Remediation of mixed waste landfill sites in the Basel industrial region

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Dr. Richard Huerzeler, Chief Remediation Officer
F. Hoffmann-La Roche Ltd.
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Definitions and Background

Contaminated land / environmentally affected sites (e.g. landfills)

Areas of land or property, above or below ground, where the surface, (sub-)soil and/or groundwater is polluted by the presence of (human-made) chemicals or other adverse alteration in the natural environment.
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Common sources for wastes at mixed landfill sites

• Municipal waste
  – Municipal mixed rubbish
  – Deconstruction / road construction waste (tar)
  – Excavation materials
  – Combustion products (ashes)
  – Spent tires
  – Old furniture

• Small and medium sized enterprises
  – Varnish, paint
  – Adhesives
  – Batteries
  – Galvanic slags

• Chemical manufacturing
  – Filter residues, distillation residues, organic solvents, heavy metal-containing material, incineration residues, off-spec materials
Common chemicals involved at landfill sites

- Petroleum hydrocarbons (fuel, diesel, oil etc.)
- (Halogenated) Organic solvents (e.g. Tetra- and Trichloroethene)
- Pesticides, e.g. DDT
- Polychlorinated Biphenyls (PCBs)
- Polyaromatic Hydrocarbons (PAHs)
- Benzenes
- Heavy metals
- Inorganic salts (sodium chloride, ammonia, nitrates etc.)
- etc.
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Risks (acute and chronic) by landfills

- Contamination of aquifers and (drinking) water supplies
- Direct contact with the contaminated soil by humans
- Inhalation of vapors from the contaminants, including through basements of buildings
- Direct or indirect effects to ecosystems (increasing throughout the food chain in plants or animals)
- Ingestion of contaminated soil or soil products
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BCI waste treatment practices over time

<table>
<thead>
<tr>
<th>Production</th>
<th>Year</th>
<th>Wastes / Waste Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color extracts / start „tar chemistry“ production in water / acid</td>
<td>1860</td>
<td>Wastes „diluted“ (&quot;waste-mills&quot;) and discharged or dumped as solids into the river Rhine</td>
</tr>
<tr>
<td>start of pharmaceutical chemistry</td>
<td>1880</td>
<td></td>
</tr>
<tr>
<td>start production of Textile aids</td>
<td>1900</td>
<td></td>
</tr>
<tr>
<td>start „Triazine chemistry“</td>
<td>1920</td>
<td></td>
</tr>
<tr>
<td>start plastics chemistry</td>
<td>1940</td>
<td>Dumping of solid wastes off-shore (North-Sea)</td>
</tr>
<tr>
<td>start agrochemical chemistry</td>
<td>1960</td>
<td>Dumping into Basle regional landfills</td>
</tr>
<tr>
<td>DDT</td>
<td>1980</td>
<td>Dumping into Bonfol landfill</td>
</tr>
<tr>
<td>start solvent-based chemistry</td>
<td></td>
<td>Dumping into Kölliken landfill</td>
</tr>
<tr>
<td>use of halogenated solvents</td>
<td></td>
<td>Drummed wastes into Teuftal landfill</td>
</tr>
<tr>
<td>Waste separation, Avoidance, Minimization, Recycling; high-temperature Incineration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Waste streams diluted into the river Rhine (before 1955)

Waste(water) discharge by pipeline to the bottom of the Rhine river
Waste dumped into the Rhine river (before 1955)

Ferryboat for waste dumping

Horse-drawn waste carts
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Basel region mixed waste landfills as of 2001

Landfill sites, where companies of the Basel Chemical Industry were involved: 12 sites in 3 countries
The „Feldreben“ and “Rothausstrasse” landfills for municipal wastes in Muttenz / Switzerland

in operation
late 40ies to late 60ies
The „Hirschacker“ landfill in Grenzach-Wyhlen / Germany

in operation 50ies to 70ies
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Socio-political aspects of Remediation activities

• Emotional and/or negative reactions of stakeholders likely:
  – do remediate and protect my drinking water resource, but „not in my backyard“ (noise, traffic, emissions ...)
  – low support, if tax-payer‘s money is used to co-fund activities

• Damage to reputation of chemical and pharmaceutical companies possible / likely

• NGOs and (local) media build a strong case and media-campaign around the Basel regional landfills and the risks associated
Socio-political aspects of Remediation activities

• Contradiction between the environmental law, the public perception and the economical aspects:
  – The law knows different steps of responsibility for historic waste generators / polluters / (current) owners
  – Since often ”chemicals” lead to a remediation decision it is wrongly perceived that the chemical industry has “to pay for everything”
  – The technical feasibility or overall ecological benefit for a remediation project in the eyes of the public thus seems less important, since the chemical industry shall anyway assume all cost
Plakativ auf Stimmenfang

Liestal | Hart umkämpfte Chemiemüll-Initiativen


Die Grünen forder in ihren Initiativen, dass die Pharmaindustrie als Hauptverantwortliche für eine Totalsanierung der drei Muttenzer Chemiemüll-Deponien besorgt ist – und auch dafür bezahlt.

Die Grünen bewerben ihre Initiativen mit einem markanten Totenkopf im Wasserglas.
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Foundation of the IG DRB

• Country specific contaminated site legislation developed in the late 90ies in Germany, Switzerland and France

• In 2001 the chemical and pharmaceutical companies in Basel joined forces and proactively founded the association “IG DRB“ (Interest Group relating to landfill safety in the Basel region).

• The IG DRB
  – conducted a thorough review of internal and external sources and identified 12 disposal sites, 4 in each country, where its members or their predecessor companies had been involved
  – established a collaboration, as single point of contact, with relevant stakeholders such as authorities, municipalities, residents, the media etc. at locations in all 3 countries
Foundation of the IG DRB

• By tackling the issues of historic landfilling in the Basel area it was soon realized that
  – Basel regional landfills were all “mixed waste landfills” with municipal wastes and varying amounts of chemical wastes as opposed to “pure” hazardous waste landfills
  – the landfills were very individual, given their locations, hydro-geology, mix of contaminants etc.
  – an overall solution (“one remediation approach fits all landfills”) is impossible

• All investigations were based on a constructive approach (preliminary assumption of costs, result oriented procedure)

• Consequently, the IG DRB developed its own procedures, methods and tools; e.g. for soil and groundwater-analysis, analytical screenings, dedicated sampling methods, novel quality assurance concepts etc. (see below)
Foundation of the IG DRB

Three countries, three legislations, usually more than one company per project.

Roche
Founded 1894
Pharmaceuticals
Vitamins
Cosmetics
Fragrances
Medical Devices
Diagnostics

Ciba
Founded 1884
Colorants, technical application products
Pharmaceuticals
Agrochemicals
Photo chemicals

Geigy
Founded 1758
Colorants, Textile chemicals
Industrial chemicals
Pharmaceuticals
Agrochemicals
Photo chemicals
Trade mark articles

Sandoz
Founded 1896
Pharmaceuticals
Agrochemicals
Chemicals

Ciba-Geigy
Fusion 1970
Pharmaceuticals
Agrochemicals
Plastics & Additives
Colorants & Chemicals

Novartis
Merger 1996
K&A, F&C
Agrochemicals
Pharmaceuticals
Generics
Consumer Health

Syngenta
Spin off 2000
Agro business

Ciba SC
Spin off 1997
Specialty chemicals
2009: Take over by BASF

Clariant
Spin off 1995
Specialty chemicals
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Contaminated sites legal framework in Germany, France and Switzerland

Germany
- „Verwaltungsvorschrift über Orientierungswerte für die Bearbeitung von Altlasten und Schadensfällen“ (September 1993, valid for Baden-Württemberg)

France
- Some sections in the following laws also apply: Code des communes, Code rural, Code de la santé publique and Code d’urbanisme

Switzerland
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Guiding principles in Remediation / Clean-up

• No decisions on any activities (remediation, partial remediation, securization measures, monitoring) without the corresponding decisions and coordination with the respective authorities and legal framework

• All remediation measures must be
  – adapted to the problem
  – positive overall environmental benefit
  – technically feasible, state-of-the-art
  – (socially) sustainable
  – handled in a transparent way
  – economically justified / bearable
  – suitable to eliminate long-term risks / liabilities

• If any remediation activities were required, the respective solution will be different for all individual landfill sites

• A chemical / environmental risk based approach is applied: “how clean is clean”? remaining pollution > “0” !}
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Basel region mixed waste landfills as of 2016

12 landfill sites (3 in each country)
- 4 investigated and/or remediated: no remaining risks
- 2 with on-going remediation
- 5 are being monitored
- 1 with remediation pending after authorities’ decision

Landfill sites, where companies of the Basel Chemical Industry were involved:
12 sites in 3 countries
Summary and Outlook I

- The waste treatment by landfilling, including hazardous wastes, was considered in the past as good standard practice, according to scientific knowledge and legal framework
- There was little afterthought about future issues
- At the turn of the century in 1999/2000, in the Basel region a considerable „waste-heritage“ from the past existed
- Developments in the environmental law, emerging environmental issues and the potential land re-use were the drivers to launch investigation / remediation projects in the Basel area
- The media and social pressure exerted on the chemical and pharmaceutical industry is an issue for their corporate governance
Summary and Outlook II

- considerable costs have been and will be generated to conduct these remediation projects and to resolve all respective environmental issues
- there are no standard solutions; each landfill and remediation project is unique and requires an individual solution
- these solutions must be risk-based, socially acceptable, economically viable, sustainable and environmentally favorable
- the chemical and pharmaceutical industry in the Basel area have done their homework and developed novel approaches which have been introduced in the local remediation projects
- any omissions and mistakes in today’s waste handling would generate new issues in the future; the wastes not handled properly today will lead to the contaminated sites of tomorrow!
Questions, discussion, feedback?
Doing now what patients need next