NICOLE

Network for Industrially Contaminated Land in Europe

REPORT

# Liability management from a financial, legal, and insurance perspective

14-15 November, 2013

Namur, Belgium

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    - Marcus Ford – Geosyntec, UK
    - Rick Parkman – URS, UK
    - Paul van Riet – Dow Chemical, Netherlands
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*NICOLE is a network for the stimulation, dissemination and exchange of knowledge about all aspects of industrially contaminated land. Its 100 members of 20 European countries come from industrial companies and trade organizations (problem holders), service providers/ technology developers, universities and independent research organizations (problem solvers) and governmental organizations (policy makers).*
*The network started in February 1996 as a concerted action under the 4th Framework Programme of the European Community. Since February 1999 NICOLE has been self-supporting and is financed by the fees of its members.*
*More about NICOLE on www.nicole.org*

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# 1. Introduction

## 1.1 General

The NICOLE Fall Workshop 2013 on ***"Liability management from a financial, legal, and insurance perspective"*** will aim to offer a comprehensive overview from a comparative international perspective on what are the current key issues for the industry when assessing, managing and transferring liabilities associated with land contamination. Special consideration will be given towards long lived liability and legacy issues such as those arising in the mining sector. The aim of the workshop is to have a broad discussion involving a range of stakeholders, including regulators, owners, insurers, financial managers and the legal profession. A key focus will be sharing experience in new approaches for liability management and transfer, and how innovation in this area should align with the problem owners' strategic and corporate objectives.
Key areas of discussion will focus on:

- Recent changes in legislation and new liabilities arising;
- Outsourcing liability management – liability transfer opportunities, risks and experiences;
- Financial options and approaches in liability management;
- Insurance options – approaches and risks and the Environmental Liability Directive (ELD);
- Novel approaches to defining and quantifying liability including mitigation banking;
- Mining legacy – societal challenges with our past.

The workshop on 14 November 2013 was Opening by the Chair NICOLE and Wallonia Ministry of Agriculture, Natural Resources and Environment.

The report summarizes presentations and discussion that arose at the workshop. For a review of the full presentations and abstracts, please see the NICOLE website (www.nicole.org).
This report reflects the conclusions of the NICOLE network meeting and the outcome of discussions. This document does not necessarily reflect the opinion of NICOLE and/or individual NICOLE members or member organizations.

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|---|---|
| | contaminated site in the Flemish Region |
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# 2. Session 2: Legal Perspectives

## Session Chair: Marianne Wilton, ENVIRON Netherlands

**Presentation Nr. 1**

**"Administrative fine, administrative obligation and other fulfilled requirements- consequences for the liability issue" by Pascal Mallien (Baker & MacKenzie Belgium)**

Paying a fine is the proof of causality of a liability and that is what we want to avoid.

There are 3 kinds of liabilities: contractual, civil and penal (criminal court). Following the French doctrine, there is possibly a 4th one: the administrative liability.

There should always be an interrelationship between damage – fault – causality. But there are some exceptions:

- In criminal liability, there is often no damage
- No fault = strict liability
- Take away the causality and is becomes a risk liability cfr Superfund

An administrative liability is an obligation vis-à-vis the authorities = easement, legal or political duty. Soil clean up is a sort of political obligation.

Administrative obligation:

- If it is an obligation, then phase 1 and 2 reports can not be used as a proof
- If it is a liability, then phase 1 and 2 reports can be used as proof by third parties

The author thinks however that 3 liabilities is enough.

Administrative fines: criminal or not

- Law says "you have the choice" : either you pay a retribution, or you pay an administrative fine

- But if an administrative fine is a punishment, then it is criminal following the jurisprudence of the European Court of Human Rights, even if paid on ones behalf (also seen as acceptance of fault in contractual or civil liability case)
- Hence : by paying a fine as punishment, you accept the wrongdoing and payment will be considered as the acceptance of the fault

**Conclusions and Q&A:**

- Paying an administrative fine could be considered as an acceptance of fault in the contractual/civil liability
- This also applies when the payment occurs by a third party (family…)
- Saving legislation: immunity of the employees if the fault is not knowingly and willingly committed or on purpose
- Settlements in the USA have no influence on civil liability.

**Presentation Nr. 2**

**"Environmental liabilities related to hydraulic containment systems of polluted groundwater- what's new after recent Italian legislation Nr 69/2013?" by Andrea Compio (Environ Italy)**

The new Italian legislation (2013) provided, legal clarification regarding use of pump & treat systems to remediate polluted groundwater and the use or definition of fill material and can change the liabilities a sites. Perhaps critically, in the past, groundwater treatment linked to pump and treat solutions could be limited because the permit to discharge abstracted groundwater was based on industrial effluent discharge consent. The 2013 regime does not allow this and many pump and treat systems require upgrading and incorporation of new treatment technology.

The new decree constitutes an opportunity for increasing the efficiency of P&T systems:

- Groundwater can be re-injected without pre-treatment and use the soil as filtering system
    - This can reduce the liability for incoming contaminate groundwater

  - Will decrease the treatment time and costs
  - Effluent can be used as sprinklers
  - It can decrease the volumes of groundwater to be treated by using the vadose zone as filtering system
- Extracted water: often lower limits than the discharge limits for production waste water, hence effect of dilution. Until TODAY: groundwater needs to be treated before discharge
- New principles: reduce mass instead of stopping the flow
- Physical barriers are now “last option” (slurry walls) when other systems cannot be applied and there are no other possibilities
- **Extracted** groundwater shall be considered as industrial wastewater deriving from a discharge, and not under the waste legislation. This means that it is no longer considered as a waste and it can be treated in WWTP’s for industrial waste water.

**Presentation Nr. 3**

**“Shale gas in the Netherlands-risks, effects and legal perspective” by Siefko Slob (Witteveen+Bos The Netherlands)**

The presentation resumes a study to look into the possibilities of shale gas exploitation in the Netherlands.

Shale gas can be found all over the world. In France, the Paris basin was reported to comprise the largest basin structure (although this development is on hold now). In the South Netherlands, the test drillings entailed a lot of opposition, as has typically been the case in Europe to date.

Difference between conventional gas and shale gas:

| **Conventional gas** | **Shale gas** |
|---|---|
| Methane | Methane |
| In permeable and high porosity rock such as limestone, sandstone | In impermeable and low porosity rocks such as shale, coal |

| | |
|---|---|
| Gas is trapped by geological structures or impermeable layers on top | Gas is trapped in the rock itself |
| Gas flows to the wells by, from itself (may need fracking in the late stage development) | Gas does not flow, it needs fracking |

Difference in exploration and production:

In the **exploration** phases, in both cases there is the need for :

- Desk study
- Seismic exploration
- Petrophysical measurements
- Lab tests on core samples

But specifically for shale gas, following is required :

- Lateral drilling and fracking tests
- Tests include :
  - TOC (total organic carbon)
  - Vitrinite reflectance (amount of maturity)
  - Porosity (amount of clay, sand, silt)
  - Frackability (strength, stiffness)

In the **production** phase, following difference exist :

| **Conventional gas** | **Shale gas** |
|---|---|
| Vertical well (in NL between 0,5-5 km) | Vertical well (in NL 3-5 km) |
| Production tests | Horizontal drilling of the shale layer (2km) |
| Sometimes fracking for well simulations | Fracking required |
| Few wells | Multiple wells per location (up to 10) |
| Few locations | Multiple locations (scenario in N-Brabant : 13) |
| Long term production (> 10 y) | Short term production (< 10y) |

**Fracking**: the purpose of fracking is to increase the permeability of the rock. This is achieved by injecting large volumes of fracking fluids and proppant under high pressure. The result is that the induced in the rock are kept open and the methane can flow freely.

Potential impacts on the environment :

1) Footprint and nuisance :

One location is typically requires 2-3 hectares, each location containing up to 10 multiple wells. With boreholes are typically longer than in conventional gas production. Materials, water and chemicals need to be supplied and there is light and noise pollution.

2) Water usage :

The water usage for drilling and fracking depends on depth and local conditions :

- Drilling: 900-2.400 $m^3$
- Fracking: 7.000-30.000 $m^3$

Development scenario for N. Brabant : 130 wells in 13 locations, development and production over 15-25 years.

| **Total N. Brabant** | **Per year (15 years)** | **Per year (25 years)** |
|---|---|---|
| 2,6 million $m^3$ | 176.800 $m^3$ | 106.080 $m^3$ |

3) Potential sources for water

| **Source** | **Suitability** | **Availability** |
|---|---|---|
| Groundwater | Suitable | Limited (no additional wells allowed) |
| Surface water | Suitable after treatment | Limited (during dry summers) |
| Drinking water | Very suitable | Available (amount <1% of |

| | | |
|---|---|---|
| | | marketed Brabant water) |
| Effluents sewerage installations | Suitable after rigorous treatment | Available |
| Effluents industrial waste water | Suitable after rigorous treatment | Limited (only near industry) |
| Brackish groundwater | Suitable, limits fracking techniques | Limited, only in coastal areas |
| Sea water | Suitable after rigorous treatment, limits fracking techniques | Limited, only in coastal areas |

4) Waste water

It was estimated that flow back water would initially amount to 15-30%, while 50% could flow back with production water. The flow back water needs to be stored in tanks because it contains methane (etc.). It was reported that shale gas wells produce a maximum of 95 $m^3$/day of methane saturated groundwater during the production phase (so relatively limited).

The quality of the waste water depends on the local geological conditions and the fracking fluids. The waste water can potentially be toxic, carcinogenic or radio-active (Naturally occurring radioactive material NORM in source rocks).

In the development scenario of N. Brabant (130 wells) 0,4-1,1 million $m^3$/year of waste water will be produced.

5) Fracking fluids

The fracking fluids contain water, proppant (2.500 t/well) and additives (1-2%). The additives are needed to prevent clogging of the pores, increase the viscosity of the fracking fluids to transport

the proppant and prevent scaling, algae and microbial growth and pH control. The additives have to fulfill the Reach requirements.

6) Drill cuttings

Each well will produce 200 m³ of cuttings, for the N. Brabant scenario, the equates to 26.000 m³. The cuttings need to be monitored for radio-activity (NORM). In the NL, no readings exceeded the standards, however radon was not measured.

7) Methane emissions

In the USA, storage of production and fracking fluids is allowed in open basins, hence methane can escape freely in the air. In the Netherlands, this is not allowed, the fluids need to be stored in tanks, methane needs to be captured.

8) Climate footprint

If the methane is captured, the climate footprint is still slightly higher than with conventional gas production. Because of more intense logistics and longer drilling, fracking increased the emission of CO2.

9) Earthquake and subsidence

While fracking generates tremors that are not felt, injection of fluids near existing active faults can in some cases induce earthquakes. Subsidence does not occur since there is no compaction.

<u>Risks to personnel and the environment :</u>

While in conventional gas production, the flow back is the largest safety risk for personnel, this risk is significantly smaller in shale gas production. Due to the larger number of locations, the

longer drilling and supply activities, the accumulated potential risk per location in shale gas production is higher.

Risks for the environment include potential groundwater contamination due to failure of well bore integrity or due to migration of fluids and methane. Contamination of soil and surface water is possible due to leakages from surface operations and activities.

Prevention and litigation of risks :

It goes without saying the well bore integrity needs to be properly ensured and continuously monitored.

In order to prevent spills and leakages, production water needs to be stored in tanks and watertight floors and secondary containmentneed to be installed.

In order to minimize migration of fluids and methane, a safe distance from old wells needs to be respected. Buffer zones should be installed in order to take into account the activities of other subsurface users.

To prevent local effects, insight in the EIA should be provided and the presence of active faults need to be investigated. The light and noise pollution has to be tackled.

Legal aspects (fracking) :

The fracking activity falls under the construction and maintenance program of well bores and is not obliged to be reported to the Dutch State Supervisions of Mines.

Chemicals and additives need to fulfill the Reach requirements. A fracking program needs to be submitted.

**Conclusions and Q&A :**

- There is a need to adapt the legislation in order to include fracking activities and the use of additives
- Best practice protocols for shale gas exploration and production need to be put in place
- Is shale gas cheaper than conventional gas : there is a potential, however price of drilling is very high because the equipment is lacking.

# 3. Session 3: Transferring Liability

## Session Chair: Paul van Riet, DOW Benelux, the Netherlands

**Presentation Nr. 1**

**"Liability transfer from the perspective of a private equity company" by Bencis (Capital Partners the Netherlands)**

Invest in companies (buy them). Rationalise and improve them to create shareholder value; then sell after typically 5-7 years. Founded 2000. 16 people in Brussels and Amsterdam offices. 75M investment in any one transaction for investments up to 250M (so so-called mid-market transactions). The first fund set up has been liquidated. Fund 2 has been partly divested. Active Fund 3 has about 10 companies in it and Fund 4 has just been set up and has invested in 3 companies to date.

Due Diligence process (EDD) starts with screening and preliminary valuation; full due diligence then takes place. EDD one part in about 10 of the overall DD process (commercial, financial, legal, tax, Environmental, operational, insurance, management, IP)

EDD is about understanding risks and liabilities. Key components that are assessed are permits, soil contamination, hazardous and regulated substances, water and waste management, air emissions, and noise levels.

A number of ways of dealing with identified environmental liabilities are used, including Having a remediation plan designed and implemented, via contractual indemnification in SPA, or price adjustment (up front and/or escrow).

In one deal the environmental liability (remediation costs) represented an estimated 25% of the deal, which is a problem (potential walk away scenario). It may be possible to delay the deal or make the liability remain the seller's obligation. . Price adjustment of this scale usually cannot be agreed.

It was noted that a share deal (versus an asset deal) Is often good if there is a clear understanding of all the main risks and liabilities.

A case study was presented involving the acquisition of Xeikon (industrial scale digital printers; some analogue printing – plates based printing) in late 2013. The business has a toner production facility with 440 employees and €130M revenue. All manufacturing sites located in Belgium. Soil contamination by heavy metals at toner plant which was not linked to toner manufacture. This liability remained with previous owner with funding already in place. Worst liability for operational business linked to hazardous chemical storage and was <€100K, so below materiality.

Q from Paul (chair) re. what type of sites are acquired? BCP don't like buying sites with big contamination issues – distressed businesses or contaminated soils and/or groundwater (although it was recognised that this could be a business opportunity if one addresses such issues in the timeframe of the investment cycle to generate a significant potential upside).

Q: If seller indemnifies buyer because of contamination, why don't they put restrictions on land use (if set up a specific Escrow then seller will still want restrictions in what can be done)? Answer was BCP buy family businesses typically and they don't understand such issues so do not put restrictions on them. If they did this could be a deal breaker for them.

**Presentation Nr. 2**

**"Liability transfer to third parties – experience from the UK and Europe – Lessons learnt" by Richard Clayton (WSP Remediation-UK).**

A summary of the experience gained from 5-6 years of site liability buyouts by WSP. It was made clear that this has been a hard road to get clients interested in the concept and use this service (WSP has no interest in land or business), however with a few notable success stories. Trust can be an issue as WSP set budget to do the work (Escrow) and then of course do the work.

It was noted that there are 3 key aspects to take account of, as follows:

1. Transactional context. Most examples linked to transfer of a site of business between 2 parties
2. Transfer of obligations. Not possible to transfer legal liability (thought it was possible but ultimately it was not). Polluter is outsourcing management of liability. Can get to the point where regulator calls WSP, but not always possible even when the problem is fully outsourced.
3. Problem must be defined: Needs to be a tangible problem so that the remedy can be fully scoped and costed. Perpetual care sites do not work.

Most important thing is the contract. These have been typically quite simple and include length and term; what is covered and what is not; access agreements as needed, payment terms including incentives. The end Point is key to define – remediation goals and defined end use. Parent company guarantee needed typically (Holding Co of WSP provides this). Warranties by WSP required.Bonds in place to make sure contract can be honoured in the event of contractor business failing, with insurance backing also. Funds transferred are ring-fenced (e.g., Escrow) to protect both sides. Risk & Reward options can be considered to incentivise success.

Once the project becomes live (deal done) then decision making is quick (self-regulating client model)

**Case Study 1** (Kodak Knowsley). Former Ordnance factory. 2007 liability transfer **following detailed due diligence process.** New owner came in and site became sublet (various units leased out to 3rd parties). Cost cap insurance, third party claims etc. (12 years). Contractual obligations met in Dec-10 and able to return money to stakeholders,within time and under budget. New tenants caused some new contamination (discharges to drains related). Contamination of perched groundwater. Able to sort out quickly because WSP had free rein to sort things out.

**Case study 2**: Operational factory 24/7. Fixed price remediation contract. Through EDD focussed on CHCs issue but Cr issue not understood. Pilot study found $Cr^{6+}$ had been created

(chemical oxidation process was to be used for CHCs). Changed tack to DPVE based remediation. On-going (not closed yet).

**Case study 3**: small site on old industrial estate on old gas works site (Saltley Gas Works). EDD project. Buyer was risk adverse so WSP took on liability (indemnity for one year and insurance policy for client with WSP named party).

Q: Do WSP extend indemnities? No.
Q: What happens if no further action letter required? Problem area as does not happen very often. Have to agree end point but it can be difficult.
Q: In case Study 1 was former munitions history of site excluded? No but issues had already been resolved. As very high level of EDD undertaken and it worked (it was noted that a burning ground and landfill were not included in WSP contract).
Q. Why do authorities see fixed cost remediation as a liability transfer? If remediation agreed then to complete it under such a contract then regulator should sign off and as such client has removed liability (or should have).

**Presentation Nr. 3**

**"Liability transfer of plumes, framework, organisation and cases" by Hans Slenders (Arcadis , the Netherlands)**

This presentation focussed on so-called Area Wide Groundwater Management (AWGM), which since July 2012 has been enshrined in Dutch Law on soil protection. A Remedial Management Plan (RMP) necessary (including AWGM). The choice of area must be substantiated. No goals for source area given in the overall plan (as this requires site specific work).
The upper 0-5m of the soil profile remains the responsibility of the site owner (they are considered best placed to deal with this aspect). If contamination >5m deep it is unlikely to be a risk to surface receptors. The 5m depth was provided by the speaker as a practical, defined depth (not set in law)

The main reason an AWGM is considered important is to allow holistic protection, improvement and use of groundwater. Positive (improving) groundwater trends needed (need to address source), but exemptions are possible if cost effectiveness is an issue.

**Case Study 1**: Area of 200km$^2$ with about 200 plumes (7 municipalities north of Utrecht). 4 drinking water protection areas (DWSs) in it. Sand from 0-200m so DNAPL has migrated to depth. In the 1970s the first contamination of DWS was detected (e.g., Hilversum DWS). Abstraction (Q) had to drop from 8Mm$^3$ to 2Mm$^3$ to minimise plume impacts. The key source of groundwater contamination was a major effluent lagoon, with the residual source down to 180m depth. There has been 20 years of cooperation so far, with the source-pathway-receptor (SPR) risk-based methodology applied. Process followed looked at which plumes were most relevant. Multiple plans by areas and plumes. For example for one PWS an early warning system incorporating a number of wells to various depth was established. For areas where many plumes a different approach typically adopted with the creation of an overall management area; compliance monitoring line with buffer zone beyond. Restrictions on land use (hazardous chemical use) and groundwater use.

The Area Manager role is key: Aftercare organisation under the umbrella of the Province. Budget €4M, which for number of problem holders is small. Sites pay and in process can transfer their liability (under contract). 5 contracts so far signed (so limited transfer although most existing problem holders paying something).

**Case Study 2**: similar to 1. SPR risk-based approach. Groundwater to river in this case. Plan incorporated monitoring at edge of contaminated zone towards river and nature zone to north. The Municipality is the Area Manager. Budget of €1M for 30 years of monitoring. Average liability transfer cost 100K for an individual plume holder.

**Case Study 3:** 7-10 companies on small industrial estate, with an old sewer system the main cause of the area wide contamination of groundwater(multiple sources). Area Manager is Aftercare company (€1M liability) – cannot be a private company as problems typically last too long. Cooperation is between 5 companies; plus the Municipality which owns three sites).

Already clear financial agreements in place by 2010, based on defined relative contribution to contamination. All sites have transferred liability. Municipality able to remediate their sites and Municipality is the owner of about half (>50%) of the plumes/problems due to their sewers and sites. So Municipality is the main problem holder and therefore appropriate to act as overall manager and take leadership role. It was noted that both public and private plume issues need to be transferred.
Finallyit was noted that plumes can spread for up to 30 years, as long as stay within a defined boundary area – Rule in Netherlands.

Q: What happens is local authority runs out of money. Can they go and ask for more money from former problem holders? Hans said he is not a lawyer so could not answer.

Q: What happens if problem holder not paying anything. That company would have to deal with its own contamination anyway under Dutch law so will be addressed separately.
Q: Lawyers too involved (as difficult involving a lot of parties)? No – it is all about Area and site manager negotiations and level of cooperation seems to be high. Sum of money is typically not huge and companies usually happy to pay it or can negotiate easily and reach agreement

Q: Large industrial estates with one owner? Another scenario? Possible. Need to find someone to take over the management.

Q: Top 5m responsibility of site owner. Remediation may interfere below 5m? The 5m is arbitrary and if a site wants to go deeper they can. Source remediation is encouraged, as needed, under Area Wide Groundwater Management schemes and this is a key benefit (sites which transfer liability have responsibility under this contract to address their shallow contamination if needed as part of the deal).

# 4. Session 4: Insurance

## Session Chair: Session Chair: Rick Parkman, URS, United Kingdom

The fourth session of the workshop included three presentations highlighting the role of insurance in the management of environmental liabilities. The potential to claim against historic insurance policies for environmental liabilities was also explored.

**Presentation Nr. 1**

**" Liabilities and insurance arising from Environmental Liability Directive "(ELD) by *Simon Johnson (AON, UK)***

The number of cases where regulators have imposed clean-ups under the ELD remains limited across the EU and is variable in different Member States. Examples provided were a 6,000 fish-kill due to a pollution incident in the UK and an oil pipeline failure in France. It is noticeable that the number of cases is starting to increase as the legislation takes effect. A scenario was given of markedly increased costs because of ELD, with a Pesticide in warehouse fire (France 1996) having a mere €12K cost at time, which has been estimated to be elevated to nearer ~€4M (if under ELD now) because the firewater went to river and had a major biodiversity impact.

Certain Member States, notably Poland, have applied ELD to require remediation in absence of other applicable legislation. In Poland, with some 200 cases, ELD is actually embedded in EPA legislation and this is why they have so many apparent ELD claims.

Standard corporate and property insurance policies held by most companies are unlikely to provide full cover for ELD claims, as they generally do not cover triggers such as Gradual Pollution, Environmental Damage (i.e. biodiversity impacts) or direct regulatory action, for which a polluter can be held liable under the terms of the ELD. Most policies have excluded these since 1986.The insurance industry has responded in recent years to this gap with the development of Environmental Impairment Liability (EIL) insurance policies, which refer specifically to definitions included in the ELD and cover gaps in typical corporate or property insurance. It was noted that there is no cap on liability linked to Damage in ELD. One difficulty

for the insurance market has been to try and estimate the cost of restoration on ELD based claims, which include such aspects as biodiversity and possible complimentary or compensatory remediation (little case study data out there). The 4 main challenges to the insurance industry were reported to be (1) prevention of imminent threat is new (2) primary remediation (clean-up costs awareness but biodiversity related restoration not so), (3) compensatory remediation (considered pure financial loss so excluded in most insurance policies); and (4) complimentary remediation (beyond incident area so again a new concept).

Insurance can also be used to demonstrate the presence of financial guarantees required under the ELD in certain Member States (Portugal, Bulgaria, Czech Republic, Slovakia, certain regions in Spain, plus more committed to do so), with the added benefits of providing effective risk transfer and not adversely impacting the balance sheet (as can be the case for other guarantees such as bonds and provisions). The European Council will provide further clarification during 2014 regarding the need for financial guarantees.

**Presentation Nr. 2**

> **"Case studies and experience using historical insurance to pay for remediation in the US, Canada, UK and its application to other European countries" by *John Malanchuk, (Eisenstein Malanchuk LLP, USA)***

Insurance recovery (i.e. claiming against historic insurance policies) for environmental liabilities is well established in North America, with numerous specialist advisory firms in the market. It is all about using old insurance policies, where possible, to pay for things like site remediation, as pollution was not excluded in policies written more than ~25 years ago. However, despite tangible opportunity existing in Europe, the practise is not commonly pursued.
The three key requirements for successful insurance recovery are: policy rights (company can prove legal rights for policy coverage), sufficient liability (probably not worthwhile for liabilities below 1M US$), and knowledge of insurance (retention of records, proof of coverage).

Obstacles to insurance recovery exist, notably notice/trigger periods, specific limitations/exclusions (e.g. pollution exclusion, third party liability) and other policy terms (e.g. damage definitions, retrospective liability).

A number of case studies were presented, mainly from North America. The majority of successful claims were made against policies dating from before the early 1990s which did not have specific pollution exclusions. A UK case was alluded to in which a fire at a facility was covered under a policy (damages caused) but the regulatory action and requirements post fire were not.

The key takeaways were: 1) the recovery of environmental liability from former insurance policies can be material (> 1M$); 2) for a minimal fee, an exploratory search can be made to assess the potential for insurance recovery before pursuing a case; 3) negotiated settlements with insurance companies are preferable to legal proceedings; 4) efforts should be made to ensure the maintenance of insurance policies during acquisitions; and 5) companies should implement adequate record retention to increase the opportunity for future recovery.

**Presentation Nr. 3**

**"The Role of Insurance in the Management of Environmental Risk" by *Duncan Spencer, (EDIA, UK)***

The final presentation of the session provided a clear overview of the role of insurance to complement gaps in Public Liability insurance and Professional Indemnity insurance, which typically exclude "pollution" and gradual events. In the UK pollution covers was limited to sudden events only in 1991.

Two main types of cover can be provided under Environmental Impairment Liability (EIL) insurance: 1) for Historical Liabilities (i.e. for pollution events that occurred prior to the policy period); and 2) for Operational Liabilities (e.g. sudden releases during the policy period).
The importance of reviewing and, if worthwhile, maintaining insurance policy terms during acquisitions was stressed. As with Presentation 1, the role of insurance as a form of Financial Provision (FP) was highlighted, particularly in light of new FP requirements under the Environmental Liability Directive (ELD) and Industrial Emissions Directive (IED). The table below provides a useful comparison of the benefits of insurance versus the other main forms of FP used by companies (balance sheet provisions, bonds).

| ISSUE | INSURANCE | BALANCE SHEET PROVISIONS | BOND |
|---|---|---|---|
| Known/ foreseen events | Insurance will not respond | Works | Works |
| Small value provision vs company value | Insurance not cost effective | Works well but ties up cash | Works well but ties up lending |
| High value provision vs company value | Insurance scalable | Company unlikely to be able to make provision | Either unavailable or very costly |
| Incident on purpose/criminal | Regulator needs to be an insured on policy, otherwise not covered | Works well | Works well |
| Event gradual or within property or as a result of poor maintenance | PL Policy will not react. EIL cover required | Works well | Works well |

A Case Study example was provided to illustrate how the issue of sudden versus gradual loss can be difficult to determine. An organic chemical loss took place as a sudden event during a tank farm transfer (300 tonne loss that required immediate clean up and long term MNA). The primary insurer did not pay as they argued that the pipe had been failing for many 10s years, i.e., it eventually failed. Nowhere in the policy was there a definition of sudden loss so they won the day. The incident was however covered under a secondary policy which incorporated gradual pollution.

# 5. Session 5: Financial and case studies

## Session Chair: Oliver Phipps, ERM, United Kingdom

This Session focused on the various issues that need to be considered in developing and managing appropriate provisions and reserves for managing environmental liabilities.

The Chair opened the Session with an introductory comment that more input and connection is required by those that take the lead on sustainability with those that have responsibility for financial decision making within an organization. Additionally, financial reserves for environmental liabilities can have a big impact on shareholder value.

This session included three presentations on the management, development and/or use of financial provisions, the third of which included a case study, which also comprised a bespoke legal approach within the overall solution.

**Presentation Nr. 1**

**"Financing Remediation" by *Paul van Riet* (Dow Benelux BV)**

An overview was presented on the various issues that need to be considered by large Industrial owners in discharging their responsibilities for managing environmental liabilities and remediation projects. For organisations on the stock exchange there is an obligation to make appropriate provisions for remediation, which can be taken out of the yearly budget (Profit and Loss; P+L) as an operational cost or out of a remediation Reserve as an accrued cost.

Various issues need to be considered in determining the appropriate budget provision and in managing accrued costs. For example, is the existing dataset sufficient or are new data needed bearing in mind that use of older datasets is likely to carry greater uncertainty in developing budget estimates? Is external support required to develop the estimates and what is the required timescale as sometimes the information is required at short notice? All derivations

need to be auditable with clear, defendable explanation and a progressive, flexible approach is also required to adjust estimates as necessary to accommodate new data as and when such information becomes available.

Accruing costs can give rise to various issues. By definition, accrued costs are taken ahead of any project when a definitive solution for dealing with a liability may not be known; changes in technologies and/or the regulatory decision making process may also change and there is risk of influencing the P+L bottom line.

Budgets are normally determined by planned projects for the next year and may be developed in house or using external consultants. Commercial issues can arise if too much optimism is included in the forecast (e.g. underestimating any anticipated project delays) or as a result of changes in available resources. Also, if a budget is not met or used, this can cause an accounting issue for the problem owner.

Alternative finance may be available for funding; for example subsidy funds (e.g. for R&D activity) and/or taking advantage of tax breaks or obtaining compensation for historical pollution (cross refer to Session 4 on insurance). If a subsidy is received it should be checked to confirm that it has been approved by the EU commission.

**Presentation Nr. 2**

**"Environmental Liability Provisioning and Real Estate Portfolio Management: new tools, requirements and trends within the actual economic crunch" by *Dirk Nuyens (*ERM, France)**

There are several drivers for developing robust environmental provisions as these may need to be disclosed to external stakeholders, shareholders and employees. Reporting of Environmental liabilities is complex and built up from several components that span a backward and forward looking view of the business or operation considering legacy risks, compliance and operational risks, integrity and longer term sustainability risks (which may include costs for closure). Other aspects to consider include brand reputation, the value of the business and

assets, considering the real estate portfolio and the core and non-core business operations. Provisioning also needs to account for the Regulatory and Accounting Framework Standards e.g. IFRS and US-GAAP and the reporting requirements for each are different.

There are two key ways to make Environmental Liability Valuation (ELV) predictions either using single point estimates (e.g. most likely and reasonable worst case scenarios) or using probabilistic (stochastic/ deterministic) cost models using Monte Carlo simulations. The latter requires more effort by more experienced people and provides a better way to account for variation and uncertainty. Either method requires a review of capital and O&M costs. The benefit of the probabilistic modelling is that the output can be cut in different ways dependent on the different requirements of the different stakeholders. For example, developing estimates for insurance or provisioning purposes and for setting and buying reserves. Two case studies were presented to illustrate the approaches to cost estimating.

**Presentation Nr. 3**

**" Creative Legal Solutions to Redevelop a Complex Contaminated Site in the Flemish Region" by *Eveline van Meihaeghe (*URS Belgium) and *Stijn Vandamme,* (LDR ADVOCATEN, Belgium)**

An interesting case study was presented in which a combined technical and legal solution was provided for managing contaminated land liabilities at a 14 ha Brownfield site ("Park Ragheno"). The site was formally used as a railway depot and component factory before operations ceased in the early 1970's and was heavily contaminated with VOCs, BTEX and TPH as a result of these historical operations. The site has several challenges in terms of developing an appropriate remediation solution as it is underlain by complex geology (low permeability layer in the top 6m underlain by a higher permeability layer) and contaminative activities upstream of the site are also present (former gas and munitions factories). In redeveloping the site for alternative use, legal challenges were also faced as Flemish law prohibits the transfer of liability unless it can be demonstrated that certain conditions and uncertainties have been met.

URS undertook baseline site investigations in 2007 and the results were first reported to the regulatory authorities (OVAM) in 2010 and a remedial plan was submitted and approved by OVAM for the first phase of redevelopment which started in 2013 with the construction of the new Red Cross Flanders Building. Creative legal and technical solutions were required to commence the process which included placing the new building on the non-contaminated sections of the site, allowing remediation to occur over three phases and to be state subsidised as a result of securing a Brownfield covenant agreed between the developer and the government.

The case study provides a good example of the need for different specialists and stakeholders to work closely together to manage the transfer of liability and risk in redevelopment and to be compliant with the prevailing legal regime.

## 6. Session 6: Mining Legacy and Liability

Session Chair: Lucia Buvé, UMICORE. Belgium

This session was directed at various themes concerning mining legacy and liability – not only practical aspects such as management of tailings, which constitute a significant secondary area of mine operation; but also the scale, both geographically and historically, on which mining operations take place and the legacy matters that arise as a result.

### Presentation Nr. 1

**"UMICORE's mining legacy – liability management approach" by *Arne Hüttmann (UMICORE, Belgium)***

Umicore is a company for diversified materials technology and recycling. Metals are at the core of Umicore's business -- there is an element of metals in all or most of the Umicore business groups and units. Two examples of historic metals-related activities are: a) former zinc mining at Vieille-Montagne during the 1800s (from ca 1805) wherein germanium substrate materials were mined; and b) cobalt mining at Union Meuniere du Haut-Katanga (mining in the Congo) during the 1900s. Cobalt was used in cathode materials for Li-ion batteries.

Umicore has undertaken inventory of historic mining concession, mining areas etc; and has evaluated these to make strategic decisions on retention and/or management of historic deeds, concessions etc. Finding historic information on mining activities can be a challenge; and even when the information is inventoried, surprises can still arise. Arne Hüttmann presented several cases in which the company faced historic legacy challenges. Decision on risk inventory and management for these has been based on local (national) laws and on site-specific circumstances.

Historically Pb and Zn mining laid the foundation for predecessor Umicore companies, in current-day Belgium. Umicore predecessor companies have also moved, and mined, in other countries: Germany and France, with one mine in the USA.

In Germany, 154 concessions were identified within Umicore, of which 72 were in North Rhine-Westphalia, mostly to the east of Cologne; 85 in Rhineland-Palatinate near Koblenz; and one in Hesse. Mining activity at most sites ceased in the late 1800s / early 1900s, with a handful of sites continuing active until after WWII. The last mine was closed in 1978. Upon the introduction of a new federal mining law in the early 1980s, it was decided by Umicore to retain all concessions. Under the current law it is theoretically possible to return concessions to the German state, however liabilities for these lands remain with the last known concession-owner. Umicore therefore elected to **retain** the concessions for German historic legacy sites.

To inventory and assess risk and (potential) liabilities, a document-based risk assessment programme was initiated in 2008. Future mining-related expenditure for safe-guarding of shafts, adit openings, tailings management, etc were assessed (some of this using Monte Carlo simulation). Site visits were subsequently completed in 2009-2010 at the identified most risk-prone sites. Provisions (under IFRS guidance initially; and later changed methodology under German accountants' / tax consultants needs – based on a scheme used in German gold-mining provisioning) made for 10-year periods to cover mining-related works. The company also invested in GIS-based electronic archiving, a system that the company have continued to populated since 2011.

Potential liabilities associated with these historic legacies were identified to include:

- collapsing shafts,
- open adit entries,
- tailing heaps,
- unstable slopes, erosion by wind and water
- percolating water
- acid mine drainage.

Possible issues pertaining to water have not as yet been provisioned due to uncertainty surrounding rough estimates.

The inventory and overview for German sites is also useful for response to enquiries concerning:

- planned changes in land use
- building planning
- individual building projects
- boreholes (shallow geothermal energy, private water supply etc)
- claims related to damage to buildings, roads, etc

In France the company held 15 concessions, by the end of 1980s, in southern France. Under French mining law, concessions can be relinquished to the State ("renunciation"). Obligations for monitoring however remain. Implementation of the EU WFD and its applicability to former mining sites is pending. Land with tailings heap remains Umicore's property, and the maintenance of these continues – there is a site in particular with potential reputation liability at this site.

In Belgium: 6 concessions have been obtained in eastern Wallonia. These were reviewed and concessions were returned (submitted request in 2000 and heard back in 2012).

US concession: there is one former gold mine in Colorado, acquired in the early 1980s. The mine is owned (there is not a concession system), but has not been exploited / mined. There has been no revenue, but there is potential liability. The mine lies far from production sites, at an altitude of 3000m; the mine is therefore not accessible for 7-8 months (winter months). There is high seasonability in water discharge from the mine. Water discharge leads to

potential issue with metals in a local river. Very tight discharge limits have been imposed by the US EPA.

Conclusions:

- depending on legal framework, different approaches are needed to address legacy from former mining activities and concessions.
- Liability can have a direct financial impact, but also tangible reputation impact even if no wrongdoing is determined in court

**Presentation Nr. 2**

**"Smart Tailings: Enabling safe and cost-effective management of Mine Waste Site Closure and Rehabilitation" by *Rob Dijker, D.J. de Krame, and M. Van der Wijk (Witteveen+Bos, Netherlands)***

This presentation was directed at the offering of a broad picture of mining sites, and a profile of the development and typical storage situations that are found for tailings. Uncontrolled and/or unmonitored dumping, stock-piling, storage etc can lead to some of society's largest environmental spill disasters (e.g. break in a dam made of tailings, in Kolontar, Hungary in October 2010). Appropriate monitoring, modeling and assessment can be done to manage tailing heaps on a large scale. The presentation offered a number of examples.

The speaker gave an overview of mining distribution across the world. Mining principles and site typically include the following:

- overburden in a mine goes to waste rock;
- ore goes to processing (crushing/grounding, separation; extraction/stripping, smelting/refining, electrolysis etc). This processing may occur or typically occurs on site;
- processing yields tailings and purified metal product.

Liabilities and risk arising from mines present a challenge due to:

- the large scale ad volume of mine tailings and waste;
- mine tailings and waste form a complex system of geochemical, physical and biological processes.

Mine tailing heaps, dams, structures could be viewed as 'sleeping dragons' (citation: Professor Robertson). These structures must be managed, for which a typically 'linear' project management approach could be taken. Instead Witteveen+Bos, and consortium partners in the 'Smart Tailings' program and concept. The Smart Tailings concept entails a cyclic approach with various levels of assessment; with an aim to identify actual risk and optimize cost-effectivity of actions in a tailings management program.

- Phase A: desk-top study is done, a conceptual model and risk evaluation is completed, and this leads to the identification of measures;
- Phases B – D: actions are taken that are directed at tailings monitoring and management. Several case studies were presented;
- The cyclic approach allows for the assimilation of increasingly more data enabling a focused approach to risk identification and management specific to a particular site; or, even, of remediation. Given the scale of issues and therefore liability that can arise from badly managed or unmanaged tailings sites, the Smart approach advocates the development and implementation of an (active) monitoring and management program rather than simply closing a site and walking away to avoid expenditure.

Possible measures that may arise from analysis may be options to: re-process of old tailings, e.g. dry-stacking (de-watering of tailings, compaction to lower permeability, less vulnerable for AMD formation); monitor for changes to the tailings heap or structure and/or leaching processes (including leaching out of tanks used to store tailings). This may include monitoring for deformation in dams.

An example of a mining legacy site is the Bor Copper Mines in Serbia:

- Closed dump site and tailings facility, covering a surface area of approximately 1,000 hectares;
- Europe's largest copper mine complex;
- Serbian State decided to take over the mine, with the support of the World Bank.

An environmental management and monitoring plan was developed for the rehabilitation and remediation of the closed site. The plan was developed based on the history and characteristics of the tailings sites, to track changes and development of the tailings.

Other examples given concern situations in which re-mining of old tailings may be the best solution; and an historic example where, based on aerial photographs, the shift or change / stress exhibited by a tailings dam was actually visible. The dam gave way, however the photographic sequence illustrated the point of tell-tale signs that may have actually been noted, had these been monitored.

Summary and Conclusions:

- Risk management of old mine tailings sites is a major challenge due to their scale, complexity and evolution in time.
- Safe and cost-effective management can be achieve

**Presentation Nr. 3**

**"Approaches for Reducing Liabilities in Tailing Management" by *Stany Pensaert (DEC), Sigfried D'haene (DEC), Piet Wens (Pollux)***

Landfilling Is not typically a core business for an industrial site. A solution to landfill 'management' or the closing of a site often consists of a 'stand-alone' solution that may or may not be followed up by monitoring. However even if monitoring, this may not carried out on the basis of specialized expertise. Companies may typically know their product well but not their waste.

Example: tailing ponds that develop and/or are left behind; covered and abandoned landfills.

A longer-term strategy for management can be difficult to introduce and/or carry out. Long term aspects to tailings management may include the introduction of liners, re-processing of tailings, etc. The speaker(s) further presented examples of the level of expenditure that after-care monitoring may arise, in terms of percentages (%) of GDP.

Challenges in Tailing Pond Management may include the following:

- Design of a tailings site may be such that there is risk of failure. Programs in 3d-modeling, simulation of development, etc are available monitor this progression;
- Administrative Liability Management a permit may allow a company to operate, however the permit does not necessarily offer a guarantee of no liability. Depending on the regulatory regime that pertains, there may in addition be other derivative liabilities, responsibilities but also benefits to consider.
- large ticket issues which can be covered with the use of an insurance policy. However there may also be challenges (incorporation into general liability; specific landfill policy) to consider that cannot be covered by an insurance policy.

Technical aspects of reducing liability or potential liability may include: the increase in stability of tailing ponds (good geotechnical characteristics of filter cake); recycling of metals / chemicals from tailings during dewatering; post treatment – chemical stabilization of filter cake; post-treatment: solidification of filter cake. An example is given from the Nyrstar site located in Balen, Belgium, where a tailings management programme had been in place but where space had started to become a shortage for tailings storage.

- Process residues total: goethite (FeOOH 75,000 tons dry matter /year); and gypsum (precipitated /from neutralization sludge) 30,000 tons dry matter / year.
- Initial phase of the program:
    - A new goethite pond was built by raising the height of dikes, thsu creating additional storage capacity

- Old ponds that had been capped were re-mined:
  - excavate material,
  - dewater,
  - dry-stack material (filter cake) into the same lagoon.
- A treatment / dewatering plant was built on site.
- a recovery process (zinc recovery) was introduced.

For the above example, outsourcing of tailings management using a DB(F)O approach, ie design and build and (finance and) operate, proved to offer a successful new solution for an active site.

# 7. Session 7: Liability management and case studies

## Session Chair: Marcus Ford, Geosyntec, United Kingdom

**Presentation Nr. 1**

**Development and use of a tool for assessing environmental risks and managing liabilities at a refinery in Spain by *Chiara Senzolo (Worley Parsons, Spain)***

The EU Environmental Liability Directive requires that an operator who has caused environmental damage is financially liable for reparation of any such damage. The objective of the Directive is to encourage operators to understand and minimize the risks that their operations pose to the environment and, in doing so, help prevent environmental damage. In Spain, operators of potentially contaminating installations are additionally required to maintain a bond, or insurance, to cover reparation costs should environmental damage occur.

Starting from earlier versions and concepts dating back to 2002, Worley Parsons has, since 2005, developed a series of risk quantification tools for REPSOL based on precedents developed for Petrochemical facilities in the UK (those dating back to 2002) and separate developments for other oil and gas operators. The tools have benefitted from input from REPSOL personnel on their facilities and site conceptual models. The early REPSOL models respond to the need for risk management identified by REPSOL well ahead of the Liability Directive becoming part of Spanish law.

To assess and manage environmental risks, a series of tools for quantifying environmental risks and the related potential financial obligations from their operations was developed for the Refinery of PETRONOR (REPSOL) in northern Spain. The most recent tool (called MR02), completed in 2012, is used to conduct risk assessment of the refinery with its associated terminal on the coast that is located adjacent to a protected tidal estuary. Potential exposure routes include soil, groundwater, surface water and air.

The development of the MR02 was an innovative way to standardize and automate the following 4-stage process:

(1) identification of potential accident scenarios that could lead to environmental damage; (2) consequence modeling to estimate the extent and severity of damage from each scenario; (3) estimation of the probability of damage occurring; and (4) monetization of the damage.

The MR02 tool was developed to model the probabilities and consequences that would result from 26 potential initiating events involving more than 2,500 potential sources including tanks, pipes, pumps, flare stacks and treatment ponds. The consequence modeling incorporates a series of commonly used and bespoke equations to predict the extent and severity of damage to various environmental receptors including soil, groundwater, surface water (rivers, estuary and marine environment), protected areas and protected species. The use of GIS and particle tracking through a detailed conceptual model account for heterogeneity within the subsurface improves the accuracy of the risk estimates and accounts for the effects of mitigation measures such as subsurface barriers and groundwater monitoring and recovery wells. The tool tabulates probability of occurrence versus consequence for more than 6,500 scenario combinations. The set-up of the underlying database has been one of the most difficult development issues due to the great amount of available information and the need to select the most representative scenarios with the coordination and agreement of PETRONOR/REPSOL.

The critical equipment and the highest risks are easily identified by plotting probability versus monetized damage; consequently, the improvement measures for risk prevention and mitigation can be readily prioritized. The required financial bond, or insurance, required by Spanish law can then be calculated by taking into consideration the damage associated to 95% of the cumulative risk, according to the Spanish Regulation.

The presentation highlighted the characteristics of the tool and its capacity to monetize the damage and to quantify the required bonding or insurance.

**Presentation Nr. 2**

**Legacy site management for community benefit by *Phil Crowcroft, (ERM, United Kingdom)***

The presentation gave an overview on the development and operation of a liability management system operated by the Land Trust (an independent charitable trust) which manages land liability for both the original land owner, and for the Land Trust as new owners of land with special value as community assets such as country parks and woodland.

The presentation details on Actual or Potential Liabilities associated with Acquisitions being Existing or Future Legal Liabilities, Future Remediation Cost and Future on-going cost. The Land Trust uses a Risk Management method. All solutions are categorized under; Technical, Financial, Management and Insurance.

Two examples (landfills which have received chemical wastes) in the UK are used to demonstrate the model of liability control which uses technical, management, legal and insurance tools to remove legacy liabilities and manage the land for community benefit. Because the projects involve land lease or ownership transfer, stakeholders include both seller and buyer in the transfer as well as the wider community who will enjoy the land as a local leisure asset which will also enhance the vibrancy of the area, creating a more attractive environment for investment and job growth.

The first site is a former landfill used to take all the waste from the regeneration of coking works. The greatest challenges were ensuring that the restored site was healthy and supporting good

tree growth, alongside the process of surrendering the environmental permit for the landfill itself, and

having to show that the site had stabilized from a gas, leachate and settlement standpoint.

The second landfill is a former chemical waste site – where batteries containing mercury encased in concrete have been deposited -where potential impacts on ground and surface water quality have to be addressed in order to remain compliant with the regulatory regime.

The benefits of addressing these sites have been described from all standpoints, as the value of what the Land Trust model delivers accrues to everyone involved in the transaction. Past landowners are able to remove provisions from their balance sheets associated with land with little commercial value, the new owner adds to their portfolio of community assets in a managed and financially sound manner, the community sees new areas of land delivering leisure opportunities and the local economy receives a boost through the enhancement of the attractiveness of the area, making it a more desirable investment option.

The presentation has been presented from a Land Trust standpoint, combining the views of their advisers who work for both legacy landowners and the Trust in helping transactions happen.

**Presentation Nr. 3**

> **"Securing management exits and future value share from liability sites" by *Simon Towers, (NPL Developments, UK)***

Simon provides in his presentation a brief overview of the activities and makeup of the NPL group, which through its Landcare subsidiary, is uniquely able to provide complete, secure managed exits for a growing list of chemical-, industrial- and waste management clients from legacy liability sites.

Predicated on full freehold and environmental responsibility transfer at the outset, the process is backed by legal, commercial and insurance based mechanisms, thus ensuring that divestment by clients is comprehensive and lasting.

The presentation offers thoughts, backed by examples as to how value can be gained from redundant and orphan sites and bring same back into productive use, thus presenting add on value to previous owners post divestment.

A number of examples are provided which included;

1. A former Chemical works site in Cumbria acquired in 2012 that included two former landfills requiring on going legacy management, a large works footprint suitable fora variety of redevelopment opportunities. The typical due diligence process will be described utilising the 'open disclosure' basis and risk analysis, the use of environmental insurance and the agreement of a financial structure, which met the aspirations of both the vendor and the purchaser. A look at the post completion works and development programme including community engagement to develop a low conflict redevelopment of the site.
2. A portfolio of former landfill sites in the north of England from the public sector, outlining the process of assessment, and the calculation of the environmental responsibility payment which accompanied the sale. Landcare's ability to asses sites across a wide spectrum of future uses, from community assets to commercial development and numerous others in between across the 18 sites in the portfolio.
3. A former chemical works site in Cheshire and associated landfill facility, upgrading of open space provision on the landfill that creates a higher value residential development on the works site which value is shared with divesting company. The residential development is sold, with the landfill retained under long-term stewardship.

The key benefits and route map of a divestment process will be identified from simple sale of non-core assets, removal of provision and corporate responsibility to sharing in future value following redevelopment.

Value can be created from orphan sites with innovative thinking, from renewable energy opportunities through to more traditional developments. Not considered core activities by divesting companies, the key is finding the right partner to unlock value and just as importantly secure long-term divestment.

# 8. Concluding Remarks

The workshop offered diversified subjects to all members. It provided interesting new perspectives. Due to the content of the workshop, it attracted a lot of attention from the Industry side.

**Overview of past NICOLE workshops**

| | |
|---|---|
| Data Acquisition for a Good Conceptual Site Model, Carcassonne, France | 10-11 May 2006 |
| Making Managmenet of Contaminated Land an Obsolete Business – Challenges for the future (NICOLE 1996-2006 Ten Year Anniversary Workshop), Leuven, Belgium | 5-6 October 2006 |
| Redevelopment of sites – the industrial perspective. Akersloot, the Netherlands | 14-15 June 2007 |
| Using baselines in liability management: what do upcoming Directives require from us? Brussels, Belgium | 15-16 November 2007 |
| Sustainable Remediation, London, UK | 3 March 2008 |
| Environmental Decision Support Systems, Madrid, Spain | 9-10 October 2008 |
| Basics and Principles of Environmental Law, Brussels, Belgium | 31 March 2009 |
| Sustainable Remediation - A Solution to an Unsustainable Past? Leuven, Belgium | 3-5 June 2009 |
| From Site Closure to Disengagement, Douai, France | 18-20 November 2009 |
| Contaminated land management: opportunities, challenges and financial consequences of evolving legislation in Europe, Triest, Italy | 5-7 July 2010 |
| Emerging contaminants and solutions for large quantities of oil contaminated soil (Technical meeting), Brussels, Belgium | 4 November 2010 |
| Operating Windows for site characterisation, Copenhagen, Denmark | 25-27 May 2011 |
| Rotterdam Revisited; a renewed look at soil and groundwater management, Rotterdam, the Netherlands | 16-18 November 2011 |
| Water in Contaminated Land Management, the challenge of | 13-15 June, 2012 |

preservation of our water resource, Baden-Baden, Germany and Lauterbourg, France

Implementation of sustainability in management of contaminated land – in particular using emergin " green" technologies — 12-14 June 2013

*For a complete overview of all networks meetings that have been held from the start of NICOLE up to now see [www.nicole.org](http://www.nicole.org).*