DEVELOPMENT AND APPLICATION OF A QUALITY CONTROL AND ASSURANCE SCHEME FOR REUSABLE SOIL

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ABSTRACT

This paper describes the development of the market for reusable soil against the background of developing legislation. In the eighties, the (re)use of lightly contaminated soil was prohibited in The Netherlands. The nineties saw the advent of reuse policies on the provincial level. The concept of "functionality" was embraced. Essentially, site-specific reuse standards were set, based on contaminant concentration levels. This propelled the establishent of soil recycling facilities on a regional scale. Eventually culminating in the establishment of the Dutch Association of Soil Recycling Facilities, now membering 13. The Dutch Building Materials Decree, which regulates the (re)use of primary and secondary materials, became fully effective in mid 1999. Technical procedures to assess soil quality, in terms of contaminant concentration and leachability, are strictly prescribed. The 2000's saw the advent of increased and formalised attention for quality control and assurance. For reusable soil a certification scheme was developed incorporating the following elements:

- Input control and acceptance procedures, dependent on soil quantity in the ranges < 100 ton, 100-2000 ton and 2000-50.000 ton.
- Sampling of the soil stockpiles, with quantity dependent strategies.
- Chemical analysis and leaching procedures.
- Soil qualification procedures.
- Soil certification and delivery to the customer.

All (including laboratory) procedures are audited on a regular basis by independent organisations. Typical (estimated) features of the reuse market for soil are gathered in the Table below.

ENTRY	DIMENSION	QUANTITY
Reuse of untreated soil	Mton/year	9
Reuse according to certification scheme	%	30
Soil recycling facilities	number	30
Certified organisations	number	20
Total reuse costs	Euro/ton	2-7
Soil qualification costs (only)	Euro/ton	1-2
Certification costs (only)	Euro/ton	0.5

It is concluded that the use of a certification instrument allows for the reliable, environmentally sound and cost-effective reuse of soil. The use of the certification scheme has significantly enhanced customer confidence and compliance with legislation.

1. INTRODUCTION

The Dutch Building Materials Decree [1] regulates the (re)use of primary and secondary materials. Procedures to determine the environmental quality – in terms of contaminant concentration and leachability- of these materials are prescribed in great detail. However, while environmental properties of different types of building materials vary greatly, these procedures are similar for all types of materials. Therefore, the legislator created the option for suppliers to develop material-specific quality control and assurance schemes. Based upon technical knowledge and thorough R & D efforts, simplifications of the prescribed technical procedures are permitted. This paper describes the development and application of such a certification scheme for lightly contaminated reusable soil, against the background of policy and market development.

2. HISTORIC PERSPECTIVE

Policy development

The conception of the contaminated land issue occurred in 1980 in The Netherlands with the discovery of a housing project (Lekkerkerk) positioned on a chemical waste disposal site. This stirred the development of national policies and legislation regarding site remediation, soil treatment, reuse and landfilling. Based upon the perception of total remediation costs in the order of 0.5 billion Euro, the concept of "multifunctionality" was embraced. This concept dictates full remediation of contaminated sites and the (re)use of clean soil only. At the end of the eighties it became abundantly clear that remediation costs were a factor 100 higher. Also, it became apparent, that the majority of urban areas were mildly contaminated. By then the concept of "functionality" was gradually introduced. The site to be remediated or the soil to be (re)used needs to fulfill the required standards for anticipated future use, ranging from kindergarten to industrial sites. The beginning of the nineties saw the advent of reuse policies on the provincial level. Essentially, for both organic and inorganic contaminants, concentration ranges were defined for clean and reusable soil. Local policies were replaced by the Building Materials Decree [1,2] which became fully effective in mid 1999. This Decree strictly defines soil quality assessment procedures such as sampling, chemical analysis and leaching. In addition, the environmental soil quality standards are unambiguously defined. Recently, the effectiveness of the Building Materials Decree has been evaluated. Based upon new insights and practical data, legislation will be amended to enhance practical use within the boundaries of formulated policies.

Market development

The formulation of local soil reuse policies in the beginning of the nineties propelled the establishment of soil recycling facilities. Entrepreneurial municipalities, such as Rotterdam and Amsterdam, took the lead in this process. Soon to be followed by other organisations. In 1999, the Dutch Association of Soil Recycling Facilities was established, presently incorporating 13 members, with both a public and private background. Through active exchange of information and data gathering, soil qualification (sampling, chemical analysis, leaching) and logistical procedures could be optimised. In addition, a prototype certification scheme [3] was developed and effectuated in 1999. The framework (i.e. technical format) for this certifcation scheme is directly provided for by the Building Materials Decree. The nineties also saw the development of ex-situ soil treatment technologies, as has been described by A. Honders at al.[4]. At present, the soil market is considered to be fully mature. Some typical features are gathered in Table 1. Technologies are listed in preferential order.

TECHNOLOGY	THROUGHPUT [kton/year]	COSTS [Euro/ton]	FACILITIES [number]
Reuse untreated soil	9000	2-7	30
Reuse treated soil	1500	0-3	-
Thermal treatment	725	35-65	3
Biological treatment	265	20-40	24
Soil washing	855	20-45	25
Immobilisation	150-250	40-45	12
Landfilling	550	40-70	40

TABLE 1 – Soil reuse, treatment and landfilling (data 2001).

Quality control and assurance (QC/QA)
To enhance customer confidence and to improve compliance with existing legislation, the 2000's saw the advent of increased and formalised attention for quality control and assurance. A central organisation (SIKB), shaped as a public-private partnership was established in 2001. One of its tasks is to develop certification schemes for the multitude of processess – such as site investigation and remediation, soil qualification [5-7] and reuse [3] - in the soil market. At present, numerous market players – such as environmental consultants, laboratories, civil engineering contractors, soil recycling facilities – carry out their processes and deliver their products according to the agreed certification schemes. Auditing is performed on a regular basis by independent and specialised companies (e.g. KIWA). It is expected that in 2004 national legislation regarding QC/QA will be adopted. All processes financed with public funds need to be carried out under a certification scheme.

3. DEVELOPMENT AND APPLICATION OF A CERTIFICATION SCHEME

In the 1999-2002 period, the Dutch Association of Soil Recycling Facilities has adapted the prototype certification scheme for reusable soil. Technical aspects and acceptance procedures are highlighted.

Technical aspects
The following steps are incorpoarted in the certification scheme for reusable soil:

- STEP 1. Input control and acceptance procedures for soil lots are based on expected soil quality as derived from historic information, indicative tests or site investigation. Without information, soil lots smaller than 100 ton are assembled. When information regarding (expected) soil quality is available, larger quantities of soil (100–2000 ton) are assembled as well.
- STEP 2. The sampling strategy is dependent on the quantity of the soil lots. Soil stockpiles smaller than 100 ton are sampled by assembling 20 increments (of 180 g). Soil stockpiles in the 100–2000 ton range, are sampled by taking 2 x 50 increments. For soil stockpiles in the 2000–50.000 ton range, a specialised scheme was devised. Essentially, a graduated approach incorporating composite samples of 50 increments is followed. All sampling procedures are carried out according to established certification schemes [5,6].
- STEP 3. Collected samples are chemically analysed for a standard set of parameters (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn, mineral oil, sum-PAH's, extractable halogenated organics). Based upon historic information, additional parameters can be incorporated as well. A decision support scheme for leaching [8] is occasionally employed. Otherwise leaching tests are performed for heavy metals and inorganic paramaters. All chemical analysis and leaching procedures are carried out according to established certification schemes [7].
- STEP 4. The soil stockpiles are qualified against the environmental standards of the Building Materials Decree. Four types of soil are distinguished. Clean soil can be used without restrictions. Contaminant leachability determines the height of application (both Class I and II soil) and addional measures to prevent leaching to the surroundings (Class II soil only). When contaminant concentrations exceed the reuse standards, the soil stockpiles are either treated or landfilled.
- STEP 5. After qualification, splitting of soil stockpiles smaller than 100 ton is prohibited. For stockpiles up to 2000 ton, splitting to quantities of 500 ton is allowed. Splitting procedures for stockpiles ranging from 2000 – 50.000 ton are now under development.

- STEP 6. Soil stockpiles are delivered to the customer, accompanied with a certificate stating soil quality and maximum height of application.

It is estimated, that the reliability for correct soil qualification with this assessment scheme is higher than 90 %.

Acceptance procedure and auditing proces

The first draft was circulated nation-wide amongst stakeholders. Comments and inputs were incorporated in the draft document. The reworked document was then evaluated against a model certification scheme and relevant legislation by a panel of independent experts. After incorporation of final comments, the certification scheme for reusable soil was activated, and is in use since 1999. The Dutch Ministry of Environment granted an official status to this certification scheme. The whole process was repeated in 2001 and 2002 to incorporate new information and modified procedures. In 2003, an improved certification scheme will be available.

Operational experience

In the period of mid 1999 to mid 2002 approximately 20 organisations were accredited under the certification scheme. These organisations are evaluated by an independent auditor three times a year. An estimated 30 % of reusable soil in The Netherlands was supplied with a certificate in 2001. Soil qualification costs are in the 1 Euro/ton ballpark.

4. REFERENCES

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