ENVIRONMENTAL RISK ASSESSMENT OF PERSISTENT ORGANIC POLLUTANTS IN RIVER-BASINS THROUGH FUZZY LOGIC

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INTRODUCTION

Persistent organic pollutants (POPs) are organic compounds resistant to environmental degradation through chemical, biological, and photolytic processes. Because of this, they have been observed to persist in the environment, to be capable of long-range transport, bioaccumulate in human and animal tissue, biomagnify in food chains, and to have potential significant impacts on human health and the environment due to their potential toxicity. The different industrial and agriculture activities are the responsible of the use and release into the environment of these compounds. The Stockholm Convention (2001) established a set of measures to control a list of well-known POPs [1] and highlighted the need to include new POPs families in this list.

METHODOLOGY

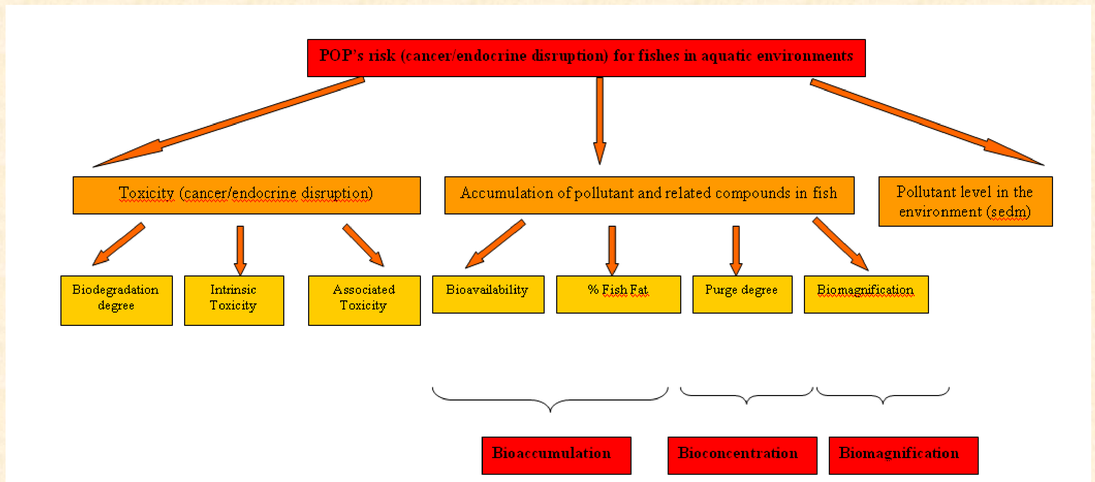
As a result of the increasing interest of these new groups of POPs, their growing industrial production and consume, and the risk that they can pose for the human health and the environment, a new methodology is being developed to assess their environmental risk. Estimating risk involves identifying the events that represent hazards and produce risk, predicting the magnitude of their consequences and estimating their likelihood of occurrence [2]. For a complete environmental risk assessment, a great amount of data is required. Unfortunately, often environmental data tends to be vague and imprecise associating uncertainty to risk assessment. The proper management of this imprecision has become a major concern in environmental risk assessment studies. Fuzzy logic techniques are used to deal with uncertainty and can be very useful when having poorly characterized parameters such as new emerging contaminants. Moreover, the outputs of risk assessment using fuzzy logic are of high relevance in making decision processes due to their easy interpretation.

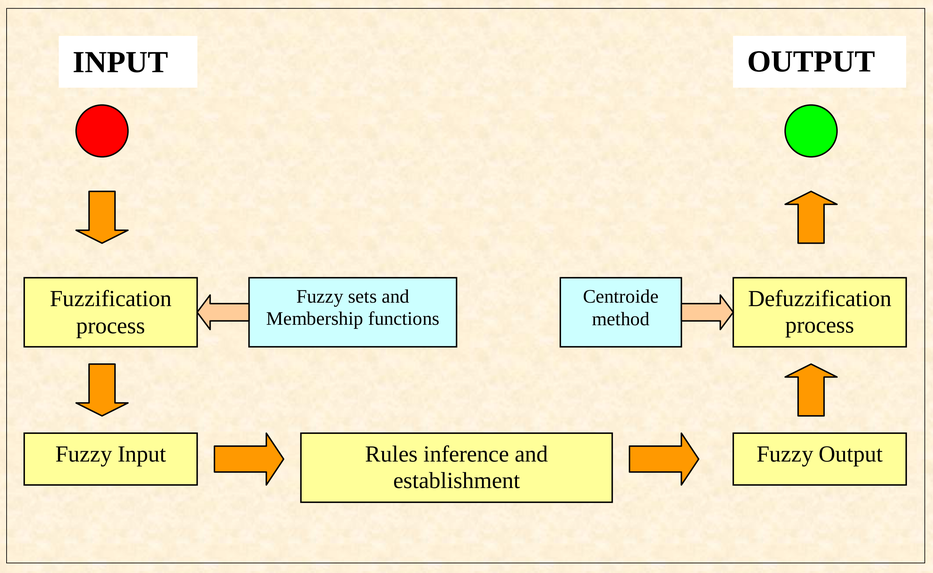
FUZZY LOGIC

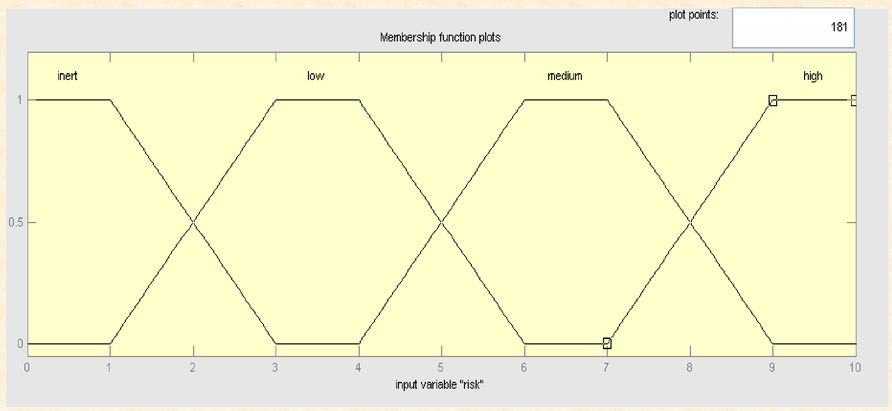
Fuzzy logic uses linguistic variables in place and/or in addition to numerical ones [3]. The values that are used are sentences in a natural or artificial language. Fuzzy logic is a decisional system based on rules such as “if…then…else”. Whereas for the classic logic every proposition must either be “true” or “false”, for the fuzzy logic an affirmation can be simultaneously “true” or “false”, with a certain degree of membership to each class.

This abstract presents an application of the fuzzy logic to develop a preliminary risk assessment tool to support decision making for the management of releases of POPs in river-basins. The first step in the methodology is to study of the fate and behaviour of emerging chlorinated and brominated POPs into the environment (i.e. their distribution into the different environmental compartments). Parameters such as concentration level in the environment, toxicity of the substance, accumulation in the aquatic organisms (e.g. bioavailability, bioaccumulation, metabolic transformations) are being assessed. Once this information is available, the fuzzy model can be built. Each input and output will be treat as fuzzy variables. Finally, the system will be test in a set of case-studies of river-basin areas polluted with POPs and adjusted if necessary.

VARIABLES







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