

EMERGENT RISKS

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Petrochemicals



Nuclear Decommissioning



Hospital Construction

Introduction

This paper was produced as a result of research by the IRM Emergent Risks Special Interest Group. This group was originally set up following Peter Vickery of the British Nuclear Group contacting Steve Fowler, Chief Executive of the IRM to see how other industries:

- Dealt with low probability but potentially catastrophic risks and to explore whether there was a commonality between the risk processes being operated by risk managers in their respective industries.
- Develop and deploy methodologies to deal with Emerging Risks in a project environment, particularly in industries undertaking complex projects over long time scales.
- Mike Walker, Director of the IRM arranged and chaired the first SIG on 23 January 2003 at Currie & Brown Office Manchester with Steve Fowler, Chief Executive of the IRM giving an overview of the IRM and Peter Vickery, through a keynote introduction, setting the objectives and focussing on the development of the SIG in Manchester and the North of England.

Subsequent SIGs chaired by Bryan Richardson have been held at AMEC Office Warrington, NHS Estates Office Leeds, BNFL Office Risley and Currie & Brown Office Manchester with presentations being given by the following presenters and organisations on the Nuclear, Health and Petrochemical Industries:

- Robin Phillips – British Nuclear
- Graham Begg – AMEC
- Melvin Goody – NHS ProCure21
- Bryan Richardson – Currie & Brown
- Jim Waite – ConocoPhillips
- George Houghton – AMEC
- Peter Gerzon – Emergent Risk
- John Wood – NHS ProCure21

Organisations who have attended the above SIGs supporting the IRM include:

- Amec
- British Nuclear Fuels
- Cranfield University
- Cyrilsweet
- ConocoPhillips
- Currie & Brown
- Health & Care Northern Ireland
- Ministry of Defence
- Mowlem
- Procure21
- UKAEA

Definition of Emergent Risks

Emergent Risks are those that have not yet occurred but are at an early stage of becoming known and/or coming into being and expected to grow greatly in significance.

They do not have the 'track record' of other better known, non-emergent, risks and usually arise in the longer term.

Recognition of Emergent Risks

Recognition is not a precise process as:

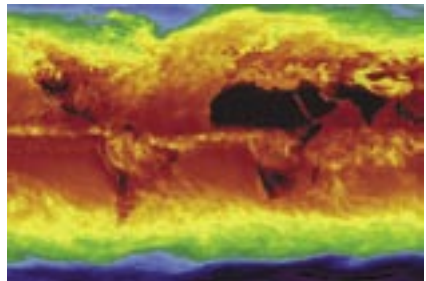
- There is no clear boundary with other types of risk
- Emergent Risks cannot often be easily identified or anticipated
- At an early stage they are often low probability / high consequence.
- Any identification process would probably target such risks as they are more likely to have the major effect.

Examples of Emergent Risks

- 9-11
- Chernobyl
- Flixborough
- Foot and mouth
- Global warming
- Mad cows' disease
- MRSA
- Sars
- San Francisco earthquake
- The sinking of the Titanic



RMS Titanic



Global Warming



Mad Cow Disease



??? The next Emergent Risk

Emergent Risks Matrix – Definition of Terms

The matrix provides a framework for approaching Emergent Risk identification and was developed as a technique to aid this. It consists of a topic list that defines the broad areas in which risks can occur and a list of consequences and impacts if the risks do occur. The advantage of this approach is that it provides a structured way of identifying risks using two different but complementary approaches.

A topic list was used in the matrix as it is widely used as an aid in defining risks. Consequences and impacts were used as they can be similar for many Emergent Risks after they occur requiring similar mitigation actions. The mitigation required to prevent these risks occurring will usually be different.

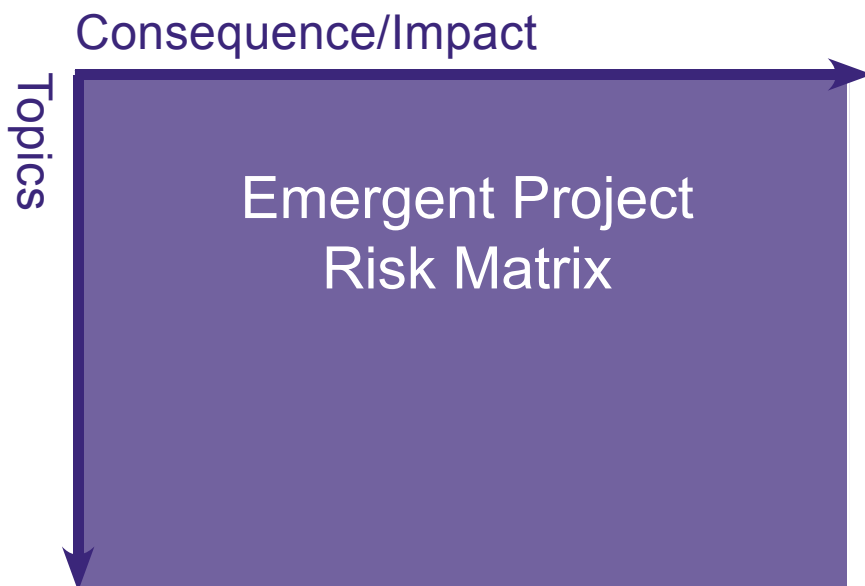
The lists of topics and consequences/impacts may be varied to suit the requirements of different projects and industries.

The sections below attempt to define the meaning of the terms used in the topic and consequence/impact lists used as an aid in defining Emergent Project Risk Registers.

Method of Identification

- Risk Workshops
- Brainstorming
- Round table discussion
- One to one interviews
- Available data and history
- Forms and pro formas/Risk Matrix

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Topics

SOCIETAL VIEWS AND ATTITUDES

Political

Related to changes in political policy (eg due to a change of Government) or to actions of the political authorities.

Legal

Risks arising from legal action or decisions made by the Courts. Examples are limitations on what can be done or financial penalties including damages and compensation.

Regulatory

Actions and limitations by the regulatory authorities. Regulatory authorities include not only those covering a given industry but also more general authorities such as those responsible for health and safety, the environment and construction planning.

Direct Public Pressure

Direct action by the large numbers of the public (eg by boycott or other acts) or by pressure groups (eg those based on local concerns or those having a specific agenda). It excludes cases where direct pressure results in action through the political, legal or regulatory processes.

ILLEGAL ACTIVITY

Security

This covers risks occurring from actions needed to ensure security in the short term in response to specific events or threats and in the long term from the general security risks in society. It also covers the risk of breaches or failures in security such as terrorist attacks.

Criminal Activity Early mitigation

This covers all forms of criminal activity. Examples are violence, sabotage and fraud.

PROJECT DESIGN AND APPLICATION

Technology

Changes due to the effects of new technical developments that feed through into changes that affect the project. These may be based on new scientific discoveries or on further implementation of existing knowledge.

Engineering

Risk from the application of engineering to a project including any failures or improvements in current or planned work. Engineering failure may occur due to factors that cannot be reasonably anticipated.

Requirements

This covers the risk that a project completed according to a defined specification may not meet the required need. This can result in a shortage of required facilities or low use because they are not suitable. Examples are a specification that has been in error or needs that have changed either during the project construction period or afterwards during its lifetime.

MISCELLANEOUS

Environmental

Risks due to any environmental factors. These include climate change, weather, natural conditions, natural disaster, disease and contamination. They include the effects of changes to the environment due to human activity.

Financial and Economic

This covers risks due to the finance of the project or the economic circumstances (local, national or international) surrounding it. Examples are under or overspend, failure of finance and severe over or underestimation of commercial markets.

It should be noted that all risks to a project are likely to have financial consequences, many of them major. This topic is not meant to cover the all risks but only those of a financial nature.

Knowledge

Risks arising from a lack of knowledge. This may occur for a number of reasons including loss of records, gaps in existing knowledge and insufficient knowledge of those involved or related to the project.

PERSONAL VIEW AND ATTITUDE

Culture

This covers risks that may occur due to the culture within the project or related organisations. It covers the general attitudes that exist that affect the approach of an organisation to any work or project it undertakes. The culture of an organisation could have either positive or negative effects on the progress and successful completion of a project.

Human Factors

These risks arise due to the actions of people. They can come from the action of a large number of people (eg a major strike) or from one or a very few individuals (eg unauthorised trading, concealment of important information).

OTHER

This list is not exhaustion and dependent upon the industry there may be other Topic headings

Consequences/Impacts

Delay

This covers the delay in a project due to the occurrence of a risk. It may range from a short period to extended delay

Refusal to Proceed

This covers risks resulting in a project or part of a project not being allowed to proceed. This will either result in the project being stopped or some alternative approach being adopted to proceed to the project intentions.

Change Limits

These consequences arise from changes in the limits or boundaries applying to all or particular aspects of a project. They occur in a wide variety of areas including health and safety, allowable discharge or contamination levels and acceptable boundaries in financial services. They are most likely to arise from a change in regulation.

Disaster

Disastrous failure resulting from a risk occurrence resulting in major consequences for the project.

Operational Failure

Failure in the operation of the project leading to under-performance and failure to meet objectives. This may range from minor to major significance. Projects may also operate better than planned leading to an opportunity.

Lifetime Failure

Failure of the project to operate for its expected lifetime. This may be due to early termination of a project that is capable of continued operation or failure of the project to operate for the expected time due to replacement by an alternative or because of poor results. Projects may also operate in excess of their expected lifetime providing an opportunity

Finance/Commercial

Financial and commercial consequences of project risks. These may be positive or negative. It should be noted that most or all risks to a project are likely to have financial consequences, many of them major.

Blank Matrix for Emergent Risks

Download a copy of the blank matrix from www.theirm.org

Consequences/Impacts →

INDUSTRY / SECTOR

EMERGENT RISKS

EMERGENT RISKS MATRIX

		EMERGENT RISKS	1	2	3	4	5	6	7	8
			Low	Medium	High	Very High	Critical	Operational Failure	Liability Failure	Reputational
I	Political	1								
		2								
		3								
II	Legal	1								
		2								
		3								
III	Regulatory	1								
		2								
		3								
IV	Direct Public Pressure	1								
		2								
		3								
V	Security	1								
		2								
		3								
VI	Operational Activity	1								
		2								
		3								
VII	Technology	1								
		2								
		3								
VIII	Engineering	1								
		2								
		3								
IX	Requirements	1								
		2								
		3								
X	Environmental	1								
		2								
		3								
XI	Financial and Economic	1								
		2								
		3								
XII	Knowledge	1								
		2								
		3								
XIII	Culture	1								
		2								
		3								
XIV	Human Factors	1								
		2								
		3								
XV	Other	1								
		2								
		3								

Topics ↓



Hospital Examples

Hospital complex

HOSPITAL EXAMPLES
HOSPITAL COMPLEX
10 EMERGENT RISKS

EMERGENT RISKS MATRIX

Consequences/Impacts

		EMERGENT RISKS		1	2	3	4	5	6	7
				Delay	Refused to proceed	Change LEGIS	Disaster	Operational Failure	Ultimate Failure	Financial Consequence
1	Political	1	CHANGE OF GOVERNMENT	*	*					*
		2								
		3								
2	Legal	1	CLAIMS AGAINST CLINICIANS	*		*		*	*	*
		2								
		3								
3	Regulatory	1	ISSUES/ISSUE IN HOSPITAL (MISAL)	*		*	*	*	*	*
		2								
		3								
4	Direct Public Pressure	1								
		2								
		3								
5	Security	1	FIRE / TERRORISM IN HOSPITAL	*			*	*		*
		2								
		3								
6	Criminal Activity	1	SABOTAGE IN HOSPITAL	*			*	*		*
		2								
		3								
7	Technology	1	WORLD CLASS HOSPITAL SERVICE	*				*		*
		2								
		3								
8	Engineering	1	GENERATOR / BACK UP FACILITIES	*	*		*	*		*
		2								
		3								
9	Requirements	1	FAILING TO COPE WITH PATIENT WORKLOAD	*				*		*
		2								
		3								
10	Environmental	1	AMPHIBIOUS (EVENT) IN HOSPITAL	*		*		*		*
		2								
		3								
11	Financial and Economic	1	RESTRICTION IN FINANCE FOR CAPITAL AND TREATMENT	*				*		*
		2								
		3								
12	Knowledge	1	QUALITY OF CLINICAL STAFF	*		*			*	*
		2								
		3								
13	Culture	1	EFFICIENT USE OF RESOURCES FOR TREATMENT	*				*		*
		2								
		3								
14	Human Factors	1	AVAILABILITY OF CLINICAL STAFFING FOR HOSPITAL	*	*					*
		2								
		3								

Nuclear Examples

Decommissioning



NUCLEAR EXAMPLE
DECOMMISSIONING
18 EMERGENT RISKS

EMERGENT RISKS MATRIX

Consequences/Impacts

		EMERGENT RISKS		1	2	3	4	5	6	7
				Delay	Refused to proceed	Change Limits	Disaster	Operational Failure	License Failure	Financial/Commercial
1	Political	1	CHANGE OF GOVERNMENT	*	*					*
		2	DELAY IN THE PROVISION OF FINAL DISPOSAL	*	*					*
		3								
2	Legal	1	CLEARANCE AND/OR RADIOACTIVITY EXPOSURES	*				*	*	*
		2								
		3								
3	Regulatory	1	REDUCTION IN RADIOACTIVITY LEVELS	*		*				
		2	CLEAN UP OF LOW ENVIRONMENTAL ACTIVITY			*				*
		3	RECLASSIFICATION OF NUCLEAR MATERIALS & WASTE			*				*
4	Direct Public Pressure	1	EFFECT ON LOCAL RESIDENTS' BUSINESS	*		*				
		2								
		3								
5	Security	1	RADIOACTIVITY ESCAPE	*			*	*	*	*
		2								
		3								
6	Criminal Activity	1	SABOTAGE PLANT	*			*	*	*	*
		2								
		3								
7	Technology	1	LONG TERM TREATMENT OF WASTE	*				*	*	*
		2								
		3								
8	Engineering	1	TREATMENT OF WASTE	*			*	*	*	*
		2								
		3								
9	Requirements	1	WORTH OF PLANT OPERATIONS					*	*	*
		2								
		3								
10	Environmental	1	LOCAL EFFECT ON WILDLIFE ETC	*			*	*		*
		2	LONG TERM CLIMATE CHANGE							
		3								
11	Financial and Economic	1	RELEASE OF FINANCE	*	*					*
		2	RISING COSTS	*	*					*
		3								
12	Knowledge	1								
		2								
		3								
13	Culture	1	NUCLEAR / GAS / COAL ENERGY	*		*		*	*	*
		2								
		3								
14	Human Factors	1	UNAUTHORIZED OR INEFFECTIVE ACTIONS	*	*			*	*	*
		2								
		3								

Topics



Petrochemical Examples

Refinery

PETROCHEMICAL EXAMPLE
REFINERY
10 EMERGENT RISKS

EMERGENT RISKS MATRIX

Consequences/Impacts

		EMERGENT RISKS	Consequences/Impacts						
			1 Delay	2 Refusal to proceed	3 Change limits	4 Disaster	5 Operational Failure	6 Lifetime Failure	7 Financial/Commercial
1	Political	1 CHANGE OF GOVERNMENT	*	*					*
		2 CO2 LIMITS							*
		3 ACTION BY GOVERNMENTS ETC (E.G. OPEC)	*	*				*	*
2	Legal	1 EMISSIONS EXCEED LIMITS	*		*	*			*
		2							
		3							
3	Regulatory	1 ZERO EMISSIONS		*			*		*
		2						*	
		3							
4	Direct Public Pressure	1							
		2							
		3							
5	Security	1 EXPLOSION / FIRE / TERRORISM	*			*	*		*
		2							
		3							
6	Criminal Activity	1 SABOTAGE OF PLANT	*			*	*		*
		2							
		3							
7	Technology	1 OPPORTUNITY SELLING							*
		2							
		3							
8	Engineering	1 FAILURE OF DESIGN / PLANT	*			*	*		*
		2							
		3							
9	Requirements	1							
		2							
		3							
10	Environmental	1 AVAILABILITY OF GAS/OIL	*				*	*	*
		2							
		3							
11	Financial and Economic	1							
		2							
		3							
12	Knowledge	1 STATE OF THE ART OPERATING PROCESSES	*				*		*
		2							
		3							
13	Culture	1							
		2							
		3							
14	Human Factors	1 UNAVAILABILITY OF SKILLED LABOUR IN UK	*	*			*		*
		2							
		3							

Topics

Selection or Quantification of Emergent Risks

- This area is imprecise and difficult.
- The need for continuous or regular review both of likely emergent risks and their probability and likely impact.
- Defining the most likely (say top 10) emergent risks at any one time and the techniques for selecting them.
- Retaining a full record of risks identified even those which are not considered likely to occur (discarded risks may become active)
- Reviewing the consequence / impact mitigation to group emergent risk consequences.
- A quantitative element will be needed to select the top Emergent Risks either on a number scale or defining risks as say very low, low, medium, high and very high probability and impact.

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Mitigation and Control

- Development of GAP Template Action Plans
- Definition of mitigation actions
- Further investigation
- Regular review
- No action is not an alternative
- Best practice in current and planned work
- Input into public and regulatory process
- The Gap Template Action Plan is a useful tool for performing risk reviews.

Timing of Mitigation

Early mitigation

- Likely to be lower cost and completion within planned timescales and can provide space or facilities to install more capacity

Later mitigation

- Likely to involve higher costs and possible delay as plant and structures will be in place

Solution to the Problem

- Accurate definition of what is an emergent risk at a reasonably early stage to correctly target mitigation

The Gap Template Action Plan is a useful tool for performing risk reviews.

Risk I.D.: 1. Outbreak of Foot and Mouth		RANKING:	
Risk Buckets:			
DESCRIPTION		RISK CHAMPION	
Description of the risk: That foot and mouth outbreak occurs during construction of a pipeline (right of way just completed.)		Contact for the risk: Risk Manager	
IMPACT		SCORE	
What is the impact of the risk on other risks? Construction Work would be suspended in the infected areas, resulting in delays and additional costs.		Risk Score	
		PROBABILITY	
		Occurance %	
CURRENT MANAGEMENT INITIATIVES		LEADING PRACTICES	
Current initiatives actions in place to manage risk: 1. Discuss with DEFRA options regarding continuing construction. 2. All equipment sterilised between land owners 3. Disinfectant at ownership boundaries and pipeline right of way 4. Public right of way restricted 5. Operatives disinfected at start and finish 6. Restriction on movement between countries and disinfected at airport and ports. 7. Inoculation of Livestock. 8. Culling of livestock.		In the industry	
GAPS		COST OF RISK	
Key gaps and deficiencies between the "AS-IS" and the "TO-BE" scenario: To eradicate F&M completely by complying with action plans		Minimum Most Likely Maximum (Minimum)	
		Most Likely	
		Maximum	
		50% Percentile	
ACTION PLANS AND TIMELINES			
Steps to be taken to complete the GAP along with the timeline. Mitigate by <i>Hold, Avoid, Reduce, Transfer, Share</i> (HARTS)			
<input type="checkbox"/> Hold	1 = 1	Infected farms could cause proliferation in infected buffer zones areas until DEFRA give the OK.	
<input type="checkbox"/> Avoid	1 = 1		
<input type="checkbox"/> Reduce	1 = 1	Above measures reduce spread of F&M.	
<input type="checkbox"/> Transfer	1 = 1		
<input type="checkbox"/> Share	1 = 1		
AGREED OBJECTIVES			
The agreed objective brainstormed at the workshop:			
Agreed Objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This template can be downloaded from www.theirm.org

The Institute of Risk Management

IRM is risk management's professional education body. Established as a not-for-profit organisation, the Institute is governed by practising risk professionals and has strong links to leading universities and business schools across the world. Recognising that risk management is a multi-disciplinary field, we also work closely with many other specialist institutes and associations and seek to represent an increasingly broad and diverse set of stakeholders.

The worldwide membership is drawn from industry, commerce, consultancy and the public sector, and members have backgrounds in many different risk-related disciplines.

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