

ERRATUM – added 14 January 2020

The subsequent erratum addresses two shortcomings of the paper “Multilevel water quality management in the international Rhine catchment area: how to establish social-ecological fit through collaborative governance”. First, the discussion and interpretation of the results reported in the RESULTS and CONCLUSION sections, Figures 3-5 are incomplete in terms of a full discussion of under-represented misfit motifs. Second, the authors were made aware of a potential misleading interpretation of the values reported as p-values in Figures 3-5. These deviate from standard statistical use of p-values as a test statistics. Indeed the authors themselves overlooked the two-tailed implication of the p-value as it is defined in the analysis (see e.g. notes to Figure 3). Consequently, p-values of “1” (or close) have erroneously not been considered as significant results. Therefore, the frequency values in Figures 1–3 might have been slightly overemphasized, in particular regarding the comparison between the empirical and the random networks. In two out of the three cases, these differences are only minor in absolute values, as outlined in detail below.

Generally, these shortcomings do not change the major conclusions of the paper. Only one conclusion with respect to the similarity of the three cases had slightly to be adapted. However, for reasons of full transparency the authors decided to disclose shortcomings in this erratum.

RESULTS SECTION

In the **Moselle region (Figure 3)**, we outline in the paper that the three misfit motifs *a1*, *BC3*, and *c1b* have a higher frequency than expected by chance. However, particularly in the case of *a1*, outlining that actors who are connected to the same sub-catchment are not collaborating with each other, the difference in terms of frequency is minimal. We need to conclude that this indicates a rather small substantial difference.

Additionally, we discuss here the misfit motifs *b1*, *BC4* and *c1a*. They occur more often in the random networks. Thus, the under-representation indicates lower misfit than expected. Again, the observed effect regarding frequency is rather small in the case of *BC4* and *c1a*.

Results for the **Ruhr region (Figure 4)** are described correctly. But generally we have to add that, in terms of frequency, the differences between the empirical and the random networks are rather small.

For the **Basel region (Figure 5)**, motif *a1* as one typical baseline misfit configuration is rather frequent (over 20%), but slightly less as in the random networks. In the original paper, this result was described as not significant although—following the p-value definition—it is significant. Similarly, the misfit motifs *b1*, *c1a*, and *c1b* occur significantly less often in the empirical network compared to the random networks. The under-representation of these misfit motifs indicates a stronger overall fit in the Basel region.

DISCUSSION AND CONCLUSION SECTION

We stated in the original paper, that three out of four fit motifs occur significantly more often in the empirical networks than in the random networks. This statement has to be completed by the observation that in the Moselle and the Basel regions, the misfit motifs occur less often compared to the random networks thus indicating a sign of fit. This under-representation of misfit motifs could not be observed in the Ruhr region. Hence, we have to revise our conclusion stated in the last paragraph of the paper that there were no significant differences between the three case studies. Actually, there are and we have an overall trend to misfit in the Ruhr region, and fit in the regions of Basel and Moselle. The Ruhr is the only single-country case with no strong cross-border and international dynamics. It is thus rather a counterintuitive finding, that fit in a jurisdictionally non-fragmented region is lower than in fragmented ones. And this needs further investigation. But an explanation for the enhanced fit in the two trans-boundary regions of Basel and Moselle is that this cross-border setting gives more incentive for collaboration and finally fit. While in a single country context the borders of environmental problems remain mainly invisible, national borders—even when they do not match with environmental problem borders—could initiate some culture or demand for cross-border collaborative resource management or at least change the perception of collaboration by the involved actors. Thus, upstream- and down-stream dynamics as well as international treaties and commissions (such as the International Commission for the Protection of the Rhine) require cross-border and trans-national coordination of actions in the Rhine. To conclude, problem pressure and trans-national institutions might be important triggers for collaboration and social-ecological fit.