Biodegradation **15:** 467–473, 2004.

Legal aspects of natural attenuation in Germany

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Accepted 13 April 2004

Abstract

The legal aspects of Natural Attenuation are multifarious. Therefore, the specific legal situation in Germany shall be described in the following as an example of the classification of NA in an European country. Additionally, a short reference to the international dimension of NA is included at the end. The article is meant to introduce the reader to the ongoing legal discussion in Germany. A comprehensive legal examination will be part of the final report of the so-called 'KORA' project (Natural Attenuation: Retention and Degradation Processes Reducing Contaminations in Groundwater and Soil) funded by the German Federal Ministry of Education and Research. The authors participate in this project as coordinator for legal affairs. The final report is expected in 2006.

Definitions

Natural Attenuation (NA) describes the natural processes of the reduction and containment of hazardous substances, whereas 'Monitored Natural Attenuation' (MNA) refers to the long-term monitoring of these processes. 'Enhanced Natural Attenuation' (ENA) describes the support of natural processes in the soil by additional artifical measures.

Legal background

After a long legislative process in Parliament, the ''Act for the Prevention of Harmful Soil Changes and for the Remediation of Contaminated Industrial Sites'' (Federal Soil Protection Act, Bundes-Boden-schutzgesetz – BBodSchG) was passed in 1998 and came into force on 1999-03-01. The lawmaker thus reacted to the fact that soil had yet been the only one of the three media water, soil and air not being protected by a separate legal codification, but just being referred to as a matter of protection in various different regulations. At the same time the new law was designed to help solve the problems connected with the remediation of contaminated industrial sites. These problems had been dealt with on the basis of the ''General Law of Hazard Protection'', which proved unsatisfactory due to the lack of specific regulations.

Legal aspects of NA are directly connected with the BBodSchG. It was only the exchange of ideas accompanying the parliamentary process concerning the possible content of the act, which was the starting point for scientists, engineers, and legal experts to deal with the question of the use of self-cleaning capacities of soil within the remediation procedure. In order to create a basis for the discussion of open aspects concerning the classification of NA and MNA, and questions about the requirements for the implementation of the instruments for monitoring and analytical technology, the basic principles and the background of the BBodSchG will be explained in the following. This illustration is supposed to enable the development of a legal framework for the application of monitoring and analytical technology.

According to its conception, the BBodSchG is supposed to ensure a comprehensive protection of the soil. However, soil protecting provisions can already be found in numerous other regulations. The lawmaker thus decided to include rules for soil protection into the BBodSchG concerning issues that are not yet covered in other specific legal regulations. This becomes visible in section 3

BBodSchG, according to which a list of other regulations with rules for soil protection have priority over the provisions of the BBodSchG, concerning legal topics such as the waste disposal law, building law or the law of protection against harmful immissions. This provision is useful as the creation of a soil conservation act in the sense of a full and comprehensive codification of all soil protecting provisions would have lead to the consequence of tearing apart other fields of law. The resulting disadvantages are obvious taking into consideration the regulation of basically identical matters in different acts. There is no point in eliminating provisions concerning soil protection in the building law and putting them into the BBodSchG. Therefore the lawmaker's solution to the problem is to be regarded as more advantageous in contrast to the idea of a full and comprehensive soil protection codification.

The regulatory framework of the BBodSchG

The purpose of the BBodSchG is the sustainable protection and restoration of soil functions, section 1 (1) BBodSchG. According to section 2. (2) BBodSchG, these functions include the natural functions such as the function of being the natural basis of life for man, flora and fauna, the function of being an archive for the history of nature and cultural development and practical functions, e.g. being a deposit for natural resources. Section 1 (2) BBodSchG names the protection of the soil against harmful changes, furthermore, the remediation of soil and contaminated industrial sites as well as consequentally caused water contamination and the prevention of negative effects to the soil in the future as instruments of soil protection in this sense. Here, three kinds of action in the law of environmental protection are taken into account, the hazard protection, the reparation of damages and the prevention of future dangers or damages. As none of the functions of soil mentioned in section 2. (2) BBodSchG is – according to the wording of the act – given priority, but as the natural functions of soil should be protected as a top priority with regard to the soil consumption of approx. 130 ha/d, negative effects to the natural functions and to the function of being an archive for the history of nature and cultural development are to be avoided as effectively as possible according to section 1 (3) BBodSchG.

A key term of the act is the harmful soil change ('schädliche Bodenveränderung'), section 2. (3) BBodSchG, according to which harmful soil changes are defined as negative effects on the soil functions that are able to cause dangers, significant disadvantages or material nuisances to an individual or the general public. The definition shows that the classification of an effect as a harmful soil change is subject to a two-step test. The first step is to examine whether there is a negative effect on the soil functions named in section 2. (2) BBodSchG, the second step is to check if these effects are fit to cause dangers, disadvantages or nuisances. According to the official legislatory explanation of the act, negative effects on the soil can be caused by the discharge of pollutants into the soil as well as the sealing or erosion of soil. Dangers arise especially when the high discharge of harmful substances into the soil leads to a mobilization of the hazardous material which is then transported to the surface. This can be caused e.g. by gas emissions from revitalized former waste dumps.

Next to the term of harmful soil changes the act defines the term of the contaminated industrial site ('Altlast') on the federal level for the first time, section 2. (5) BBodSchG. On the one hand it includes areas of disused waste disposal facilities ('Altablagerungen'), on the other hand former industrial sites, at which environmentally hazardous substances were dealt with ('Altstandorte' such as gas works, coke works, chemical industry). With this wording the basically identical terms of the state regulations have been transferred to the federal level.

In order to remediate harmful soil changes and contaminated industrial sites the BBodSchG constitutes three general kinds of measures in section 2. (7) i.e. measures of decontamination (section 2. (7) no. 1), securing measures (section 2. (7) no. 2) and measures of elimination or reduction of harmful soil changes of a physical, chemical or biological kind (section 2. (7) no. 3). In addition, the act names measures of protection and restriction in section 2 (8).

Decontamination measures are measures that eliminate or at least reduce hazardous substances in the soil. Securing measures are meant to prevent or reduce a further extension of hazardous substances on a long-term basis without their elimination. Harmful soil changes can also be caused by effects other than the discharge of hazardous

material into the soil, e.g. soil erosion or soil compression. An elimination of such damages is possible using the measures of section 2. (7) no. 3 BBodSchG. With regard to chemical changes this provision is meant to be a subsidiary instrument for cases that are not subject to the decontamination measures of section 2. (7) no. 1. Measures for the elimination of biological damages focus on the restoration of the natural constitution of the soil, e.g. by draining.

The measures mentioned in section 2. (7) no. 1 and no. 2 are definitely more important to the practical remediation of contaminated industrial sites. In this context decontamination and securing measures are equally applicable without priority. Only if the harmful soil change occured after 1999-03-01, decontamination is given priority over securing measures taking into account the pre-existing damages to the soil and the proportionality of the measures, section 4. (6) (1) BBodSchG.

A soil remediation in the sense of a complete elimination of hazardous substances is only possible and guaranteed by measures of decontamination (real remediation, 'echte Sanierung'). Therefore, some state regulations acknowledged only these measures as legal measures of remediation in the past. As a full soil cleaning is not even technically feasible in most cases, a reduction of hazardous material is considered to be sufficient as decontamination measure in the sense of the BBodSchG. Securing measures, too, have to be seen as measures of remediation. Although the harmful substances remain in the soil, technical measures avoid their further spreading. These measures have to at least reduce the further spreading. If only a reduction of the spreading is possible, it should be mandatory to undertake everything technically and financially feasible to achieve an isolation of the harmful substances as far-reaching as possible. Otherwise, the term remediation in the sense of a 'healing' of the soil would not be justified.

On the other hand, measures of protection and restriction mentioned in section 2. (8) BBodSchG (e.g. fencing of contaminated sites, limitations of access) are always of lower priority in comparison to the remediation measures of (7) of this provision and are themselves not regarded as remediation measures in the sense of the act. This follows from section 4. (3) (3) BBodSchG, according to which measures of protection and restriction are only to be taken into account when the remediation measures of section 2. (7) are not possible or unreasonable.

Natural Attenuation as remedial action

NA did not find its way into the BBodSchG as a measure of remediation or protection in the sense of section 2. (7) and (8) BBodSchG. Since the mid-1990s, NA has been discussed as a remediation concept in the United States. Literally, NA means 'natürliche Verminderung'. The key thought within the concept is how the self-cleaning capacities of the soil can be made use of within other measures of remediation or as such a procedure itself. NA only describes the natural processes of the reduction and containment of hazardous substances, whereas MNA refers to the long-term monitoring of these processes. ENA describes the support of natural processes in the soil with additional artifical measures. Most of these measures are identical with the conventional instruments of remediation. The question is whether the use of the natural processes of containment and decomposition in the soil can be subsumed under the legal definitions in section 2. (7) and (8) BBodSchG.

The classification of MNA in the system of the BBodSchG is difficult because both section 2. (7) and section 2. (8) use the term 'measures'. Measures are generally linked to human actions, MNA on the other hand mean leaving the soil to itself.

Some suggest MNA have to be regarded as measures of decontamination in the sense of section 2. (7) no. 1 BBodSchG. It would not make any difference whether natural processes of reduction of hazardous substances are included in active or passive measures. They consider the administrative framework as a 'measure' in which the natural processes of containment and decomposition of contaminants take place and in which the remediation targets are defined and where their attainment is supervised by monitoring the development of the natural processes.

Other experts consider MNA to be "other measures" in the sense of section 2. (8) BBodSchG, because a measure exclusively consisting of monitoring could not constitute a remediation measure in the sense of section 2. (7) BBodSchG. This classification would have the disadvantage that

MNA could then only be subsidiary to decontamination and securing measures.

Another problem of MNA results from the fact that it will be difficult to make reliable predictions whether remediation can be achieved by the self-cleaning capacities of the soil. Especially, the necessary amount of time will be difficult to assess. Furthermore, it has to be taken into account that some hazardous substances cannot be eliminated or reduced by MNA at all.

The legal problems and difficulties in practical application make it obvious that MNA have to be improved to become a practical instrument of the remediation of contaminated sites. The application of MNA is especially useful when due to technical problems or shortage of financial means a remediation based on conventional methods is not manageable.

A framework is to be set up with special regard to prognosis reliability, monitoring of the processes of decomposition and containment and the follow-up measures. Taking into consideration the already intimated difficulties to predict the success of remediation measures using MNA, it is necessary, following already existing regulations, e.g. within the Federal Ordinance on Soil Protection (BBodSchV) or in the law relating to water, to develop a system of measurement that provides a means to evaluate the progress of decomposition and containment of harmful substances in the soil, the so-called 'state of remediation'. This system of measurement is therefore to be developed for cases in which there is a danger in the sense of the general law of hazard protection and in which MNA are applicable. Said system has to be designed in a way that allows a flexible reaction to each specific remediation, its remediation target and the anticipated timeframe. The regular checks of progress of MNA represent the only human participation. MNA therefore mean deliberately leaving the natural soil processes to themselves in a controlled manner.

Necessary follow-up measures have to manageable for the involved authorities. There are especially reservations about the prognosis on seeping water in the Federal Ordinance on Soil Protection (BBodSchV).

The remediation order or the remediation contract including MNA should, using the measurement system still to be developed, force the addressee to make a prognosis on the envisaged natural processes in the soil concerning the contamination with harmful substances. As with all remediation orders, the addressee applying MNA remains responsible to achieve the remediation targets set by the soil protection authority in a certain amount of time. This timeframe can extend to 20 years or more. In this context the addressee is obliged to apply the measurement system himself and to evaluate the acquired data to assess whether the remediation progress matches the prognosis. A monitoring system has to be set up that can include self-monitoring and/or monitoring by a third party. The data have to be reported by intermediate reports, the remediation success by a final report to the competent authority. The official requirements should relate to specific emissions and immissions caused by the contamination. Additionally, specific measures have to be defined for the situation that the natural developments have been predicted wrongly e.g. that the remediation success cannot be reached in the anticipated timeframe.

In order to put such remediation orders or contracts into practice the tolerable amount of remaining harmful substances remains to be assessed in the final 'KORA' report and the potential emissions and immissions and the expected remediation success and its timeframe have to be elaborated upon. In this context it is necessary to develop requirements for single case specifications and the proportionality of the monitoring measures. The question has to be answered whether the requirements of each case are to be laid down in a remediation order or in a remediation contract, or whether the conditions should be included in a general regulation or an internal administrative directive.

Additionally, the description of the scientific understanding of the process is necessary: Monitoring is a process with qualitative and quantitative requirements and therefore, is no static measure.

Rules of hazard protection in the BBodSchG

Section 4 BBodSchG regulates the duty of hazard protection. According to section 4. (1) BBodSchG everyone is obliged not to cause any kind of harmful soil changes. Subsection 2 prescribes that real estate owners and everyone having factual

control over real estates have to take measures to fight against potential harmful soil changes resulting from their real estate.

Key provision within the rules of hazard protection is section 4. (3) BBodSchG. Thereby, everyone factually causing a relevant danger or having a real estate in possession that is subject to a contamination or a harmful soil change, his successors in law and everyone who has given up possession of the real estate are obliged to take remediation measures on the contaminated soil and connected water contaminations so that dangers, material disadvantages or significant nuisances for the individual or the general public are avoided.

The limitation of liability of the responsible real estate owner (and everyone having the real estate in possession) has been subject of discussion for a long time. Even without personal responsibility for the danger and also without knowledge of the circumstances liability causing in the moment of purchase, the owner is responsible for the state of his property. This liability, often considered inadequate, was supposed to be changed in the BBodSchG defining the market value of the real estate as a liability limitation. But this approach did not find its way into the BBodSchG. On the other hand the Federal Constitutional Court held in 2000 that the potential price of sale after a remediation constitutes an upper limit for the scope of remediation duties of the owner. Responsibilities exceeding this limit would only be acceptable if the owner deliberately took this risk e.g. having knowledge of certain contaminations at the time of purchase.

As for measures needed, the remediation of contaminated soil may not be the only one, precautions against erosion or the removal of soil compressions can be necessary, too. The measures of hazard protection are not limited to the soil itself but include the obligation to remove sources of danger on disused industrial sites that result from old industrial machinery itself e.g. from pipelines still polluted with harmful substances. At former waste dumps hazard protection has to focus on waste related pollution as well.

Whether addressees of remediation orders can fulfill their duties by taking advantage of the natural capacities of decomposition and containment in the soil depends on the question of the legal characterization of these processes as remediation measures. The answer to this question already described as highly controversial is left to the final 'KORA' report.

With regard to water remediation only the problem of the 'if' is relevant, the 'how' is subject to the provisions of the law relating to water. As MNA include the remediation of both soil and water, the attention shall also be drawn to the EU Water Framework Directive. According to article 1 of the directive its aim is to set up a framework for the protection of all waters including ground water. Section 4 requires the protection of all ground water carrying bodies, their improvement and their remediation with the target of reaching a good ground water condition. The ultimate goal of the EU Water Framework Directive is also to eliminate all dangerous substances in the water. Next to these general targets the directive includes in its appendices concrete measures how to reach these targets. Appendix V is of special importance for ground water remediation: Under no. 2.3. it is described how the chemical condition of water is to be analyzed and when a good water condition is reached. Following no. 2.4. of appendix V a network for ground water control is to be established. The evaluation of the consequences of these European regulations for the application of MNA will be made in the final 'KORA' report.

Section 8 BBodSchG includes an authorization of the Federal Government to establish soil related key limits. These limits will be used to initiate soil controls or specific remediation measures. When control limits are exceeded, single case examinations will have to take place to verify whether harmful soil changes or contaminations exist. When the stricter measure related values are exceeded, the existence of a harmful soil change or a contamination is presumed and remediation measures have to be executed. These values are to be evaluated in relation to the anticipated use of the soil differentiating between sensitive purposes (children's playground) and less sensitive purposes (industrial complex): The more sensitive the future use the lower the amount of harmful substances in the soil may be. This is mirrored in the control limits and the measure initiating limits that are low in the former and high in the latter constellation.

The mentioned soil limits are part of the Soil Conservation Regulation (BBodSchV). Consequently they – for the first time – have a legally binding effect and end the state of legal uncertainty as the previously applied limits being part of 30

different listings on state level did not have this legal authority. Especially, with regard to the revitalization of former industrial surfaces, these generalized soil limits will have positive consequences.

The evaluation of whether a contaminated industrial site also constitutes a danger, an evaluation that has up to now been made on the basis of the general law of hazard protection, is now regulated by the specific provision of section 9 BBodSchG. Experts did not agree on the question whether the owner or other individuals responsible could be forced by the competent authority to take measures for the exploration and examination of dangers and who would have to pay for such measures. Section 9. (1) BBodSchG now rules that the state authorities are responsible for the risk management on their own examining concrete indications for harmful soil changes or contaminations. Only if these indications lead to a reasonable suspicion of such contaminations, the authority can oblige the individual responsible to carry out further measures of danger assessment.

Apart from the aspect of hazard protection that is underlined in section 4 BBodSchG, the act follows a preventive approach. Section 7 obliges the owner, anyone having the real estate in possession and anyone executing works on the real estate that could possibly lead to soil changes to take preventive measures to avoid harmful effects. The addressees have to take such measures that the use of the ground does not lead to harmful soil changes. The mere possibility of such negative changes is sufficient. The actual requirements can be found in the BBodSchV. It includes the conditions under which precautionary measures become mandatory. Possible measures are a change of ground use or the installation of technical equipment to reduce the negative effects on the soil. The question remains if this provision is relevant in the majority of cases as according to section 3 BBodSchG section 7 BBodSchG is only subsidiary to other regulations such as the building law code (BauGB) or the Federal Immission Control Act (BImSchG).

Additional provisions of the BBodSchG

Sections 11*et seg*. BBodSchG include additional provisions for contaminated industrial sites. The registration remains a task on state level, section 11 BBodSchG. In the case of complex contaminations according to section 13 BBodSchG, the state authority is obliged to make the individual responsible undertake the necessary remediation related examinations and let him develop a plan for remediation. The remediation related examinations follow the risk management and serve the purpose to identify the extent in which a remediation of the soil is necessary. The results influence the remediation plan that should include evaluations as to the remediation target, the necessary measures and should specify the anticipated future use of the property. It should be underlined that section 13 (4) BBodSchG now clearly opens the way for a remediation using a remediation contract under public law instead of a unilateral remediation order.

The responsibility for costs caused by remediation measures is regulated by section 24 BBodSchG. As a general rule they have to be borne by the person responsible for the remediation, section 24. (1) BBodSchG. One exception is found in (2): If the measures of danger assessment, that the individual responsible had to take, do not confirm the suspicion of harmful soil change or contamination, these costs have to be refunded be the state unless the individual is responsible for the indications that had lead to the examinations.

International dimension

The future of MNA as a remedial action in Germany is – as shown above – closely linked to the framework of the BBodSchG and its general definitions that do not yet explicitely mention Natural Attenuation. Thus, the act opens room for judicial interpretation and causes legal uncertainty as to the characterization of MNA and its suitability to substitute other means of remediation.

No help for the necessary interpretation derives from European legislation. Apart from the above mentioned European Water Framework Directive there is no specific directive or regulation concerning the remediation of the soil at the moment. Nevertheless, the European Commission has intensified its interest in the field of soil protection over the last years. A draft for a European Soil Monitoring System is expected before July 2004.

Additional reference is be made to the United States and the United Kingdom which both have

introduced regulations dealing with MNA as remedial action. An American directive put forward by the U.S. Environmental Protection Agency (Office of Waste and Emergency Response; OSWER-Directive) considers MNA to be a passive measure of remediation. It is seen as a true alternative to active remedial actions. A maximum duration of the MNA is not explicitely included in the directive but the remediation targets have to be reached within an acceptable amount of time. Under this directive MNA is subject to very restrictive requirements of proof for the progress of remediation.

The English Guidance on the Assessment and Monitoring of Natural Attenuation of Contaminants in Groundwater (Environment Agency U.K.) accepts in principle both MNA and mere NA as remedial actions. The timeframe must not exceed 30 years.

Outlook

We expect the final report of the 'KORA' project to answer to the questions mentioned above concerning the legal classification of MNA and ENA in Germany and concerning the control limits and measure related limits for a NA-process including possible suggestions for further legislation.

Further readings

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