

We would like to thank Ute Schoknecht for the time she has taken to read our manuscript and her helpful comments to improve it. In the following section we are going to repeat the points brought up (in grey italic letters) and subsequently respond to them:

Specific comments

Line 48 Bollmann et al., 2016 and Bollmann et al., 2017b report on transformation of terbutryn and OIT on facades, please add these references here – will be added

Line 50 231 days: this value was a result of Bollmann et al., 2017a- will be corrected

Line 57 There are numerous papers that report on transformation products of diuron, terbutryn and OIT. This statement could be related to façade coatings to avoid a long list of references. However, the papers of Bollmann et al., 2016 and Bollmann et al., 2017b should be cited here at least. It may also be important that modern investigations on degradation products of diuron is usually limited to diuron-desmethyl although there are reports on a number of other transformation products (e.g. Jirkovský et al.: Photolysis of Diuron. Pesticide Science 50/1 (1997) 42-52 and other reports, see also Hensen et al. 2020). Possibly, other degradation products of diuron have been overlooked (not only in this study).

We will revise this paragraph so that its focus on selected TPs and on façade coatings becomes clearer. Regarding degradation products Diuron, we will include different relevant TPs. Thank you for your additional literature suggestions. We were not aware of the study by Jirkovský et al., 1997 and will add this to the manuscript.

Line 69 Biocides and their TPs can enter the environment only in case of driving rain to the surface (not generally during rain events). - We will clarify our statement.

Line 70 Please explain how the elution experiments were performed on roof materials from house 4 – especially in case of horizontal orientation.

This comment refers to line 170. We will include more details on the elution experiments as follows: Most roof materials (i.e. Roofing foils, roof access, roof cladding, elevator shaft foil and grass foils) were tested where their orientation was vertical, e.g. around vertical orientated pipes or shafts. We conducted experiments like on facades. Railings were accessible from all sides so we conducted elution experiments by setting a container underneath them. At the railings there were certain limitations regarding area poured with water so this might not be comparable to experiments at the facades. We dismantled parts of the wooden terraces so we were able to access the substructure and set a container underneath the wooden bars. This way we could perform leaching experiments on a horizontal surface the same way as on the facades.

Line 196 Please add information on the recovery of the SPE procedure for the analytes. Recovery was determined by spiking water samples with 1 mg L⁻¹ of analytical standard and was found to be 97.7 % (Diuron), 88.5 % (Terbutryn) and 93.5 % (OIT), 85.0 % (Diuron-desmethyl), 66.2 % (Terbumeton), 50 % (Terbuthylazin-2-hydroxy) and 92 % (Terbutryn-desethyl) (Hensen et al., 2018).

Line 230 Estimation of net BE: The estimation of net biocide emissions according the given formula cannot be correct. Several reasons why this is incorrect are discussed later in the text (Line 349). Please change wording under 2.5 to clarify that this calculation is a rough estimate with certain reservations.

We are aware that our estimation has many limitations and only gives a very rough estimate. We will clarify this also here.

Line 255 *Differences in substance patterns are probably also caused by different intensity of UV radiation.*

We will add this as a possible explanation also here. This nicely fits into the paper, since we have also mentioned the impact of UV radiation in the introduction and in section 3.2.1.

Line 277 *Different patterns of transformation products depending on different pigments were observed by Urbanczyk et al. 2019 (Influence of pigments on phototransformation of biocides in paints. Journal of Hazardous Materials 364 (2019) 125-133).*

Thank you for your remark and reference. We will add this fact as an additional explanation.

Line 435 *Missing biocides in the samples is not necessarily explained by former wash-off. Water solubility of most transformation products is probably higher than water solubility of the biocides. Therefore, the TPs should be washed off easier than the biocides. Probably, biocides that were available on the surface were almost completely transformed. It cannot be excluded, that biocides are still present in deeper layers of the materials that were not reached during the very short elution experiment.*

Thank you for clarifying. We will add this explanation to the discussion on façade (Section 3.2.1). We will also shorten the original sentence here.

Line 444 *For environmental risk assessments it is urgently required whether PNEC values are occasionally or permanently exceeded. The data for the swale indicate that the PNEC values for diuron and terbutryn were exceeded in one out of four samples from the swale. Please clarify this statement.*

Thank you for pointing this out. We did not aim for a complete environmental risk assessment and will clarify our statement. We are aware that a limited number of measurements cannot give information about long-term environmental risk. However, we will stress the fact that biocide pollution remains an issue after more than a decade after construction has ended.

Technical Corrections

Title *please add a blank between '2' and 'ha' - will be corrected*

Line 14 *use capital letters for Central and Northern Europe (also in the following text) - will be corrected*

Line 64 *please delete either 'and' or 'but' - will be corrected*

Line 95 *Please check the number of samples (52). The number of samples described in Table 1 amounts to 49. 3 samples from artificial experiments on facades and 20 samples from artificial experiments on roof materials from house 4 and x samples from a leaching test on the wooden terrace are mentioned in the text. - Possibly, the origin of the samples can be mentioned here (collected in the swale, rain downpipes and drainage pipe; from elution experiments on facades and roof materials from house 4 and a leaching test on the wooden terrace).*

We will update the table and make it clear.

Line 97 *please correct: 'selected' - will be corrected*

Figure 1 *please correct: Step 2 – Part 1 Identify source areas (instead of ‘sources’) – will be corrected*
Method: the phrase ‘elution experiments at selected infrastructures’ would facilitate understanding the different methods mentioned here – will be corrected

Table 1 *The information ‘(Duplicates >1)’ seems to be unnecessary and rather confusing.*
Thank you for your suggestion. Indeed, this might be a bit confusing. We will change it to ‘Samples taken per event (0 = no samples, 1 = 1 sample, 2= duplicate samples taken during one event)’.

Line 246 *please add a blank between ‘below’ and ‘4’ - will be corrected*

Line 250 *please add ‘in samples’ after ‘desmethyl’ - will be corrected*

Line 253 *please delete ‘detect’ - will be deleted*

Line 432 *please correct: ‘systems’ - will be corrected*

Line 500 *please add a link*

This refers to line 501 where a link is missing. We will add the link accordingly (<https://echa.europa.eu/de/information-on-chemicals/biocidal-active-substances>).

Line 510 *please add a link – will be added (<https://www.thesourcemagazine.org/urban-groundwater-mobilising-stakeholders-to-improve-monitoring/>)*

References

- Bollmann, U. E., Fernández-Calviño, D., Brandt, K. K., Storgaard, M. S., Sanderson, H., and Bester, K.: Biocide Runoff from Building Facades: Degradation Kinetics in Soil, *Environmental science & technology*, 51, 3694–3702, doi:10.1021/acs.est.6b05512, 2017a.
- Bollmann, U. E., Minelgaite, G., Schlüsener, M., Ternes, T., Vollertsen, J., and Bester, K.: Leaching of Terbutryn and Its Photodegradation Products from Artificial Walls under Natural Weather Conditions, *Environmental science & technology*, 50, 4289–4295, doi:10.1021/acs.est.5b05825, 2016.
- Bollmann, U. E., Minelgaite, G., Schlüsener, M., Ternes, T. A., Vollertsen, J., and Bester, K.: Photodegradation of octylisothiazolinone and semi-field emissions from facade coatings, *Scientific reports*, 7, 41501, doi:10.1038/srep41501, 2017b.
- Giacomazzi, S. and Cochet, N.: Environmental impact of diuron transformation: a review, *Chemosphere*, 56, 1021–1032, doi:10.1016/j.chemosphere.2004.04.061, 2004.
- Hensen, B., Lange, J., Jackisch, N., Zieger, F., Olsson, O., and Kümmerer, K.: Entry of biocides and their transformation products into groundwater via urban stormwater infiltration systems, *Water research*, 144, 413–423, doi:10.1016/j.watres.2018.07.046, 2018.
- Jirkovský, J., Faure, V., and Boule, P.: Photolysis of Diuron, *Pestic. Sci.*, 50, 42–52, doi:10.1002/(SICI)1096-9063(199705)50:1<42:AID-PS557>3.0.CO;2-W, 1997.