

To:
The State Secretary of Housing,
Spatial Planning and the Environment (VROM)
P.O. Box 30945
2500 GX The Hague

TCB S63(2006)

The Hague, 24 November 2006

Re: Recommendations on the assessment of the environmental aspects of
wood preservatives

Dear State Secretary,

In your letter dated 29 September 2006¹, you asked the Soil Protection Technical Committee (Dutch abbreviation: TCB) for its recommendations regarding the environmental assessment of wood preservatives.

Wood preservatives are biocides. Directive 98/8/EC concerning the placing of biocidal products on the market (Directive 98/8/EC) provides for the joint assessment of the effects of active substances contained in biocides, based on aspects such as the health of humans and animals and effects on the environment. Active substances that meet the stated requirements are included in Appendix 1 of the Biocides Directive. Member states may permit the use of only these constituents. The assessment was carried out based on information concerning efficacy, the effects on humans (human toxicology), and the effects on the environment (eco-toxicology). This recommendation relates to the effects of wood preservatives on the soil ecosystem and is not concerned with the effects on human and animal health, or the effects on surface water, ground water or air quality.

The directive offers a stepwise assessment of the effects of biocides on the soil ecosystem. The first, relatively simple step is an estimate of the concentration of the active substance in the soil using statistical modelling. The predicted concentration is called the *Predicted Environmental Concentration* (PEC). The PEC has been calculated for a number of different applications of preserved wood such as wooden fences and houses. Appendix 1 of this recommendation contains a summary of the features of the scenarios used.

The PEC is then compared to the chosen environmental criterion (the standard). In this case this is the *Predicted No Effect Concentration*, the PNEC. The PNEC² indicates the concentration at which no

¹ Reference BWL/2006305904, see Appendix 2.

ecological effects are anticipated in the soil. The Biocides Directive stipulates that if the PEC/PNEC ratio is greater than one, the active substance is not permitted unless the second assessment step demonstrates that there are no unacceptable effects under field conditions. The scenarios and the statistical models for step 1 were developed jointly in work groups made up of scientific experts from EU member states. At present it is still unclear what the second assessment step will hold.

According to provisional calculations, it appears that all the active substances assessed exceeded the environmental criterion for soil. This means that the first assessment step for the environmental criterion is not definitive. Based on this modelled assessment, the application of wood preserved with biocides therefore results in unacceptably high concentrations in the soil. Active substances may only be included in Appendix 1 of the Biocides Directive via the second assessment step mentioned above. However, a number of member states find this undesirable. Further negotiations on how the environmental criterion is to be tested are therefore underway in the relevant European committees.

Part of the applied assessment scenarios for preserved wood is the size of the area of soil involved in the assessment. A distance of 10 cm from the preserved wood was selected as a measurement for the entire serviceable life of the application. However, this so-called 'leaching distance' was chosen arbitrarily. The concentration of the active substance in the soil is calculated by dividing the quantity of the active substance that has leached into the soil (obtained via leaching samples) by the volume of the receiving soil. An estimate of the PEC is achieved by subsequently adjusting for the bulk density of the soil. Now that it has been established that all the active substances assessed via the first assessment step exceed the environmental criterion, discussion has arisen regarding the leaching distance to be applied.

To try to solve this problem, you have asked the TCB whether an acceptable distance for the leaching of biocides can be established that can be supported by relevant evidence. You would then wish to incorporate the TCB's recommendation in the relevant European committees. In the following recommendation, the TCB describes how the legislator can regulate the trading and use of biocides with respect to various objectives regarding soil protection. The TCB then deals with your specific question by discussing a number of alternative assessment criteria. Following the conclusions, the recommendation ends with a summary.

GENERAL CONSIDERATIONS

You have asked the TCB to provide evidential support for an acceptable leaching distance of biocides from preserved wood. Such evidential support depends strongly on the extent to which the legislator wishes to protect the soil, and on how soil protection is measured against other environmental and social considerations. At one end of the spectrum, no soil pollution whatsoever is deemed acceptable. In this case, the distance in the scenarios would be set at zero. The soil would then be completely protected. Assuming that zero pollution is technically impossible to achieve, this would effectively mean that wood preserved with biocides could no longer be used. Only

² The PNEC is determined on the basis of dosage-response relationships which are gained from laboratory studies of various organisms (aquatic, land and micro-organisms and primary predators such as birds and mammals).

other, more environmentally friendly methods of wood preservation would then be permitted. Various other alternative methods are available. There are also various types of wood which are naturally resistant to rot. Generally speaking, these alternatives are currently still more expensive than biocides, and at present their availability is a limiting factor for large-scale application. A ban on the use of biocides for wood preservation could therefore stimulate the development and large-scale, cost effective availability of such alternatives. It is also often possible to choose materials other than wood. In order to arrive at a well-balanced assessment and understanding of the various social and environmental consequences, the TCB recommends a broad analysis of the social and economic consequences of a ban on biocides.

At the other end of the spectrum, the environmental criteria for soil would be scrapped altogether when assessing the active substances of biocides, which is an option currently under discussion in EU negotiations. In this case, only the other assessment criteria of the Biocides Directive would be assessed, such as surface water and groundwater quality and the health of humans and animals. The TCB recommends research into the maximum amount of damage to the soil that this approach would incur, in order to assess the effects of this option on soil quality.

If a total EU ban on the use of biocides is deemed unacceptable, conditions placed on the production of preserved wood by the Community would represent an alternative. In the Netherlands, this is regulated by a compulsory municipal environmental permit for companies. Over the last ten years there has also been an endeavour to reduce damage to the environment further by way of mandatory and voluntary agreements with manufacturers. There are a number of measures that can be applied to the production process, such as the use of impermeable floors and roofing to cover preserved wood in storage.

The scenarios applied are based on wood that has recently been preserved, with follow-up treatment only as recommended by the manufacturer. However, seepage into the soil could be greatly reduced by then giving the treated wood an additional follow-up treatment which removes or fixes the constituents that leach out. A number of such techniques are available³, such as dousing the wood, or allowing the wood to rest for a period before it is used. After an additional follow-up treatment such as this, a biocide which does not meet the environmental criterion at present, could perhaps be included in Appendix 1 of the Biocides Directive, as the greatest damage to the soil always occurs directly after preserved wood has been put in place. The TCB recommends an inquiry into whether measures such as these during the production phase would provide the required flexibility, obviously within the limits of the effectiveness of the biocide, and within the manufacturers' economic constraints.

A pragmatic approach is also possible. By using the models and scenarios of the first assessment step, a leaching distance could be calculated that would result in one, two or more active substances contained in biocides just barely complying with the environmental criterion. It would then have to be decided which leaching distance would still be deemed acceptable. The TCB will return to this subject when answering your question further on.

³ The report on 'best available techniques for wood preservation' (*Best beschikbare technieken voor de houtverduurzaming*) by A. Jacobs and R. Dijkman of the Flemish VITO (Flemish Institute for Technological Research) of 1998 describes various options.

The TCB has ascertained that the effects of active substances in biocides on the quality of water, the health of humans and the soil ecosystem are assessed via separate evaluations. In the TCB's opinion, the entire assessment becomes clearer when the various partial evaluations are integrated at some point. In the present request for advice, the leaching distance is examined exclusively from the point of view of the soil ecosystem, without trying to explain what the effects of 10 cm leaching into the soil would be on the health of children at play for instance, or on ground or surface water. An integrated analysis provides an understanding of the relative importance of each scenario. If it were proven that a 10 cm leaching distance is not acceptable for one of the other evaluations, the first question would be rendered irrelevant.

IN ANSWER TO THE QUESTION

The TCB has studied the Emission Scenario Document⁴ which describes the procedure for assessing the leaching of wood preservatives. In these *guidance documents*, as they are called, the emissions of preserved wood are estimated at two moments during the wood's lifecycle: Firstly, the emission occurring during the preservation process and then again while the treated wood is stored before it is brought onto the market, and secondly, during the wood's application. In this part of the recommendation, the TCB focuses its advice on the latter phase. Comments on the production phase have already been provided above.

The Emission Scenario Document is the result of cooperation between experts of the OECD member states. Establishing the extent of the receiving soil area was one of the difficult questions asked of this group of experts, as no agreement could be reached regarding the scientific criteria to be used.

Based on the first provisional and confidential calculations that are being circulated in the European committees, applying a distance of 20 cm instead of 10 cm results in 3 of the 11 constituents tested possibly being able to comply with the environmental criterion for soil, at least with regard to one or more application scenarios. No single constituent complies with all application scenarios. At 50 cm, two preservatives comply with virtually all the application scenarios. Only at 80 cm do a fair number of preservatives comply. It therefore appears that 50 – 80 cm appears to be the leaching distance at which at least some of the active substances can be included in the Biocides Directive Appendix.

The ecological significance of 50 – 80 cm of unprotected soil surrounding preserved wood depends, amongst other things, on the density with which the wood is applied. If it is a question of one post in an area that is otherwise left alone, the effect around the pole may be great without it having any significant impact on the functioning of the area's soil ecosystem. In general, it can be assumed that as the number of houses, fences and railings of preserved wood in and on the land increases, the negative effect on the ecological quality of the soil will increase. As far as the TCB is aware, there is little scientific literature available on the consequences of such 'spatial pressure' on the functioning

⁴ Emission Scenario Document for Wood Preservatives part 1, 2, 3, and 4, OECD series on emission scenario documents number 2, OECD environment directorate, joint meeting of the chemicals committee and the working party on chemicals, pesticides and biotechnology.

of soil ecosystems. However, such information would be necessary in order to lend fundamental support to the advice on distance as requested.

The TCB therefore advises that the effects of spatial pressure should be quantified in more detail, and that this research should focus on the preservation and protection of ecosystems' ability to recover, as described by Scheffer *et al.*⁵. Whereas many policy and control measures focus on preventing disturbance of the ecosystem, this *review* article assumes disturbance of the ecosystem to be a natural phenomenon. In view of this, it would not be meaningful to wish to avoid all disturbance. Healthy ecosystems can absorb and recover from disruptions. In general, the loss of an ecosystem's ability to recuperate occurs imperceptibly. Only in the case of extreme loss of this ability can a 'normal' disturbance lead to an unexpected, sudden and irreversible transition to a different ecological balance. This new balance is usually socially undesirable. Policy measures are therefore most effective when they focus on keeping the ecosystem stable. The TCB assumes that spatial pressure and its degree of irreversibility play an important role in the ability of soil and other ecosystems to recover from disturbances, such as those caused by biocides.

A great deal of research will still have to be carried out before an assessment can be made of which activities above and below the soil contribute to the stability of ecosystems, and how this relates to spatial pressure. Due to the lack of knowledge on this subject, it is difficult to establish the extent of the leaching distance that can be described as 'reasonable'. However, the TCB has made a rough estimate using the limited information available. This is explained below and is based on greatly simplified assumptions.

The TCB has based the *realistic worst case* on an average new housing estate in the Netherlands with a high density of fencing. The surfaces not built on or paved are generally used for public green areas and/or gardens. It is desirable for the soil ecosystem of the public green areas and gardens to function healthily, so that plants can grow and pets and animals experience no adverse effects.

Within the work field of environmental standards, the 'healthy functioning' of a soil ecosystem is quantified according to the well-known concept of the Maximum Permissible Risk (MPR). The standards of water quality in the Water Framework Directive are also based on this concept. The concept assumes that the functioning of the soil ecosystem is guaranteed when at least 95% of the species in a soil ecosystem are protected against the negative effects of any substances. However, this concept has no spatial component.

Analogous to the 95% protection of species named above, the TCB now proposes to prescribe protecting 95% of the ground surface against exceeding the PNEC, on the assumption that by doing so, the functioning of the soil ecosystem will not be damaged. This assumption still has to undergo further examination, one reason being that linear barriers occur in the case of fencing. The migration of organisms may be obstructed by this, with possibly detrimental effects on the recuperative ability of the soil ecosystem. The TCB's starting point was a square garden measuring approximately 50 m², fenced on three sides by 7 m long fences. Five percent of this area equals 2.5 m². At a 3 x 7 m length of fencing, the matching acceptable leaching distance is approximately 12 cm. Based on the expertise of the members of the TCB, this is an order of magnitude they would

⁵ Scheffer, M. et al. Catastrophic shifts in ecosystems. *Nature* **413**, 591-596 (2001).

expect. From this simple and rough estimate, the TCB concludes that the distance of 10 cm of the emission scenario document is of the same order of magnitude. From a precautionary point of view, a smaller distance would be preferable. Based on these calculations, increasing the leaching distance cannot be justified and, in the opinion of the TCB, would lead to insufficient protection of the soil.

ALTERNATIVE ASSESSMENT CRITERIA

The inclusion of active substances in Appendix 1 of the Biocides Directive is determined by both the chosen environmental criterion (the PNEC) and the way in which exposure is calculated (via the PEC). There is insufficient time here to conduct an exhaustive analysis of the strengths and weaknesses of the scenarios, assumptions and parameters used. The TCB recommends that such an analysis be carried out. It would provide greater understanding of the alternative control variables (other than the leaching distance) which could affect the inclusion of active substances in Appendix 1 of the Biocides Directive.

In anticipation of such an analysis, two aspects of the scenarios stand out as likely options for these alternative assessment criteria. The TCB explores this subject further below.

Biodegradability

The biodegradability of constituents is currently not included in PEC calculations. This therefore constitutes a *worst case* approach. In the case of an active substance that is biodegradable, this approach is perhaps too conservative. Article 10 of the Biocides Directive states that an active substance cannot be included in the Appendix if it is classified by *Directive 67/548/EEC* as bio-accumulating and not readily biodegradable. However, a temporary excess of a $PEC/PNEC > 1$ for biodegradable constituents could, for instance, be applied as an acceptable criterion. Time would then become an element of the standard. Perhaps certain constituents could then still be included in Appendix 1 of the Biocides Directive. The TCB would prefer such an approach to methods that result in long-lasting constituents entering the soil due to increasing the leaching distance.

Leaching

The TCB has already pointed to the possibility of making use of wood that has been preserved with biocides by imposing additional measures focused on limiting leaching as much as possible. The reduction of leaching from preserved wood prior to application is an effective method of protecting the soil, whereas increasing the leaching distance in the statistical model would result in inadequate soil protection.

CONCLUSIONS

Due to its concern for soil protection and precautions, the TCB advocates that the leaching distance for the active substances of preserved wood be kept to a minimum, preferably nil. This would stimulate the use of alternatives. If this cannot be achieved politically, at least some environmental gain could be achieved by adopting measures during the production phase, enabling the percentage of direct leaching from preserved wood to be eliminated or fixed within the wood before the wood is applied. A great deal of research is still required in order to arrive at a leaching

distance that can be supported by relevant evidence. This requires knowledge of the effect of the spatial scale of the preserved wood used on the stability of the soil or other ecosystems. As the number of houses, fences and railings made of preserved wood increases, the adverse effect on the ecological quality of the soil will also increase. Based on calculations and assumptions, the TCB does not advocate the moderation of the first assessment step by increasing the leaching distance. Perhaps the assessment could be made less strict by tolerating temporary excesses in the PEC/PNEC ratio of active substances that are easily biodegradable. In any event, this would be a way to prevent persistent substances from entering the soil.

SUMMARY

Supporting evidence for an acceptable leaching distance for biocides contained in preserved wood is largely determined by the degree to which the legislator wishes to protect the soil. Total protection forms one end of the spectrum, whereby wood preserved with biocides would no longer be permitted. Such a ban would stimulate the development of alternatives. The TCB recommends that a broad analysis of the environmental, social and economic consequences of a ban on the use of biocides be made, in order to gain a better understanding of this issue.

At the other end of the spectrum, there would be no explicit decision to protect the soil, an option that is currently being discussed in the negotiations between the EU member states. The TCB recommends conducting research into the maximum soil damage that could occur if biocides were assessed entirely according to the other criteria in the Biocides Directive.

If the consequences of a ban on the use of biocides were deemed to be unacceptable, the TCB would suggest the imposition of Community requirements on the process of wood preservation. In particular, additional follow-up treatment of preserved wood during the production phase, such as dousing and allowing the wood to rest for some time, could largely reduce leaching into the soil. The TCB recommends conducting research into whether such source-oriented measures would provide the latitude currently sought for, of course within the limits of the biocides' effectiveness and the manufacturers' economic constraints.

A pragmatic approach is also possible by opting for a larger leaching distance, as calculations have proved that an acceptable number of active biocide constituents would meet the environmental criterion in this case. The TCB does not advocate this approach, as it would not adequately protect the soil.

As an increasing number of houses, fences and railings made of preserved wood are constructed in and on the soil, the adverse effect on the ecological quality of the soil increases. The spatial pressure on the soil increases as a result. The TCB recommends a more detailed quantification of the effects of spatial pressure, based on the conservation and protection of the ecosystems' ability to recuperate. In spite of very limited scientific knowledge on the subject, the TCB has made a rough estimate of an acceptable leaching distance. The leaching distance we calculated hardly differs from the 10 cm currently used, and lies within the order of magnitude that the members of the commission would expect, based on their expertise. As a precaution, a distance smaller than 10 cm would be preferable. In the TCB's opinion, the soil would be insufficiently protected if the leaching distance were increased.

However, if the objective is greater flexibility, the TCB would prefer an assessment based on accepting a temporary exceedance of the environmental criterion for active substances that are easily biodegradable. This at least prevents persistent substances from being absorbed into the soil.

Yours faithfully,

A handwritten signature in black ink, consisting of a series of connected strokes that form a stylized, somewhat abstract shape.

Ms L.E. Stolker-Nanninga
Chairwoman,
Soil Protection Technical Committee (TCB)

SUMMARY OF THE APPLIED EMISSION SCENARIOS

There are five different application categories for preserved wood, classified according to the extent of overhead cover and the wood's contact with water and soil. A number of relevant application scenarios have been developed for each application category. Applications in categories 1 and 2 are completely screened against weather conditions and there is no risk of emissions into soil or water. These application categories are therefore not taken into account. Categories 3 and 4 are important where the TCB's recommendation is concerned. Category 3 consists of wood or wood products that are not covered, and which stand on the ground. The wood or wood products are permanently exposed to the weather, to surface water and to the soil. Category 4 consists of applications in the soil or in surface water. The table below describes the categories that are relevant to soil. Category 5 is not taken into account as it consists of wood or wood products that are permanently in contact with salt water.

In principle, a leaching test should be carried out for the scenarios in which treated wood is in contact with rainwater and where soil or surface water is the receptor. A rain pattern is simulated in such tests. However, for a variety of reasons it has been decided to apply leaching tests where wood is in direct and permanent contact with water. One of the reasons is that leaching tests using simulated rainfall are difficult to standardise. The analysis of available data also shows that leaching is greater from wood that is in direct contact with water than from wood that is exposed to rainfall, whereby the *worst case* situation is approximated. Finally, the estimate of the emissions from treated wood during storage and use would necessitate two leaching tests being conducted, one with simulated rainfall and one in direct contact with water. This would mean a substantial increase in costs.

For the scenarios in which the product is in permanent contact with the soil (underground sections of wood in application class 4a), a test should actually be carried out in which pieces of wood are placed in the soil, in direct and permanent contact with it. The *expert group* agreed that estimating exposure can be based on the results of leaching tests based on permanent contact with water, for constituents which are not regarded as difficult to dissolve in water. If a wood preservative is regarded as difficult to dissolve in water, a leaching test for wood in contact with the soil may be necessary. The competent authority will decide whether this is required and will assess it per case.

TABLE: EMISSION SCENARIOS FOR VARIOUS APPLICATIONS OF PRESERVED WOOD

Classes	Description	Application	Receptor	Volume of receiving soil/water (width*depth*length)
3	Situation in which wood or wood-based product is not covered and not in contact with the ground. It is either continually exposed to the weather, or is protected from the weather but subject to frequent wetting.	a. fence b. noise barrier c. house, completely faced with wood	Soil (concentration in wet soil resulting from rainfall or direct contact with the soil)	a: 0.1 x 0.1 x 1 m b: 0.1 x 0.1 x 1000 m c: based on a house circumference of 50 m, 10 cm away from the outside wall and 10 cm deep.
4a	The wood or product is in permanent contact with the ground.	a. transmission pole with a diameter of 0.25 m and 2 m deep in the ground b. fence post measuring 10 * 10 and 0.5 m deep	Soil (concentration in wet soil resulting from rainfall or direct contact with the soil)	a. 10 cm around the pole, 10 cm under the pole over a total pole depth of 2 metres. b. 10 cm around the pole, 10 cm under the pole over a total pole depth of 0.5 metres.