SYSTEMIC FOCUS IN THE RESEARCH OF HYDROGRAPHIC BASINS

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SUMMARY

The objective of this paper is to determine the most appropriate scientific focus in the research to be carried out with the purpose of proposing a methodology for the formulation and environmental economic evaluation of ordination plans for the hydrographic basins in the Province of Misiones, Argentina.

The term Hydrographic Basin means the portion of land surface whose waters pour to a certain course of water and Hydrographic Basin Ordination, is the realization of planned operations to reach objectives related with the basin management.

The hypothesis outlined presented in this paper, is that the systemic focus is the most appropriate in the research to be developed in hydrographic basins.

The main focuses of the science, the structure and operation of a hydrographic basin, were analyzed determining that the same is the ordination unit, because it naturally constitutes a system where the balance of water, of energy closes, and by being dynamic, the action on its parts generates measurable reaction on other parts of the system.

The result of the present paper, indicates that the systemic focus is the most appropriate, recommending its application in the research to be developed.

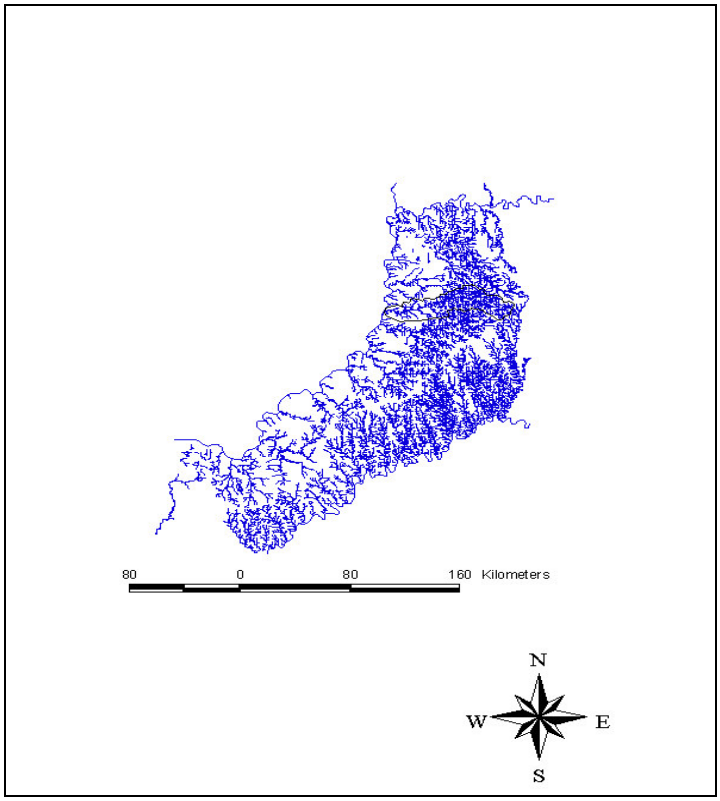
KEY WORDS Hydrographic basins, Systemic focus, Ordination, Research .

INTRODUCTION

To determine the most appropriate scientific focus in the research of hydrographic basins, we consider the hypothesis that the systemic focus is the most appropriate in the research to be developed.

As shown by *Figure 1*, hydrologically the Province of Misiones is very rich, but due to the lack of ordination and rational handling of its hydrographic basins, it frequently lacks the availability of pure and abundant water, manifested in population health, fires, economic damage problems and other negative consequences.

Figure 1: Province of Misiones, Argentina Hydrography



Source: Based on data from Ecology, Renewable Natural Resources and Tourism Ministry.

The term “hydrographic basin” is used in the same sense as that of collector or reception basin and one understands by this, the whole land surface portion whose waters pour into a certain river or water course, big or small, or that will discharge into a river, lake or sea[1].

By ordination of hydrographic basins one understands as the realization of practices and operations planned to reach the desired objectives in connection with the basin operation. The two fundamental words of this definition are planned and objectives[2].

To solve the mentioned hydrological and environmental problems we propose then, to formulate and to implement ordination plans in each one of the hydrographic basins, to achieve as a result of their integration, the Province of Misiones, Argentina, territorial ordination.

Next a brief presentation of the main current focuses of the science will be made in the research, which were analyzed, such as the mechanics and systemic focuses.

MECHANIC FOCUS

The world mechanic focus has its roots in the philosophy of the Greek atomists who saw matter as constituted by several “construction basic elements", that the atoms are purely passive and are intrinsically dead.

Atomism was conceived by the Greek philosophers Leucippus, his disciple Democritus, and Anaxagoras (500-428 B.C.), and continued by Democritus, Greek philosopher that among other topics developed the atomic theory, and Epicurus teacher and prolific author that left 300 manuscripts when he died.

Atomism was prolonged in the Renaissance by thinkers like Nicolas of Cusa and the physicist Giordano Bruno who perished burnt alive by the Inquisition in 1600. According to atomism, the Universe – understood as the group of sensitive phenomena - is the result of the

[1] Lopez, Cadenas de Llano, F. 1976. Forestry Hydrology. Escuela Técnica Superior de Montes. Madrid, 1st Part. 520 pp

[2] FAO. 1992 Manual de Campo, para la ordenación de cuencas hidrográficas. Rome. Vol. 1 185 pp.

accidental composition of the atom properties that matter is formed by. The quality of union, decline or deviation of the atoms would give origin to the explanation of its encounters and combinations, allowing to introduce the contingency notion (and therefore of free will) in a Universe not subjected to a strict determination (Thines G. and Lempereur A.).

It was thought that the atoms were moved by some external force that frequently was attributed to spiritual origin, with which it was supposed to be fundamentally different from matter. This image ended up being an essential part of the western way of thinking, and gave origin to dualism between spirit and matter, between mind and body which is characteristic of western thought.

This dualism was formulated in its more definitive form in Descartes' philosophy who based his vision of nature in a in a fundamental division between two separate and independent environments: That of the mind (res cogitans) and that of matter (res extensa).

The Cartesian division allowed the scientist to treat matter as something dead and completely separated from them and they saw the material world as a multitude of different objects gathered in an enormous mechanism. Such a mechanic vision of the world, was what Newton used as a base for the construction of his mechanics, and from it he made the foundation of classic physics.

Two significant modern atomism representatives have been the logical German Ludwig Wittgenstein and the English mathematician Betrand Russell, who lived, taught and researched at the beginning of the XX century. Russell enunciated the logical atomism theory in his work Principia Mathematica, according to which the world appears to the logical analysis as a multiplicity of separate elements - the logical atoms – not analytically integrables.

Atomism basic thesis is that among the atomic components of a whole - or the linguistic expressions that represent them - there are no interdependence relationships; only of conjunction, addition or disjunction. Any interrelation expression among these parts of the whole, will be of metaphysical character and therefore inadmissible and illogical.

In synthesis, this old method of analysis of the data of the reality consists on breaking into fragments the reality studied in as many parts as be possible, to finally analyze each

element, recomposing them by means of simple conjunction operations, implication, etc., to reach the understanding of the whole. It is not necessary to intend the search for associations or interrelations among the parts because - according to this strategy – this would take us to “metaphysical”, imaginative or imaginary elaborations. One has to limit oneself to find, enumerate, and see how the parts of the studied matter are distributed. This whole procedure is also called “analytical method."

SYSTEMIC FOCUS

The system concept starts off from the problem of the parts and the whole, already discussed in antiquity by Hesiodus (VIII B.C.) and Plato (IV B.C.).

Georg Hegel (1770-1831), said that beings are a “moment of the process that is living the wholeness” and that each “being” is committed within the flow of the whole. He relativises knowledge when thinking on reality like a group of relationships", they are unique which present the character of the absolute. This thought has the force of the systemic. Hegel said that we can only understand the particularities in the whole, and only in connection with the others. His model of being is the “being in relation". As we see his thought about the “I” is also completely different to the one proposed by Descartes and he expresses without leaving a margin for doubts when telling us, “the I is what it is, in relation with what is not", a dialectical expression which is in permanent change which at the same time, assures us the unavoidable condition of social beings.

For Hegel the form of evidencing the behaviour characteristic of reason is when the same becomes dialectical, one sets off from a whole, beginning to structure reality with an affirmative statement, (the thesis) that should be contradicted (antithesis), to later carry out the reconciliation between the opposing ones which he denominates synthesis (syn – from the Greek-composition).

These would be the three fundamental moments, connected among themselves with such a degree of commitment, that the synthesis of a process will be the thesis of the following one, which will impede the dispersion to the infinite to reach the surpassing synthesis. He defines thesis as “any statement” and sustains that all concepts have within themselves a conflict, this is what will give it "movement" which is called antithesis. As negation of the statement it will be the one in charge of energizing reality.

As an end and a beginning, synthesis appears, which is considered as a reconciliation movement whose function will be the overcoming of the conflict that can be seen as the negation of a previous negation, but of which it will conserve the positive of the two previous moments. It is at that point where the germ of perpetual creation resides.

However, the study of the systems as such does not preoccupy, up till the Second World War, when there is interest in the inter-discipline work, and the existence of analogies (isomorphism) in the operation of biological and automatic systems. In the fifties, L. Von Bertalanffy proposes his Systems General Theory.

The appearance of systems focus, has its origin in the apparent inability of science to treat complex problems. Thus, the systems focus appears to approach the complexity problem through a thought form, based on entirety and its properties that supplement scientific reductionism.

Lord Rutherford pronounced the sentence that reflected more clearly the success of reductionism’s scientific method during the first third of the XX century: "There is Physics and there is stamps collection". The ultimate objective was to explain any natural phenomenon in terms of Physics.

It was the biologists who saw themselves in the first place in the necessity of thinking in terms of entireties. The study of live beings demanded considering them as hierarchy organized in levels, each one more complex than the previous one. In each one of these levels emergent properties appeared which cannot be explained starting off from the components of the inferior level; simply because they are derived from interaction, and not from the individual components.

In the forties an active live interest begins with the inter-disciplinary studies, with the purpose of exploring nobody's land, existent among the established sciences. These studies show the existence of analogies (better say isomorphism) in the structure and behaviour of systems of very different nature (biological, mechanical, electric systems etc.).

It is in this way how Wiener and Bigelow discover the ubiquity of the feedback processes, in which information on the operation of a system is transmitted to previous stages, forming a closed curl that allows to evaluate the effect of the possible control actions and to adapt or to correct the system behaviour. These ideas constitute the origin of Cybernetics, whose object is the study of the communication phenomena and control, as much in live beings as in machines.

In this same decade, von Bertalanffy proposed the foundations of a General Systems Theory, and in 1954 the Society for the Research of General Systems, is created. Von Bertalanffy's final objective was, the development and diffusion of an only systems metatheory mathematically formalized, this has not been fulfilled. In its place, what we can speak about is of a systems focus, or a systemic thought, that is based on the use of system concept as an irreducible whole.

THE HYDROGRAPHIC BASIN

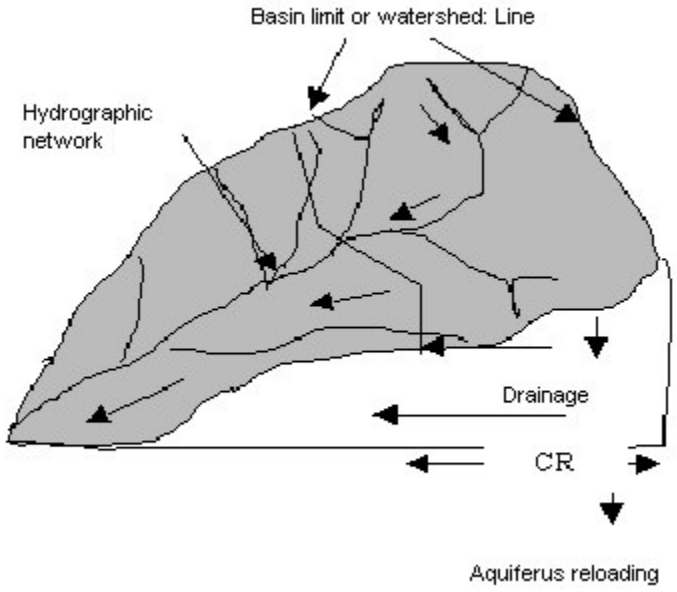
The water that man needs comes from the hydrographic basins or collectors and from it, logically; the concept of ordination of the basins is derived, which is not only just another part of all good planning in taking advantage of the Earth.

When you reach the practical execution of this planning it is important that this be applied to sufficiently homogeneous areas as for their physical, biological, economic and social characteristics, so that they offer an appropriate base for an ordination program. Such a unification is provided by the hydrographic basin, be it big or small.

The basin is a natural systemic unit. Its limits are determined at first sight, because they are conformed by the highest line in the area.

In the outline of figure 2, the grey area represents a hydrographic basin. It is an area of land surface that gathers the rain that falls on it and it takes it, flowing towards the centre and inferior part. The border of the area is the basin limit. (Divortium acuarium).

Figure 2: Outline of hydrographic basin



Source: Own elaboration.

From the point of view of soil and water conservation the quantity and quality of the water provided by the basin, considered as an ordination unit, will be the effectiveness measure of the ordination methods that have been applied to it. Such methods will be partly the sum of the individual technical knowledge applied in the tasks of soil conservation and of water course regularization. It explains why day by day greater importance is granted to the ordination of basins in all the countries of the world.

Every program with a solid base so much as from the technical point of view as economic and social, demand the preparation of basins ordination plans. Subsequently, the

final and more important matter is the one of using the necessary economic means to carry out the precise programs and to fully develop these.

THE RESEARCH PROJECT IN HYDROGRAPHIC BASINS

Up to where we have been able to verify, in the Province of Misiones there is a lack of methodology to make a correct environmental economic valuation of the basin resources and of the alternatives of handling them. This situation causes that up to the present, no hydrographic basin of the Province, has an ordination plan and it is a decisive factor, be it in the devaluation as in the deterioration of the natural resources, that rebound negatively in the environmental quality of stream water and it affects the inhabitants well-being.

The proposed research topic: “Methodology for the formulation and environmental economic evaluation of ordination plans for the hydrographic basins in the Province of Misiones, Argentina,” searches to solve this problem of great environmental economic repercussion applying its results to the Misiones Province hydrographic basins.

This is how the research problem is determined.

How to systematize present existing knowledge in the ordination of hydrographic basins, that keep in mind hydrology, ecology and the economy, to elaborate a methodology that allows to formulate and carry out the environmental economic evaluation action plans in the hydrographic basins tending to their productive and environmental rehabilitation, in the Province of Misiones, as in the region?

The general objective is to propose a methodology for the formulation and realization of the environmental economic evaluation of ordination plans for the Misiones Province hydrographic basins.

CONCLUSION

The basin is a complex natural system, where physical, biological, economic and social aspects interact.

The bibliographical revision registers antecedents of studies that recommend the improvement of the environmental quality and the development of hydrographic basins by means of planning models of and integrated analysis.

This planning is facilitated with a systemic focus and it is difficult to be approached with a mechanics focus, because in a hydrographic basin relationships exist among the environment, development and planning. In the planning objectives of environmental quality should be included and the dynamics and the interactions that affect system should be considered, constituting interdisciplinary teams. The environmental considerations should be taken into account through the integrated planning using methodologies for the planning of hydrographic basins based on the systems analysis.

Once, identified the problem, that the thesis seeks to help to solve, the structure and the operation of a hydrographic basin characterized, enunciated the objectives of the research and analyzed the main focuses of the science in the research, you reach the conclusion that the systemic focus is the most appropriate in the research, to carry out with the objective of proposing a methodology for the formulation and environmental economic evaluation of ordination plans for the Misiones Province hydrographic basins, for the improvement of water quality and the productive development in harmony with environmental quality.

BIBLIOGRAPHY

- Carpio, A. (1992). *Principios de Filisofía. Introducción a su problemática.* Glauco Editions.
- Chalmers, A.F. (2002*). Qué es la cosa llamada ciencia*? Siglo Veintiuno de Argentina editors.
- FAO. (1992). *Manual de campo para la ordenación de cuencas hidrográficas*. Rome. 1 volume.
- López Cadenas de Llano, F. (1976).*Hidrología Forestal.* Escuela Técnica Superior de Montes. Madrid. 1st and 2nd part.
- Marecos, E. A. (2001). *Las Relaciones y la realidad.* Revista de Posgrado de la Cátedra Vl Medicina Nº 105. 1-2 pp.
- OAS. (1978). Calidad ambiental y desarrollo de cuencas hidrográficas: Un modelo para la planificación y análisis integrados. Washington D.C.