# REDEVELOPMENT OF LANDFILL SITES

## STATE OF ART AND REAL CASES

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### 1. INTRODUCTION

Based upon a rough estimation, Europe counts more than 150.000 landfills. Most of them are old and abandoned landfills. The total costs of traditional aftercare of old and abandoned landfills in Europe is roughly valued at € 40.000 to 50.000 million (€ 40-50 billion). This is a hugh amount of money, which can hardly be financed from public environmental budgets only.

Application of new aftercare technologies, such as Natural Attenuation, will already help to lower the costs of aftercare significantly. But investments from the private (a.o. real estate) sector within the framework of redevelopment of the landfill site is really one of the best ways to finance the aftercare costs. Depending on the type of re-use (housing, industrial area, office buildings, etc.), the private sector will take care of the aftercare costs by discounting them in the total costs of redevelopment of the landfill site.

Especially in urban areas the re-use of old landfill sites can be considered as privileged. A combination of relative low aftercare costs due to natural self-cleaning processes in the landfill (Natural Attenuation) and high benefits by redevelopment projects of housing, office buildings, industrial area is the most favourable opportunity.

In urban areas the subject of contamination can not be avoided. It is an illusion to think that one can still build on clean land in an urban environment. So the most important prerequisite is the cleaning up the landfill site in order to make it acceptable i.e. suitable for the intended re-use.

For old landfills especially, the province of Brabant in the Netherlands is trendsetter to this subject by making a memorandom 'Re-use of landfills', including granding subsidy, to stimulate redevelopment initiatives.

## 2. WHAT DO WE MEAN BY REDEVELOPMENT?

Re-use of landfill sites means a wide range of redevelopment possibilities. An overview is presented in table 1.

Table 1 Re-use possibilities

| Quality of re-use | Type of re-use |
|---|---|
| Low-graded | Parking area |
| ↓ | Industrial area |
| | Shopping malls |
| | Office buildings |
| | Nature |
| | Sports and recreation |
| High-graded | Residential area |

The choice of type of re-use is depending on the urban or rural spatial planning of the area in which the landfill is situated. Table 1 shows the redevelopment possibilities, categorised from low-graded re-use to hig-graded re-use. The type of re-use can also related to the potential vulnerability, expressed in the average number of hours per day that people are spending at the location. The more spending hours, the higher the chance on potential exposure to the landfill site and the higher the potential vulnerability. Figure 1 shows the relation between vulnerablity of the type of re-use and the environmental risk-levels of the landfill.

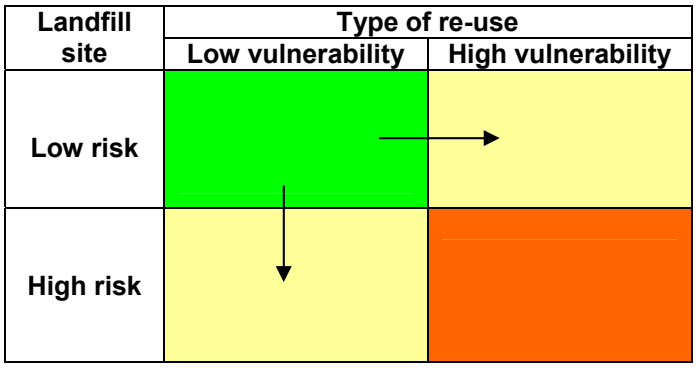
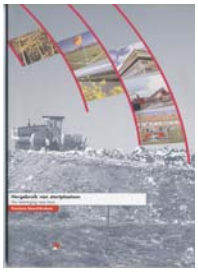



Figure 1 Types of re-use versus risks of landfills

It is obvious that in the green box situation redevelopment projects can be initiated and carried out without any problem. The red box represents the opposite situation. From a psychological point of view the re-use of the landfill site for housing will not be feasible anyway and should in fact not be wanted. In the yellow box situation many types of re-use are possible, but the feasibity is depending on the local situation.

## 3. POLICY ON REDEVELOPMENT OF LANDFILL SITES

As far as known no specific policy has been developed in the European countries in order to stimulate and facilitate redevelopment projects at landfill sites. Only in the Netherlands policy has recently been developed at national as well as regional level.



For old landfills especially, the province of North-Brabant (NL) is trendsetter to this subject by making a memorandom ‘Re-use of landfills’ (hergebruik van stortplaatsen) in 2005, which also includes granding of subsidy to stimulate and facilitate redevelopment initiatives. This resulted so far in more than 30 initiatives in the province of North-Brabant.

Besides the Dutch national Ministry of Spatial Planning and Environment has decided to subsidy a hugh redevelopment project, called Belvédère, concerning a residential area at a landfill site of 15 ha. in the city of Maastricht. Besides technical investigations, the emphasis of this pilot project is laid on the strategy of communication to the potential future owners of the houses to be built.

It is clear that the existance of national and regional policy, legislation and guidelines is necessary to support the local authorities in their decision-making and to stimulate simultaneously the initiatives from the private sector.

## 4. SOCIAL ACCEPTANCE OF REDEVELOPMENT OF LANDFILL SITES

From a point of social perception old landfills do have a negative image and are considered to be a threat to human health and the environment. For that reason public and private redevelopment inititiatives have never been taken. As a consequence the old landfill sites remained undeveloped areas with hardly any economic value.

In 1980 the first scandal of polluted residential district in the Netherlands became news when the media zoomed in on Lekkerkerk. Serious pollution has been discovered in the soil, which resulted in a huge clean-up operation by means of excavation of all polluted soil underneath the houses. It caused a national pollution-trauma.

From that period the social perception in the Netherlands to 'pollution related to redevelopment' has been transformed in the last 25 years from 'trauma' into 'acceptance'. This tranformation process is illustrated by the timetable mentioned below.

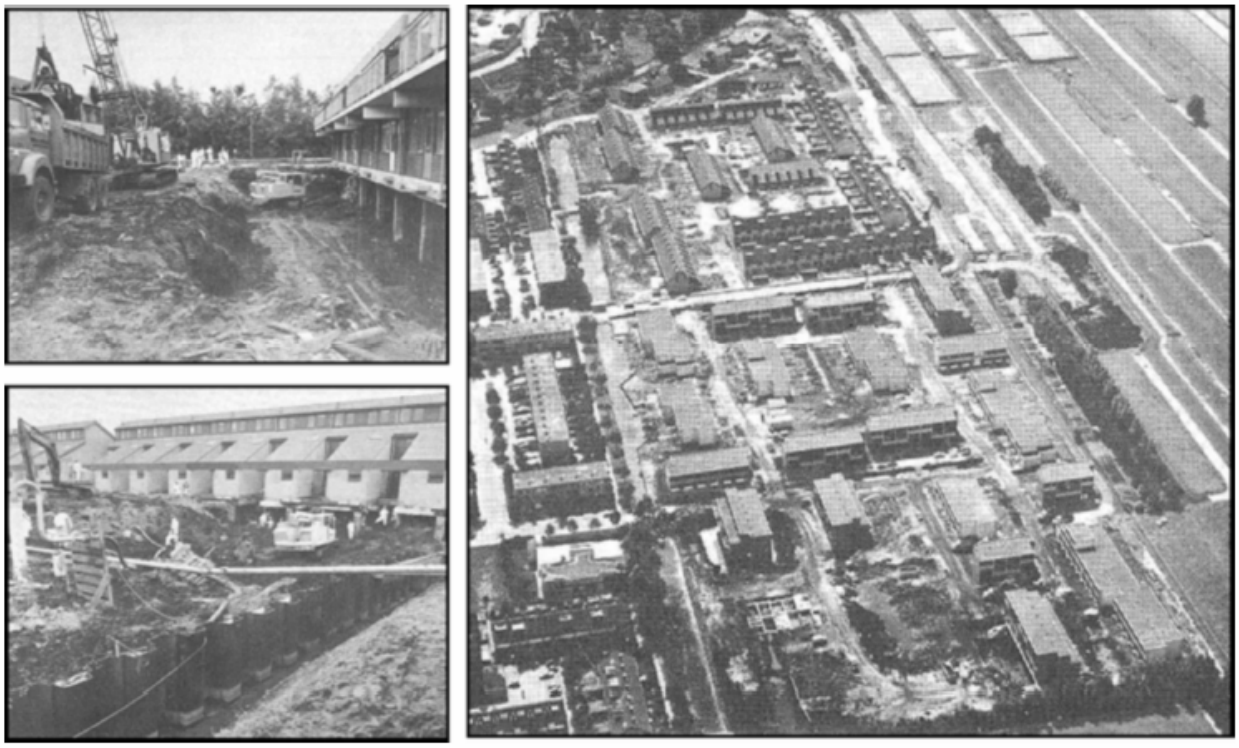
**1983**: Lekkerkerk caused a national pollution-trauma.

**1983 – 1995**: better understanding of human risk-assesment, open communicaton to society, new and better remedial technology, social habituation to pollution.

**1995 till now**: redevelopment of polluted sites more or less common use, excepting landfills (image of chemical time bomb!).

**Since 2000**: results of nation-wide landfill investigation, new technology (NA) and intensive communication proves actual and future absence of risks of former landfills → social acceptance.

**At present**: policy-makers, politicians, real estate developers are very interested in planning and realisation redevelopment projects at former landfills (> 50 projects).



The Netherlands became aware of its polluted soil in 1980 through the "Lekkerkerk affair." Lekkerkerk was a residential district with over 250 homes that were built on chemical waste. This community proved to be the tip of the iceberg as far as contamination was concerned.

Due to new insights the landfill is considered to be a dynamic biochemical reactor in stead of a chemical time-bomb. Natural self cleaning processes (natural Attenuation) are reducing or eliminating pollution in the landfill body, which results in harmless landfills without any negative effects to human health and environment. This resulted in a positive adjustment of the public opinion in the Netherlands with respect the redevelopment of landfill sites.

Nevertheless the public opinion remains playing a major role in the redevelopment process. Questions as 'how dangerous is the pollution ?', 'will it affect human health ?', 'what kind of aftercare actions are taken ?'. etc. must be answered by means of adequate and open communication. Insight in the psychological aspects in perception of pollution is one of the succes factors in the communication process.

## 5. REAL CASES OF REDEVELOPMENT PROJECTS

| Type of re-use | City | Country | Status |
|---|---|---|---|
| Golf course | Rotterdam | NL | realised |
| Ski run | Zoetermeer | NL | realised |
| Nature & recreation | Boxtel | NL | realised |
| Residential area | Oosterhout | NL | planned |
| Residential area | Huissen | NL | realised |
| Sludge depot | Baarn | NL | planned |
| Industrial area | Venice | IT | realised |
| still to be defined | Leipzig | GE | planned |
| still to be defined | Cröbern | GE | planned |
| still to be defined | Emden | GE | planned |

In European countries and especially in the Netherlands redevelopment projects has been initiated and even realised. Only in the Netherlands more than 80 projects could be identified. A few examples of the redevlopment projects are presented below.

## 6. FEASIBILITY OF REDEVELOPMENT

The redevelopment process requires an integrated approach within the fields of spatial planning, finance and environment, the so-called SFE-approach. In this approach the evironmental aspects are representing the **costs** of aftercare actions, the spatial planning and financial aspect are representing the **benefits** in terms of value of land and real estate. The redevelopment project is considered to be feasible when the cost-benefit-analysis ends up positive.

Of course the realisation of the redevelopment project is also depending on **social** and **political** acceptance and feasibility. This means an open process of communication of the redevelopment plans to the public and the competent authorities. An important issue are the financial garantees to be able to fulfil the obligations with respect to aftercare.

Last but not least **legal** aspects must be tackled with respect to liabilitiesbetween the involved participants in case of unexpected negative environmental effects due to the landfill site after realisation.

## 7. STRATEGY OF REDEVELOPMENT PROCESS

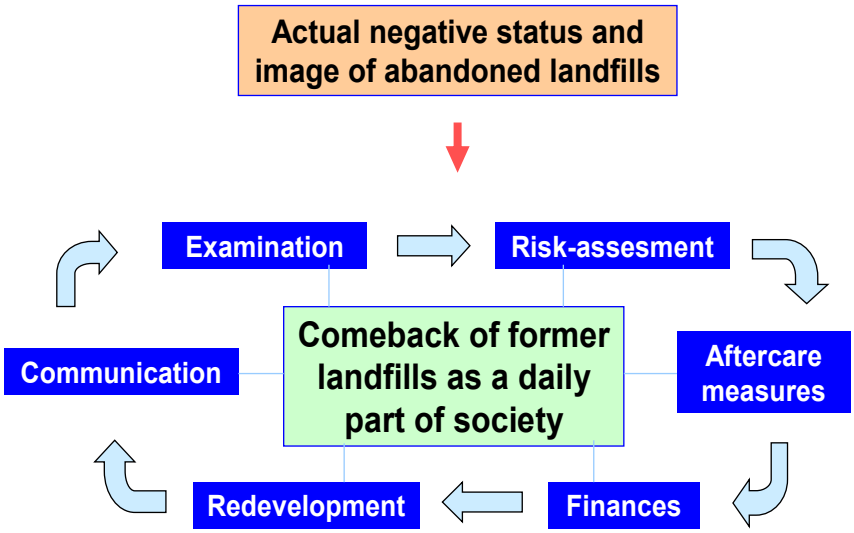
The strategic objective of the redevelopment process can be formulated as the transformation of the abandoned and unused landfill sites into land with a economical value by means of clean up actions and high-grade re-use. In other words to change the actual negative status and image of abandoned landfills into a comeback of these landfills as a daily part of society.

This objective can be realised by taking into account::

- an **integrated approach** from the very start of the redevelopment process, which contains the continuous life-cycle of the following relevant aspects:
  - examination;
  - risk-assesment
  - aftercare measures
  - finances and cost-benefit analysis
  - redevelopment possibilities
  - communication
  - legal aspects and liabilities

- a strong **interaction** and/or **co-operation** between public and private sector to get financed the necessary aftercare measures, which are extra costs in comparison with redevelopment projects on clean soil.

Above mentioned strategy and objective is visualised in the picture on the next page.


Actual negative status and image of abandoned landfills
Examination
Risk-assesment
Comeback of former landfills as a daily part of society
Communication
Aftercare measures
Redevelopment
Finances