ENVIRONMENTAL BASIN LIKE PLANNING UNITS FOR SUSTAINABLE LOCAL DEVELOPMENT

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ABSTRACT – This article proposes a critical reflection based on the enviromental basin concept from the perspective of its application in environmental planning, with a view to sustainable local development. Although the territorial unit on the watershed level has a considerable extent, the focus of environmental planning is directly linked to water resource management, limiting the actions of water sustainability, rather than actions directed the social sustainability of populations. Thus, environmental planning in urban watershed management has been ineffective, particularly within the peripheral areas of brazilian cities. Viewing a systemic approach to environmental dynamics of a basin it is possible to use environmental planning in a city with a vision of sustainable development by incorporating the number of connections between social and environmental demands and economic and institutional directives and thus enhance and identify the local potential and vulnerabilities, in order to take corrective and preventive actions for the planning more efficiently. The applied method consists of defining the coverage areas within physical – territorial limits. Then characterize environmental, social and economic well as the public policies involved in cutting territorial chosen. Relate the performance including indicators that involve economic growth, social equity, environmental preservation, and then provide viable targets for environmental planning toachieve new designs with new hydrographic landscape ecosystems.
KEY WORDS: River basin; Enviromental basin; Sustainability.

RESUMO – Este artigo propõe uma reflexão crítica baseada no conceito de bacia ambiental a partir da perspectiva de sua aplicação no planejamento ambiental visando o desenvolvimento sustentável local. Embora a unidade territorial na bacia hidrográfica tenha uma extensão considerável, o foco do planejamento ambiental está diretamente ligado à gestão dos recursos hídricos, limitando as ações de sustentabilidade da água, ao invés de ações direcionadas a sustentabilidade social das populações. Assim, o planejamento ambiental na gestão de bacias urbanas tem sido ineficaz, em particular nas zonas periféricas das cidades brasileiras. Visualizando uma abordagem sistêmica da dinâmica ambiental de uma bacia é possível o planejamento do uso em uma cidade visando o desenvolvimento sustentável, incorporando o número de conexões entre as demandas sociais e ambientais e diretrizes econômicas e institucionais, e assim, melhorar e identificar o potencial e as vulnerabilidades locais e as ações corretivas e preventivas para o planejamento obter uma melhor eficiência. O método consiste na definição das áreas dentro de coberturas físicas - limites territoriais. Em seguida, caracterizar bem ambiental, social e econômica, as políticas públicas envolvidas no corte territorial escolhido. Relacionar os indicadores de desempenho que envolve o crescimento econômico, equidade social, preservação do meio ambiente, e, em seguida, fornecer metas viáveis para o planejamento ambiental e então ter novos projetos com a nova paisagem hidrográfica do ecossistema.
PALAVRAS-CHAVE: Bacia do rio; Bacia ambiental; Sustentabilidade.

RESUMEN – Este artículo propone una reflexión crítica basado en el concepto de cuenca ambiental en la perspectiva de aplicación para la planificación ambiental visando el desarrollo sostenible local. Aunque la unidad territorial en la cuenca hidrográfica tiene una extensión considerable, se hace la planificación ambiental esta siempre vinculada a la gestión de los recursos hídricos, limitando las acciones de sustentabilidad del agua, y no llevando a cabo acciones de sustentabilidad sociale de las poblaciones. De esta manera la planificación ambiental en la gestión de las cuencas urbanas no es eficaz, en particular en las zonas periféricas de las ciudades brasileñas. Dando un enfoque sistémico de la dinámica ambiental de una cuenca hace posible la planificación del uso de agua para una ciudad, con visión de desarrollo sostenible, vinculando el número de conexiones entre las demandas sociales y ambientales y directrices económicas e institucionales, y en este sentido, mejorando e identificando el potencial y las vulnerabilidades locales y las acciones correctivas y preventivas para planificación con mejor eficiencia. El método aplicado consiste en la definición de las áreas dentro de las coberturas físicas – límites territoriales. Después se hace una caracterización ambiental, social y económica, las políticas públicas adjuntas en la parte del territorio elegido. La elucidación de los indicadores de rendimiento que implica el crecimiento económico, la equidad social, preservación del medio ambiente y luego proporcionamiento de objetivos viables para la planificación ambiental apoya a proponer nuevos proyectos con la nueva paisaje hidrográfico del ecosistema.
PALABRAS CLAVE: Cuenca del rio; Cuenca ambiental; Sustentabilidad.

INTRODUCTION

Conduct environmental planning, restricting the overall evaluation of the landscape by physical limits of a watershed is a task unproductive by urban activities modify the conformations of the environment exceeding the territory delimited by the basin. This paper presents the enviromental basin like a proposal for dynamic territorial unit for environmental management of urban waters from the perspective of sustainable development, where the area of application, about the concept of environmental basin, was the city of João Pessoa in specific the Cuiá watersheed. Thus, it was possible to analyze the behavior of an integrated energy of the water ecosystem, limited by barriers topographically defined and characterized by a territorial space of dynamics conformation, whose limits are set by

the environmental relations of dimensions ecologically, economically and socially.

The basin like a spatial unit of environmental work is based on the concept that the physical limits of a watershed are inserted in a context of understanding, which presents in a unified and dynamic interactions and pressures of human occupation on natural systems or created by man. However, defining the limits of a dynamic terrestrial ecosystem was considered difficult, Bormann & Likens propose the watershed as the basic unit of work (Golley, 1993).

However, to Odum (1988), an ecological system is only considered when it constitutes a functional unit that *"covers all the agencies that work together in a given area, interacting with the physical environment such that a flow of energy to produce clearly defined biotic structures and a cycling of materials between parties living and nonliving."*

The use of watersheds as a unit of environmental planning is a widely used criterion for a natural system is well defined in space, comprising a set of geographically land drained by a stream and its tributaries, where interactions are integrated and better interpreted and characterized as described in Figure 1. According to Santos (2004), as already recognized by many authors, the adoption of the watershed as a planning unit is universally accepted.

Thus, it is possible to consider water as a renewable natural asset, circulating cycles through the atmosphere and underground, organized into drainage basins, however, this ecosystem is weakened by the complexity of urban functions.

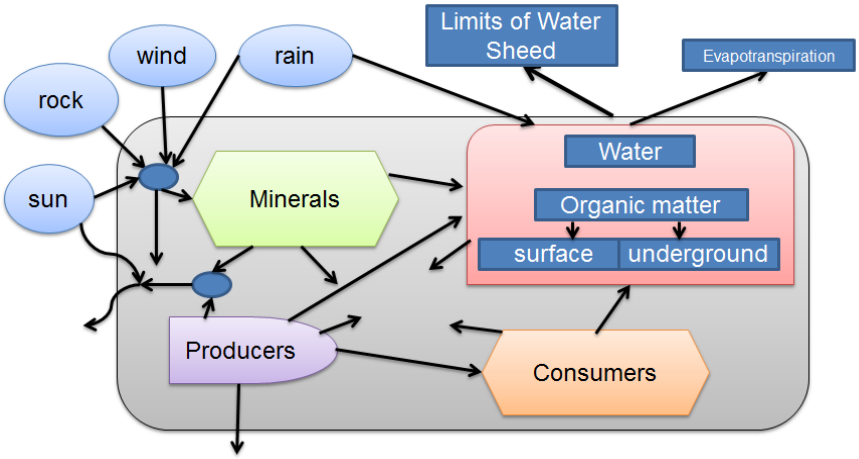

Figure 1. Watershed. Source: Modified from Santos (2004).

By becoming a territory that is inserted into various urban activities, the watershed has its high degree of complexity resulting from the interplay of the users who compose it, so have new hydrographic designs with new landscape ecosystems. If the location of cities on the banks of streams allowed in a first moment, that the natural environment of the basin was adequate (satisfactory) as a planning unit, the diversity of variables that lead to urban sprawl, requires viewing new conformations of the physical environment. (Rutkowski & dos Santos, 1998).

Conceptually, the classical watershed definition only considers the hydrological and hydrographic aspects relevant to the study area and establish a priority that this is his physical limit of analysis. Since the concept of environmental basin is characterized by a territorial space of dynamic properties, which limits are set by the relationship between environmental sustainability dimensions involved (economic, environmental and social) as described in Figure 2.

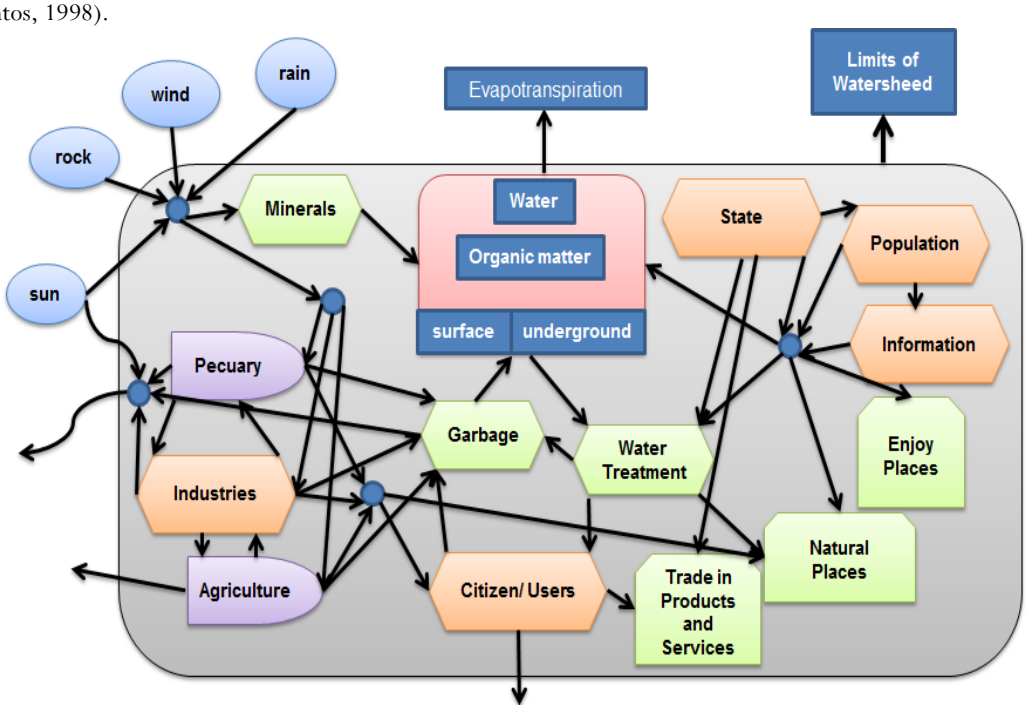

Figure 2. Energetic Dynamic of Water Ecosystem. Source: Modified from Santos (2004).

The concept of hydrographic basin does not consider it within its limits all existing relationships between the needs and desires of social groups that act directly on the urban space and the availability of water resources. In many cases not respect territorial limits defined by political society, caused partial interpretations of the real situation in this area, so this concept presents itself ineffective in identifying the actual area of influence of the proposed objectives of an effective planning. (Rutkowski, 1998 and Santos, 2004). But the concept of environmental basin relative to physical space, minimizes its limits, favors the inter-relationships at various levels and allows a dynamic analysis of the situation of an urban area. Therefore the study proposal for a environmental basin treats all data in a unified manner by all staff, with no focus or prioritization of goals.

MATERIALS AND METHODS

The method of this paper is based on the principle of inseparability of relationships of influence factors that cause changes in natural resources be they human or natural.

According Paranhos Filho et al. (2005) uses and unsustainable rural activities cause changes in the natural environment, with effects on water resources. Deforestation, land movements and pollution resulting from the use of pesticides and fertilizers are examples of environmental changes that may occur in rural areas. However, in urban areas (the case of urban Cuiá watersheed in João Pessoa) on the outskirts of the city, you can find these activities on a small scale.

It is based on this concept that planning toward local sustainability is realized because it follows the same direction in carrying out the dynamic interconnections between the scales of environmental management.

The work was growed Cuiá watersheed on the coast south of Joao Pessoa, Paraiba, Brazil. This area was selected because it contains geographical limits well defined and easily identified and yet to provide strategic importance to various social and economic relations in the city of João Pessoa and relevance in the conservation of coastal ecosystems.

The methodology used in this study which provided data for environmental planning of urban watershed in which the study was conducted was that of the Dashboard Sustainability Indexes since this reduces the distortions between territorial scales, because it uses the prerogative to gather and low aggregate indicators consider the connections with the other scales, making the coverage area in which it was applied.

Dashboard Sustainability is an index that represents the sustainability of a system comprising the average of several indicators with equal weights, categorized into four performance categories: economic, social, environmental and institutional. It is presented through a range of colors ranging from dark red (critical result), through yellow (medium) until you reach the dark green (positive).

The research was conducted following these steps:

- Literature research on the topic proposed.
- Using the schematic diagram (Figure 3) demonstrates that the basic procedure for defining the study area within the concept of environmental watershed, this method represents the sum of the areas that depict human actions present and past, and includes the effects environmental impacts of their activities, thus describing the interests of social groups and environmental interests to be the environmental planning in the basin.

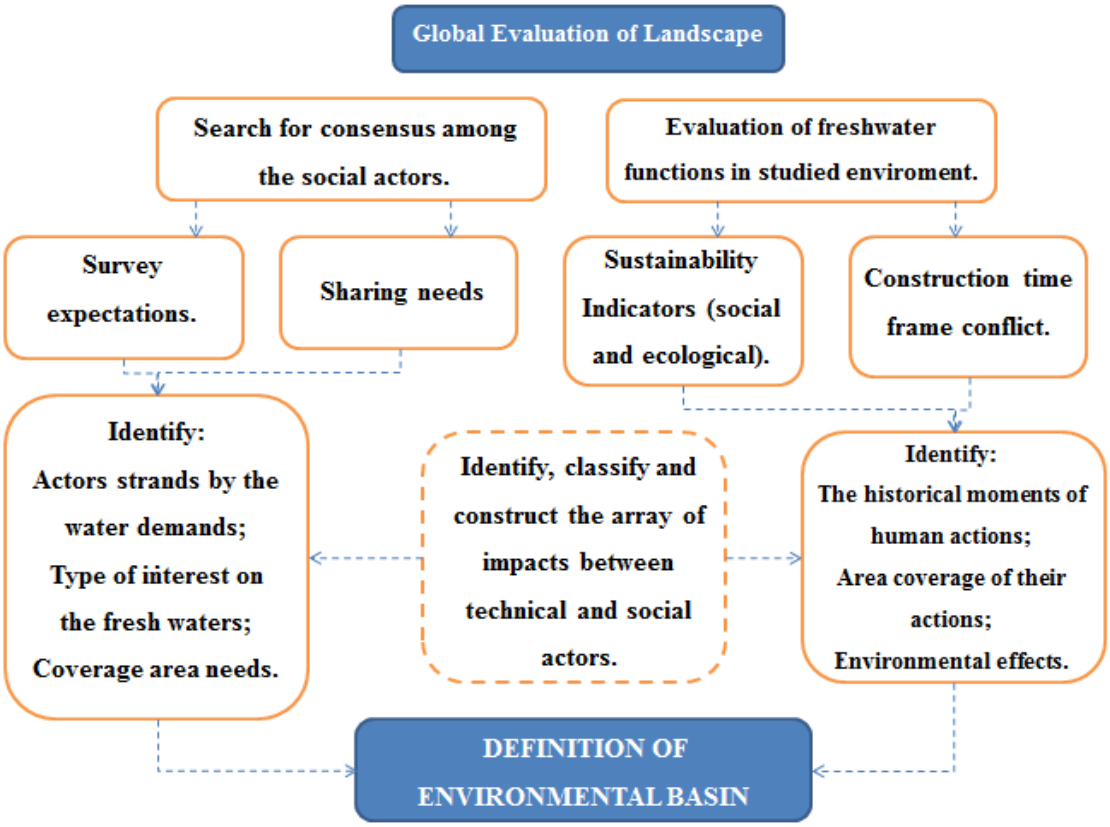

Figure 3. Schematic diagram for Landscape Global Evaluation. Source: Adapted from Santos (2004).

- Choice of Dashboard sustainability because in its scope contain the systemic prerogative to consider the environmental, social, economic and institutional.
- Collection and analysis of primary data.
- Allocation of indicators performing a multicriteria evaluation and multidisciplinary information collected,

considering the performance of each indicator in relation to the requirements previously established by the monitoring agencies and in accordance with the significant feature in relation to local sustainability, reproducibility of measurement focus and measurability integrated.

- The union of the various indicators provided Sustainability Index of the specific study area, though without isolation with the other areas of coverage.

- For each dimension of sustainability was given equal weight, so it was possible to characterize the trend of sustainable site according to the multicriteria scores and their trend is given by the formula 100 * (X-worst) / (best-worst).

Score Range	Collor Gradient	Score Range	Collor Gradient
0 - 10		51 - 60	
11 - 20		61 - 70	
21 - 30		71 - 80	
31 - 40		81 - 90	
41 - 50		91 – 100	

Chart 1. Relationship between scores and color gradient. Source: Adapted from Van Bellen (2006).

- Establishment of the Dashboard Sustainability obeying the criterion score in chart1
- Upon completion of the numerical relationship with the colors that characterize the performance of each indicator on their respective dimensions was made a panel of sustainability dashboard, where the visual presentation of performance indicators is easy to understand and to propose measures for environmental conservation, economic growth and social equity indicators that show performance below 60 points.

RESULTS AND DISCUSSION

After surveying the characteristics of Cuiá Watersheed, can build a dashboard sustainability indicators (see table 1), evaluate their performance and therefore generate Sustainability Index applicable to the study watershed, thereby identifying the Tendency Local Sustainability and propose planning actions.

Table 1. Ranking of indicators applied to Cuiá Watersheed. Source: Reis (2010).

DIMENSIONS	INDICATORS	NOTE	COLLOR
Enviromental	Vegetation Cover	15	
	River Quality	50	
	GROUPING	33	
Institutional	Implementation and Monitoring of Sustainable Development	9	
	Monitoring of Permanent Preservation Areas	20	
	Prepare and response to natural disasters		
	Planning and access to information	45	
	GROUPING	20	
Social	Estimation of Population Density	43	
	Quality of Essential Services	33	
	GROUPING	38	

Economic	Trade Development	43	
	Service Consumption	9	
	Social Classes	15	
	GROUPING	22	
	FINAL GROUPING FOR INDEX	28	

Using the formula described in the methodology, the final score of the group for the Sustainability Index of the studied area contains the value of number 28.

Moreover, to represent the grouping of the indicators used is the Dashboard Sustainability, where you can simultaneously view the performance indicators and trends of sustainability of the site (Figure 4). Figure 4 represents the condition of sustainability of the Cuiá Watersheed.

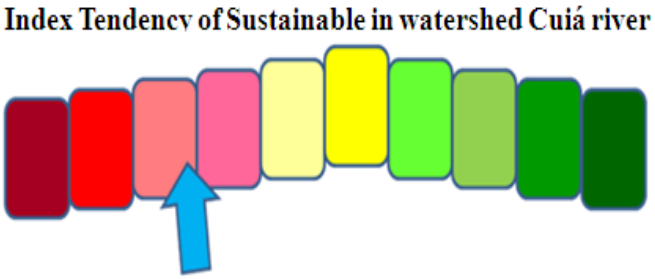

Figure 4. Panel on Sustainable in Cuiá Watersheed. Source: Reis (2010).

The results presented in Table 2 and Figure 4 show which indicators should be improved, since they find - in a critical range of risk and represents the trend of sustainability in the study area. You can also explain the low performance of each indicator pointed and thus the index. This low performance is due to the imbalance of the indicators in each dimension and grouping of indicators tends to lower the performance index.

The situation is more critical due to seasonal climatic factors and water balance in the interfering parameters, can thus reveal the relationship between members of the indicators of the four dimensions of sustainability, improving the reliability index that indicates the trend of sustainability found in the Cuiá Watersheed.

The current approach on sustainable development is characterized by a mission to reveal the factors of unsustainability of the current pattern of consumption and development of society, taking - into account the particularities of the social, economic, environmental and institutional (political) and the space constraints - temporal and cultural needs of a population that has taken root in everyday life the culture of capitalism.

The dashboard sustainability is presented as a tool that can be used in front of a multifaceted scenario, with the interaction of numerous actors and serves as a model for unification of information, assesses the degree of sustainability or unsustainability and indicates the path to be followed sustainable so that the goals are achieved.

The main objective that justifies the use of this system of sustainability indicators is to provide a conceptual transformation of sustainable development in a feasible and operational reality.

For this system promotes and assists in the democratization of knowledge by introducing indicators as management tools for public policies, thus applicability directed to social equity, economic growth and environmental quality, highlighting the vulnerabilities and strengths of the study areas, offering integrated local issues public policies based on a certain reality.

The situation found in the Cuiá watersheed with respect to sustainability is critical and extremely disturbing because none of the indicators reached up to a median score in relation to the scale of the panel of sustainability.

It is noteworthy that the indicator of social class performance is critical because of the huge inequality between social strata.

In general, the Index performance of Cuiá watersheed is very low due to poor performance of its networked indicators, which in turn present performance ranging between the regular and very critical.

This is mainly because there are guidelines or policies directed towards true sustainable development, respect for the laws already established and the lack of monitoring of the relevant guidelines for a urban environmental basin.

CONCLUSIONS

Assuming defined on sustainable development, it was concluded that with present data from the readings that had based its theoretical framework, sustainability is a condition of dynamic equilibrium between the dimensions involved and disregarding any form of breakdown between them.

Also, we can conclude that when it comes to sustainability, its operation is clearly visible when applying as a tool of environmental planning, the methodology of indicators by the dashboard sustainability, and operationally, through it was possible to evaluate the current conditions of sustainability of the Cuiá watersheed.

A technical conclusion highly relevant, is about the concept of hidrographic basin and environmental watershed. After reviewing the literature on the subject of the classic definition of a hydrographic basin and can be applied to the delimitation of the study area, however, the most appropriate setting to evaluate the interactions among the various processes of an urban basin is the environmental basin, even as the study areas, according to this definition, provides a better foundation and application of Dashboard Sustainability.

After evaluation of these two parameters concludes - that the reduction of vegetation preservation in basin area directly influences the quality of river water. This double degradation coming from the housing boom in this area is exacerbated by the lack of action at the institutional level.

The social and economic characteristics found in the Cuiá watersheed below the common trend in the city of Joao Pessoa and Paraiba State. That is, economic growth or development is present and latent in the basin, however that "wealth" is poorly distributed in the neighborhoods that comprise it.

There are neighborhoods where people are concentrated higher monthly incomes and it is precisely those places where the quality of services provided by public or private companies is better supported. Already in the neighborhoods where most residents have a monthly household income or lower middle classes A and B, the quality of services offered by government or by companies not fully meet the expectations of users.

Finally can conclude that the use of the indicators associated with the concept of environmental basin is a viable alternative to measure, evaluate and promote local sustainable development in territorial units as a basin or a municipality.

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