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## **SOLUTIONS External Stakeholder Board Memorandum**

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### **1. Context**

The SOLUTIONS project is a European Commission-supported five-year Collaborative Project under the 7<sup>th</sup> Framework Programme for Research and Technological Development of the European Commission (Grant Agreement #603437) coordinated by Professor-Dr. Werner Brack of the Helmholtz Centre for Environmental Research – UFZ, in Leipzig, Germany. The main goal of SOLUTIONS is to address major gaps and provide innovative approaches to assess the large number of legacy, present and future chemicals posing a risk to European water resources for future monitoring and regulation. The project started formally in October 2013 and will conclude in September 2018. Investigators from 39 European, Chinese, Brazilian and Australian research institutes have been directly supported by the project in disciplines ranging from ecotoxicology to hydrology to database management. The Stakeholder Board consists of approximately 20 members from several sectors including research, regulatory and business who may benefit from the findings of the SOLUTIONS project.

This memorandum provides the entirely personal perspectives of the success and shortcomings of the project as of the date prescribed above by the authors who served as

external Stakeholders and represented the federal regulatory environmental agencies of the United States and Canada.

## 2. Evaluation

### *Successes*

The SOLUTIONS project itself was comprised of several sub-projects: Concepts and Solutions, Tools and Case Studies. On an overall technical basis, the SOLUTIONS project achieved many advances and pushed the science of environmental monitoring forward significantly.

- Some of the noteworthy technological breakthroughs included:
  - Scaling-up of sample extraction through development of a portable, large volume, comprehensive solid phase extraction device; novel sharing of multiple extracts across research institutions
  - Miniaturization of effects-directed assay (EDA) with high throughput capability, with development of novel 'Virtual EDA'
- Collaborative achievements were impressive. The SOLUTIONS project was able to capitalize on a number of other initiatives, realizing significant cost and time savings. Perhaps the best example of this is the Joint Danube River survey, which was already planned by the partners and which SOLUTIONS was able to ultimately partner with, thus adding even greater value to the initiative for all partners. Another example is the collaboration with the GLOBAQUA project (also funded under the 7<sup>th</sup> Framework Programme) and the Spanish project SCARCE with the Iberian basins of the rivers Llobregat and Ebro, that are also affected by water scarcity conditions along with anthropogenic contaminants.
- One of the main outcomes of SOLUTIONS was to recommend consideration of real world environmental contaminant mixtures that goes above and beyond so-called priority pollutants to establish river basin specific pollutants (RBSPs). This is a wake-up call to regulators and policy makers who often regulate on the basis of single chemicals.

- Comprehensive linkages were established between different levels of biological organization using effect-based approaches that examined impacts on cells, individual organisms and *in situ* populations. It should be noted that such an advance could only be realized through a project with the resources and expertise such as SOLUTIONS. Many tools were developed using this approach and were then validated with the linkages established between levels of biological organization. Products such as trigger values, bioassay panel modules and, ultimately, combining such measures with complementary chemical measurements will link chemical and ecological status, enabling prioritization of mixture effects, diagnoses of modes of action, and solutions-oriented water management.
- As noted above, SOLUTIONS seamlessly collaborated with the other projects funded by the 7<sup>th</sup> Framework Programme including GLOBAQUA as well as the MARS project, providing everyone involved, including the Stakeholders, with a much broader context for the range of projects supported by the European Commission and how they integrated together.
- Finally, the degree of Stakeholder engagement in SOLUTIONS was admirable. At every annual general assembly and interim meeting, SOLUTIONS held Stakeholder Board meetings to maintain communications and build confidence in the project. This level of engagement was manifested in the final general assembly in Leipzig where so many Stakeholders provided narratives giving evidence of their need and use of the SOLUTIONS products and expertise.

### *Shortcomings*

Compared to the *Successes* of SOLUTIONS, the shortcomings are minor and limited.

- The vast majority of the anthropogenic contaminants focused upon by SOLUTIONS were organic compounds. While there are tens of thousands of these chemicals produced each year and our knowledge of their fate and effects in the environment is often very limited, other stressors including metals and ammonia can be present in European waters. SOLUTIONS often under-emphasized these other stressors in favor of the organic

compounds. In the future, greater consideration of these other stressors is probably prudent.

- The following shortcoming is less a constructive criticism and more of a reflection of the scale of the SOLUTIONS project. During the project, so much data was being generated that it was challenging to communicate. In retrospect, having more time for the Stakeholders, as well as other audience members, to be exposed to the new data via presentations and posters would have been valuable.

### **3. Concluding Statement**

The ultimate success of the SOLUTIONS project will depend on regulatory and policy uptake by the European Water Framework Directive and respective member countries. Other indicators of success could entail policy adoptions by other Stakeholder countries, such as the US and Canada.

The authors of this memorandum are consulting with their respective regulatory colleagues to assess the level of interest in sponsoring a SOLUTIONS webinar(s) designed to allow the SOLUTIONS participants to describe their progress to North American regulators and scientists. This approach may provide the mechanism for Canada and the USA to begin the process of adopting some of SOLUTIONS findings.