

Environmental Risks

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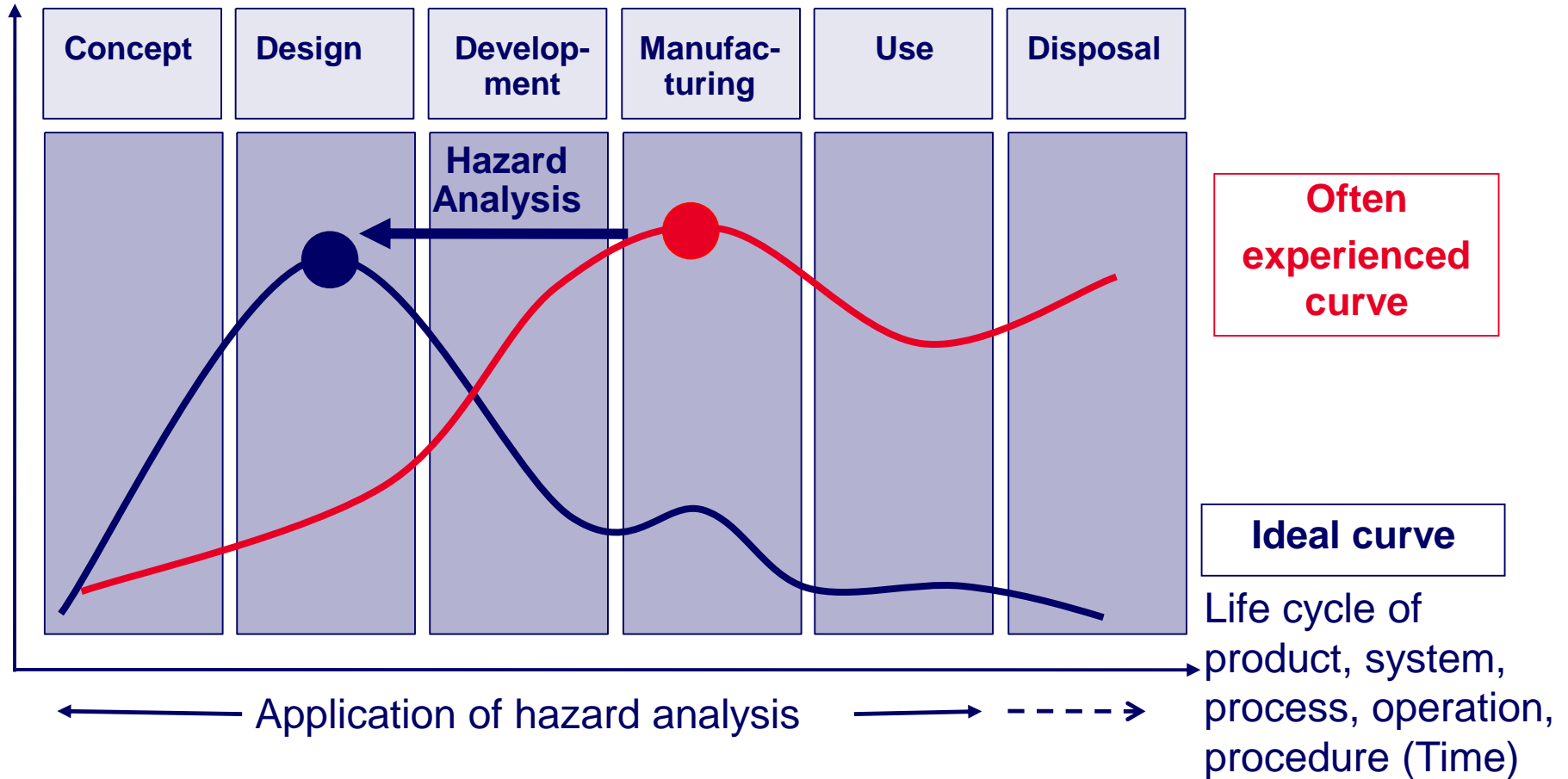
Environmental risks

Environmental risks are one of the 5 key challenges facing the world today, according to the Global Risks Report 2017. While they pose risk to both operations and supply chains for businesses, those risks also impact our lives: water scarcity due to climate change could cost up to 6 percent of global GDP; it can lead to conflict and migration.

Businesses, governments and societies have a strong interest in developing resilience against environmental risks. They need to work together to implement strategies that promote resilience, mitigating and preventing future risk.

System life cycle

Safety efforts
(Costs)



Our Responsibility



The way you manage environmental issues can strongly impact your business's profitability and public perception. Your company needs the ability to respond quickly to environmental hazards and instill practices to safeguard your business's future.

Consider the Possibilities

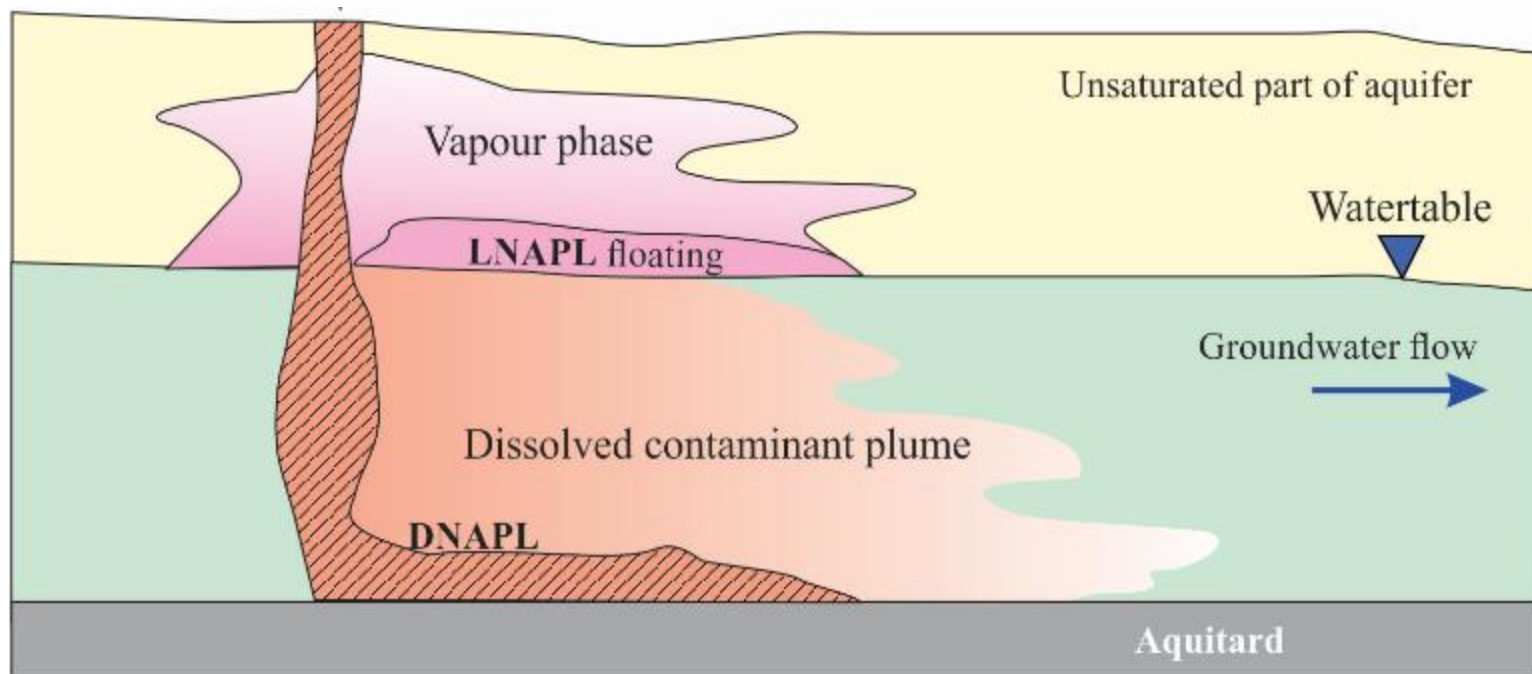
- Your company acquires property to expand its operations. During construction, contamination from a previous use of the site is discovered. Your construction falls way behind schedule while you negotiate with regulatory authorities to find a solution.
- Your company receives a complaint from residents in the community alleging that you have caused contamination resulting in bodily injury and property damage. You must mount an expensive defense, even though it is likely that the contamination migrated through your property from an adjoining industrial facility.
- Your company has a sudden, on-site release that, despite your efforts, has caused the evacuation of nearby residents and impacted neighboring wetlands.

Threat to any business.



Each of these hypothetical examples can happen – and indeed often have happened – to companies just like yours. In today’s business climate, the scope of environmental impairment includes industries once thought to be invulnerable to environmental risks. Risks like these can crop up suddenly or lay dormant, unknown and unexpected, for years. Either way, they can represent a serious threat to any business.

LNAPL vs DNAPL



Legislation defines PRP (Potentially Responsible Party) as one of the following:

- Current owner and/or operator
- Previous owner/operator who was present at the time the hazardous substance contamination occurred.
- Intervening owner who had knowledge of the presence of contamination and did not disclose it to the prospective buyer.
- Hazardous waste generators who arranged for the disposal of hazardous substances on the property.
- Persons who accept hazardous substances for transportation to facilities that cause release.

Liability for site cleanup



- Strict liability-The liable party may be without fault. In other words, ignorance of a preexisting condition or ongoing occurrence is no defense.
- Joint and several liability-Liability may be shared by owners, operators, transporters and waste management companies. This may be irrespective of the amount of individual contribution.
- Retroactive-Any party who conducted a business on the property at the time contaminants were disposed of may be liable

Innocent land owner defense



- In 1986 SARA (Superfund Amendment) the innocent landowner defense was created.
- Under the law, if a purchaser can show due diligence in the performance of a property investigation, liability may be reduced.
- ASTM Standards

- E 1528 Limited Environmental Due Diligence: Transaction Screen Process
 - This standard is designed to be performed by non-environmental professionals with respect to potential contamination.

- E 1527 Phase I Site Assessment.
 - This practice is intended to permit a *user* to satisfy one of the requirements to qualify for the *innocent landowner*, *contiguous property owner*, or *bona fide prospective purchaser* limitations

- E1903 Phase II Environmental Site Assessment
 - This guide describes a process for further evaluating a parcel of commercial property with recognized environmental conditions, as defined in Practices E1527 and E1528

Transaction screening

- The record search of government databases is limited to
 - NPL
 - RCRA
 - LUST
 - Landfills
- It is limited to a questionnaire aimed to the current owner/operator of the site.

- Phase I: The Phase I is the initial investigation for assessing a property. The information gathered may lead to further investigation. The end result is the probability for property contamination to be low, medium or high. Samples are not typically collected.
- Phase II: Involves some actual sampling to confirm results of medium to high potential for contamination.
 - A phase II assessment detects formaldehyde in porous soils under a cosmetic manufacturing facility and geology is fractured. A major aquifer serving a 700 K people community is located under the site. The owner may determine to install a monitoring well in the aquifer to confirm any contamination and pull out the well before core samples are taken. Core samples are expensive!

Phase I components



- Environmental Setting
- Historic Usage of Property
- Regulatory Agency Listing
- Site Reconnaissance
- Interviews

Environmental setting

- Geographic Description
- Topographic Characteristics
- Surface Soils
- Subsurface Geology
- Hydrogeology
- Hydrology

Historic usage



- Title search
- Aerial Satellite photographs
- Fire insurance maps
- Local street directories
- Property tax records
- Zoning records

Permits



- Building permits
- Environmental records
- Sanitary sewage permits
- Stormwater discharge permits
- Solid waste disposal permit

Property and area survey

- Attempt to do a visual examination of every square foot of the property.
- If not feasible, the following areas should be covered:
- Perimeter, surface water routes (including dry creeks), all storage areas, roads and areas reasonably accessible.

Signs of potential contamination



- Soil mounds
- Ground depressions
- Distressed, stained soils
- Poor or no growth of vegetation
- Evidence of surface water contamination
- Surface impoundments
- Signs of subsurface structures
- PCB transformers

Adjacent properties

- Undeveloped properties may have been used for local dumping.
- Effluents
- Tanks/ drums
- Industries with high potential for discharging constituents such as plating and battery recycling.

Interview items to covered



- Property usage
- AST/USTs
- Landfills
- Demolished buildings
- Effluents/air emissions
- Vents or pipes in the ground
- Debris
- Drums
- Pits, ponds, lagoons
- Water wells
- Pesticide usage
- Environmental Management

Local government officials



- Interview local fire dept., health agency, disposal agency, environmental agency.
- Incidents and events which are not part of a formal record.
- Interview with neighbors

Standard guide for risk based corrective action at petroleum site – ASTM E1739



- RBCA is the integration of site assessment, remedial action selection and monitoring using USEPA recommended risk and exposure assessment practices.
- This is a tiered approach involving increasingly sophisticated levels of data collection and analysis.

RBCA steps



- Site assessment
- Site characterization and initial response action
- Tier 1
- Tier 2 and 3

Site assessment

- Historical records of site activities
- Identification of chemicals of concern
- Location of maximum concentration of chemicals in soil and groundwater
- Identification of significant transport exposures
- Identification of potential receptors

Site characterization and initial response action



- 1-Immediate threat to human health, safety or sensitive environmental receptor
- 2-Short term (0 to 2 years) threat to human health, safety or sensitive environment
- 3-Long term (> 2 years) threat to human, health, safety or sensitive environmental receptor
- 4-No demonstrable long term threat to human health, safety or sensitive environmental receptor

Tier 1 approach

- During the Tier 1, the existing maximum contaminant concentration is compared to Risk Based Screening Levels (RBSL)
- The RBSL are non-site specific clean up objectives and are calculated based on USEPA Integrated Risk Information System Database and USEPA Health Effects Assessment Summary Tables

Tier 1 evaluation

- It is recommended that an exposure evaluation flowchart based on the collected data be used
- If concentrations of chemicals of concern exceed target levels of compliance, then either:
 - remedial action
 - interim remedial action
 - further tier evaluation

Tier 2 and Tier 3



- If a decision is not reached using the Tier 1 approach, site specific target levels (SSTL) are developed
- These target levels are a function of both the distance from the source to the receptor and the soil type
- More complex groundwater modeling is utilized in Tier 3

Definition of Symbols Used in the Treatment Technologies Screening Matrix

Factors		● Above Average	○ Average	○ Below Average	Other	
Development Status Scale status of an available technology		Implemented as part of the final remedy at multiple sites, well documented, understood, etc.	Has been implemented at full scale but still needs improvements, testing, etc.	Not been fully implemented but has been tested (pilot, bench, lab scale) and is promising	◇ Level of Effectiveness highly dependent upon specific contaminant and its application/design N/A "Not Applicable" I/D "Insufficient Data"	
Treatment Train Is the technology only effective as part of the treatment train?		Stand-alone technology (not complex in terms of number of media/treatment technologies, maybe one "routine" technology in addition)	Relatively simple (two-car train or so), and well understood, widely applied, etc.	Complex (more technologies, media to be treated, generates excessive waste, etc.)		
Relative overall cost and performance	O&M Operation and Maintenance Intensive	Low degree of O&M intensity	Average degree of O&M intensity	High degree of O&M intensity		
	Capital Capital Intensive	Low degree of capital investment	Average degree of capital investment	High degree of capital investment		
	System Reliability /Maintainability The expected range of demonstrated reliability and maintenance relative to other effective technologies	High reliability and low maintenance	Average reliability and average maintenance	Low reliability and high maintenance		
	Relative Costs Design, construction, and operations and maintenance (O&M) costs of the core process that defines each and pre-and post-treatment	Low degree of general costs relative to other options	Average degree of general costs relative to other options	High degree of general costs relative to other options		
	Time Time required to clean up a "standard" site using the technology	in situ soil	Less than 1 year	1-3 years		More than 3 years for in situ soil
		ex situ soil	Less than 0.5 year	0.5-1 year		More than 1 year for ex situ soil
groundwater		Less than 3 years	3-10 years	More than 10 years for water		
Availability Number of vendors that can design, construct, and maintain the technology		More than 4 vendors	2-4 vendors	Fewer than 2 vendors		
Contaminants Treated Contaminants are classified into eight groups: - Nonhalogenated VOCs - Halogenated VOCs - Nonhalogenated SVOCs - Halogenated SVOCs - Fuels - Inorganics - Radionuclides - Explosives		Effectiveness Demonstrated at Pilot or Full Pilot or Full Scale	Limited Effectiveness Demonstrated at Pilot or Full Scale	No Demonstrated Effectiveness at Pilot or Full Scale	Same as above	

Remediation of soil and groundwater

- Soil, sediment, bedrock, and sludge. ground water, surface water, and leachate
 - In Situ/Ex Situ biological treatment
 - In Situ/Ex Situ physical/chemical treatment
 - In Situ/Ex Situ thermal treatment
 - Containment
 - Air emissions/off-gas treatment

Contaminant perspective

- Nonhalogenated volatile organic compounds
- Halogenated volatile organic compounds
- Nonhalogenated semi volatile organic compounds (SVOCs)
- Halogenated semi volatile organic compounds (SVOCs)
- Fuels
- Inorganics
- Radionuclides
- Explosives

Remedial action



- Soil Venting
- Bioventing
- Air Sparging
- Pump and Treat
- Natural Attenuation
- Bioremediation
- Excavation

