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**Título:**

Human Impacts on River Systems. Development of Methods and Tools for Integrated Catchment Management

**Resumen de la Memoria:**

Human impacts on aquatic systems in general and in river systems in particular are threatening the availability of water and other natural resources and services in the proximate future. Most of the available methods to evaluate the effect of human activities on fluvial systems are based on the deviation of biological groups (algae, macrophytes, macroinvertebrates, fishes or riparian vegetation) or other river components (hydrology, river morphology or water quality) in comparison with a reference condition. However, all these components are influenced by many natural factors that vary at different spatial and temporal scales. This makes the setting of reliable management or restoration targets for all hydrological, river morphology, water and biological characteristics within a water agency domain very difficult. Moreover, predicting changes of metrics or indices in response to human activities is also difficult due to multiple, cumulative and feedback effects. Finally, the paucity of datasets that include hydrological, river morphology, water quality and biological data constitutes a significant impediment to the understanding of biophysical relationships and interactions. Attaining sustainable water resource management is, then, a major challenge for environmental engineering and planning, which can only be achieved through a multi-objective, multipurpose catchment perspective. Integrated Catchment Management (ICM) is an emerging discipline and process within the integrating assessment field, which attempts to address the demands of decision makers for water and natural resource management. However, ICM practice and tool development needs to tackle three main questions in order to get reliable predictions: (1) high complexity level of fluvial systems, (2) lack of biophysical data in most parts of the catchments, and (3) high uncertainty of system responses to environmental changes (human induced or not). Environmental hydraulics, eco-hydrology and environmental assessment are key disciplines, in which the candidate has been working in depth, for the development of methodologies and tools for water and natural resource management. In this regard, the candidate is working nowadays on the construction of a new catchment theoretical framework that could increment the understanding of biophysical relationship complexity, fluvial system processes and responses to environmental factors (human or not human induced). Data modelling with novel techniques that handle variable interaction and non linear relationships could also assist in the lack of data from many water agency catchments, while GIS spatial analysis tools coupled with mathematical models are basic to understand the link between changes on bio-monitoring or hydro-morphological metrics and human impacts. Finally, the development of Spatial Decision Support Systems with user-friendly representation of data is a requirement for effectively communicating and using scientific results in natural resource planning and management.

**Resumen del Curriculum Vitae:**

The applicant's professional career could be divided in two clear-cut stages that follow a logical development. The first stage (1998-2005) covers from the last years of the candidate's graduate to the end of his PhD thesis, while the second period (2005-2011) covers the post-doctoral and Juan de la Cierva position. During the first stage, the research developed by the applicant was directed towards increasing the understanding of the natural functioning of river systems within the freshwater ecology discipline. This work allowed gaining a lot of expertise and knowledge on how macroinvertebrate communities and other river biological communities responded to hydrology, land uses, river morphology and water quality. At the end of this first period the candidate started also to acquire experience on the management, conservation and restoration of fluvial systems. The beginning of the second stage of the applicant's professional career, when he joined an interdisciplinary group of researchers in the University of Cantabria, comprised a migration from the freshwater ecology discipline towards natural resource management, water resource planning and environmental engineering disciplines. The work of the applicant during this phase was mainly directed to the development of methods and techniques to quantify human impacts on fluvial systems by means of biological and hydro-morphological metrics. During this phase, the candidate was also actively involved on the development of environmental flow methods and on the designing and supervision of river restoration works. During the last part of this second stage, the applicant has been working on improving the ability of different methods and tools to quantify the effect that different human activities have on river systems, so that more effective water management and restoration programs can be established. During these two phases the candidate has published more than 20 scientific contributions in SCI journals and books and has participated in more than 20 contributions to scientific conferences dealing with the main research lines he has pursued. Moreover, the candidate has actively participated and supervised more than 15 scientific and consultancy projects in which the interaction between different disciplines (engineers, chemists, geographers, biologists, etc..) has been quite effective. In addition, the candidate has also acquired wide experience on lecturing since his pre-doctoral stage and is currently lecturing four papers in a post-graduate course titled 'Environmental Management of Water Systems', at the University of Cantabria. The applicant has also developed experience on supervising new scientists on a variety of topics all related to the management of water systems, with 8 doctoral and master theses supervised to date. Finally, the candidate is nowadays part of an interdisciplinary group of researchers within the IH-Cantabria / University of Cantabria that are aiming to open new research lines on Eco-hydraulics and Eco-Hydrology disciplines. In this regard the applicant has actively participated in the design and supervision of the Hydro-biology laboratory in the new building of the IH-Cantabria that should be finished and running by autumn 2011 (<http://www.ihcantabria.unican.es/WebIH/en/>).