The case studies covering concrete examples of sediment risk assessments for particular chemicals and/or conditions are intended to support the breakout group discussions. All submitted case studies will be distributed to the participants as supporting background material for the workshop and will be included in the workshop proceedings. The Scientific Committee will select some case studies or selected areas of the case studies and will invite the authors to present these cases during the workshop, either at the plenary session or during the break-out groups.

**NOTE:** By submitting this form, the authors confirm that they have the ownership of the information presented in the case study and that they authorise ECHA to distribute the submitted information to the workshop participants and to publish it in paper and/or electronic format as part of the workshop proceedings.

**Contact details for the submitter**

<table>
<thead>
<tr>
<th>Last name: Galloway</th>
<th>First name: Tamara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email: <a href="mailto:t.s.galloway@exeter.ac.uk">t.s.galloway@exeter.ac.uk</a></td>
<td></td>
</tr>
<tr>
<td>Tel:0(44) 1392 263436</td>
<td></td>
</tr>
<tr>
<td>Organisation/Company: University of Exeter</td>
<td></td>
</tr>
<tr>
<td>Country: UK</td>
<td></td>
</tr>
</tbody>
</table>

*The European Chemicals Agency will ensure on its part that your personal data is processed as required by Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community Institutions and bodies and on the free movement of such data. You have the right to access and rectify that data. To exercise these rights, please contact the data controller at WSRA2013@echa.europa.eu.*
**CASE STUDY – SUMMARY FORM**

(Number to be filled by the organisers)

**Case study details**

Case study is particularly relevant for the subthemes:

*Note: the case study should cover all three areas, but please indicate if it is particularly relevant/informative for one or more subthemes*

- [x] Problem definition and conceptual model for sediment risk assessment
- [x] Exposure assessment
- [ ] Effect assessment

**Authors:** Larner F, Dogra, Y, Tyler CR, Dybowska A, Fabrega J, Stolpe B, Bridgestock L, Goodhead R, Weiss D, Moger M, Leadj, Valsami-Jones E, Rehkamper M and **Galloway TS**

**Title:** Tracing Bioavailability of ZnO Nanoparticles Using Stable Isotope Labeling

**Keywords:** sediment toxicology, risk assessment, zinc oxide nanoparticles, *Corophium volutator*, crustacean, mesocosm

**Summary:** Zinc oxide nanoparticles (ZnO NPs) are widely used in commercial products and knowledge of their environmental fate is a priority for ecological protection. In this case study we synthesized model ZnO NPs that were made from and thus labeled with the stable isotope $^{68}$Zn and this enables highly sensitive and selective detection of labeled components against high natural Zn background levels.

We combined high precision stable isotope measurements and novel bio-imaging techniques to characterize parallel water-borne exposures of the common mudshrimp *Corophium volutator* to $^{68}$ZnO NPs, bulk $^{68}$ZnO, and soluble $^{68}$ZnCl$_2$ in the presence of sediment. *C. volutator* is an important component of coastal ecosystems where river-borne NPs will accumulate and is used on a routine basis for toxicity assessments.

Our results demonstrate that ionic Zn from ZnO NPs is bioavailable to *C. volutator* and that Zn uptake is active. Bioavailability appears to be governed primarily by the dissolved Zn content of the water, whereby Zn uptake occurs via the aqueous phase and/or the ingestion of sediment particles with adsorbed Zn from dissolution of ZnO particles. The high sorption capacity of sediments for Zn thus enhances the potential for trophic transfer of Zn derived from readily soluble ZnO NPs.
The uncertainties of our isotopic data are too large, however, to conclusively rule out any additional direct uptake route of ZnO NPs by *C. volutator*.

These results have been published in Environmental Science and Technology 2013, 2012, 46 (21), pp 12137–12145 DOI: 10.1021/es302602j

Additional available information on this model system is presented in the attached paper (Annex 1) and supporting information (Annex 2):


Link to scientific paper and supporting information:
http://pubs.acs.org/doi/abs/10.1021/es202570g

**Poster exhibition**
The case study will be presented also as a poster

☐ Yes  ☒ No