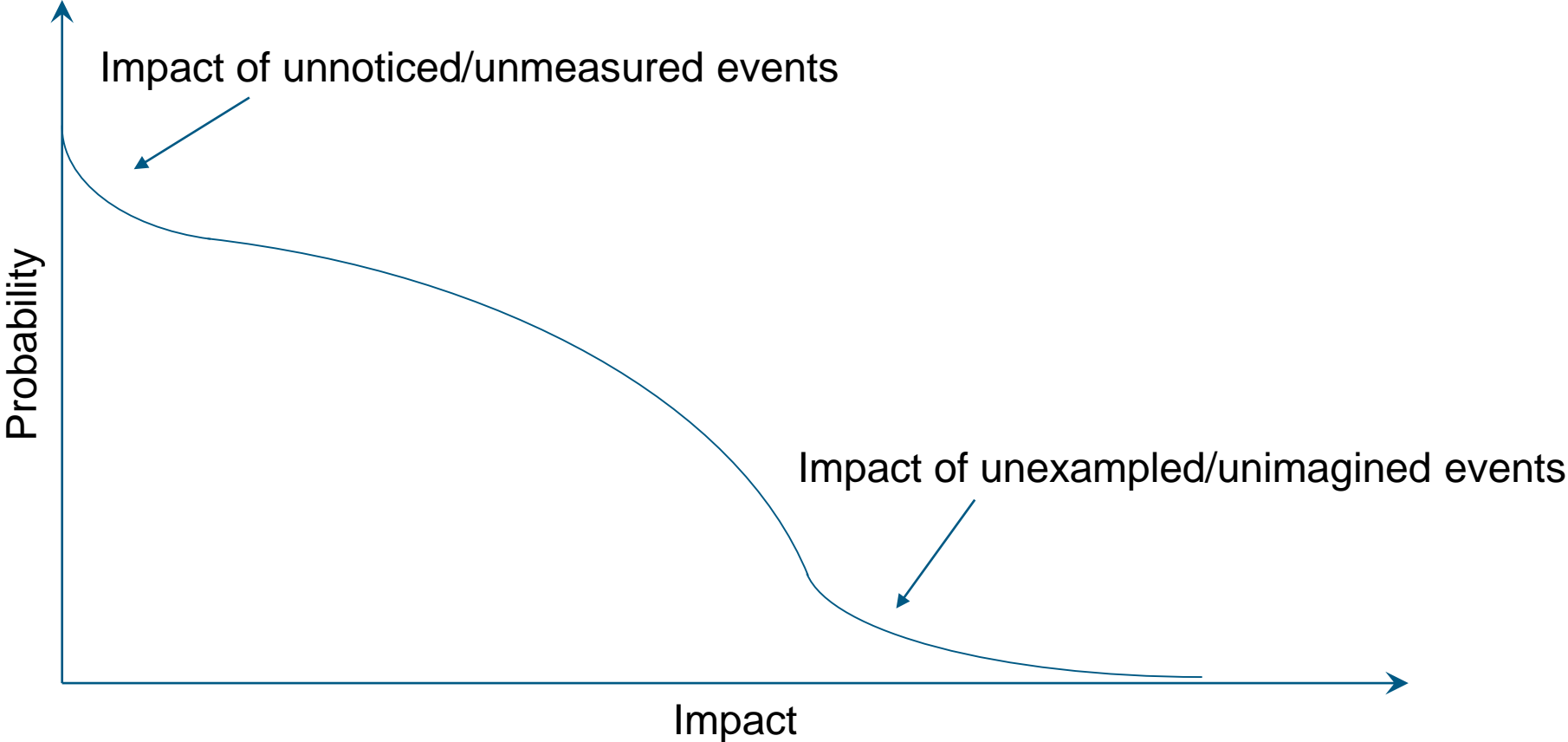
OUTAGE

FROM 2014-05-
FURTHER NOTICE

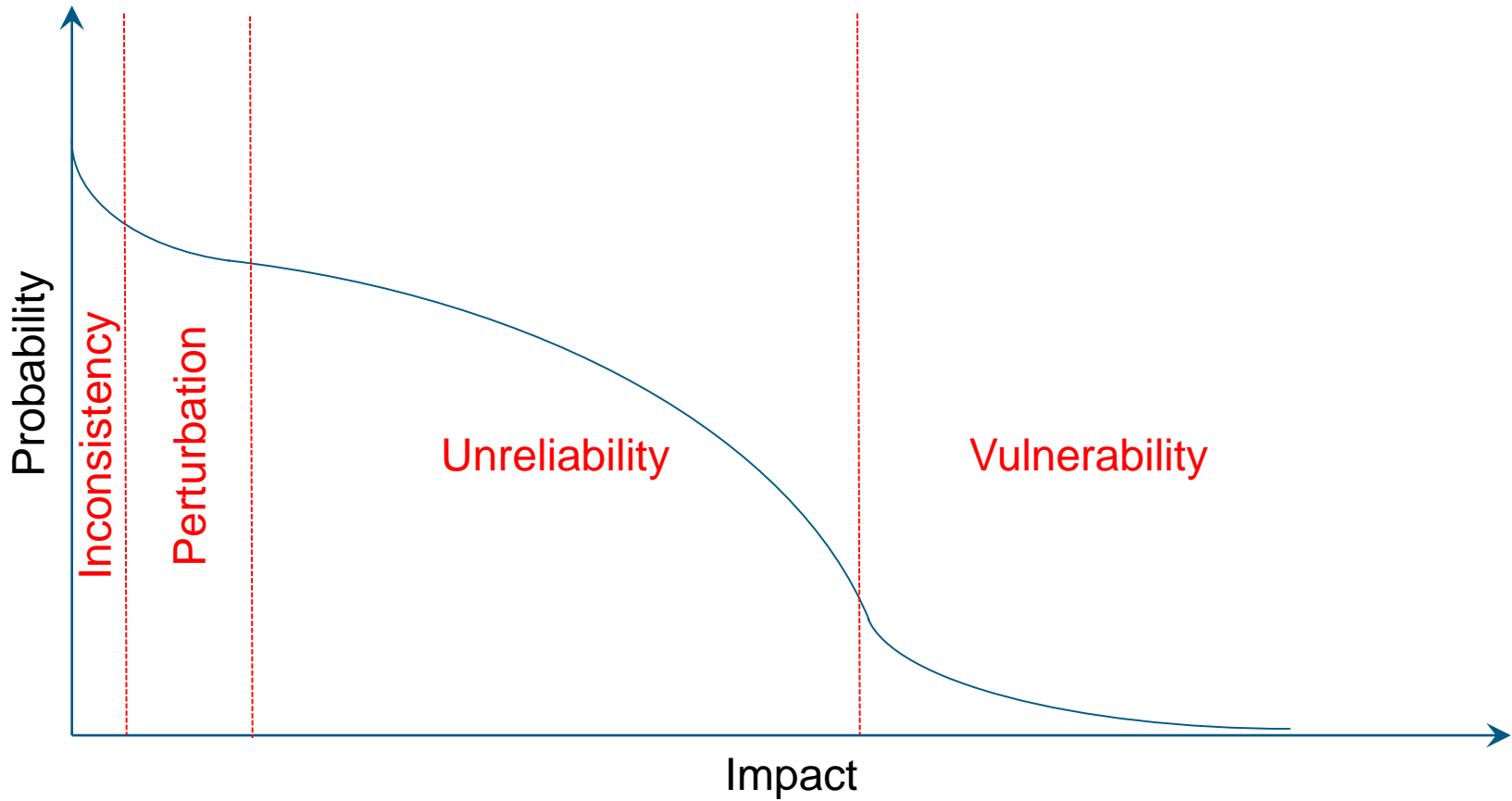
A Typical Railway System F/N Curve



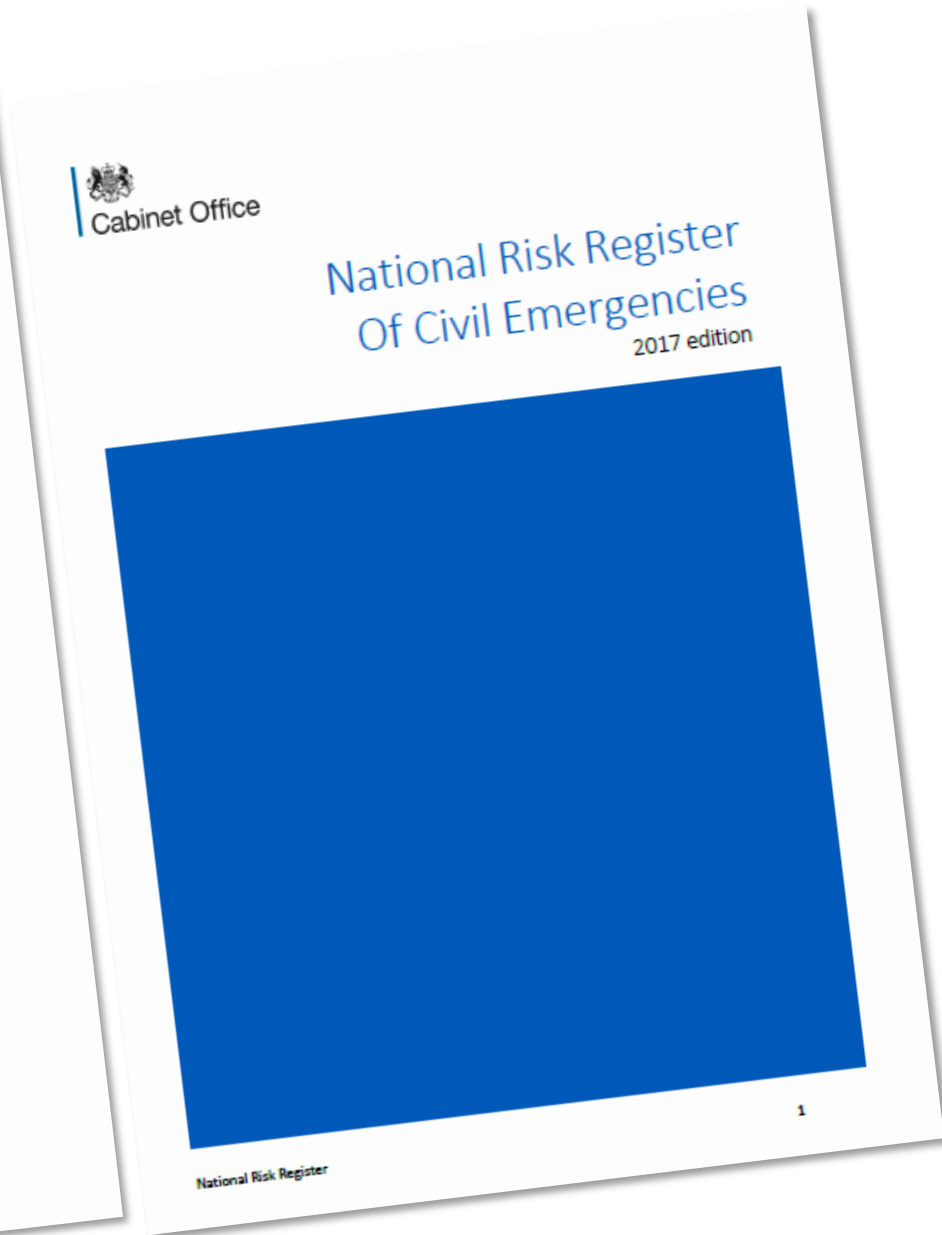
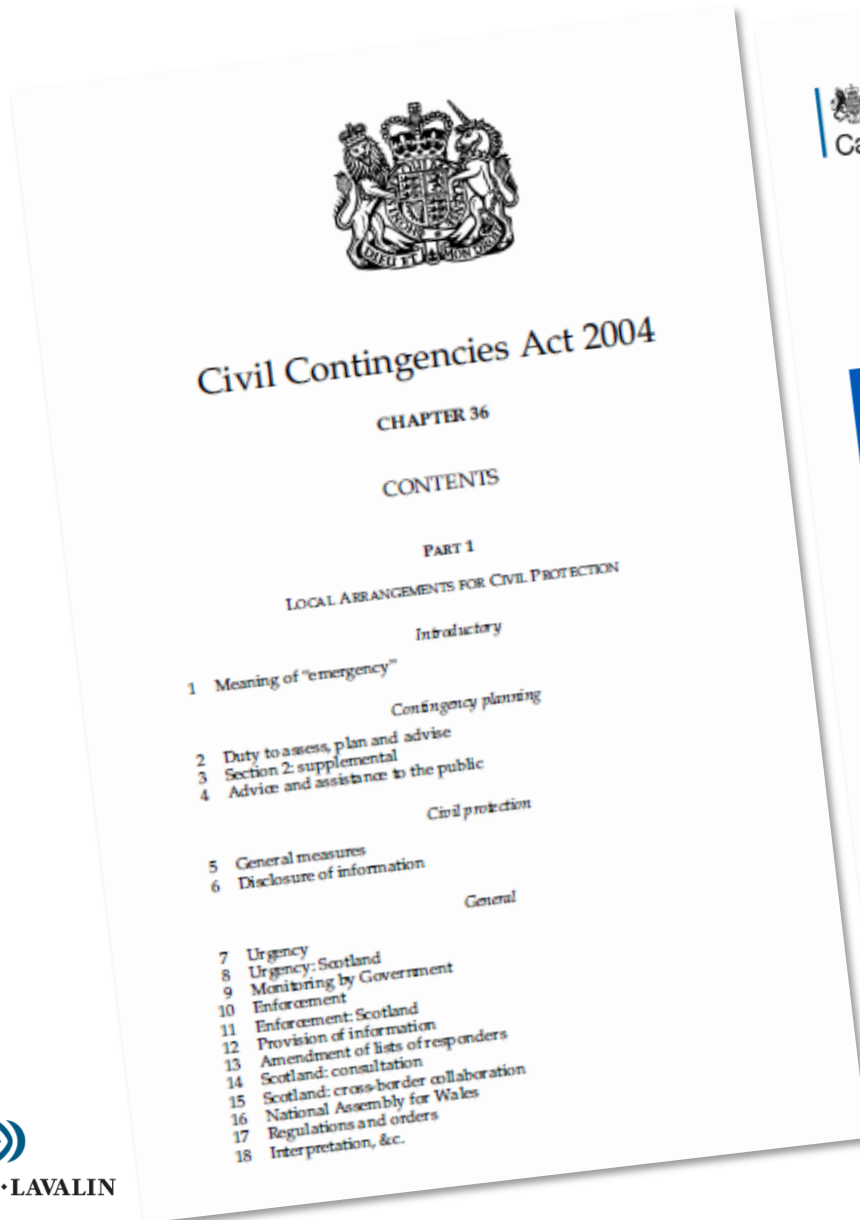
A Practical Railway System F/N Curve?



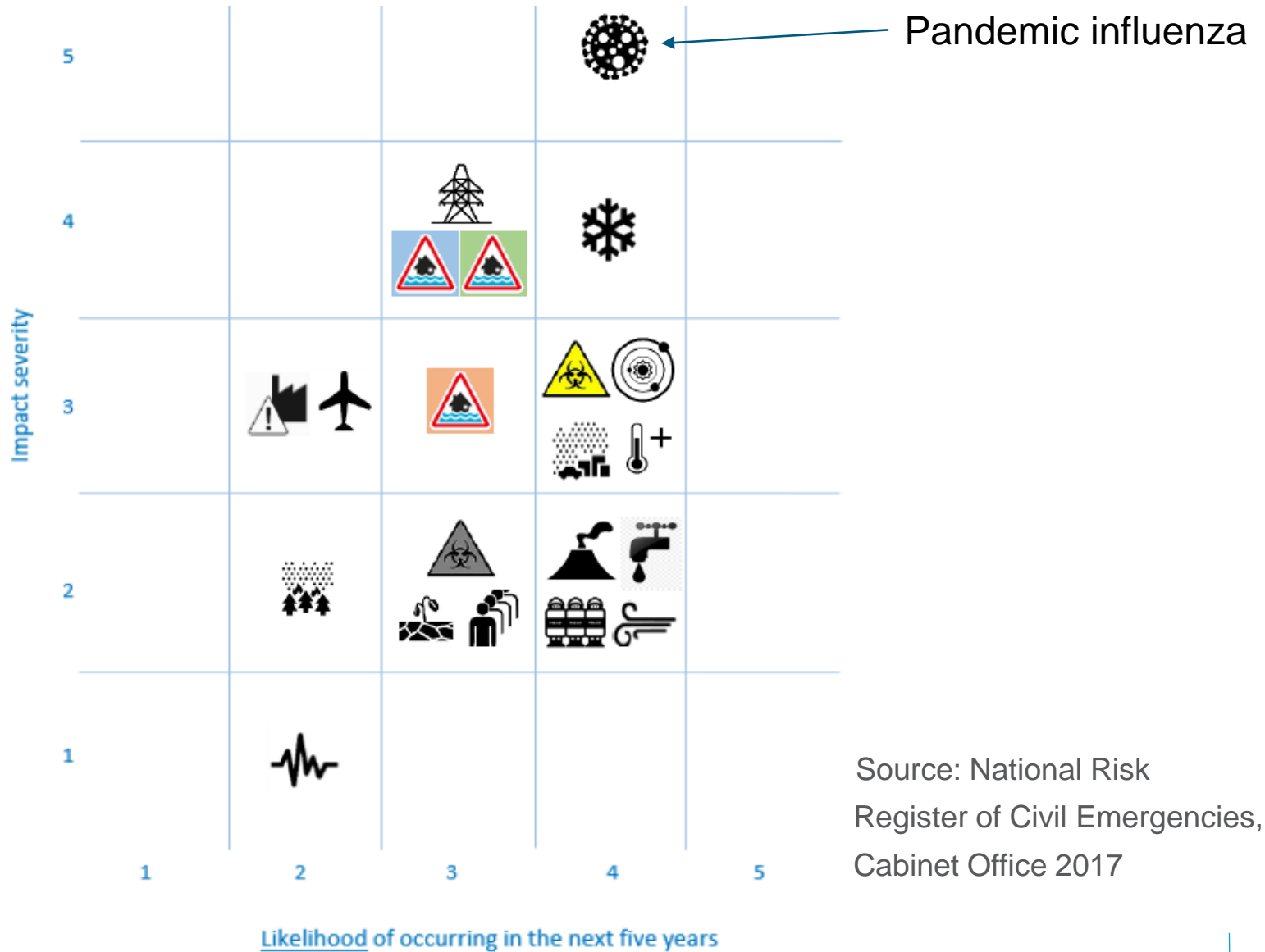
Zones of the Railway System F/N Curve



National Guidance

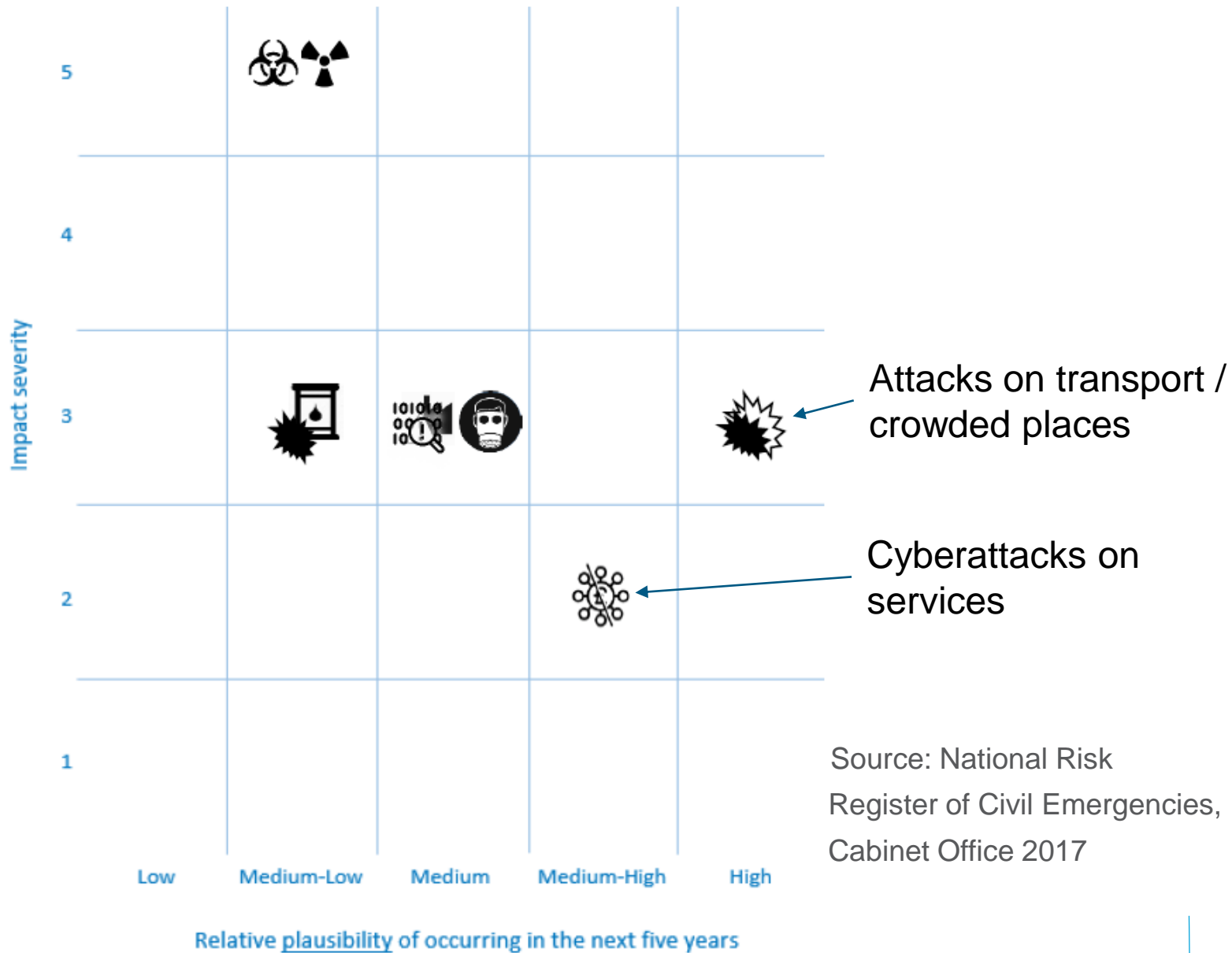


UK hazards, diseases, accidents & societal risks



Source: National Risk Register of Civil Emergencies, Cabinet Office 2017

UK malicious attack risks



Pandemic Flu UK government assumptions

- Up to 50% of the UK population experiencing symptoms
- 15 – 20% absence rates in the peak fortnight of pandemic
 - Small / specialised teams to plan for 30% staff absence
 - This rises to 50% if staff have caring responsibilities
 - Impact of school closures
- Fatality of 0.03% - 1.13% of the population
- Supply chain disruption if borders are closed
- Lack of performance from suppliers due to staff shortages

Sources:

National Risk Register of Civil Emergencies, Cabinet Office 2017

National Business Risk Planning Assumptions, Cabinet Office 2015

Pandemic Influenza Strategic Framework, Public Health England 2014

Pandemic Flu impact on the railway

- Staff absence
 - Illness
 - Caring for sick dependents
 - Bereavement
 - Fear of becoming infected
 - Travel/other logistic difficulties
- Impact of suppliers failing to deliver
 - Impact on international supply chains
 - Catering, cleaning, staff transport, maintenance...
- Change in ridership due to passengers being sick etc.
 - Increased sanitisation requirement for cleaning teams?

Mitigating Pandemic Flu impact on the railway

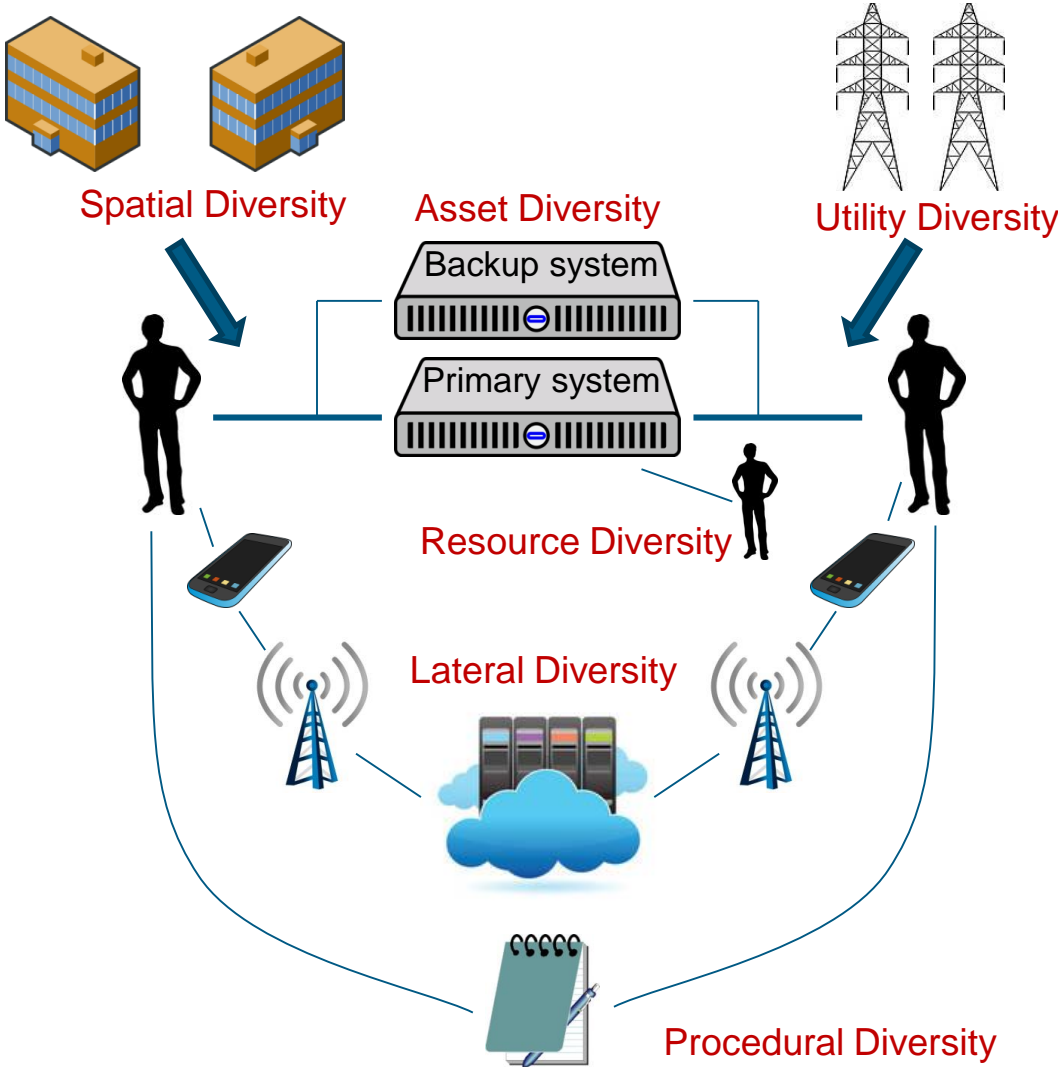
➤ Staff absence

- Multiskilling staff to give flexibility / commonality of systems and processes
- Prevention: health advice / flu vaccination / sanitising workplace
- Support for caring responsibilities (e.g. childcare)
- Prioritising maintenance – risk-assessing changes to schedules
- Diverse systems so faults do not require immediate intervention
- Working from home
 - Frontline staff
 - Automation / de-manning stations
 - Control staff?
 - How many roles could take place off-site?
 - What additional facilities / changes to procedure would be required?
 - What effect would this have on risk?

Mitigating Pandemic Flu impact on the railway

- Impact of suppliers failing to deliver
 - Stock levels for critical components
 - Real-time communication of ability to deliver?
 - Alternative suppliers
- Change in ridership due to passengers being sick etc.
 - Change service patterns to match limited resources to limited demand?
- How critical is this railway anyway?

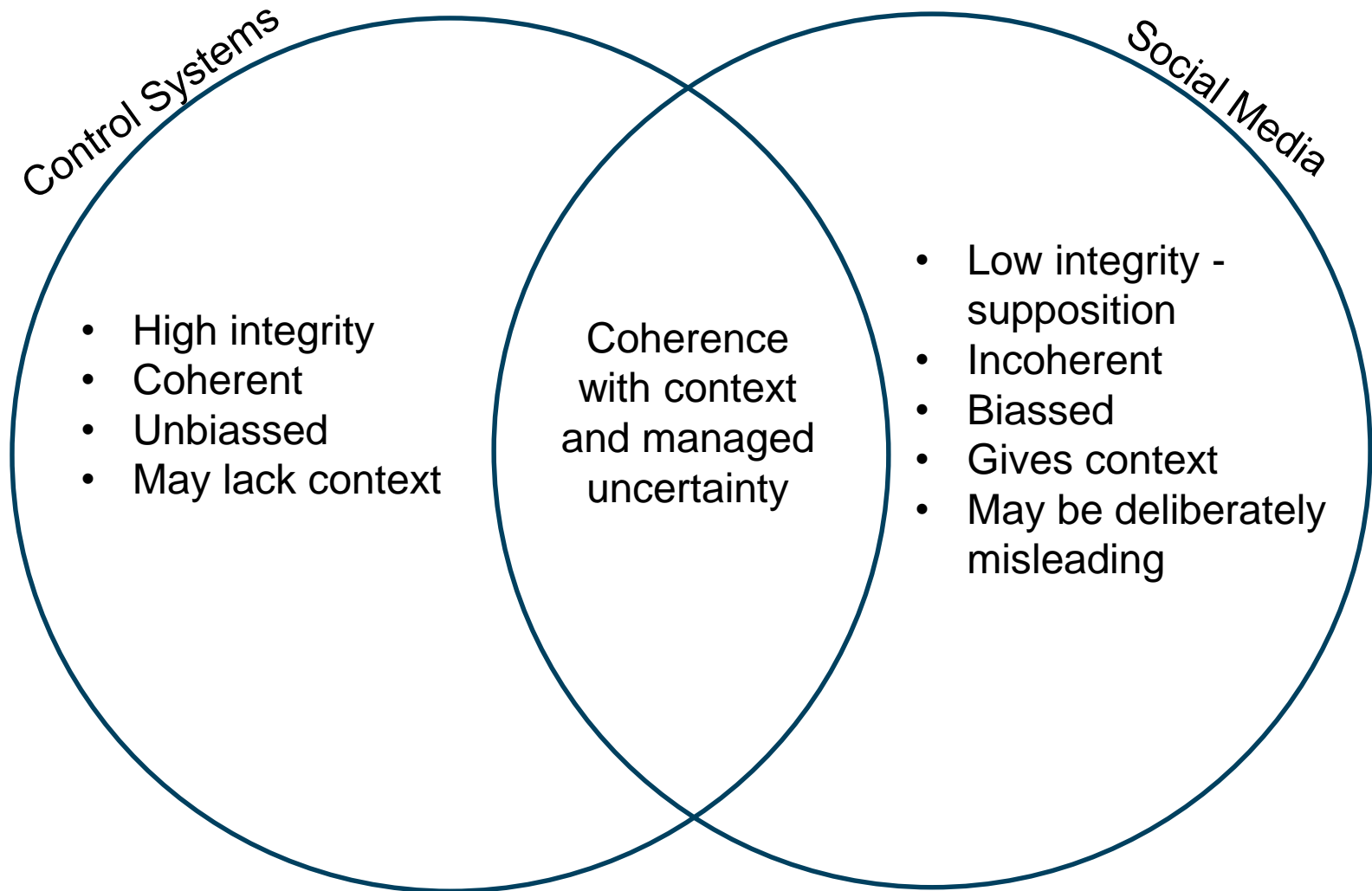
A whole-railway system resilience model



Situational Awareness



Situational Awareness from Social Media



Conclusions

- Ensure your probability/impact curve is complete
 - Include unnoticed/unmeasured as well as unexampled/unimaginable hazards
 - Don't discard potential hazards until they have been evaluated!
- Look at advice from government agencies and the experience of other railways when identifying low-probability high-impact hazards
- Plan for failure scenarios rather than asset failures
 - Use whole-railway thinking to find cost-effective techniques for maximising railway resilience
- Provide diverse sources of situational awareness for service controllers, including non-conventional sources such as open data and social media
- Test your resilience before circumstances test it for you.