



Cascading hazards and risk interaction

How complex should our assessments be?

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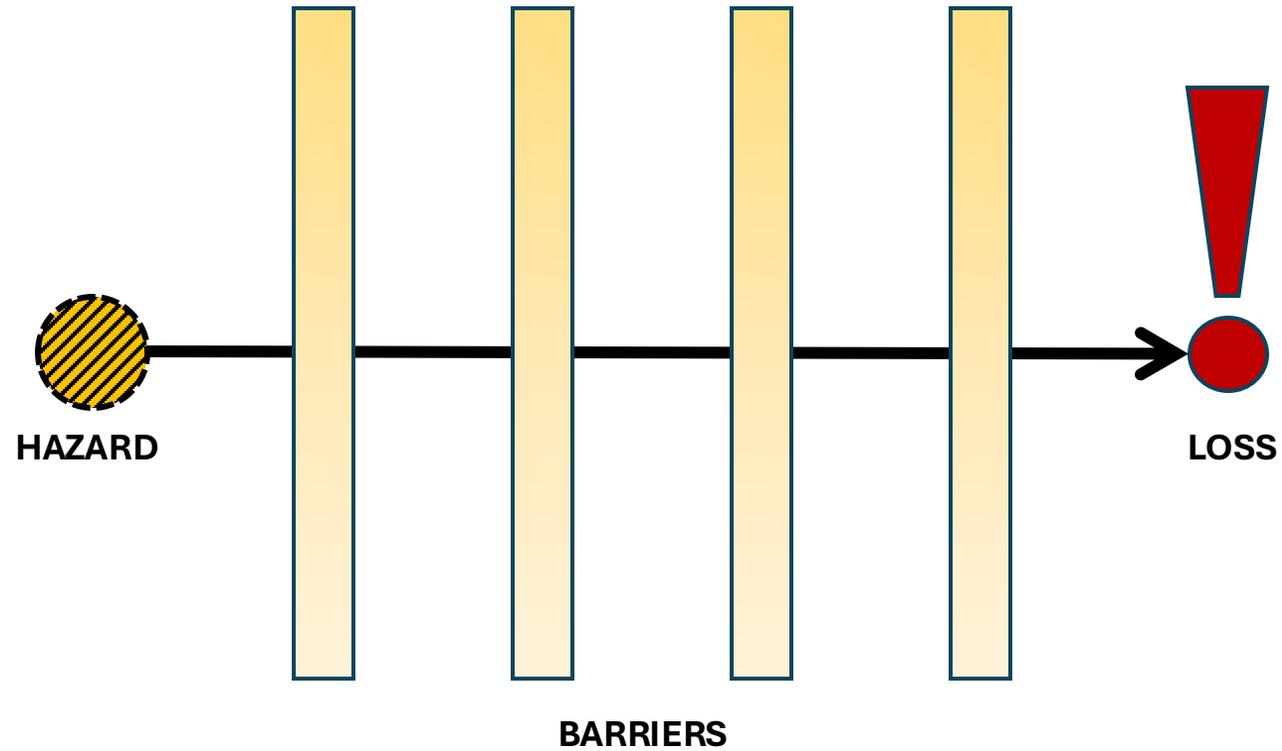
Process safety thinking

- Scenario identification – domino effects, external impacts
- Barrier identification
- Risk estimation

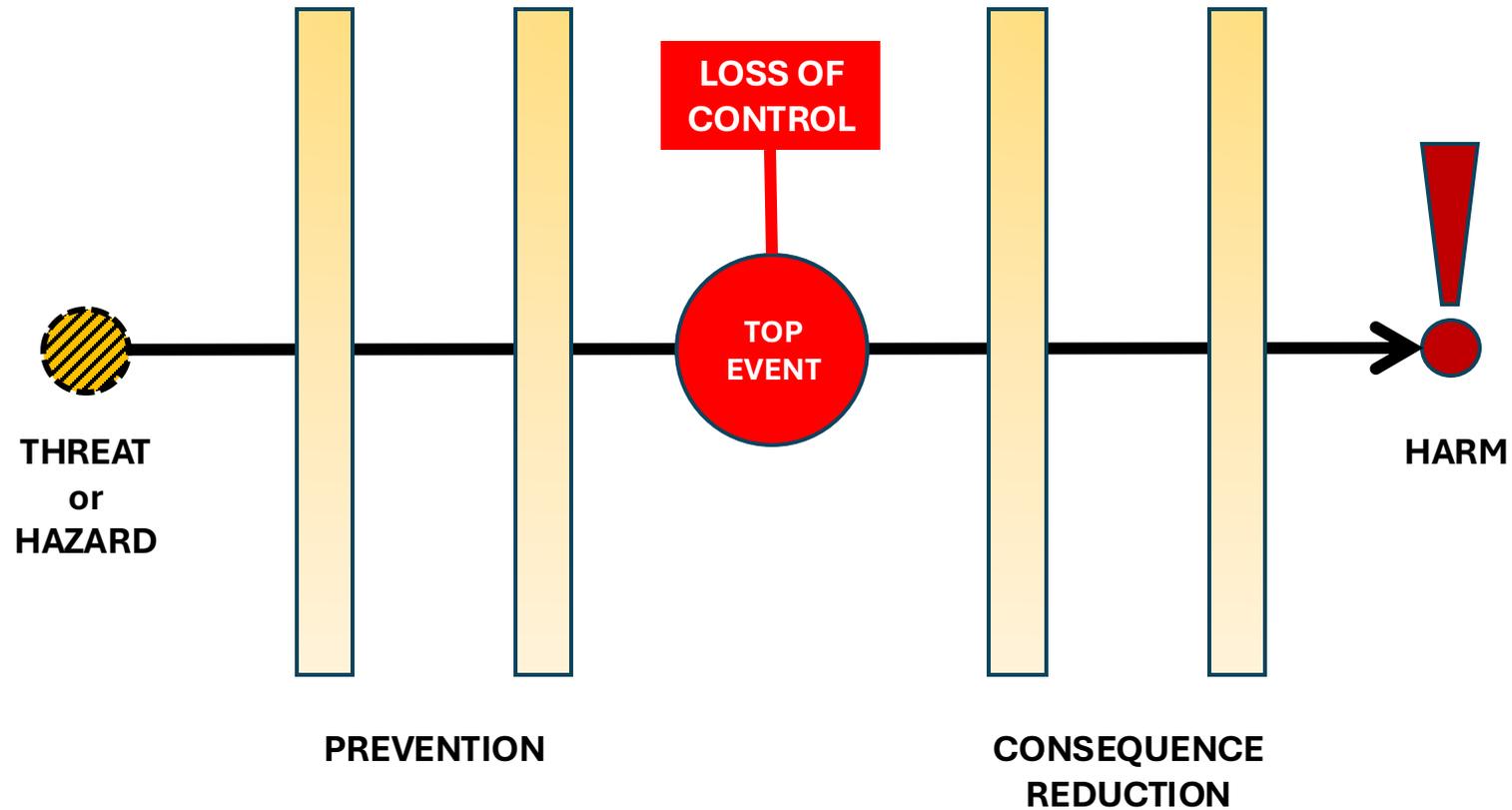
- Operate
- Maintain
- Control change
- Review



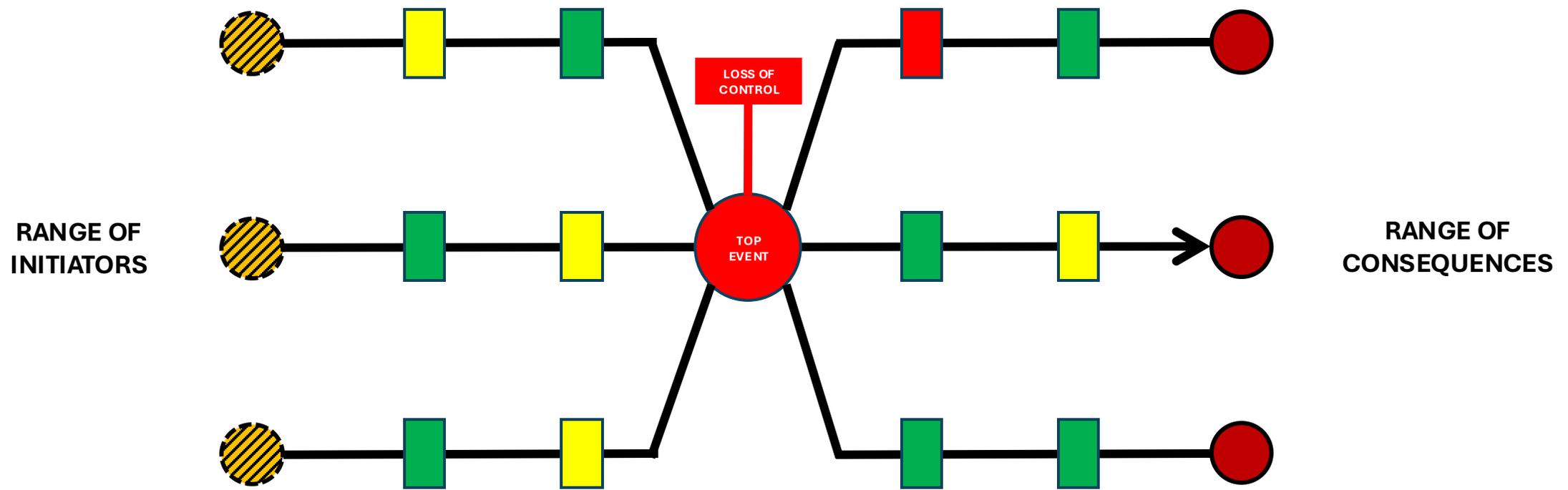
Hazard / barriers / loss



Initiator / barriers / loss of control / barriers / consequence



Complexity!



An example of interacting risks

Mumbai High North

- July 2005
- Oil/gas rig complex lost
- Support vessel lost
- 22 fatalities



Caused by a cut finger?



Lessons for risk management - Consequence as a driver:



- Designs and risk assessments don't need to identify all individual initiators in detail
- Don't have to dismiss unusual initiation
- Rules may have to downgrade some risks to limit worst consequence
- Humans need help to maintain focus on worst consequence when they make decisions in emergent or uncertain situations
- Less-than-worst consequences also need to be considered