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Hydrology and Earth System Sciences Discussions

Interactive comment on "Rivers we can't bring ourselves to clean – historical insights into the pollution of the Moselle River (France), 1850–2000" *by* R. J. Garcier

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First of all, I would like to thank the referee for the comments provided. They are very helpful in pinpointing specific issues. Here are my responses to the points that have been raised.

2. Add some detailed references (e.g. civil engineers in charge of river management in section 3.1).

In France, two main bodies were in charge of river management. For the smaller watercourses ("non-navigable and non-floatable"), it was the corps of the "Génie rural et Eaux et Forêts". For the larger watercourses (i.e. "floatable and navigable", belonging to the State), the corps of "Ponts et Chaussées" and more specifically the "service

de la navigation", took responsibility. In the Moselle basin, however, there were never such influential engineers as Tulla on the Rhine. Two reasons explain that fact. First, the chief engineers had to move periodically to other parts of the country, to prevent their being involved in local politics and compromises. Second, there never was on the Moselle such a service as the "Service special du Rhône", which guaranteed a long lasting river management philosophy, even beyond individual people.

3. Precise river reaches concerned by fish-kills and fish-less state (#3.3) in 1910 and 1920; where is the new cocking facility?

Three main parts of the river basin were concerned. First and foremost, the basins of the Fensch and the Orne, which were home to the largest single concentration of steel and cocking facilities. In the 1930s, most species of fish had disappeared in those river reaches. Second, on the Moselle itself, two sections were prone to fish mortality (even though fish did not entirely disappear): in the section between Pompey and Pont-à-Mousson (which created a new cocking facility in 1923); and in the section around Thionville, very near the confluence with the Fensch (presence of the Karlshütte).

4. In 3.2, the Rhine-type barges reach Nancy through the channelized Mosel or through the extension of the Sarre canal?

Navigation traffic always took place through the channelized Moselle. The Sarre canal faced severe navigation problems because the coal dust discharged by the French mines settled in the Sarre system. However, the Moselle was not directly accessible for Rhine-type barges before the great works of 1964. Before that, smaller boats carried industrial products from and to the Rhine itself.

5. Could you differentiate more the river management types in France and Germany between 1870-1918 ? Has the German type been generalized to the whole basin after 1918?

This is a complex issue and I can only provide limited insight into that because it would

HESSD
4, S915–S919, 2007

require another paper! In France, the top civil engineers in charge of river management were very rarely local people: they were coming from everywhere in the country and were educated in Paris at the Grandes Ecoles created by the French Revolution. When Germany annexed a portion of France, the engineers left and were replaced by Germans, most notably the engineers of the "Meliorationsbau". This does not mean, however, that the management principles changed, because Bismarck’s Germany had a peculiar legal system. For those matters concerning the Reich itself, law was made in Berlin. For matters of local interest (such as stream management and industrial pollution) however, the various states unified under Bismarck’s rule had the right to keep pre-unification legislation. This system proved useful for the Reichsländer of Lothringen and Elsaß because French law served as the "local legislation" there. It was only gradually (and not even fully) replaced. From what I read in the archives, the main difference lied in the concern for health that was more developed in Germany than in France. Accordingly, German administration and justice was more prone to vindicate complaints emanating from local people if public health was at stake. Quite contradictorily, it also advanced the concept of "Opferstrecke" mentioned in the paper, in those areas where sacrificing a stream to the industry was considered an acceptable compromise. After World War I and the return of Lothringen and Elsaß to France, this concept was endorsed by the French civil servants and French law gradually replaced most local laws again (but not all of them: those areas formerly annexed by Germany retain some legal peculiarities in health insurance and religious policies, for example).

6. You write that before 1850 the river network was in pristine state (I would rather say "subpristine" since the land cover was already much controlled by Humans), yet in the fig.5 the organic pollution is already very high in 1870. The construction of sewage stations has probably been progressive (e.g. Nancy in 1880) therefore the BOD theoretical budget cannot be based on the total basin population gradually connected to the sewer system (probably difficult to get).

HESSD

4, S915–S919, 2007

I agree with the "subpristine" qualification. The point you make is very relevant. Before the 1870s, sewer systems were not widespread at all in the region. Most organic matters were not dumped into rivers but in cesspools which had no direct connection to the river system. Accordingly, the 1850 figure appearing in the chart is a high estimate. Giving a better estimate and accounting for the gradual construction of sewer systems discharging in the rivers would require charting all sewer facilities with construction dates and population for the 1300 or so localities in the basin if the data exist.

7. The figure 5 concerns the organic pollution which has been made target of basin authorities from 1964 to 1990. You mention other forms of pollution as salt and toxic substances. The salt issue has been addressed much later as you correctly state it. The toxic substances pollution in such a mining and industrial district is still very much understated (e.g. heavy metals) and its heritage can be much longer than organic pollution and salinization. The trajectories of such pollution issues might therefore be quite different from those of the figure 5, also the mine/industries shares of pollution will be predominant. Could you discuss this point ("need for further studies"?)

I fully agree with your comment. However, precisely because of the channelization issues, the trajectory of heavy metals and toxic elements would be extremely difficult to retrace. Most industrial rivers in the basin have been dredged and recalibrated a number of times and the Moselle itself underwent massive recalibration at the beginning of the 1960s. We lack the adequate undisturbed settling ponds necessary to measure heavy metal loads in sediments and the historical data on toxic pollution is sparse. Further studies are definitely needed.

8. Can the figure 2 (Meybeck's graphic) be applied to the Mosel? I guess the dates will change and will be specific for each water pollution issue (here figure 2 concerned only the organic pollution).

Absolutely. Figure 5 is a rendition of Meybeck's graph's application to the Moselle limited to organic pollution. For salt pollution, for example, the curve would be some-

HESSD
4, S915–S919, 2007

what different because the sources are few and limited in the amount they can legally produce. The curve would show a succession of plateaux.

9. Fig 1. Where is the basin boundary for your budget (presented in fig.5)? Can you add the former political limits in 1870-1918?

The basin considered is the French portion of the Moselle basin (including the Sarre in France). I will update figure 1 to show more clearly the political limits between 1870 and 1918.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 1697, 2007.