

Hazard Combinations

Consideration of Causal, Consequential, and Coincidental Relationships for External and Internal Hazards

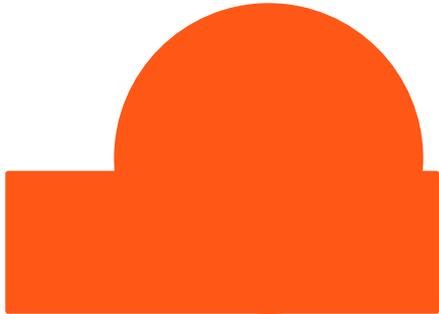
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Definitions of Hazards

Internal Hazards:

Hazards to the safety of the nuclear power plant that originate from within the site boundary and are associated with failures of facilities and activities that are under the control of the operating organisation

IAEA SSG-77



External Hazards:

hazards that originate from outside the site boundary and outside the activities that are under the control of the operating organisation

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Anthropogenic (“Man-Made” or “Human Induced”):

hazards due to human activities and over which humans could have had control over the magnitude or frequency

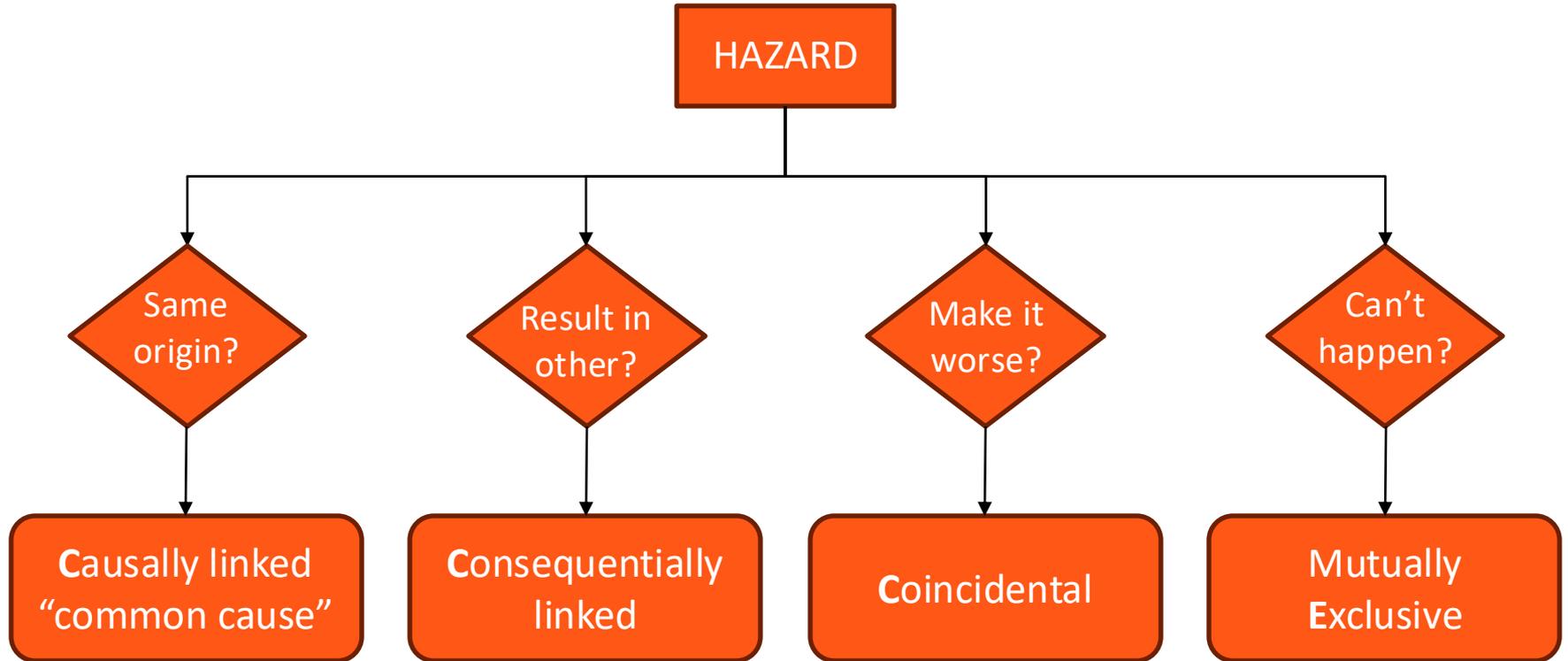
WENRA External Hazards Head Document

Natural Hazards:

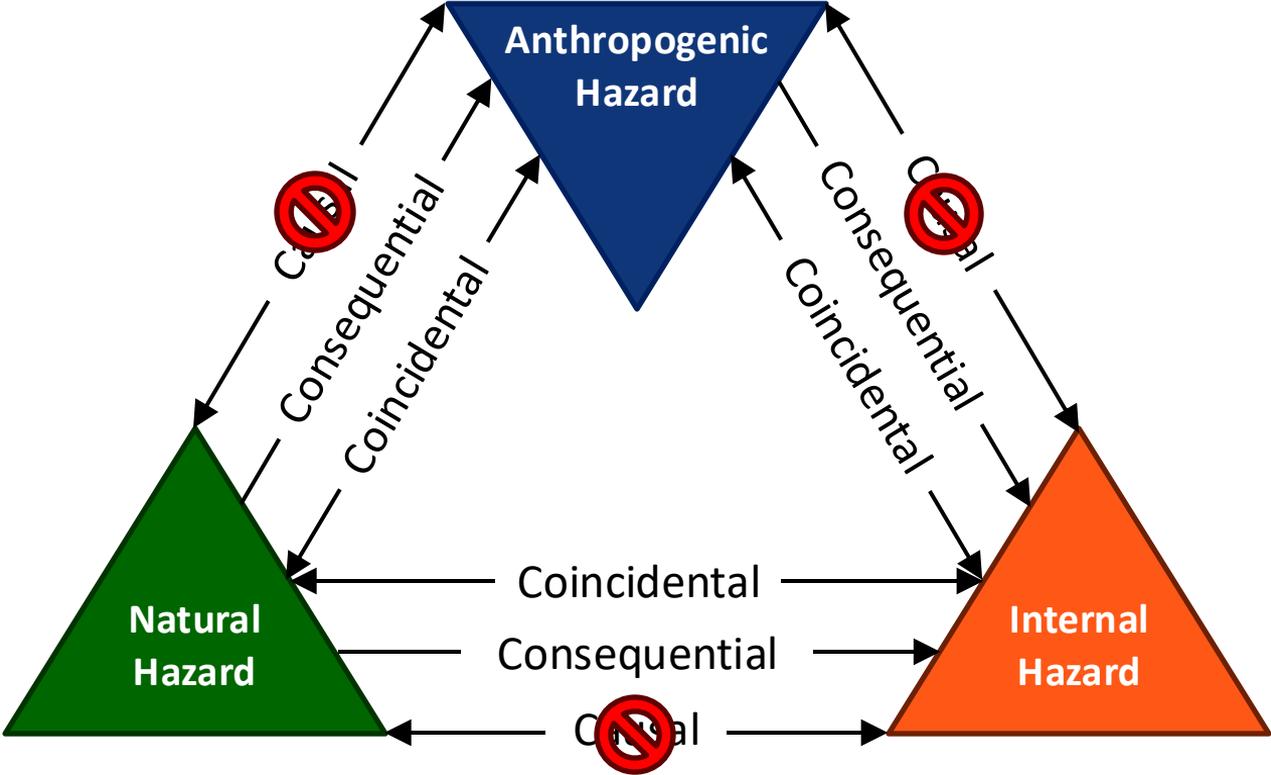
hazards which occur in nature over which humans have little or no control over the magnitude or frequency

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“I’ll take three Cs and an E”



Relationships



A Systematic Approach

Ca	Causal
Cn	Consequential
Ci	Coincidental
E	Mutually Exclusive

1. Causal - Summer Storm
2. Causal - Winter Storm
3. Consequential – Earthquake
4. Consequential – Lightning strike
5. Consequential – Heavy Rain causes high water table
6. Consequential – Offsite fire spread to site
7. Consequential – Fire suppression system causes flooding
8. Coincidental - Liquefaction
9. Coincidental - Soil moisture content effects conductivity, and earthing systems
10. Mutually Exclusive – Simultaneous High and Low Temperatures

	Seismic	Lightning	Rainfall	Hail	Groundwater	High Air Temp.	Low Air Temp.	Ext. Flooding	Ext. Fire	Int. Flooding	Int. Fire
Seismic								Cn ³	Cn ³	Cn ³	Cn ³
Lightning			Ca ¹	Ca ¹		Ca ¹		Cn ⁴	Cn ⁴	Cn ⁴	Cn ⁴
Rainfall		Ca ¹		Ca ¹	Cn ⁵	Ca ¹					
Hail		Ca ¹	Ca ¹			Ca ¹	Ca ²				
Groundwater	Ci ⁸	Ci ⁹									
High Air Temperature		Ca ¹	Ca ¹	Ca ¹			E ¹⁰				
Low Air Temperature				Ca ²		E ¹⁰					
External Flooding											
External Fire											Cn ⁶
Internal Flooding											
Internal Fire										Cn ⁷	

Thanks very much!