

Ecological Risk Assessment

➔ Practical cases and projects



In this information sheet a number of practical cases are described in which the Triad approach was used to assess the ecological risks present at various contaminated sites. The Triad approach analyses the chemical, ecotoxic and ecological parameters of a site. It is used to determine whether or not remediation is required and if so, whether the whole location needs to be remediated or just those parts where ecological risks have been identified. This increases the chances of a contaminated site being redeveloped, for example for recreational purposes, for housing or as a natural area. The Triad approach has been incorporated in Dutch law and is an internationally validated and approved method for the assessment of site-specific ecological risks.

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Pollution of natural areas: what about protected species?

Often polluted sites are located in or near natural areas in which protected plant and/or animal species can be found. Traditional remediation techniques such as excavation or the application of a cover layer destroys the habitat of these protected species. Therefore it is important to consider whether remediation of a site is necessary.

A former shooting range located in the North Sea dunes in The Netherlands was contaminated with heavy metals (caused by lead shot) and PAH (found in the clay pigeons used). The location was furthermore home to a protected species of lizard (the sand lizard or *Lacerta agilis*). The pollutants were not harmful to humans; however based on computer models an ecological risk had been identified. Based on this model the entire site had to be remediated.

Before remediation started however, Bioclear was asked to re-evaluate the site using the Triad approach. The results showed the pollutants at the site to be very poorly available. Lead was only bioavailable on 3% of the site, an area covering less than 5.000 m². In this area risks owing to bioaccumulation or risks to soil bacteria and soil processes were identified. This could lead to bioaccumulation in soil invertebrates and therefore to bioaccumulation in higher animals such as the protected sand lizard.

However, because the site at which bioaccumulation of lead occurred was small compared to the foraging area of the sand lizard, the ecological risks were assessed to be low. Furthermore no bioaccumulation in birds was to be expected owing to the direct uptake of bullets. Based on the results of the Triad approach only 35 m² of the site had to be remediated. The rest of the location will be monitored for ecological risks.

Redevelopment of dredging waste depots based on actual ecological risks



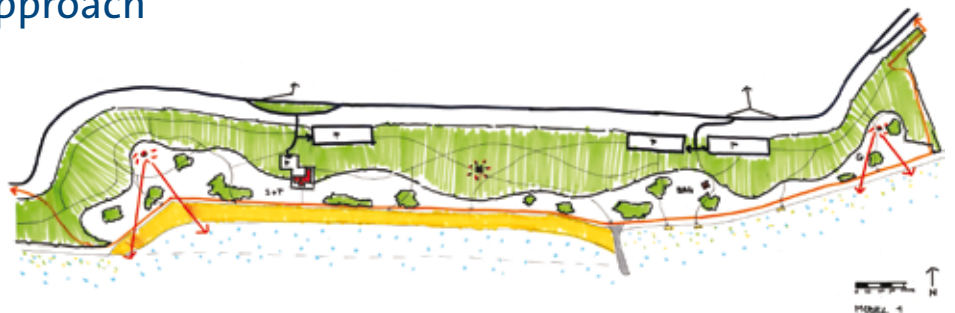
Sludge acquired through dredging activities often contains contaminants and could therefore pose ecological risks. In order to determine the possibilities of redevelopment of areas in which sludge has been dumped, Bioclear analyses the possibilities for biological degradation as well as the actual ecological risks.

A location in the Botlek (a region near Rotterdam) had become contaminated with heavy metals, mineral oils, PAH and Drins owing to the dumping of dredging sludge. Bioclear determined that stimulating biological degradation of the contaminants was not

a viable option. The Triad approach was applied simultaneously to evaluate the ecological risks. It was determined that the ecological risks, resulting from exposure to such a cocktail of contaminants, are slight as the contaminants bind to organic matter in the sludge and are therefore poorly bioavailable. The presence of a contamination in this area should therefore not prevent it from being redeveloped.

Based on this research a redevelopment plan was set up. The aim was to create a green area that would add further natural value to the region. The local authority has approved these plans and has given an order within the framework of the Law on Soil Protection.

Alternative remediation approach leads to affordable redevelopment of a recreational area



In the sixties a former depot storing dredging sludge in the Netherlands was redeveloped as a recreational area. The area covers 40 hectares and is located in an otherwise urbanized area. It is used as a recreational area by the surrounding community. It was found that the location, which is made up of sandy soil, was contaminated with Drins (the group name of the now banned chlorinated insecticides: aldrin, dieldrin and endrin). The contamination was not biodegradable and was therefore very persistent.

The ecological risks of the contamination were assessed using the Triad approach. Based on this approach it was found that the ecosystem at the location was barely affected by the contaminants. Slight ecological risks that were identified will be reduced further by specific redevelopment of the location: by condensing the forest structures in the park and by creating sharply defined transitions to grassland areas, the number of worm-eating songbirds in the area will decline. As a result, bioaccumulation of Drins in the birds will be prevented. Using this approach the use of the location as a recreational area has been safeguarded. This method of containment

was discussed with and approved by the stakeholders involved. Furthermore, the proposed developments concurred with the wishes of the community.

Compared to conventional remediation techniques, the short term and long term costs using the Triad approach were much lower. The total costs decreased by a factor of 30 when compared to covering up the location and a factor of 100 when compared to excavation of the contaminated soil.



10 years of ecological risk assessments: an evaluation

Since being developed in 1998, ecological risks assessments using the Triad approach have been performed at 56 sites in the Netherlands. The sites differed in size, pollutants, pollution grade and soil use. In 2008 Bioclear initiated an evaluation of all Dutch Triad projects in order to evaluate the approach and to incorporate all the experiences and lessons learnt in a national norm *“Soil and ecological risk assessment of soil pollution”*.

All aspects of the process of risk assessment were discussed (research plan and technical aspects, project realisation, interpretation and decision-making). After evaluation a SWOT analysis was performed. Furthermore the most important bottlenecks and points of interest were identified. An important conclusion of the evaluation was that an ecological risk assessment (using the Triad approach) is most effective when researchers, problem owners, (local) authorities and other stakeholders work together. In this way the ecological risk assessment is recognised and accepted by all parties concerned.

The main advantages of the Triad approach are summarised below:

- | The Triad approach can save money as costly remediation can regularly be disallowed (sometimes you have to spend money in order to save it).
- | The strength of the Triad approach is that during the entire process collaboration is sought with all stakeholders.
- | The Triad approach offers opportunities to conserve and develop natural areas when the actual ecological risks are lower than calculated using models.
- | The distinctive capacity of the Triad approach is the use of multiple lines of evidence, especially when compared to a modular approach.

Bioclear's strengths:

- | Reliable, sustainable and cost-effective solutions based on actual ecological risks
- | Experts in natural attenuation, in situ remediation and ecological risk assessments
- | Supporting policymaking
- | Over 20 years' experience
- | In house laboratories and R&D

➔ Further information

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