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Trace metals trapping dynamics in urban stormwater constructed treatment wetlands: Cases study in Strasbourg, Moulins-les-Metz and Leuville-sur-Orge

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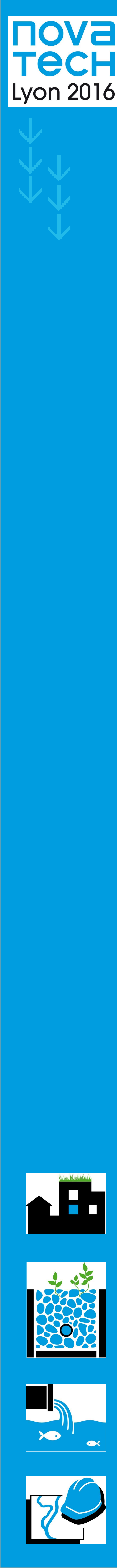
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Trace metals trapping dynamics in urban stormwater constructed treatment wetlands: Cases study in Strasbourg, Moulins-les-Metz and Leuville-sur-Orge



Moulins-les-Metz and Leuville-sur-Orge



Dynamique du piégeage des micropolluants métalliques au sein des zones humides artificielles traitant des eaux pluviales urbaines strictes

Context and experimental sites

Trace metal behaviour is a key point to evaluate the long term efficiency of stormwater constructed wetlands (SCW). The present study aimed at exploring behaviours of Cd, Cu, Pb and Zn in three SCW at the downstream of three urban catchments located in France at Strasbourg (Alsace), Moulin-lès-Metz (Lorraine), and Leuville-sur-Orge (Ile de France).



Strasbourg

Moulin-lès-Metz



Leuville sur Orge

Methods

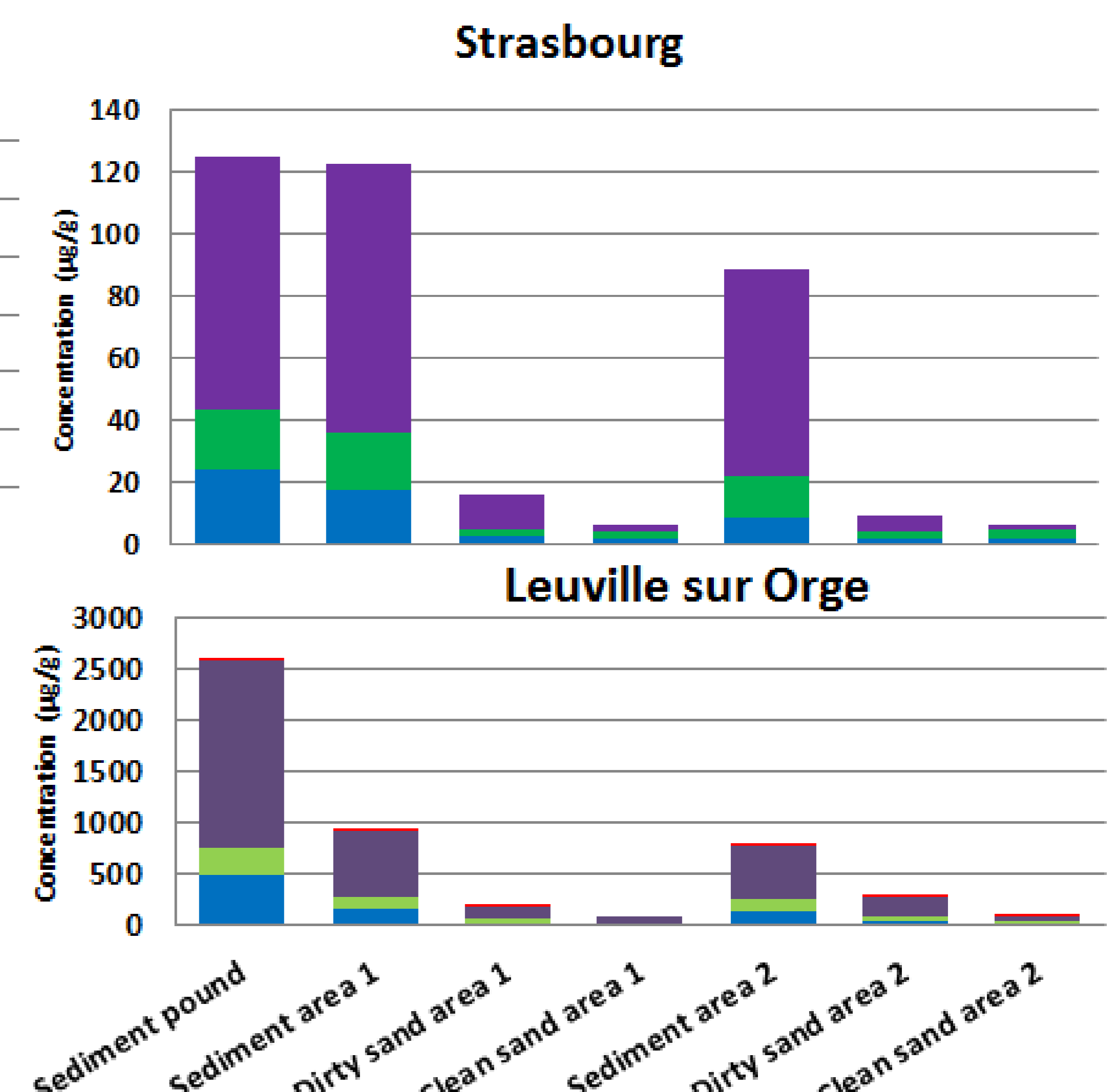
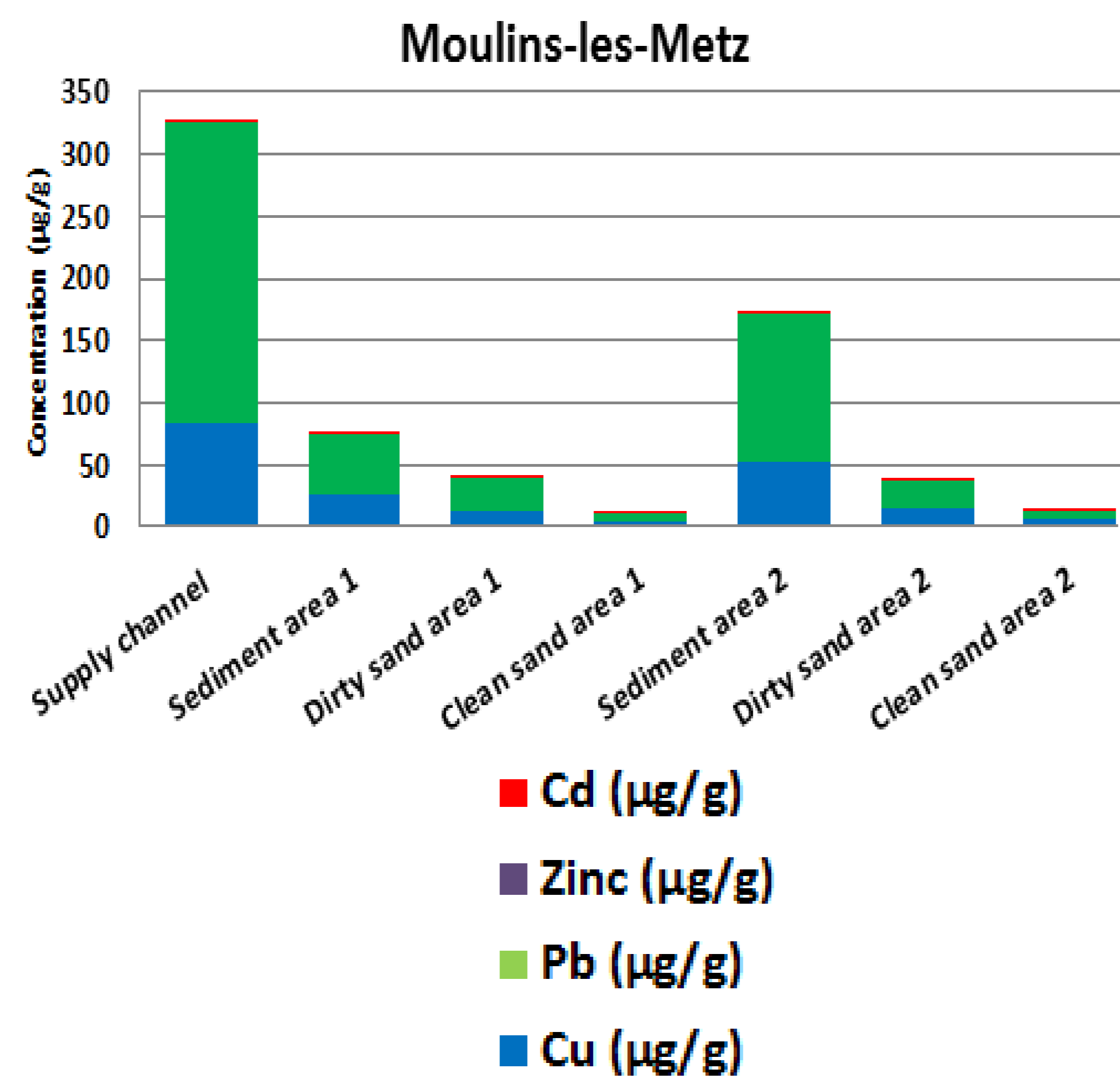
The sampling campaign took place in May 2015, about four years after SCWs setting up. The filters were split in two sampling areas according to the plant abundance (low = area 1 or high = area 2). For each sampling area, the filter media were sampled at 3 different depths (from top to bottom) and analysed by mineralization to determine metal contents and by the Tessier sequential extraction to determine their speciation in soil.

Area (m ²)	Catchment	Filter
Strasbourg	60,000	100
Moulin-lès-Metz	365,000	2,200
Leuville sur Orge	400,000	2,000

Results

Metal trapping

Metal concentrations decrease from the feeding point towards to the end of the SCWs and with the depth in the SCW. Cd is not often quantify or in low concentrations. Pb content is high in Moulin-les-Metz when Zn is the mostly present metal in the other SCWs.



Metal speciation - Strasbourg example

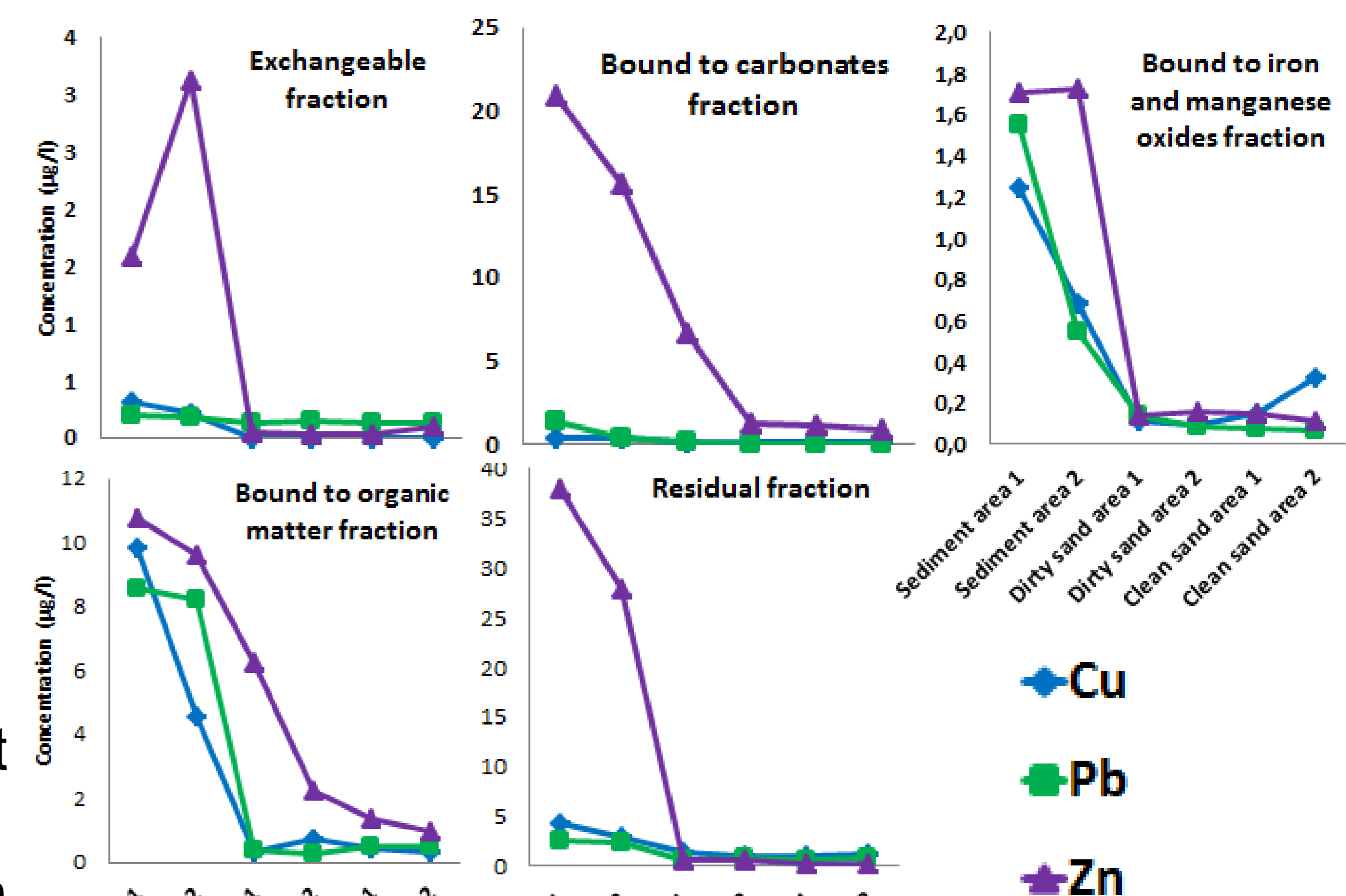
Cu and Pb

- are mainly linked to organic matter fraction in sediment layer and to residual fraction in sand layers.

Zn

- is mainly bound to residual minerals and carbonates in sediment layer, and to organic matter and oxides in sand layers.

Metal trapping in the 3 systems by sampling area



Metal speciation in Strasbourg system compartments

Conclusion

Metals are mostly trapped in the first part of CW and in first centimeters of filter for each experimental site.

In Strasbourg, there is a risk of Cu, Pb and Zn release in infiltrated water under oxidizing conditions and there is a risk of Zn release for low redox value in the sand layers.

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