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Preface

The theory of systems and ecosystems stimulates the scientific knowledge of the essential structure and dynamic of the whole, both in time and space dimensions. For instance, the observation that soil structure governs the dynamics of water movement is a common experience, but it is also true that water action (through erosion, transport, accumulation, removal) has a major role in defining, over long time periods, the shape and structure of the soil itself. There is therefore a mutual interaction, with different time constants.

The ecosystems approach has provided new criteria to analyse these processes: at least theoretically, the problem has been approached in terms of open systems (energy and matter exchange with the outside) to transit towards an upper level of complexity (Prigogine I, Stengers I. *La Nuova Alleanza. Metamorfosi della scienza.* Torino: Piccola Biblioteca Einaudi; 1999).

These aspects are fundamental in the assessment of environmental risks: the ecological culture has demonstrated the weakness of the non ecosystem approach; the natural resources are limited, the inability of nature to sustain endlessly any impact. But there are several environmental factors and antropic pressure that limit the equilibrium of ecosystems. In particular cases, several impacts originally considered of scarce weight could result critical, in particularly when they affect the stability of an ecosystem (or a society). This consideration has been the first step for the development of ecotoxicological tests which include several components of the ecosystem. Nowadays the scientific research as well as trends of several sectorial normatives have privileged the sediment matrix owing to its capability to retain time and space evolving events.

The papers included in this monography of *Annali* are oriented in this direction.

A common feature of all contributions is the priority given to an ecosystems approach, that means to consider the structure of the processes examined and not only their single specific aspects and parameters. In the paper by G. Damiani, a good introduction of this point is provided. J.F. Hatcher underlines the importance of a research based on the systems concept; the synergic role of multiple effects on different species within comprehensive toxicity parameters is stressed by B.R. Taylor and J.J. Wilson, while structural and functional alterations at higher level of integration is discussed by S. Marchini.

R. Miniero *et al*. and L. Viganò examine in detail the interactions, through accumulation and bioaccumulation (including food webs), of particularly critical contaminants in different aquatic substrates. C. Fabiani and G. Casazza present a detailed examination of updated ecotoxicological methods within the framework of the European Union legislation in the field of water policy, based on the principle of a sustainable management of water resources.

The approaches discussed find their basis on well recognised principles, however, they are not so frequently considered in the assessment and management of environmental risks: the reference mainly to single risk parameters, each of them considered by alone, is a common procedure, often related to objective needs. It is worthwhile noticing, however, that exposure to single hazardous factors is an exception, rather than the rule: humans and ecosystems are generally exposed to mixtures of contaminants, whose multilevel interaction patterns have to be taken into account with e.g. the ecosystem approach of complex systems and non-linear dynamic for prevention health.

Aim of this monograph is to offer an approach to the study of soil and water ecosystems with ecotoxicological tests.

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