



**INTERUNIVERSITY PHD COURSE**  
**“SUSTAINABLE LAND MANAGEMENT”**  
**Cycle XXXVI**

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<b>Title of the Research Project</b>	Architecture of environmental monitoring systems
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**Summary of the Research Project**

The frontier of innovation associated with environmental monitoring techniques nowadays represents a broad spectrum development possibility both from the point of view in monitoring campaigns of data acquisition, and experimental laboratory related to hardware and software progress. The architecture of environmental monitoring starts from the observation of environmental phenomena and leads to the definition of quantities of interest that are spatially located in more or less large geographical areas. The possible displacement over vast geographical areas of the quantities in question, as well as the need to have data updated frequently and in real time, has created the need to resort to mechanisms for the collection of information with transmission systems to a central processing unit that make it available for use by the subjects in charge of analysis and monitoring. The observation of these quantities takes place with the aid of sensor networks. These sensors can be both wired and wireless. Technological innovation in microelectronics and radio transmissions has allowed the creation of sensors capable of high degrees of precision in the acquisition of information, considerable local processing capacity of the latter and excellent reliability as well as effectiveness in the transmission of such data, thus allowing monitoring environments to serve areas that are no longer strictly linked only to an environmental or industrial context. Punctually defining environmental monitoring campaigns, implementing and developing new detection techniques according to the morphological, geographical, stratigraphic and in general characteristics of the environment to be monitored is the first step to be investigated for a correct environmental monitoring campaign. Secondly, developing a network of automatic detection stations capable of producing an acquisition of parameters, such as to be a valid basis of indices for new mathematical models that allow a reliable projection of the evolution of the phenomena to be monitored, represents the core of the methodology that we intend to articulate with this research project. It is therefore intended to identify two sites of regional interest, an area of environmental relief, which will represent the basis for the acquisition of data useful for defining specific thematic paths. Downstream of an ex post analysis, the quality of the surveys performed and the reliability of the subsequent processing will be assessed using specific mathematical models. Data processing is imagined to be carried out with Open Source systems, software packages that allow for a reduction in data processing costs. The spatialization of the data associated with the acquisition and processing models are fundamental for defining forecasts, in the context of the protection and management of the environmental, agricultural, forestry and naturalistic heritage, for the protection of water resources, the defense from biotic and abiotic adversities; It is therefore necessary to provide suitable systems for disseminating the processing carried out, in order to adapt the anthropic response aimed at managing the phenomena in the shortest possible time. A better synergy between the data sampling network, the forecasting model and the response times that man is able to provide, represents a fundamental aspect of this research project. It follows that the protection of naturalistic areas of environmental value, with adequate and innovative monitoring networks, located in particular rural areas, must also provide for a harmonization of the ordinary costs that these activities impose, associating them, for example, with anthropogenic phenomena such as tourist flows and / or related environmental education actions that can be undertaken in these spaces, as has already happened in other past experiences. The architecture of environmental monitoring should also become a support tool also for actions to protect botanical and faunal species, especially for selective ones in the food sector and for which the availability of non-polluting environmental tissues is a condition for the survival of native species.