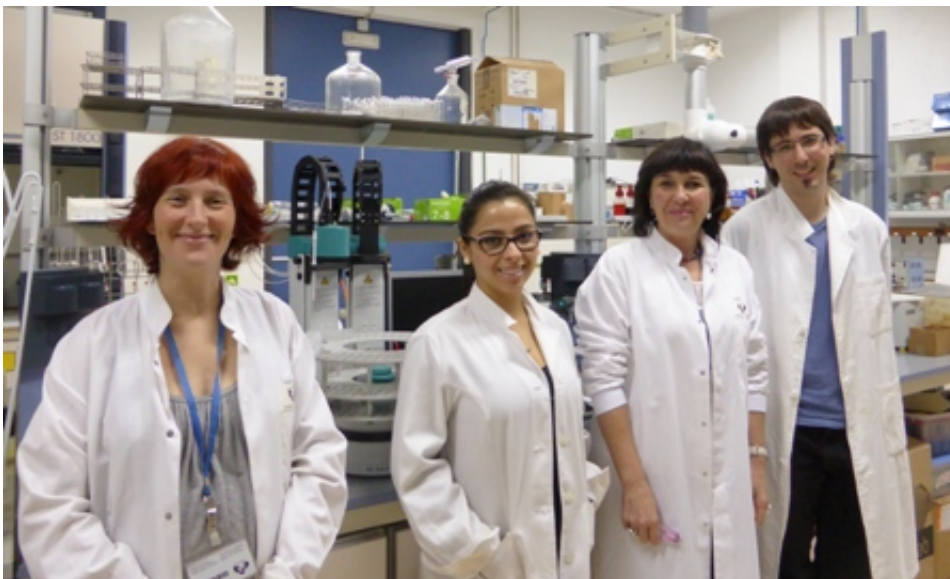


River sediments, a dynamic reserve of pollutants

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Research group led by Estilita Ruiz Romera (third from the left).

The UPV/EHU's Hydrology and Environment Research Group has located the stretches in the River Deba and its tributaries posing the greatest potential hazard owing to their high metal content, has identified the sources of pollution and has assessed the effect that a certain type of flood event has on the carrying away and distribution of sediments and associated metals.

Metals are pollutants that have to be monitored in order to obtain a global overview of the quality of water systems, due to the fact that they

remain in the environment. Although sediments act as a drain for pollutants, they can also act as a source of pollutants under certain environmental conditions (like changes in the composition of the water or movement of the sediments owing to a flood event). The UPV/EHU's Hydrology-Environment Group has conducted research on the River Deba and its tributaries to assess the influence of anthropogenic inputs and the effect exerted by major flooding events on the distribution of the metals associated with the sediments.

It is important to know the distribution of the pollutants in the soluble (water) and particulate (sediments) phases of rivers; this distribution is largely determined by the organic matter. As Estilita Ruiz, one of the group's researchers, explained, "whenever there is a change, the [metal](#) contained in the sediments can move from the particulate phase (associated with the [sediment](#)) to the soluble part (to the water), and that can increase the environmental hazard, the hazard for living beings".

The catchment area of the River Deba was chosen because it is one of the most polluted in Gipuzkoa. It is affected by major development linked to industry and population, and its resulting input of large quantities of industrial and municipal effluent. Another factor taken into consideration in this study was the mobilising of large quantities of sediments during the building of transport infrastructure, because it renders the effluent susceptible to being carried away by heavy rainfall.

What is present in the bottom sediments and how does it change?

Besides analysing the variations in the pollutants all along the riverbed of the River Deba and its tributaries (Ego and Oñati) from the headwater to the mouth in 2011 and 2012, the changes that took place in this catchment area over these two years –both with respect to sewage

management and to works taking place in the area, or flooding events occurring in that period of time- have led the group to establish the differences between the samples taken from two different hydrological years.

The collecting of fine sediment along the riverbed as well as the subsequent analysis of it in the laboratory have revealed that the main anthropogenic source of organic matter and metals is untreated or partially treated industrial and municipal effluent. This is reflected in the high organic load found in the sediments of the Ego stream, which until 2014 was receiving the untreated sewage of the municipality of Ermua. Yet the diversion of the organic effluent of the municipality of Oñati to the Epele treatment plant in 2012 has had a beneficial effect on sediment quality as its organic load has been considerably reduced and, as a result, so have the metals associated with these organic complexes. This means a reduced level of availability of these metals for the aquatic environment and, therefore, a reduced level of potential toxicity for aquatic life.

Besides the sewage, there are about a hundred medium-sized and large companies that contribute effluent rich in metals and they include electro-plating, metallurgy and foundry plants. The metals discharged by these factories are to be found in the fragments that are more susceptible to being released into the aquatic environment, should the physico-chemical conditions of the river change. In fact, turbulent flow conditions, like those arising during flooding events, could encourage the mobility and release of the metals associated with these sediments. So for all these reasons these metals need to be monitored during these events.

Finally, they have concluded that in the River Deba [catchment area](#) there is a clear increase in the concentration of [organic matter](#) and metals between the headwater and the mouth "which provides proof for the

relative non-polluted nature of the headwater streams with respect to the high pollution of anthropogenic origin in the middle and lower part of this river," explained the researcher. "The highly polluted sediments of the Ego stream reflect how far away it is from the optimum quality conditions that should be displayed by an overland stream. Furthermore, this stream has been found to exert a negative impact on the water quality of the River Deba into which it flows."

More information: M. Martínez-Santos, A. Probstb, J. García-García, E. Ruiz-Romera. "Influence of anthropogenic inputs and high-magnitude flood event on metal contamination pattern in surface bottom sediments from the Deba River urban catchment". *Science of the Total Environment* (STOTEN) 514, 10-25. 2015

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