

Risk Management Tools For Port Security, Critical Infrastructure, and Sustainability

NATO Advanced Research Workshop

Protection of hazardous installations and critical infrastructures - complementarity of safety and security approaches: application of the ARAMIS methodology

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INERIS: profile & main fields

- Created in 1990, INERIS is a public institute under the supervision of the French Ministry of the Environment.
 - INERIS' first objective is to more fully understand and anticipate dangerous phenomena associated with accidents for improved risk prevention
 - **Accidental risks**, fire risks and explosion risks associated with industrial activities and the transportation of hazardous materials.
 - Impacts on the environment and human health associated with technological development and chemical substances.
 - Risks to persons and property arising from quarries and mining
- ⇒ developing methodologies and tools for risk analysis and assessment



Emergence of new risks: Malevolent on chemical sites

E.g: Cellatex - Givet – July 2000



- ⇒ « ...À la suite de la liquidation de CELLATEX, 153 salariés licenciés arrêtent la production et occupent l'usine le 5 juillet 2000...
- ⇒ Au cours de la nuit, 4 feux se déclarent dans les bâtiments. Ils sont maîtrisés. L'usine contient quatre tonnes de sulfure de carbone, 90 tonnes de soude et 50 000 litres d'acide sulfurique. Le 10 juillet, les salariés menacent de « tout faire péter » si leurs revendications ne sont pas satisfaites...Le quartier de la Soie - 500 riverains- est évacué...



Malevolent on chemical sites

E.g: Socatrem - Reims – March 2001

⇒ ...« Les 147 salariés d'une cartonnerie, en liquidation depuis le 6 mars, sans proposition concrète de repreneur, tentent de se faire entendre par le biais de manifestations ponctuelles. Hier, ils sont passés à la vitesse supérieure et ont menacé de faire sauter leur usine...

⇒ ...En ligne de mire, 2 barils de 200 litres de méthyléthylcétone. Il s'agit d'un liquide particulièrement dangereux. Explosif, incendiaire et asphyxiant...Un feu est allumé à proximité des deux barils... » (l'Union du 12 avril 2001)





Malevolent on chemical sites

Daewoo - Mont Saint Martin - January 2003



- ⇒ Difficult social climate
(Company liquidation)
- ⇒ 2 January, 2003 - threat on
chemical storage
- ⇒ 23 January, 2003 - fire on
site caused by malevolent

Report – All establishments were covered by the Seveso Directive or by specific environmental regulations



Emergence of new risks: Attacks on chemical sites or on transportation of dangerous goods



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⇒ *USS Cole – Yemen 2000*

⇒ *Limburg – Yemen 2002*



Emergence of new risks: Attacks on chemical sites or on transportation of dangerous goods



⇒ *USS Cole – Yemen - 2000*

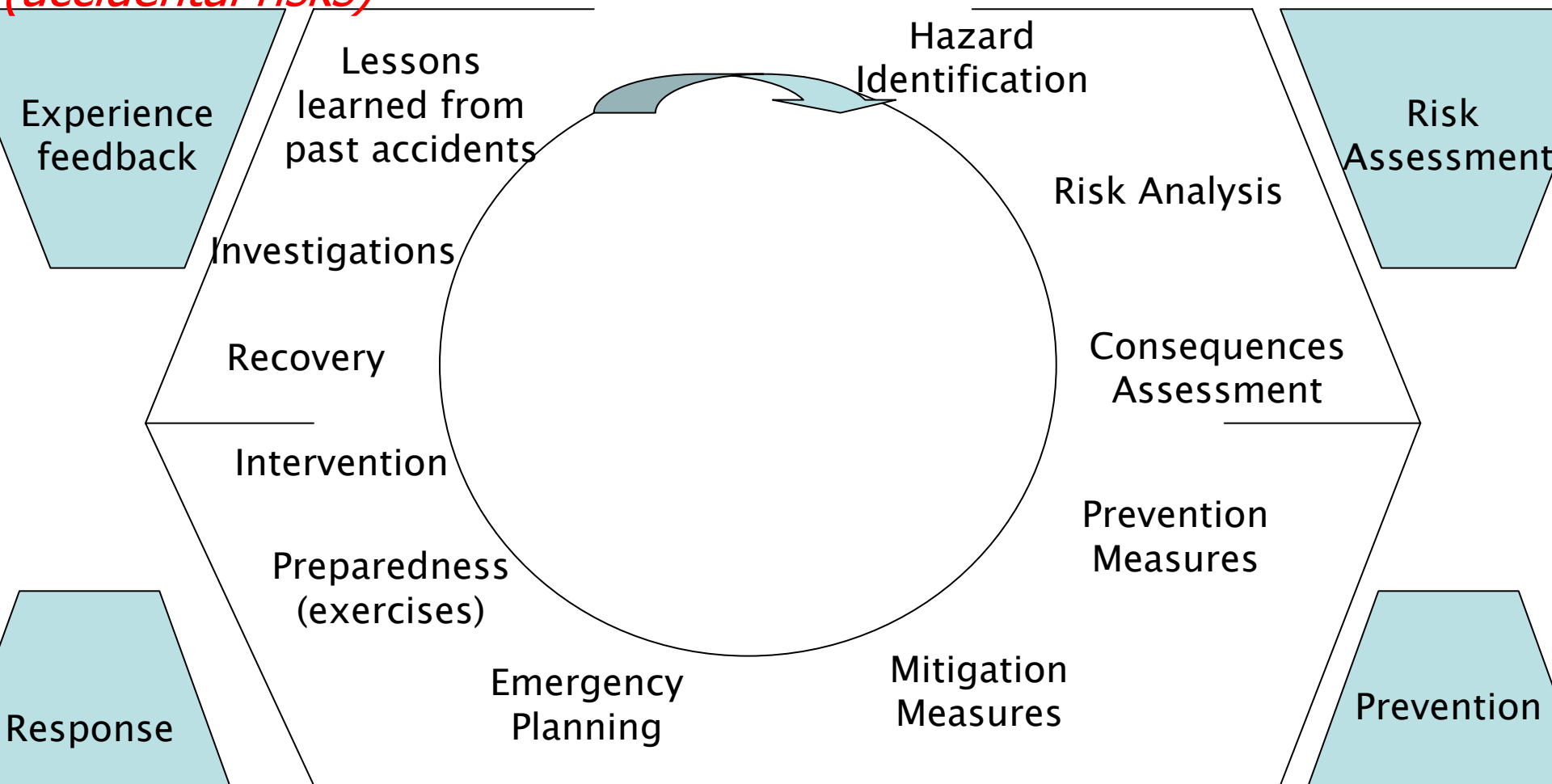
⇒ *Limburg – Yemen - 2002*

⇒ *Baqiq Oil Refinery - Saudi Arabia - February 24, 2006*

⇒ Necessity to develop adapted methodologies and tools

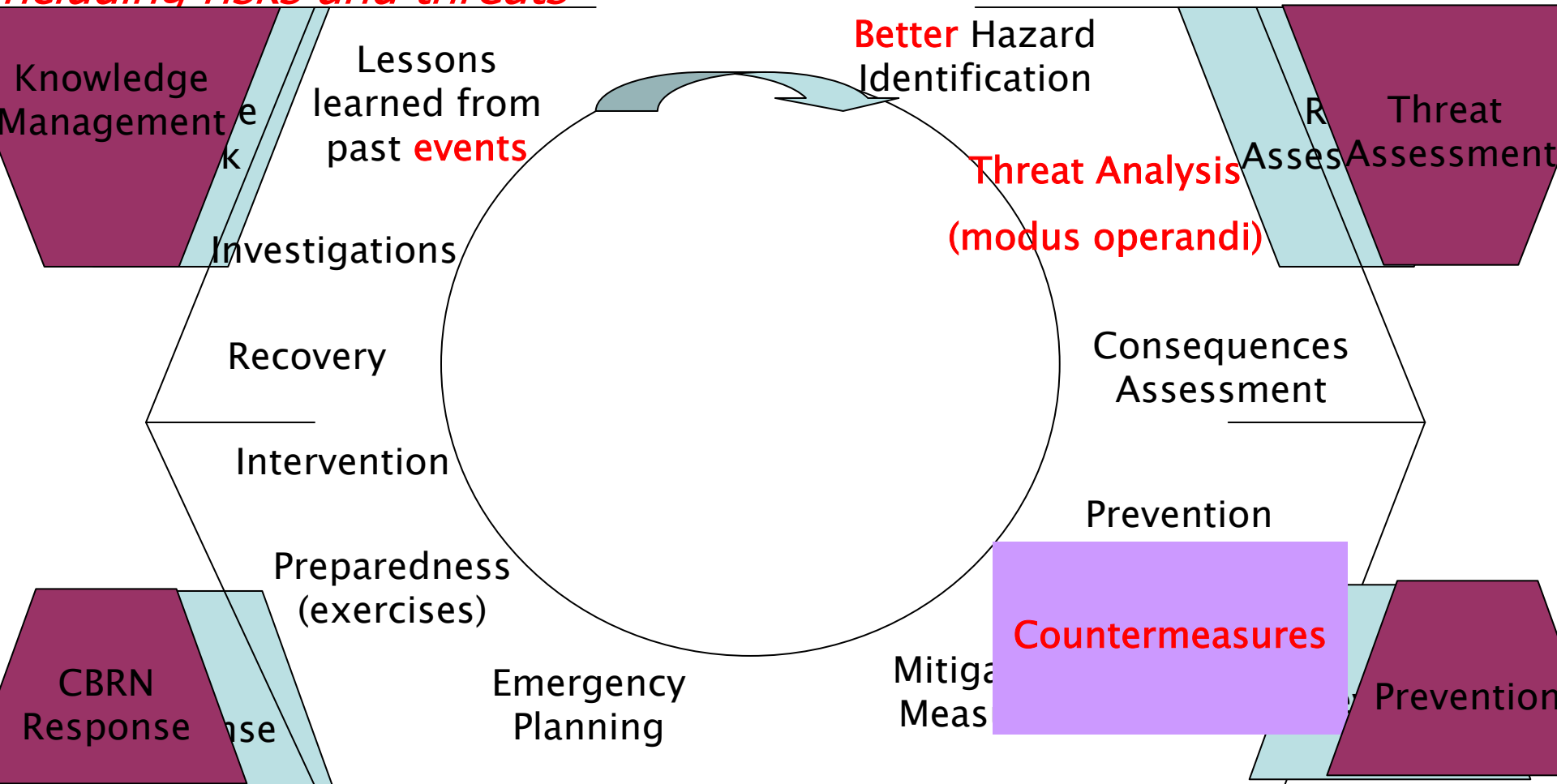


1st layer of risk knowledge: the Major Hazards Control Approach (accidental risks)



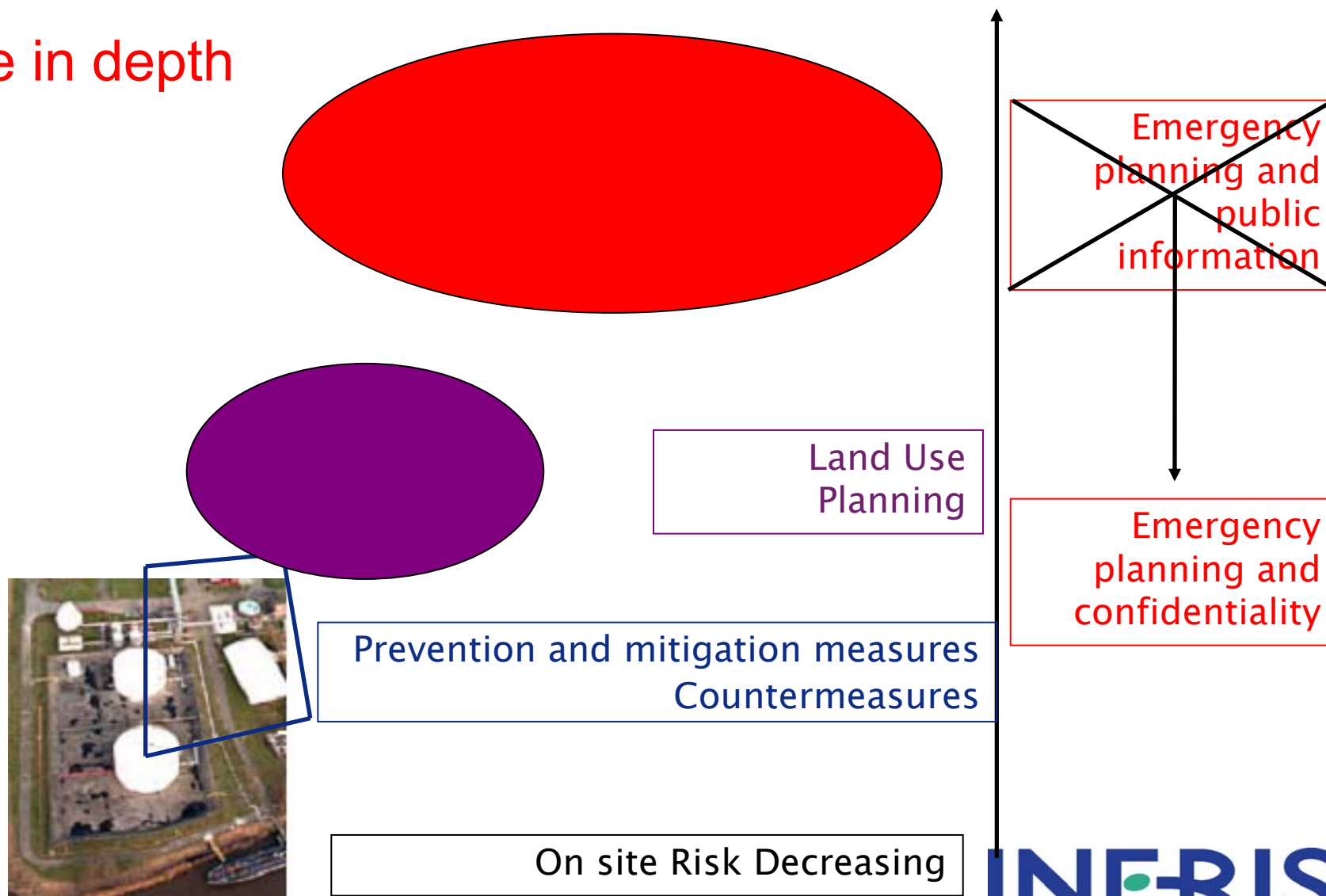


2nd layer of risk knowledge (security) to develop a global approach including risks and threats





Defence in depth





How ? - Existing Dedicated methodologies:

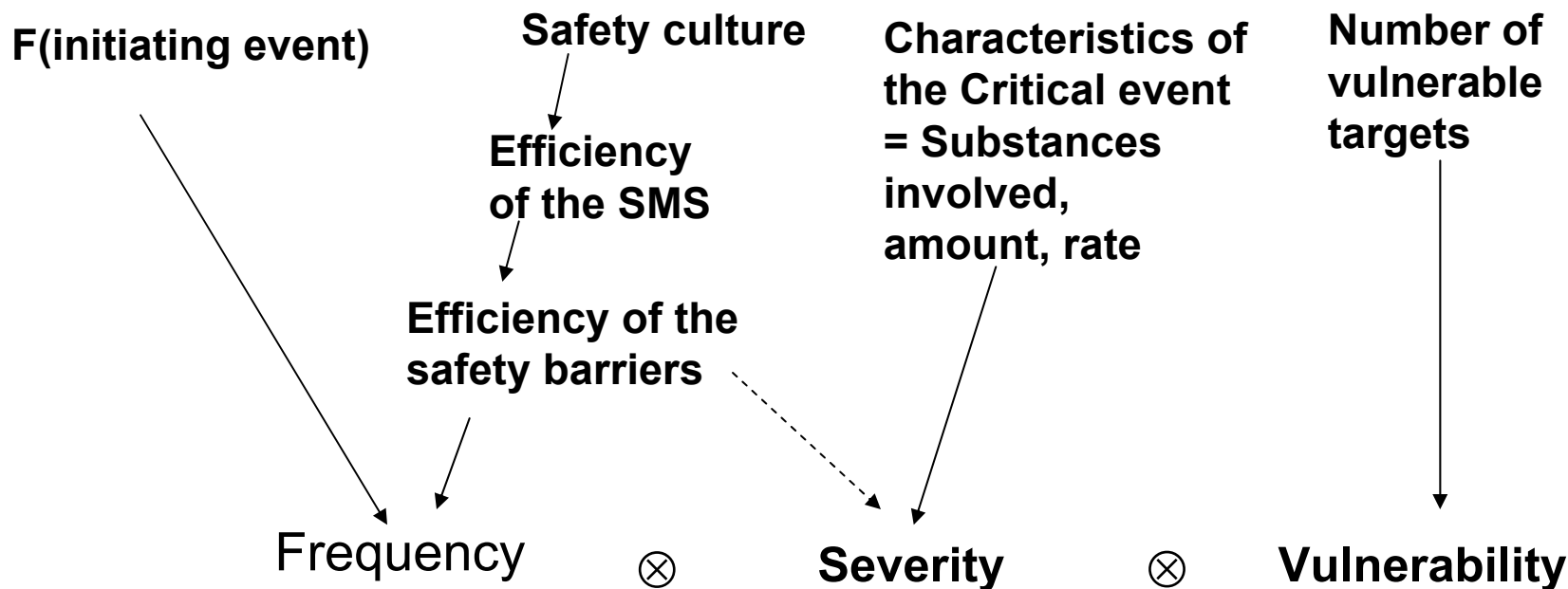
- ⇒ American Chemistry Council, ACC (2001). Site security guidelines for the US chemical industry
- ⇒ CCPS, (2002) Guidelines for Analysing and Managing the security vulnerabilities of fixed chemical sites
- ⇒ American Petroleum Institute, API (2003). Security guidelines for the petroleum industry
- ⇒ European Initiatives (Germany, Austria, The Netherlands)
- ⇒ ... **or**
- ⇒ Adaptation of the ARAMIS methodology



Principles of the methodology

$$\text{Risk} = \text{Frequency} \otimes \text{Intensity} \otimes \text{Vulnerability}$$

Risk severity Consequence



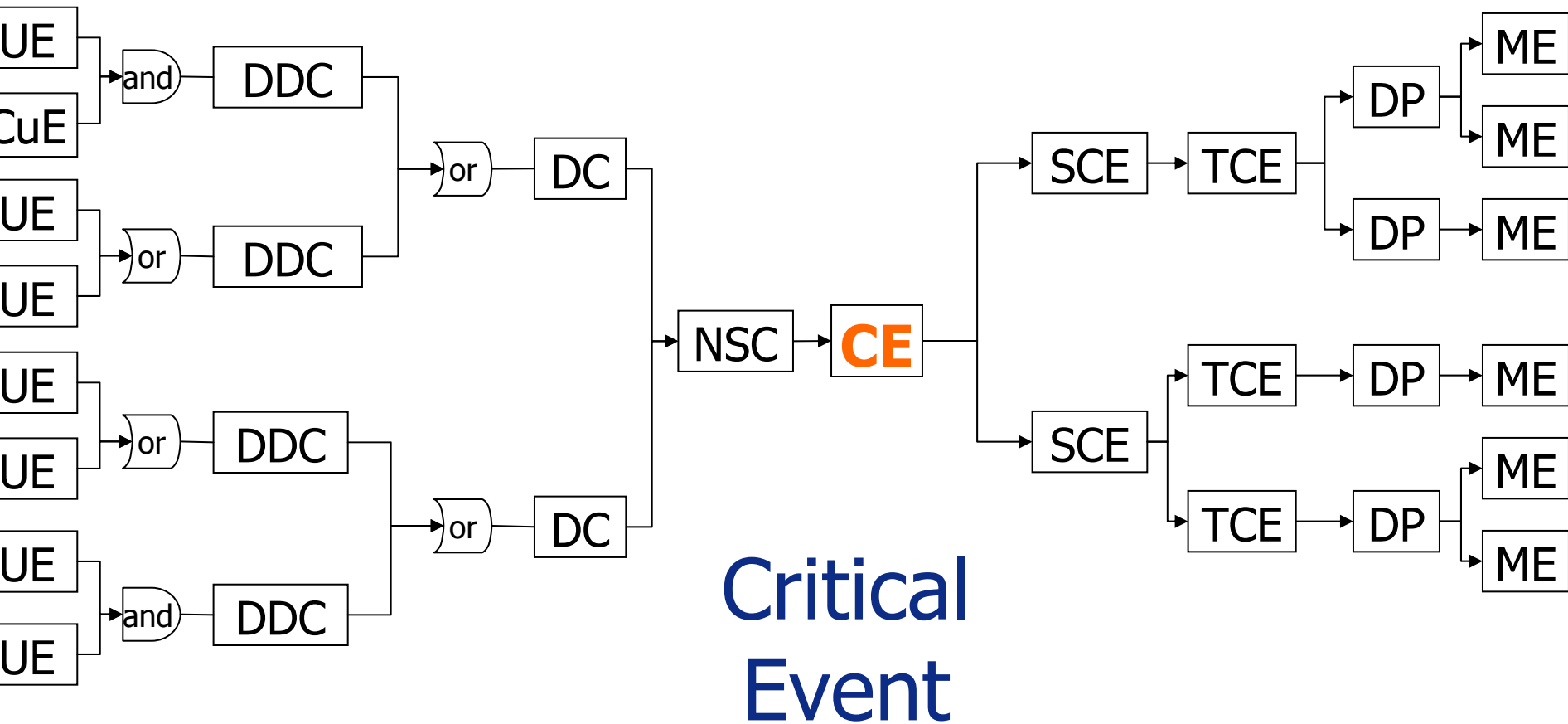


Principles of the methodology – 6 major steps

- ⇒ Identification of major accident hazards
- ⇒ Identification of the safety barriers and assessment of their performances
- ⇒ Evaluation of safety management efficiency to barrier reliability
- ⇒ Identification of Reference Accident Scenarios
- ⇒ Assessment and mapping of the risk severity of reference scenarios
- ⇒ Evaluation and mapping of the vulnerability of the plant's surroundings



ARAMIS : a bow-tie approach

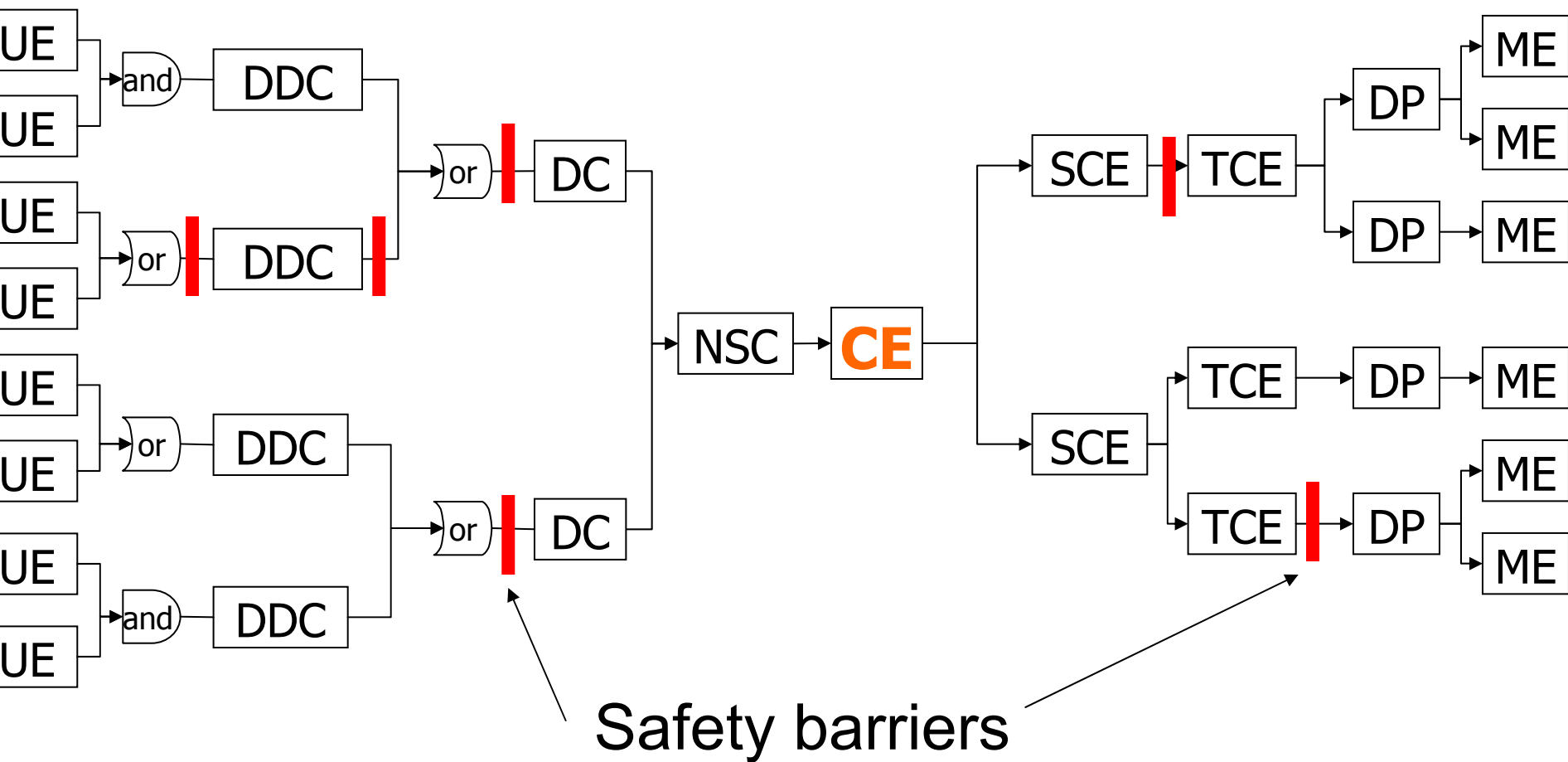


Fault Tree

Event Tree



ARAMIS : a bow-tie approach





And now ?

- ❑ New French regulation (Decree n° 2006-212 of February 23, 2006 related to the security of Critical Infrastructures (secteurs d'activités d'importance vitale)
- ❑ Some hazardous installations are considered as Critical Infrastructures
 - ⇒ Necessity to carry out a risk analysis by activities sector (e.g. chemical sites, marshalling yards etc.)
 - ⇒ Operators must establish an “Operator Security Plan”
 - ⇒ Public Authorities have to establish an “External Security Plan”

Implementation of ARAMIS methodology for assessing the safety and the security of chemical sites.



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Thank You for your attention