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Title: A review of *'Information and Communication Technologies, citizens' entitlement and environmental policy processes'* from various social learning perspectives.

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Abstract:

Social issues and stakeholders participation have become key issues in environmental debates focused on the operationalisation of sustainability. Related to these, concerns about which *institutional platforms* can be developed in order to make these participatory processes happen, as well as how to *value various stakeholders' participation*, have been the object of numerous research projects.
In this paper, we explain how such research has progressively lead us to examine why and how various types of *Information and Communication Technologies* could constitute a very useful set of learning tools for improving citizens' awareness of environmental management as well as for improving their participation in the policy-making process.

The premises of this work focus on two sets of key reflections on ICTs and on social learning:

1. ICTs open up new perspectives within which quantitative and qualitative information can be solicited. But is better and more information enough to help transform the interactions between our societies and the natural environment into more sustainable ones? Does more information automatically lead to more civilisation, more justice, higher quality of social relations or better life styles?
In this paper, we examine in what sense the new Information and Communication Technologies enhance or obstruct communication.
We argue that ICTs could help in operationalising sustainability and in enabling a variety of stakeholders them to participate in environmental debates and decision-making processes. The challenge of such ICT systems goes well *beyond* simply better scientific data bases or the 'informing of citizens about environmental problems and their places in causes and possible solutions'. In this paper, we examine how and why new ICTs can be developed as authentic components in civil society, for learning and deliberative procedures for decision-support, policy definition and evaluation in such a way that they might encourage people to work together at building 'common futures'. This examine is accompanied by a review of what has been done in the world recently, in view of meeting such an objective.

2. In this paper, we are interested in social learning processes and how ICTs can promote them.
Three dimensions of social learning are more particularly focused on:

a) Social learning and ***interactions amongst various stakeholders as well as between citizens and their environment:***

The framework for social learning has to address the interactions of stakeholders at different levels with other humans and with ecosystems. Social learning creates space for multiple visions and perspectives, creativity and energy and allows participation in a continuing collective process. Woodhill (1998) described social learning as 'a set of processes by which society democratically adapts its core institutions to cope with social and institutional changes in ways that will optimise the collective well being of current and future generations' or 'a framework for thinking about the knowledge processes that underlie social adaptation and innovation'.

b) Social learning reflects the ***link between understanding and action***, i.e. the continuous development of both knowledge and the ability to use it. In the context of environmental debates, there is therefore potentially a strong parallel between ***social learning and environmental decision-making processes***.

c) Learning about environmental issues involves the ***confrontation between a variety of objectives, interests and constraints*** that are also expressed in a variety of vocabularies and at different scales by different types of stakeholders. The governance of natural resources for sustainability requires processes of ***arbitrage and deliberation*** that social learning platform can potentially provide. This implies that stakeholders of various backgrounds (including scientific as well as non-expert audiences) can learn from each other in the context of social learning/conflict resolution platforms.

The paper explains the context in which such ICTs are being developed and provides some examples. The emphasis is put on linking three key 'ingredients', that are : Information and communication technologies, citizens' environmental awareness and participation, and various environmental issues. Often, two of them have been linked in the past, while the third was missing in the composition of what could become a very useful, up to date and user friendly tool to make people more aware of environmental issues and to create a dialogue platform which would allow 'experts' and non-experts to improve their understanding of environmental problems and what they do to attempt to solve them.
In this paper, when reviewing various initiatives that link ICTs, citizens and the environment, we put a special emphasis on social learning, the involvement of non-experts and the policy dimensions.

This paper constitutes the first research report to the European Union produced in the context of the **Virtualis** project (on Social learning on En**VIR**onmental **I**ssues with the inte**R**ac**T**ive Information and Comm**U**nic**A**tion Techno**L**og**I**e**S**)