International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.9, No.12 pp 278-284, 2016

Integration of the Stationality Climate Variability to a Model of Hidric Environmental Planning

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Abstract : The environmental Planning in the watersheds like the knowledge of watersheds hydric and the addition of integration of relevant factors and the integration of the climate order in physical and geographical conditions that represent variation of time and space scales, named season climate variety, with the propose of stablish measures in the intervention in the body of the water, could be simple or complex, of traicing and control, technological to improve the maintenance of the hydric resource and build the strategic planning represented in the answers in the medium and long term.
Key words : Planning, Climatology and hydric resource.

Introduction

The planning of the Integrated Water Resources Management (IWRM) has being realized strategically taking care of the conflict of the use of the resource, stablishing a balance between the ecological capacity of the offer of goods and environmental services of the ecosystems and the demand of them, so the compatibility of the activities realized around the bodies of the water to prevent the effects in the long term[1]. Therefore, all this mentioned shows that is required a deep comprehension of special value of the water to the human life, and the interaction of the human being with the nature and the social importance of the hydric resources to the regional economic development[2,3,4]. In the (IWRM) the special unity of hydrological planning is the watershed[18] , which exposes the homogeneous feature in the physical way and environmental as a hydric resource, looking for the guaranty of the sustenance of the hydric resource to the use, control and protection of them[5] by the knowledge of the interactions between the ecosystems and hydrological process which depend by the hydric offer to count the quantity of water available to different uses, including the water required to the maintenance of the ecosystems.

In general, the planning of (IWRM), is an interactive dynamic process and complex, to prevent the conflicts between users and jurisdictions, between interests of the future generations, the prevention of situations of hydric emergency related to the excess of lack of water, protection of superficial water and subway waters, look for the equilibrium between the environment and the exploitation of the hydric resources needed for the sustainable development and also the prevention of process of contamination and deterioration of the environment which could be irreversible[6,7]. Therefore it´s being fragment and less integrator, what generates in some cases problems of externalities (contamination of the body of the water) causing an environmental disequilibrium in the systemic order of the watershed specially, when these are limited, not articulated with the Environmental dynamic and the stational behavior, which is not enough to prevent the effects of the seasonal climate variability[8] causing with it a weak model of relation between the characters and agents, because satisfy the need of the water of all the users (exist different types of them) is not possible, and increase the conflict for the use and the disturbance of the quality of the water because of the climate variation[9,10].

Because the water is a scarce resource and shared (lots of times of unequal distribution), currently presents environmental unsustainability (Not orientated to preserve the resource and under great pressure) so the planning and order of the watershed is insufficient. So, even the majority of the environmental authorities have information about the physical, environmental, economic and social of the watershed, there is a lack of knowledge about (IWRM) associated to the variation of the climate. At the same time, there is a lack of tracing and accomplishment of the legislation and rules. For that reason, there is inconsistency by the instruments used in the process that changes the management of the water in the watershed unfortunately there are not environmental policies that apply to the context[11].

Metodology

The research applied was exploratory, it was about the seasonal climate variability and the relation with the planning of (IWRM), then precise, identify and limit ate aspects of comprehension, synergy and imitate the aspect analyzed [42]. Related to the time of occurrence of facts and the register of information related to the subject of study, the type of research applied also consider as retrospective.

Because it allows to get fundamental knowledge of the subject[12]. The information collected (Study of special literature) was categorized and classified by the structure and correlation that exists between the seasonal climate variability and the planning of the (IWRM).

Development

The (IWRM) began the Conference of the United Nations (ONU) about the human environment in Stocolmo in 1972; Then in 1992 in the ONU summit in Rio de Janeiro reforce the concept by the Agenda 21[13-17]. At this way, the focus of the (IWRM) (finita) needs to be manage and develop the hydric resources in a sustainable and balanced taking care the social interests, economical or environmental and furthermore, recognize the different groups of interests which compete one to each other for the resource, and identify the sectors that use and abuse the water, and the needs of the environment[18]. In this, also have been included some possible future effects and adaptation to climate changes[19], like an important function in the ecological aspect, in the public health, the socio economic impact and the contamination, and the mechanisms of command and control.

Taking into account social, economic and environmental interests and also recognize the different interest groups competing for the resource, and identify sectors that use and abuse water, and the needs of the environment[18] in this, they have also included the possible futures and adaptation to climate change effects[19], as an important role in the ecological environment, public health, socioeconomic impacts, pollution, and the command and control mechanisms.

The essence of (IWRM), is not a product but a process to enhance; social, economic and ecological factors to allow the decision making in all levels in the global planning, nevertheless, in some cases is not included the analysis of endogenous and exogenous factors either an specific model to a problem of management of the water, conversely, the process is useful to evaluate the program itself and is the mixture of principles and rules which could adapt to the context of the region and the watershed to make the intervention[2,6]. Also the (IWRM) with the sectoral focus does not respond to the needs of the society exacerbating the problem of lack of water and increasing the social risk associated to the spatiotemporal distribution of itself, what evidence the construction of a new management multipurpose based on conducive actions to the planning, management integrated watershed management and multiple uses[20]. Is required to take characteristics; Use the water (Plan sub-watershed, local plan of management of aquifers, local plan of water allocation of the users of the water, local government plan), implementing (Management of the provincial scale or of watershed) and politics (National e international process to develop actions, treatments and laws of the water.

For the other side, the environmental planning of the hydric resources, consider the group fluctuating of the conditions of the climate, this integrate the main factors and integrates the climate order in physical and geographical conditions which present a variation in the scales of time and space, also modifications in the interaction between the components (Atmosphere, land surface, oceans, land areas cover by the ice, biosphere and human activity) The climate system depend on the temporary variations on the climate in short terms (Years or months) around the medium state (high dependence of quantity and distribution of the precipitations), known as a climate variability[21,22].

[23,20]Even in this case, does not apply the scales of climate variability associated to the planning has[22,23,8] Intraseasonal scale (Hydric planning in the short term): This type of variability is less known and have been less studied in our media. There are evidences that, in the stations presents oscillations which determine the conditions of time during tenths of days or one or two months. The majority of the times these oscillations are not seen because the width is small, in comparison to the annual cycle. In the intraseasonal oscillations remarking a sign undulatory, between 30-60 days named Waves of Madden Julian. seasonal scale or seasonal (Hydric planning in the medium term):

- Represents the fluctuation of the weather monthly. The determination of the annual cycle of the climate elements it is a fundamental phase in the climate variability at this level[22]. The migration of the Intertropical Confluence Zone (ZCIT), is consider the dominant seasonal pattern of itself. For example, the variations are important to know the spatiotemporal variability of the fluctuations in a hydrographic waterched[24].
- **Interannual** scale (Hydric planning in the long term): To this scale correspond variations present in the climatological variables year by year. The climate variability, in the scale could be related to changes in the global balance of radiation, where the events of the boy and the girl manage the periodicity in these fluctuations.
- **Interdecadal** scale (Hydric planning in the long term): In this scale manifests fluctuations in the weather every decade. In comparison with the interannual variability, the amplitude of these oscillations is less. Even though, these oscillations in the long term are influencing strongly in the activities of the society in the inter-decadal cycles and became very important identifying possible trends in the climatic variables. The variations in this scale, its domain is represented by the Decadal Pacific Oscillation (DPO by its initials in English) and the North Atlantic Oscillation (NAO by its initials in English)

Is important to stablish, that currently in Colombia the planning of the hydric resource, people think that the weather does not change, in some stadiums of analysis, it is done in isolation with climatological information (seasonal climate variability), hydrological and the quality of the water, not detailed not integrated in the context of the perspective of analysis in the watershed hydrographic.

For that reason, include the climate variability is important, because the variation (dimension) in the space and temporary in the hydric watershed will be a key and it will represent the weather behavior of the area of study during the period of study. At this way, taking care of the temporary records of the variables analyzed could take decisions to organized and make the environmental plan (In the short term, medium term and long term with future scenarios of the weather) The watershed by a planning water environmental planning model, applicable to watershed instrumented (Environmental information available) instrumented just a little (little environmental information).

According to this, the non-accurate decisions in the (IWRM), with the information and knowledge on the watershed, not taking apart, less articulation in the instruments of command and control, normativity and regulations, does not include aspects of randomness of the weather at the time of taking decisions and the distortion applying the instruments of planning, making even more difficult manage the water in a territory. At this way the problems stablish national environmental system in Colombia, are related to dislocation and low capacity implementing environmental policies in all levels; there is a lack of mechanisms and instruments for the institutional manage and control; functional, jurisdictional, sectoral and environmental disarticulation, synchrony in the formulation and execution of ordering and environmental plans, there are several actors, who present different strategic solutions and operational incoherent losing the institutional memory, and others[25]. Also, exist the environmental planning of the hydric resource an environmental disequilibrium on the systemic order on the hydric watershed, not articulated with the environmental dynamic and the seasonal behavior, causing a model of relations between actors and weak agents, increasing the conflict by the use and affecting the quality of the water, causing environmental unsustainability and an insufficient planning and ordering hydric watershed.

In general, in the climate effects (more space variability and temporary in the precipitation) about the hydric resources can mentioned: the changes in the quantity (availability, stability and access) distribution (risk of floods)the quality of the hydric resources, this last cause significant externality (a mayor flow of pollutants and sediments by heavy rainfall, and with big volumes of water cause dissolution), increasing the illness of hydric character, affecting the quality of life and impacts of the life and significant impacts in the population behind the watershed[26-29]. So, the application of the sustainable development of the environmental structures in the territories, there is a disequilibrium emphasized in a social, economic and environmental issues, because of the lack of articulation between institutions of the State with the environmental competence, which leads to little organization and planning of the territory and also the environmental assets, entails, to little enforcement of legislation and environmental rules, I mean, is needed to redefine the model of relations, which leads to a representation and transformation of the initial state, based on the knowledge and domain of attributes and dimensions of the territory.

Now, the patterns of climate variability have more relevance and intensity over the hydric resources in the nation, getting more complexity in the holistic analysis, to keep and maintain the management of the watershed, for example, the regimes of precipitation in the country consider bimodal in the Andin region, Unimodal in the Caribbean region, influenced by the Zone of Confluence Intertropical ZCTI, and by the dynamics of the watershed of the Amazonas, Orinoco rivers and the Oceans Pacific and Atlantic. At this way, the construction of the hydric response is complex and specially to take decisions based on the behavior of the hydric resources[30,19].

For that reason, first at all we propose a new Model of Seasonal Water Environmental Planning (MSWEP) [11] for the hydrographic watershed, where is exposed a new paradigm applied to the hierarchical structures in the Ordering Plan and Management of the hydric watershed (POMCA/POMCH) and the Land Management, in terms of areas a zones and levels applied to micro-watershed or macro-watershed; this because the Territorial Environmental Management (TEM) with an instrument of environmental planning (EP), is a type of planning oriented to operability of the four general objectives of the environmental politic; The protection of the components or vulnerable areas or valuable by the society, repairing the components damaged; The optimization of the uses of the land to minimized the environmental burdens and prevent and download with relation to the wellness and human health[44,31-35].

Related to this, is needed aspects like Environment Effect investigation, planning of the Areas reserved, plans of Decontamination, the environmental contributions and Urban planning and the Land Management and the sector planning to protect or repair different components of aspects (decontamination, recovery of rivers and water bodies, management of biotopes, systems of green areas, etc.). That conventionally includes the Environmental Dimension (ED) and the protection, management and organization of the Hydric Watersheds (PMOHW)[36-38]. This at the same time analyze the inventories of the hydric resource Superficial and Underground (IRH), the influence of the population that impact and pushes in the hydric watershed (HW) by the Socioeconomically Activities of the Municipalities (M), the zones of protection of the forests and the bornings of the water (ZPB), the Actions that protect in the hydric watershed (APHW) and the offer and demand of the hydric resource (ODHR), and generates the next[11]:

If $\mathrm{OAT\ f\ (PA)\ y\ PA\ f\ (PMOCH, DA)}$, can consider that the representation of $\mathrm{CH} = \{\mathrm{IRH, M, ZPB, APCH, ODRH}\}$.

Can realized a planning of the MPAHE considering $\mathrm{N} = \{\mathrm{PTRAM, CA, EA, CH}\}$ where CA is the environmental charge and EA is the environmental effect.

Integrating the Seasonal Climate variability (VCE), based on the condition that exist at least less regists of data of precipitation between 6 to 12 months, and during a period of planning in the medium term[39,40,24].

where the resolution montly of precipitation in the model consider an impact on a significant analysis of the phenomena[19].

Also is necessary to consider a variable qualitative named disturbance (Per), which stablishes a control variable and measured, which affects adversely the value of exit in the system. In the quantification, measure consists in well known if the CH has a politic of GIRH, POMCA, control of Emerging contaminants, Municipal Development Plan, control of the factors of health for the Exposition to Hydric Contamination and affects the productive sector.

Stablishing that VCE is a function of the CH, what proves if it is valid $\forall(VCE, CH): PAHE(CVE, CH)$, and can arrive to an accurate planning to the hydric watershed and make an interrelationship of environmental dynamics. For that reason, could plan objectives like:

Identify and analyze factors in the integrated scenario, that influence in the behavior of the plants of treatment of the municipal wastewater (PTARM) in terms of variability like; Caudal (Q), DBO_5, SST, N NO_2, P total, Sludge load (CL), Electric energy consumed (EEC), and emission of CO_2 (ECO).

Analyze the information of the CH of the quality of the water DBO_5, SST, N NO_2, P

Total information of the precipitation (P), and Per

Related to this, integrates in a;

$MPAHEf\{Q, DBO, SST, NNO_2, P_{total}, CL, EEC, ECO, P, Per\}$ establishing the problem as everything not partial only, considering the interrelations with the environmental dynamic of the CH in the scalable and integrated way. Then the MPAHE can be an input that allows orientation to hydric planning by the seasonal patterns, by giving a concurrent evaluation in terms of normalization of variables equivalent to Environmental quality, considering the different intervals of the state or Environmental quality of the hydric resource, in the

collaborative model or of management model[43]:

Of $0,8 < \mathrm{CA_i} \leq 1$, too good
Of $0,6 < \mathrm{CA_i} \leq 0,8$, good
Of $0,4 < \mathrm{CA_i} \leq 0,6$, regular.
Of $0,2 < \mathrm{CA_i} \leq 0,6$,bad
Of $0,0 < \mathrm{CA_i} \leq 0,2$, too bad

Then MPAHE allows to get a map the management of the resource (guaranty the sustainability of the natural resources and keep the hydric resource) with the propose to promote information in the decision making (Considering the data available, possible options and logical process[41], reducing local impacts in the watershed, establishing conditions and critical zones of the waterbody, introducing new technologies to control the contamination, adaptability in the long term (20 to 30 years) in terms of territory, climate contexts and regulatory, to generate impact in the accurate intervention in the watershed, being this last a complex system and empiric (exosystemic service) and adaptability to the climate variability.

Conclusions

In the context of the hydric planning, the effects of the climate variability in the use of the natural resources have not been incorporated. At this way, propose a integral model and generate adjust information to the current situation of the watershed, providing advance of the knowledge of this theme. This, manifests the real need to instrument and map the hydric watershed in Colombia with this avoid the hydric planning realize actions, tactics and emergencies, by the other side, respond to particular strategies of planning of every hydric watershed.

Acknowledgements

The authors wish to thank the Universidad Distrital Francisco José de Caldas and in particular the Engineering PHD Program for their support in the preparation of this document.

Funding: The authors acknowledge the funding of this project to the University Francisco José de Caldas.

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