

Beyond DEHP: high-molecular-weight phthalate and non-phthalate plasticizers in German rivers

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Objective

The global demand for plasticizers is expected to rise to 10 million tons per year by 2020. High-molecular-weight phthalates and non-phthalates are replacing the former blockbuster DEHP on the market. Some of the substitutes are under scrutiny, e.g. DPHP that has been added to the EU REACH CoRAP list. Data are needed on the spatial and temporal trends of these substances in the environment.

Methods

Suspended particulate matter (SPM) was collected monthly at 16 sampling sites from major rivers in Germany. SPM was sieved to < 2mm and stored above LN₂ in the German Environmental Specimen Bank (ESB). Sample treatment involved solvent extraction (ultra sonic) and Florisil Clean-up. Samples were analysed with APCI-LC-MS/MS.

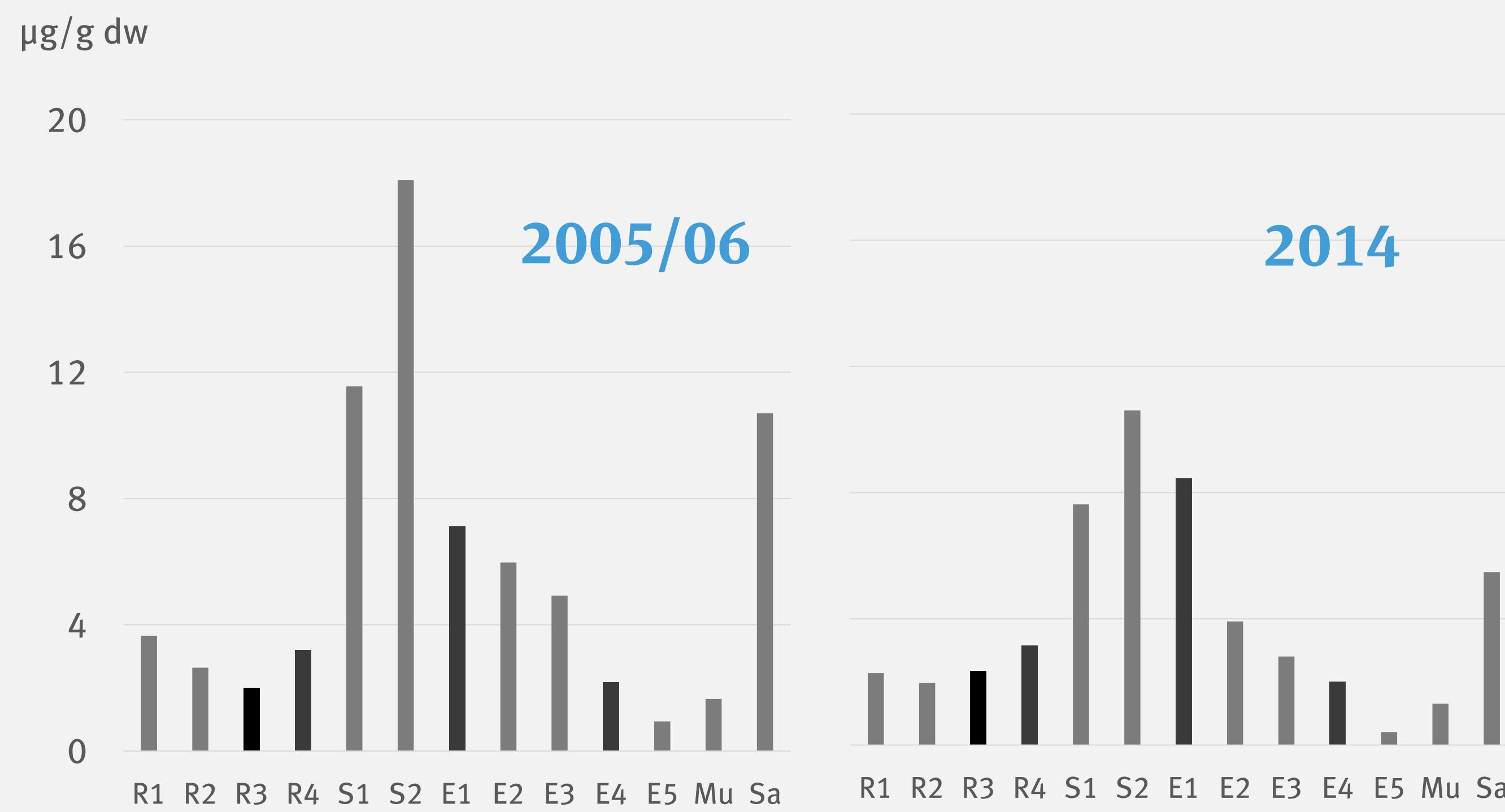


Figure 1: Levels of phthalate and non-phthalate plasticizers in SPM samples from 2005/06 and 2014 (black bars: conc. 2014 ≥ 2005/06)

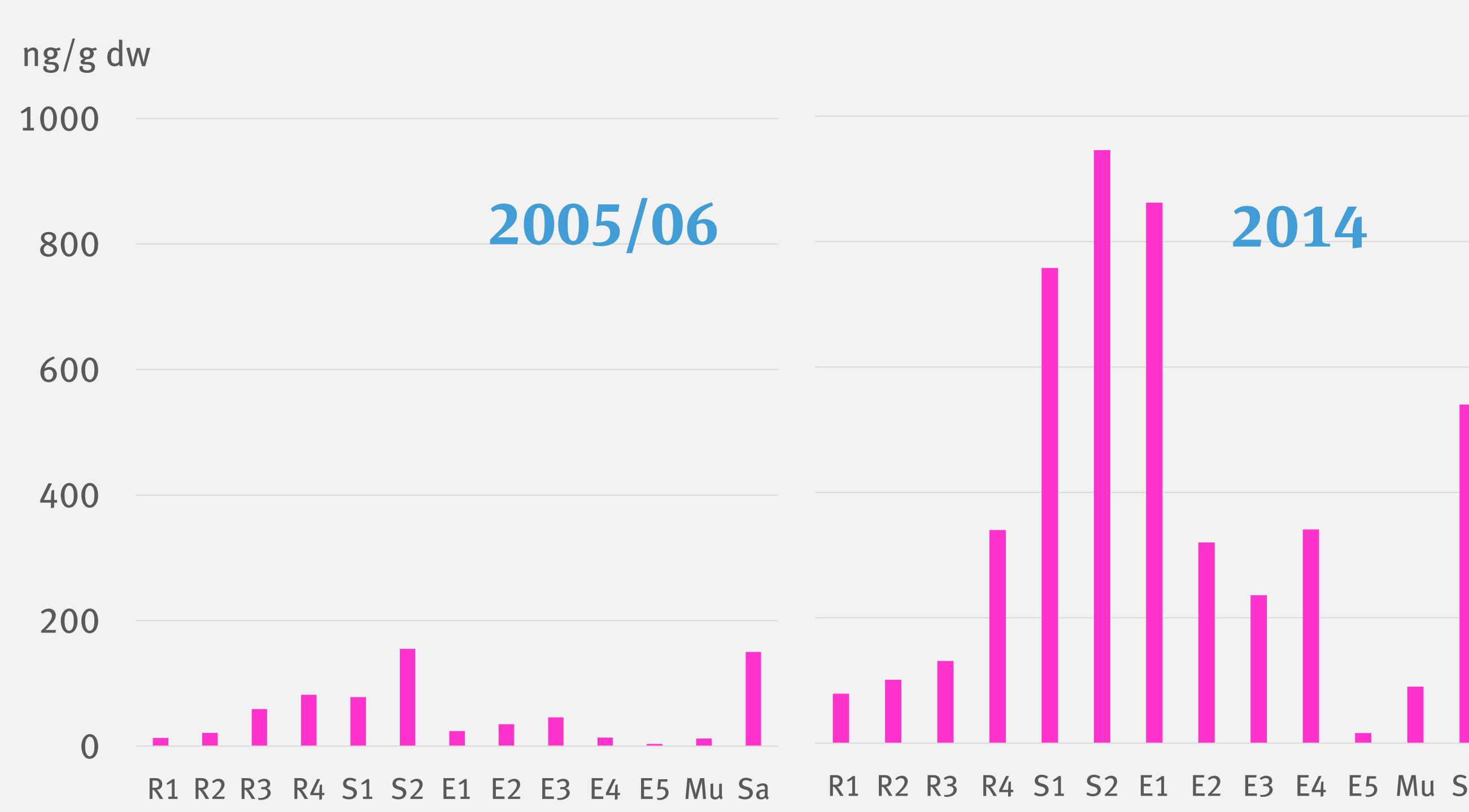
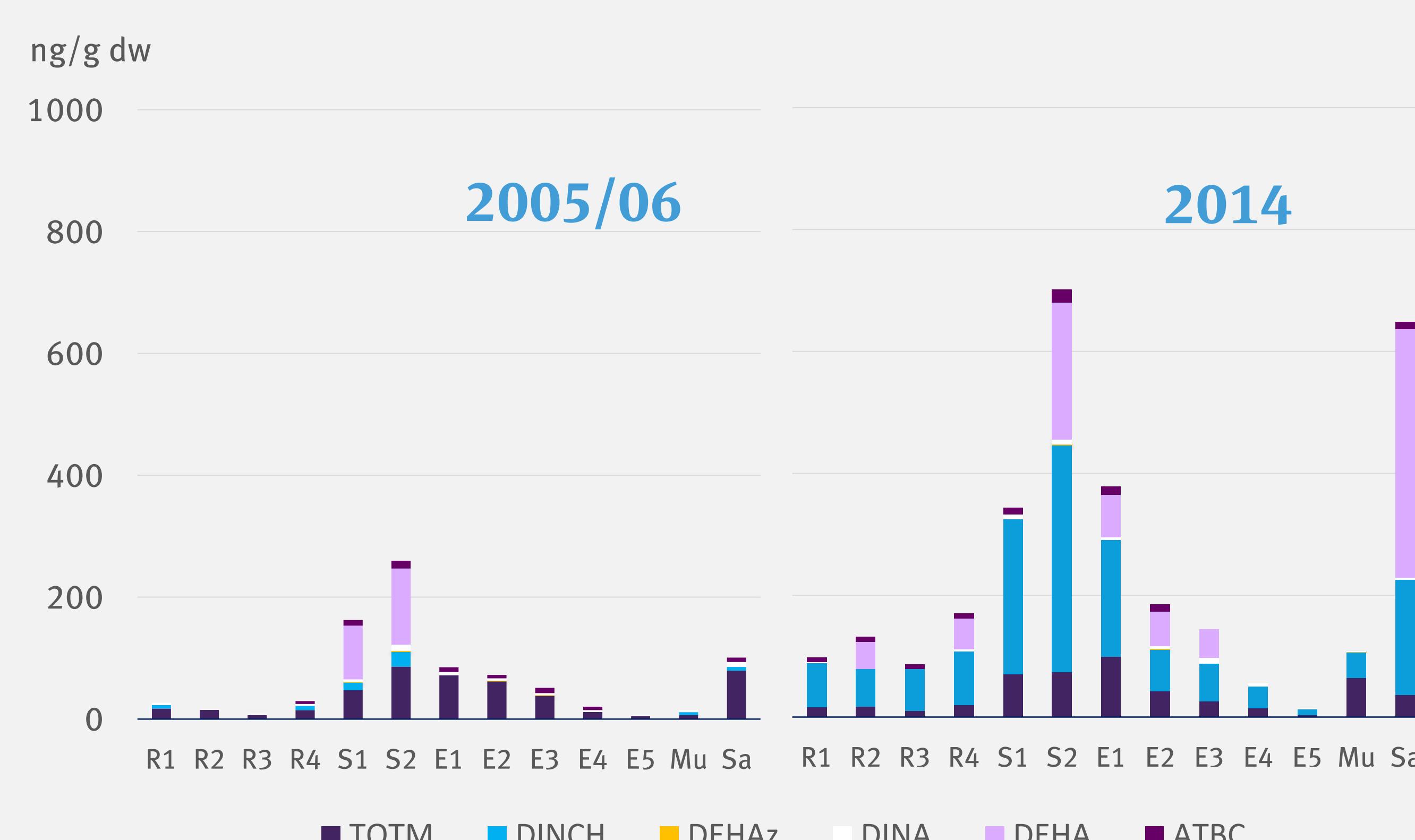


Figure 2: Levels of DPHP in SPM samples from 2005/06 and 2014



TOTM: Tris(2-ethylhexyl) trimellitate, DINCH: Diisononyl cyclohexane-1,2-dicarboxylate, DEHAz: Di(2-ethylhexyl) azelate, DINA: Diisononyl adipate, ATBC: Acetyltributyl citrate, DEHA: Di(2-ethylhexyl) adipate

Figure 3: Levels of non-phthalate plasticizers in SPM samples from 2005/06 and 2014

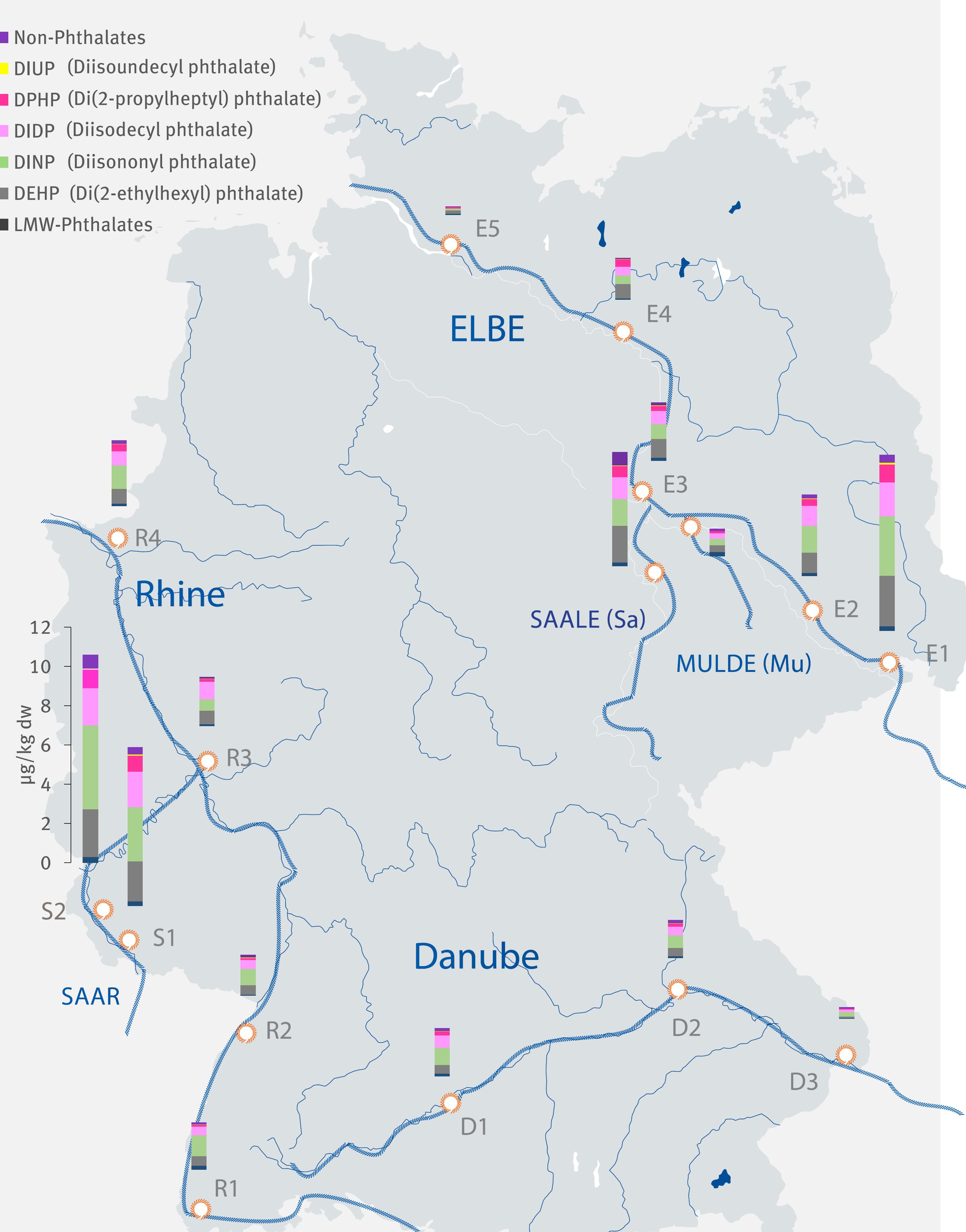


Figure 4: Plasticizers in SPM samples from German Rivers in 2014

Results

- In 2014, total levels for plasticizers ranged between 0,5 -11 µg/g dw SPM
- At some sites the levels of plasticizers were higher in 2014 than in 2005/06.
- DEHP levels decreased by 20 to 70% from 2005 to 2014 and the high-molecular-weight phthalate DINP became the dominant plasticizer.
- Concentrations for the DEHP-substitute DPHP (EU CoRAP list, evaluation 2019) increased at all sites.
- The new non-phthalate plasticizer DINCH – marketed in the EU since 2002 - is present in SPM samples from all sites.

Outlook

As a next step we will elaborate temporal trend series with additional ESB samples.