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Further integration of European Research Infrastructures related to terrestrial ecosystem research

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The exploitation of resources and ecosystem services has resulted in a series of anthropogenically-induced changes in the environment, that now threaten ecosystem integrity, therefore increasing ecological risks for human wellbeing and societal functioning. Long-term protection against possible ecological risks (the precautionary principle) have therefore a legitimate rationale for ecological integrity and sustainable development. The European countries together with the European Commission have identified the environmental challenges in general and started to build in the framework of the European Strategic Forum for Research Infrastructures (ESFRI) large scale environmental Research Infrastructures (ENVRIs, http://envri.eu/about/). In the terrestrial ecosystem domain, ENVRIs enable better understanding of ecosystems' response to climate change and related extreme events, land use changes and losses of biodiversity and reduce ecological risks by providing knowledge from observations. ENVRIs provide data and state-of-the-art facilities for researchers to stay at the forefront of new scientific developments and to push ecological knowledge further to ultimately address the complex scientific questions related to the understanding of the Earth System.
Unfortunately, the ESFRI process for developing the ENVRIs in the domain has lacked an integrated top-down steering principle resulting in a complex and fragmented landscape of several landmark infrastructures, projects and advanced communities. This presentation introduces a study that has recently be delivered in the framework of the H2020 cluster project "Environmental Research Infrastructures Providing Shared Solutions for Science and Society" (ENVRIplus) to induce a discussion process among involved scientists, RI managers, stakeholders from national governments, the ESFRI and the European Commission on how a comprehensive and efficient cooperation among those ENVRIs focused on terrestrial ecosystems and biodiversity can be realized.
This study analyses the existing European landscape of Research Infrastructures from different perspectives: underlying scientific concepts, relation to Grand Challenges, potentials of co-location, and coverage in national roadmaps/national research concepts. It outlines the perspectives of cooperation and concludes that seven further steps are necessary to achieve the desired degree of integration and cooperation.

• Core variables (for observation and experimentation) supporting essential indicators for ecosystem function, as well as Grand Challenge related essential carbon and biodiversity variables, should be developed, listed and their measurements standardized among Research Infrastructures.
• For those core variables, core competences of Research Infrastructures should be defined and used in cross-RI services in order to avoid doubling efforts and diverging standards.
• For the described cross-RI cooperation, advanced governance models for need to be developed.
• National roadmaps should be designed towards integrated approaches serving the broad scientific and societal spectrum in a comprehensive way.
• Co-location of observations by different Research Infrastructures and between observations and experiments is a straightforward strategy and should formally be developed towards "Cooperative ENVRI Master Sites" (CEMS).
• Data interoperability needs to be further developed.
• A proper strategic framework has to be established beyond the usual runtime of EC projects to support clustering over at least a decade.