A few reflections about SUSTAIN key concepts

'Sustainable development' is commonly defined as 'Development which meets the needs of the present without compromising the ability of future generations to meet their own needs'.

It is built upon **a "3 pillars" model linking environmental, social and economic aspects**, all interdependent.

As such, **sustainable development is a society project**, and a political one, that cannot be defined and implemented without science, both because science has to play a huge role in the choice of technical solutions and because science is not disconnected from society.

From this point of view, science can contribute to objectivize the reflection on social and economic phenomena as well as natural ones, and to go beyond the opinion debate. This means the scientific approach can help consider the three dimensions/ pillars of sustainable development with the same level of demand in the reasoning.

At the same time, science cannot pretend to the complete dissociation of facts from values especially when dealing with sustainable development which -as a society project- must be grounded on values and active citizenship. One of the challenges of SUSTAIN precisely lies in this balance between the demand for scientific objectivity and the demand for ethical values.

In the strategy to achieve sustainable development, the **key role of education** as a prerequisite for **promoting the behavioural changes** and **providing all citizens with the key competences needed to engage critically with issues** has been highlighted.

To answer those educational needs, a new approach has emerged, Education for Sustainable Development, which has been defined by UNESCO in the following terms:

- ESD allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future.
- ESD means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption.
- ESD also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development.
- ESD consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way.

One of the risks in implementing ESD lies in the fact that the 3 pillars model of sustainable development often leads educational disciplines to focus investment in one of the three, thus reproducing the compartmentalization of traditional teaching subjects.

Yet, ESD, on the contrary, must encourage more complex and multidimensional approaches, a synthesis of environmental and development education, which may have a number of dimensions: scientific, geographical, economic, political, social. It requires a change in the mindset and habits of most teachers, especially at Secondary level (because of the subject specialization). More specifically, ESD requires: project-based learning, helping to apprehend the complexity of the issues at stake; collaborative work, including the perception of belonging to a community challenged by the issues; a shift from transmission learning to cooperative problem solving; multi-disciplinary analysis of real-life situations. Learning how to develop and carry out ESD projects is critical for the professional development of teachers.

ESD is a developing field in Education, but much work has already been done in terms of creating resources and developing theoretical and pedagogical frameworks. Our focus within SUSTAIN is not to re-invent this development work, but to explore the unique contribution that an IBSE perspective can add. This might be considered in two related areas, scientific content and inquiry processes. IBSE is a powerful pedagogic approach for helping students to understand scientific concepts, and this understanding is important to underpin ESD. In addition, IBSE foregrounds inquiry skills and an appreciation of scientific processes which are essential if ESD is to go beyond encouraging behavioural change to address and develop critical engagement with complex issues involved in sustainable development.

Each of the network partners already has solid experience of developing teachers' IBSE competencies through appropriate approaches. In those approaches, as well as in IBSE, there are intrinsic elements for citizenship. Yet, it is necessary to go further in that direction, by engaging in a process of reflection on the societal impacts of science, on the responsibility of scientists (researchers, engineers), on the interactions between science and society, on ethics within science ("science ethics"), as well as ethics in the application of science and technology ("ethics in the use of science"), and by looking at how these topics can be concretely tackled in school with children. The professional development for teachers must extend beyond the knowledge of science and scientific inquiry processes, and touch upon engagement and responsibility issues.