Pahicmetria, a Model of Metric in Environmental Hydric Planning

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***Abstract*-This paper considers the abstraction of a parametric model of environmental planning in a watershed (expressed in processes, complex patterns, and UML diagrams), as an element for decision-making using tools ORs, which facilitates the model and implements an environmental planning water. This management strategy set during the planning of water resources, represented in ArchiMate, offers a model of integrated metric parameters and elements for proper planning that make up the actors in a watershed.**

Keywords- Software Engineering; Environmental Planning; Treatment Plants; Municipal Wastewater; Life Cycle Analysis

I. INTRODUCTION

The abstraction environmental system has the capacity to consider parametric development and evaluate environmental intrinsic models, according to the needs of the emergent customer and also a potential user [1, 2, 3, 4]. This means that an IS-based vehicle can migrate the principles of a modular system, especially of the process, complex patterns, and UML (Unified Modeling Language) diagrams UML [5, 6, 7, 8]. These are elements that make the decision of Environmental Hydric Planning (EHP) of a Hydric watershed (HW) via a methodology of analysis of the life cycle (ALC), specifically by the action and pressure of downloads and decontaminated effluents of the Treatment Plants Municipal Wastewater (TPMW) installed in the HW [9]. A considerable topic in the process of research is the measure of using a tool such as ArchiMate, which can observe the total behavior of the estimation of ALC in Treatment Plants Municipal Wastewater (TPMW) applied in EHP and HW. This paper proposes that an essential complement such as *PAHICmetria* can be used as a model to measure the metric and clearly explain the measure on research.

II. METHODOLOGY

Some of the practices used in the integration of models of natural systems with the IS include the design focus on objects and formalized modeling language [10]. The process of RUP (Rational Unified Process) allows for the timely building of a software and this use UML (Unified Modeling Language) to specify, visualize, build, and document a system of software, reducing the complexity, the design of the process, and creating an optimal development. The RUP process presents three essential characteristics; for instance, in the cases of usage, focus in the architecture. The RUP process is also iterative and incremental, with four distinct phases: the initial phase, the development phase, the construction phase, and the transition phase that focuses on the activities in each iteration [11, 12, 13, 14, 15, 16]. In the set of tools of RUP, we can mention the management of the requirements (these change during the life of the project and identify the requirements of the system in technical and economic terms), development of the software iteratively (it helps the implementation requirements and characteristics; it articulates each interaction in a predictable way and repeats all the products), visual modeling of the software (visualize, specify, construct, and document the structure and performance of the system architecture software), continuous testing (evaluates the quality of the system related to the usage functionality, reliability, and performance), architecture based on components (allows the reuse and adaptation of the current components), and controlling any changes (establishes the repeatable processes to manage the changes in the software) [17, 18]. To represent the natural language (LN), we used a surround environment that represents by a set of activities [19] articulated in the flow of ALC in (TPMW). This is done through an objective goal that is based in the process and methodologies [20], building a synergistic concept that analyzes and totalizes the ALC in TPMW [21, 22] in a theoretical conceptual strategy. For that reason, the grammar with structure of phrases to the abstraction of the studied phenomena is this:

- The grammar with structure of phrases G= (V, T, S, P) consists in a vocabulary V; a subset T of V formed by terminal elements and an initial symbol S de V – T; and a sep of productions [23, 24, 25].
- The vocabulary (V) is a finite set and not empty, where elements are named “symbols,” so a word V is a finite chain of elements of V [23, 24, 25].

Based on the above equation, we can define the language generated by G in the abstraction of the environmental system to analyze the micro watershed in this way:

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- For a consistent set of aspects we have
- N = {TPMW, EC, EE, HW}, where EA is the environmental charge and EE is the environmental effect.
- If TPMW E HW considers TPMW is an element of the set of HW, then f, ALC → N, ALC makes a map of the functionality of the set N.
- This means that ALC is considerate as a function of TPMW, EA, EE, HW that can be proved and validated if ∀ (ALC, HW): EHP (ALC, HW).

On the other side, the ALC in TPMW is used to compare alternatives or estimate the potential effect on product changes, and how it can be used to reduce the environmental consequences on a global or regional scale [26]. In general, the strength of the ALC is that it considers global and regional impacts and allows for estimating impacts on health and society. Its weakness is that it is not capable of analyzing the temporary or space character of a specific effect [27]. The ALC offers essentially two types of methodologies; the first is based on the common process of the energetic analysis and the flow of materials according to the process of manufacturing, and the second is based on the input – output [28], linking environmental data during analysis. This last option is the only mainly used [29]. The evolution of ALC has moved beyond products and materials to the analysis of productive systems like the Treatment Plants of Wastewater (TPMW) and their influence in the environment [30, 31].

In this paper, we present a way to represent the natural-language process in a machine language, done by software engineering. This can be represented by the language of programming; that is, a language of modeling of process and methodologies of software (LMMPS).

III. RESULTS

Current management strategies focus on regional planning of hydric resources to optimize the construction of wastewater treatment plants, to promote new alternatives of treatment and for the reuse of watersheds. There is also a focus on reviewing and updating policy development to adjust the instruments of policies. The environmental value of the TPMW in relation with the watersheds has not been studied or mentioned.

More efficient assignment of resources keeps the hydric watershed and also evaluates the final effects of the pollution of the hydric resources, in particular regions and in the general environment [32]. There is no reference, however, to the technically feasible and politically desirable with the explicit environmental value of the TPMW about the hydric watershed. Related to the preliminary, when we take the water available in the studied zone of watershed, it can be used in different anthropic activities (domestic, industrial, institutional, commercial, agricultural, etc.). The water manipulated is discharged or poured (liquid residue) into the same body of water, in many cases without an accurate system of harvest, treatment, and disposal, but in the shape of polluted water or wastewater. This is similar to the disposal of hydric resources. Therefore, we can use the process and operations at the end of the tube, named like treatment plants of municipal wastewater (TPMW) or in a more integral concept, like a system of wastewater treatment (SWT), to decontaminate the waste water used in the anthropic activities (Fig. 1).

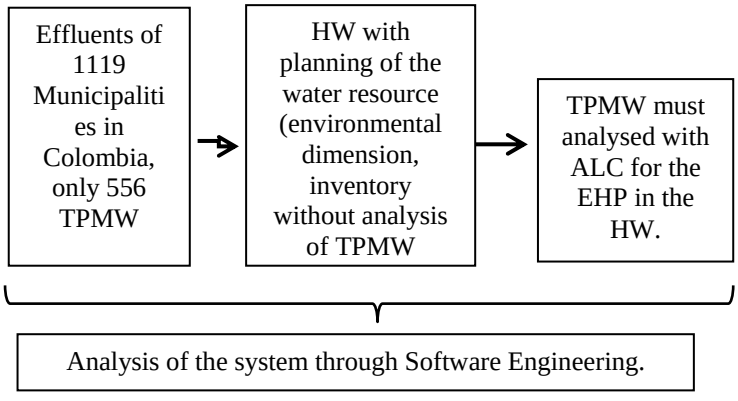

Fig. 1 Cognitive diagram of the system and interaction with Engineering Software

According to the above, it plans an environmental land management with an environmental planning (EP) instrument. This is a type of planning that focuses on the operability of four general objectives of the environmental policy: (1) the protection of vulnerable components considered valuable by the society, (2) the repairing of components of damage aspects, (3) the optimization of resources of the land to minimize environmental charges and, (4) the prevention and discharge related to wellness and human health [33, 34, 35]. This last category is related to aspects such as: the study of environmental impact, protected area planning, environmental contributions to urban planning and land use planning, and sectoral planning to protect or repair several components (decontamination, recovery of rivers and bodies of water, biotopes management, green areas systems, etc.). This conventionally includes the environmental dimension (ED) and the protection, management, and watershed planning (PMWP). This paper analyzes the inventories of the hydric superficial and underground resources (HSUR), the

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influence of the population that put pressure on the HW via socioeconomic activities of the municipalities (M), the zones of protection of forests of water births (ZPFWB), the actions to protect the HW (APHW), and the offer and demand of the hydric resource (ODHR). The following is generated:

a. If environmental land management OAT f (EP) y EP f (PMWP, ED), can consider that a representation of HW = {HSUR, M, ZPFWB, APHW, ODHR}.

b. A plan of a PAH can be realized, considering N = {TPMW, EC, EE, HW},

– Establishing that ALC is considered as a function of TPMW, CA, EA, CH that can be proved and validated if ∀ (ALC, HW): EHP (ALC, HW), it can be used for accurate planning of the HW and a interrelationship of environmental dynamics.

For this reason, the following objectives can be planned:

a. Identifying and analyzing factors included in the performance.

b. Identifying and analyzing factors that influence the performance of the TPMW (EC and EE), as well as their interrelations with the environmental dynamic of the HW.

c. Developing a methodology of ACV in the TPMW, using a model of representation (including the EC and EE) and influencing the components of the environmental dynamic and the analysis of the sensibility of HW.

d. Applying the methodology of regional ALC to TPMW (built and planned) as a factor for the EHP of the HW, allowing to take strategic and operative decisions [36, 37, 38, 39].

To estimate the ALC in TPMW, a PAH in CH is necessary. For this reason, and for the collection of primary information, it is necessary to know the data of the PTARM (already forecast and built) in the CH of the 15 provinces in the department of Cundinamarca. Then the information must be organized, recollected, and analyzed statistically. In the analysis of the information by a model of estimation, it is established that ALC should be reviewed and analyzed by technologies of TPMW (built and projected) based on the factors of emission of regional conditions. Then, the functional unit of analysis in the ALC that will be the mass or the organic charge must be considered, i.e., the environmental changes in the entrance and exit of the TPMW. Finally, in the interpretation of results, we can consider the direct environmental impact in the CH and also the sustainability in the CH (Fig. 2).

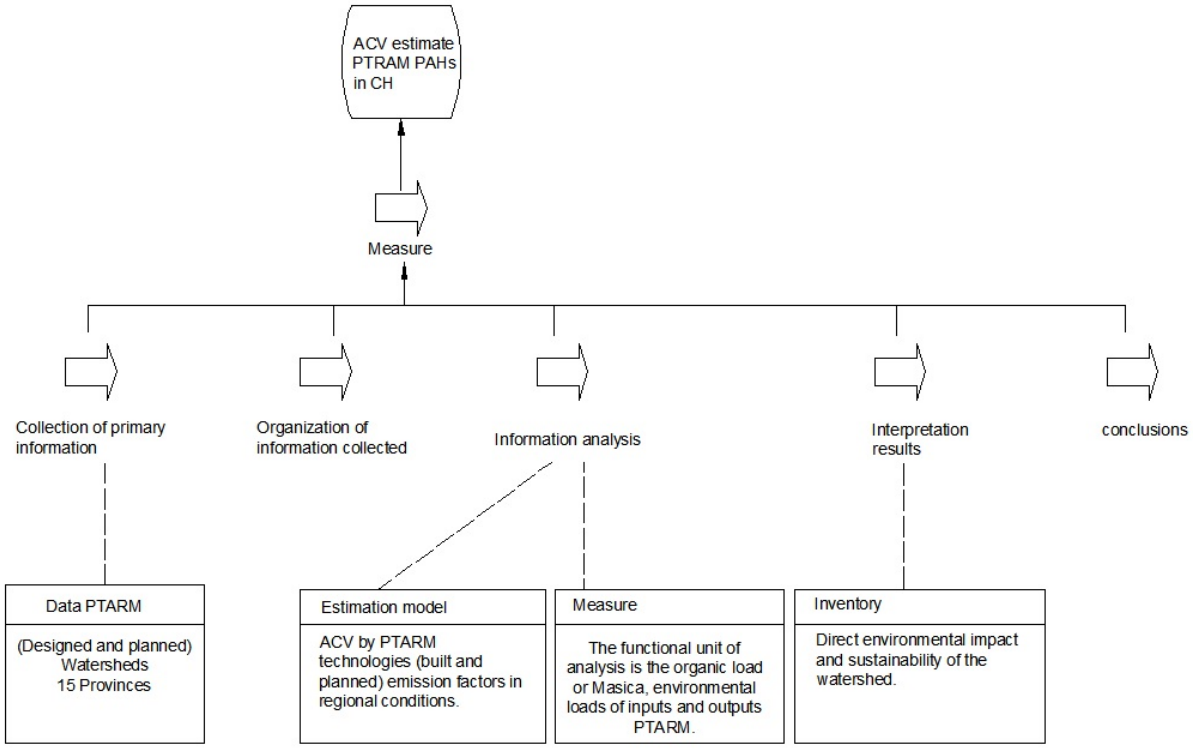

Fig. 2 Process of measure, since a point of view of the process of business archimate

By the other side, ones we got a model of measure named PAHIC metria it considers the PAH, the ACV in TPMW like an effect and environmental charge in the CH, with some restrictions and conditions like the technologies of the TPMW M, the balance Of typical mass, functional unit and the same organic charge.

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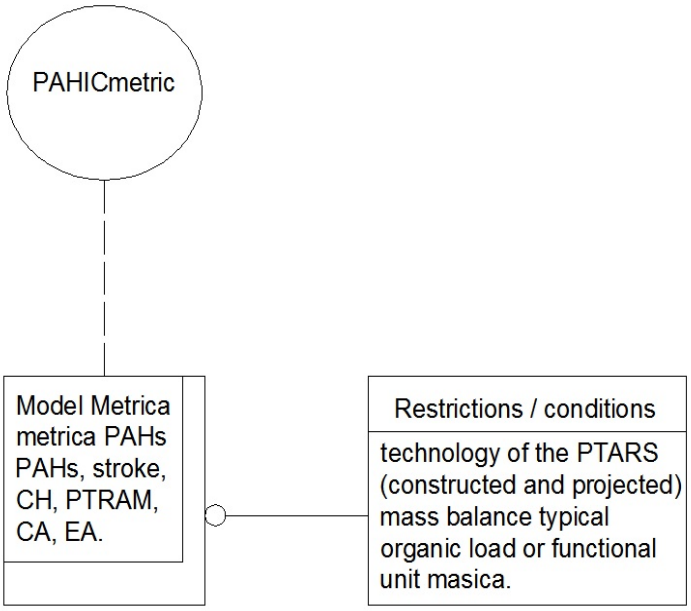

Fig. 3 Product by the point of view in archimate

When we have a product that starts with a problem, and the environmental strategy does not take into account the PAH and that the hypothesis includes PAH in the ACV in TPMW, then the experiment recognizes and builds with the data of the TPMW already built and forecast. The model of measure is based on the PAHICmetria and its validation in the 15 provinces is the expected result (Fig 3 y 4).

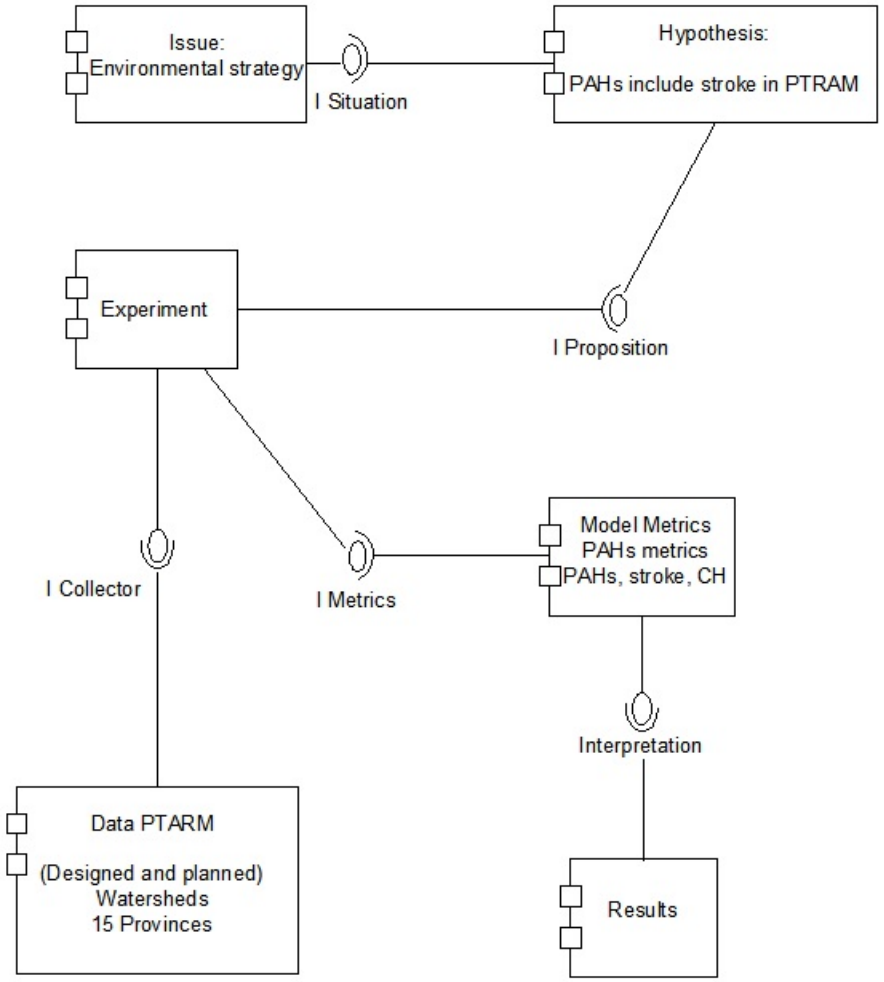

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Fig. 4 Product by the point of view framework in archimate

IV. CONCLUSIONS

This paper emphasizes that it is important to establish a model of measure that integrates the elements and parameters that make up the problem. In this case, the PAHICmetria is an innovative model that can be used to analyze the ACV in TPMW that has a new PAH in CH. This article's main contribution to the field is a methodological plan to interrelate the IS with the PAH, used by a LMPS to take decisions in the investment of TPMW. This means that including the CH and methodologies like the ACV in the configuration and personalization of the IS by the RUP and language UML should be considered in order to improve and innovate the final software product.

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