Assessment of the Water Resource Policy of the State of São Paulo for the Piracicaba, Capivari and Jundiaí River Basins

Giuliano Marcon
Núcleo de Informações em Saúde Ambiental – NISAM
Universidade de São Paulo
giulianomarcon@hotmail.com

Arlindo Philippi Jr
Departamento de Saúde Ambiental
Faculdade de Saúde Pública
Universidade de São Paulo
aphij@usp.br

ABSTRACT
The water resource management in the State of São Paulo, Brazil, is shared among the State itself, municipalities, communities and water resource users, supported by a decentralised structure of stakeholders aimed at providing solutions to conflicts and problems regarding the use of water resource. One of the successful examples of the search for understanding and solutions can be found in the Piracicaba, Capivari and Jundiaí River Basins, through its Basin Committee and its related work, in the form of institutional solutions and direct actions for the rehabilitation of the regional water resource. The objective here is to assess the Water Resource Policy in the State of São Paulo, into the PCJ, assuming the synthesised opinion of the staff who were working directly with its water resource management in 2003, and considering for discussion the water resource management documentation, such as conceptual, law and operational texts. The subjects found in the interviews were organised into the following categories: i) integration, participation and decentralisation; ii) implementation of water pricing and a basin agency; iii) the necessity of putting into practice and enhancing the Law of the State of São Paulo 7.663/91; iv) water resource management structure; v) land organisation and planning. Among other conclusions, the need for greater civil society, water resource user and municipality participation in water resource management was identified.
Keywords: policy and management; water resource; river basin; watershed; assessment.

INTRODUCTION

Law 7.663 /91 of the State of São Paulo, from 30 December 1991, establishes the legislative framework for the Water Resource Policy for the State. It also represents the first law that intends to organise the water resource management among the states of the Federative Republic of Brazil based on decentralisation, participation and integration.

In order to start an assessment of the application of this law, the opinions of stakeholders participating in the water resource management for the Piracicaba, Capivari and Jundiaí River Basins – PCJ, denominated Unit of Water Resource Management – UGRHI 5, based on the structure of the Integrated System for Water Resource Management – SIGRH – in the State of São Paulo, were collected at the end of 2003.

The PCJ is significant taking into account its economic dynamism, an inter-basin transfer of up to 31 m3/s of water from its watershed to the Metropolitan Region of São Paulo – RMSP, conflict in water use, threats imposed by pollution and by the significant performance of its basin committee which was the first in the State of São Paulo to be implemented following the orientations of Law 7.633/91. Thus, the PCJ have been considered a 'laboratory of procedures' for the implementation and evolution of the water resource management system in the State of São Paulo and Brazil.

The objective here is to reflect on the application of Law 7.633/91 in the UGHRI 5, supported by opinions of people participating in water resource management of this region and related documentation.

It is expected that this assessment may contribute to activities at deliberative levels, such as the PCJ's Basin Committee and the State of São Paulo's Water Resource Council – CRH, as well as others under the responsibility of governmental boards and agencies.

METHOD

With the purpose of collecting opinions of people involved in water resource management in the PCJ, interviews were based on the following questions:

- Are you familiar with the Water Resource Policy of the State of São Paulo? What do you think about it?
- What do you consider the most important issue in this legislation?
- Do you think this issue (what was considered the most important in the legislation) has been put into practice?
- How could it (what was considered the most important issue in the legislation) be implemented or improved?

A sample of eighteen members of stakeholder organisations involved in the water resource management of the UGRHI 5, representing the State of São Paulo municipalities, communities and water resource users, was taken: i) Board of Médio Tietê Basin, of the State of São Paulo's Water and Electric Power Agency – DAEE; ii) Piracicaba River branch, of the State of São Paulo's Environment Agency - CETESB; iii) Government of the State of São Paulo, participating in the PCJ's Basin Committee; iv) municipalities where there was political support for the Government of the State of São Paulo, participating in the PCJ's Basin Committee; v) municipalities where there was political opposition to the Government of the State of São Paulo, participating in the PCJ's Basin Committee; vi) universities, upper grade level teaching institutes, and research-technological development entities, participating in the PCJ's Basin

Committee; vii) water users, participating in the PCJ's Basin Committee; viii) water resource expert associations, professional associations, and grassroots non governmental organisations, participating in the PCJ's Basin Committee; ix) Sanitation Company of the State of São Paulo - SABESP; x) technical chambers of PCJ's Basin Committee; xi) Government of the State of São Paulo, participating in the Advisory Council for the State of São Paulo's Water Management Fund – COFEHIDRO; xii) Government of the State of São Paulo, participating in the Coordinating Committee for the State of São Paulo's Water Resource Plan – CORHI; e xiii) Government of the State of São Paulo, participating in the CRH.

Approximately two hours of opinions were recorded from interviews between the 5 and 29 November 2003, many of them during the 10th anniversary of the creation of the PCJ's Basin Committee in Piracicaba, in the State of São Paulo. Following transcriptions from speech to written texts, discourses of the collective subject were constructed supported by the software QQSOFT (FSP-SPI 2004).

opinion can be examined in Marcon (2005), shaped in full versions of discourses of the collective subject (Lefèvre F & Lefèvre AMC 2003). Such discourses preserve the whole essence of these people's opinions, along with the arguments which support their beliefs, values and principles.

This figure also shows that the total occurrence of categories amounts to more than eighteen times for any question, as each interviewee was allowed to refer to more than one opinion in their answer.

Reflections, driven by the categories of Figure 1, were developed taking into consideration documented research. This research, in turn, was based on books and papers related to water resource management concepts. Furthermore, documentation in place in 2003 such as Law 7.663/91 and Federal Law 9.433, from 8 January 1997, which establishes the National Water Resource Policy and sets the National System of Water Resource Management, were considered. In addition, other operational texts regarding the application of Law 7.663/91 in the UGRHI 5, between 1994 and 2003 were also considered.

		Categories and occurrence:					
		Integration, participation, decentralisation	Implementation of water pricing and a basin agency	The necessity of putting into practice and enhancing the Law 7.663/91	Water resource management structure	Land organisation and planning	**Total occurrence of categories / question**
Questions:	Are you familiar with the Water Resource Policy of the State of São Paulo? What do you think about it?	10	4	7	5	0	**26**
	What do you consider the most important issue in this legislation?	8	5	0	9	3	**25**
	Do you think this issue (what was considered the most important in the legislation) has been put into practice?	12	9	0	0	1	**22**
	How could it (what was considered the most important issue in the legislation) be implemented or improved?	4	10	1	3	2	**20**

Figure 1 - Categories and occurrence / question

Figure 1 depicts the different categories of opinions produced from the diagnosis of eighteen members, as well as their occurrence per question. The details of each

Some of the most relevant interviewee opinions were transcribed and emphasised along with the development of the reflections. The intention was to

elucidate common themes and enrich this discussion in light of the documented research presented.

DISCUSSION

Reflections on categories gathered through interviews with people participating in the water resource management in the UGRHI 5 in 2003 are presented. This discussion is supported by documented research.

Integration, participation, decentralisation

Not all ideas associated with this category are presented at the same time. These opinions were arranged based on their innovative character regarding not only Law 7.663/91 but also the water resource policies of other states and the Federal Law 9.433/97 itself.

Integration, participation and decentralisation are common themes observed, for example, in the answer of interviewee 14, when referring to Law 7.663/91: "(....) it's a pioneering instrument in the country, mainly because of its innovative concept of management, planning according to river basins, decentralisation of the decision making process, and an attempt at reaching integration of public policies and dealing with water in the whole hydrological cycle (....)".

With regards to integration, the inter-sector characteristic in the application of Law 7.663/91 is particularly noticed when observing that the majority of financial resource tenders from the State of São Paulo's Water Management Fund – FEHIDRO were related to sanitation, especially sewage treatment (Marcon 2005), enabling the use of treated water in this region. However, there was insufficient development of the integration of public policies for the protection of headwaters, regulation of use and occupation of the land, as perceived from the legislation in place from the most populated municipalities of the UGRHI 5.

In the institutional aspect, although the quality-quantity water management is the responsibility of CETESB and DAEE respectively, the discretionary character for granting water entitlements allows the application of the principle of integrated management. By this function the DAEE follows the understanding of the Environment Department of the State of São Paulo - SMA.

The water resource management approach and some aspects of the hydrological cycle are also outlined. Special attention is given to the budget of R$1.91 million, around 6% of the total financial resources tendered until 2003 by FEHIDRO, for the PCJ, within the Programme of Continuing Duration – PDC 9 'prevention and defence against erosion and water bodies silting'. Notwithstanding, it is worth mentioning the absence of investments for the PDC 4 (Marcon 2005), referring to development and protection of groundwater. The major risk of groundwater contamination is located in Campinas, São Pedro and surrounding areas (SRHSO-DAEE 1999).

Participation in the regional water resource management, primarily by the actions of the PCJ's Basin Committee and CRH, collegiate entities composed of the State of São Paulo, municipalities, communities and water resource users, is noted. The trend of non-exclusive governmental action on the regional water resource management could be also noted even before the approval of Law 7.663/91, by the creation of the Intermunicipality Consortium for the Piracicaba, Capivari and Jundiaí River Basins – Consórcio PCJ, in 1989, and the Study and Recuperation Committee for the Jundiaí River - CERJU, in 1982.

Besides the PCJ's Basin Committee and branches of DAEE and CETESB acting on the UGRHI 5, other analyses demonstrate the practice of decentralisation in this region. An example was the decision by the PCJ's Basin Committee, at the end of 2003, not to accept the modification to the Proposal of Legislation 676/00 made by the Government of the State of São Paulo. By this modification, the government proposed that 25% of the income gathered from water pricing would be directed following the CRH's decision. Members of the PCJ's Basin Committee officially decided not to back this modification (Marcon 2005).

The financial resources of FEHIDRO, available for water resource management actions, once such spending is prioritised by the PCJ's Basin Committee, empower the concept of decentralisation of the decision making process. However, it is necessary to remember that these actions have been accomplished, basically, from the perspective of availability of water resource, not followed by initiatives of demand management to address the critical water situation of this region.

On the other hand, the decision-making process of basin committees will be more effective (Pagnoccheschi 2003) only when assisted by their own financial resources, such as those to be acquired through water pricing. Thus, the PCJ would be less reliant on the CRH, which decides guidelines for annual distribution of financial resources from the federal sphere, as a result of the financial compensation due to the use of water resource for power generation.

The perception of the PCJ's Basin Committee as a decentralised entity for participation and integration, can be seen in the report of interviewee 15: "(....) therefore the committee was a very important forum for applying this different legislation, which demands a more integrated approach, participation (....)" and "(....) I think the Committee has to get closer to the public (....)".

A model to be considered for the UGRHI 5 is the Community-Based Watershed Management – GEPAM that was strongly based on the participation of civil society water resource management. In this project the Canadian International Development Agency - CIDA sponsored the services of Canadian experts and the Prefecture of the Municipality of Santo André - PMSA offered its operational structure to promote the re-adequacy of

occupation surrounding the Billings Reservoir, under the responsibility of this municipality between 1998 and 2004 (Gonçalves et al. 2004). The implementation relied on the inhabitants of the local community, through economical, social and environmental activities. Although this project can be seen as a governmental policy, the broad participation of the public in water resource management should be analysed aiming at identifying interface points and possibly adapted by stakeholders participating in the SIGRH in the UGRHI 5.

It is also necessary to promote a stronger involvement of municipalities in water resource management. Another issue which municipalities should consider taking action on is water loss, not only with respect to municipality water supply providers but all who deliver this service in the area of PCJ. With this action, municipalities help reduce wasted water and, in turn, more efficiently utilise this natural resource in their region. To illustrate how important this question is, the estimated water loss in the UGRHI 5 is 36% (CBH-PCJ 2000a). The deliberation of the PCJ's Basin Committee, from 30 March 2001, was a good start with regards to enabling municipalities to tackle water resource management. This deliberation was about the development programme of municipality management of water resource in the UGRHI 5 (Marcon 2005).

Implementation of water pricing and a basin agency

Interviewee 16 highlights the need to implement water pricing in the UGRHI 5: "(....) the perception we have is that it's not possible to have an agency the way we want it, autonomous, independent, able to offer services to the Committee without any bias. This would only happen if I had water pricing in place, and the water being paid for by everyone. The agency would be autonomous (....)". This opinion, as it also refers to aspects of autonomy of the basin agency supported by the implementation of water pricing, is ultimately related to decentralisation, quoted by Pagnoccheschi (2003).

Interviewee 11 illustrates possible benefits of water pricing: "(....) when it becomes institutionalised, water pricing is going to help increase the value of the water resource, because it has been taken for granted, due to its low cost (....)". Therefore it is worth analysing the likely impact of water pricing on valuing, and then rationalising the use of water resource.

A scenario which assumes that water pricing will be operated along with tariffs for water supply and sewerage services was analysed by Marcon (2005), considering non-residential water user groups of the following providers of services in the UGRHI 5: i) SABESP from the State of São Paulo; ii) Company of Water Supply and Sanitation SA - SANASA from the municipality of Campinas; iii) Water of Limeira SA – AdL from the private sector. In this analysis the maximum value per cubic meter of water averaged at around R$0.01; intended for catchment, extraction, derivation or consumption. This limitation was defined by the Proposal of Legislation 676/00, which was afterwards approved as Law 12.183 of the State of São Paulo, from 29 December 2005. When water supply tariffs from these three companies are compared, it is observed that the general value per cubic meter, due to water pricing, is much lower. In addition, it is worrying that when the adoption of water supply contracts occurs water consumption increases while water supply tariffs per cubic meter decrease. It is reasonable, therefore, to infer that contracts promote the consumption of water, rather than the rationalisation of its use.

Therefore, to promote rational water use, water pricing should be implemented along with an adequate structure of water supply tariffs. It is also important to emphasise that the initial value of water pricing, R$0.01/m^3, becomes irrelevant, raising doubts about its impact on lessening water use. There is, in turn, convergence with Ramos (2002 apud Pereira 2002): water pricing on its own is of limited effect in advocating a rational use of water resource, for not encumbering significantly water supply tariffs. Carrera-Fernandez & Garrido (2002) discern that in Italy, rising water tariffs, have been unable to promote rational water use, in view of their low cost.

As a management instrument, water pricing may be implemented not only to gather income and to rationalise water use, but also contribute to short, medium and long term goals for the water resource of the UGRHI 5, such as those described by CBH-PCJ (2000a).

Among the models that can be adopted towards a rational consumption of water and water resource management, Fontes & Souza (2004) describe one based on the capacity of payment of water users.

Another way of promoting the rational consumption of water is embodied in the Brazilian National Water Agency – ANA, in agreement with the State of Ceará (ANA 2002). Through this partnership it was possible to utilise the payment for water pricing to promote perennial cultures of greater aggregate value in the Valley of Jaguaribe River. As a disadvantage, however, this alternative favours only large developments.

During the implementation of water pricing, participation and engagement with potential payers is essential. The technical chambers of water pricing may provide assistance to this end (Conejo 2000). In the UGRHI 5, the Basin Plan's Technical Chamber of the PCJ's Basin Committee is responding to this demand.

For the implementation of water pricing in the State of São Paulo, Conejo (2000) considers cooperation between neighbouring states and the federal sphere fundamental. This is relevant considering that except for the Alto Tietê Basin, the remaining river basins include water bodies of federal domain. In the UGRHI 5, this articulation has been initiated with the establishment of the Federal PCJ's Basin Committee. This need for articulation is also referred to by Kelman (2000) assuring water flow

and minimum water quality for river basins, through water entitlements.

The dismantling of "(....) state entities (....)" at the three levels, as mentioned by interviewee 18, is the result of, among others, the search for financial stability promoted by the reform of the state (Barat 2002). This lack of financial resources further outlines the importance of a proper understanding of the impact of water pricing, in terms of additional income to be invested in water resource management. Thus, it is paramount to clarify the scale of investments sought or feasible, in the context of water pricing.

Among the investments in water resource management, there are the figures from the State of São Paulo's Water Resource Plan 2000/03, not approved as law by the State of São Paulo's representatives though. By this document, the recommended base investment for that period would be R$5.18 billion, whereas additional financial resources, resulting from the Guarapiranga-2 Project, Billings Project, Environmental Programme for Flood Control and loans due to water pricing, are at R$1.84 billion. In total, the planned investment would be R$7.02 billion for 2000/03, from which R$0.74 billion would originate through pleas to international mechanisms in anticipation of part of the income being gathered from water pricing, around 11% of the total (SRHSO-DAEE 2000).

The PCJ's Basin Plan 2000/03, based on targets proposed by SRHSO (1999), informed, as the chosen alternative, to operate priority investments of R$554.79 million to be spent in the Basin Plan's four year term. This figure, however, represented approximately 73% of the total whole alternative, R$760.58 million for the same period. With regards to the regional income source, R$271.79 million would be originated from water pricing, i.e. around 49% of the total chosen alternative, and R$54.00 million from sanitation services. The remaining amount would come from extra-regional sources: R$119.00 million from the public budget, R$60.00 million from national financing and R$50.00 million from international financing.

In conclusion, water pricing would initially be only a billing instrument for incomes to be invested back into the UGRHI 5, following priority investments considered in the PCJ's Basin Plan 2000/03.

The necessity of putting into practice and enhancing Law 7.663/91

The necessity of putting into practice Law 7.663/91 is exemplified by interviewee 14: "(....) after an analysis of the twenty-one basin committees, we know that everything which is in the law hasn't been implemented and executed 100% yet, but its principles, guidelines and the policy structure have been followed fully or mostly, I would say, implemented in the State (....)". Also related to this subject, there is a reference to the need for its evolution by interviewee 1: "(....) are there many things to be changed? Yes, there are (....)".

It must be asserted that at the time of the development of this study, just before the approval of water pricing in the State of São Paulo, one of the most common issues related to the lack of a means for income to be directed back into the river basin in which they were generated, as maintained by the PCJ's Basin Committee. At that stage it was understood that the lack of water pricing would compromise not only the rationalisation of water use but also the implementation of the basin agency in the UGRHI 5, in turn weakening the concept of decentralisation. Nevertheless, Conejo (2000) outlines that the basin agency should have a catalyst and facilitator type character to achieve integrated management that does not substitute managerial entities of water resource.

Furthermore, for effective implementation of this Water Resource Policy to occur, environmental education programs helping to change behaviour, focusing on, for example, demand management rather than only the availability of water resource, are necessary. For this, the PCJ's Basin Committee's Technical Chamber of Environmental Education is welcomed.

The pioneering character of the State of São Paulo in water resource management is highlighted by the implementation of the first state water resource council in 1987 and by the approval of the first legislation for water resource, Law 7.663/91, influencing water resource legislation throughout the Country. Yet, currently, Pagnoccheschi (2003) quotes a new generation of legislation establishing basin agencies and water pricing, as well as the need for incorporating concepts presented by the Federal Proposal of Legislation 1.616/99.

The required evolution of Law 7.663/91 is also supported by some understanding of Federal Law 9.433/97, such as: non-obligation of water entitlements for non significant uses and water pricing reliant on water entitlements, as alternatives for flexibility in the application of the Water Resource Policy of the State of São Paulo.

Water resource management structure

The water resource management issue, among all others, is the broadest, as it does not focus on any particular subject of Law 7.663/91. "(....) it's the policy itself, with all its instruments of implementation (....)", according to interviewee 16, whose comment represents this understanding.

In this item, the responsibilities of entities and those of water resource management instruments, apart from water pricing, which was discussed previously, is reflected upon.

Law 7.663/91 foresees an alignment of the institutional actions of boards and agencies already in place, such as the DAEE, CETESB, and CRH. It has already established responsibilities for the supervision of FEHIDRO, through COFEHIDRO, and for technical assistance to the CRH and to basin committees, by means

of CORHI. It has also established responsibilities for the resolution of regional problems, such as basin committees with a political role and basin agencies with technical functions. With this alignment, there is mutual dependence of one entity on the other, promoting a move in the direction of objectives and guidelines established for the whole structure.

To implement water entitlement, knowledge of water users and required flows is necessary. While the water user wants to use the entitled water, the entity responsible for the water entitlement shall be informed about the water entitlement grant and also about all the administrative situations, including registration and the evolution of the water entitlement process. This type of information is important for the entity responsible for water entitlements so they can gather information on total current demand. Completed by enforcement, with the verification of achievements with regards to obligations defined for the use of the water resource, function command and control is established.

Part of the enforcement performed by DAEE, between January and November 2003, was externally motivated through demands from the Public Prosecution Authority and municipalities. Apart from that, it was not possible to gather information about penalty charging applied by the DAEE due to offences in the use of water resource. As long as enforcement is not properly executed, water entitlement is weakened and less effective, as can be seen by inconsistencies outlined by CBH-PCJ (2000a). This document compares the data of users registered as irrigators, irrigated areas and the use of irrigation equipments. With the development of the irrigator registration project, supported by the financial resources of FEHIDRO, it is hoped that more consistent information can be achieved.

Even considering that the monitoring performed by CETESB, as part of its enforcement, has followed the main water quality parameters, monitoring of non usual water quality parameters, in any period of time, has not been identified (CETESB 2004). On the other hand, CETESB has been prioritising action on polluting companies, reflecting a proactive approach.

It has not been possible to confirm whether the accomplishment of water entitlements or licensing, respectively from the DAEE and CETESB, were liable in the guidelines established in the water resource plan for the State of São Paulo, as defined in Article 30 of Law 7.663/91. Considering the nonexistence of such water resource plans approved as legislation for the period from 1994 to 2003, the guidelines and targets for the PCJ Basin Plan were not defined. In addition, it is not possible to identify integrated actions between these two state agencies with regards to a dilution flow concept and its interrelationship with hydrodynamic conditions.

Although the State of São Paulo's water resource and basin plans are not nominally water resource management instruments as defined by Law 7.663/91, they are discussed here in respect of the considerations of the interviewees.

In the PCJ Basin Plan 2000/03 (CBH-PCJ 2000b), proposals for water quality standards for waterways, targets for water and sewage treatment and flow regularisation are presented.

Between 1994 and 2003, constraints on water resource use for any purpose were not identified. The initiatives observed were basically for the recuperation of water resource and payment for planning and management of the water resource system, as reflected by the investments of this period (CBH-PCJ 2000b). Thus, it is understandable that the planning during this period, through the application of FEHIDRO financial resources, focused primarily on the maintenance of water resource availability, in terms of water quality. Considering the critical situation highlighted by the relationship between demand and availability of water resource, all PCJ's Water Resource Situation Reports developed between 1994 and 2003 show that management focused on demand was lacking (Almeida et al. 1999). For example, this demand management could be executed through water restrictions favouring priority uses, until investments improved the availability of water resource, in quality and quantity. Kelman (2000) offers a method of water pricing following prioritisation of uses, and is therefore related to water entitlements. This author also presents a model for rationing that seeks the recuperation of polluted basins, supported by prioritisation and expected utilisation of water by each user.

The information system http://www.sigrh.sp.gov.br publicises general information on the State of São Paulo water resource management. Other information systems related to water entitlements were identified, i.e. that of the Data Processing Company of the State of São Paulo - PRODESP. Other systems were at a conceptual and developmental stage, such as water entitlements management systems and river basins. However, the management and planning basically referring to water resource availability, not followed by similar initiatives on demand management, do not provide incentive for the dissemination of information on adequacy of current water resource use.

Yet, there are pending issues in relation to the applicability of apportioning of costs, with regards to a lack of corresponding criteria and norms.

Land organisation and planning

The association of land organisation and planning with Law 7.663/91 is typified by interviewee 18: "(....) I think this is the key: the adoption of a watershed as a physical-territorial unit of planning and management (....)"; and interviewee 2: "(....) the legislation on use and occupation of the land is essential, the physical-territorial master plan (....)"

This is the case in terms of land organisation in the surrounding areas of the Jaguari, Cachoeira e Atibainha

Reservoirs, components of the Cantareira System, one of the regions of major relevance for water production in the UGRHI 5 and in the RMSP itself. CETESB (2004 p.91) reports that water quality is compromised in the "(....) spring of Jaguari, Atibainha e Cachoeira Rivers, downstream to SABESP Reservoirs (....)".

Besides non-conformity in total Phosphorus and thermotolerant coliforms in the neighbourhood of the Cantareira System, a compromise is also outlined by high phenol and Aluminium concentrations found in most of the monitoring spots alongside the Capivari and Piracicaba Rivers. Water quality observation results, gathered from the CETESB monitoring, can be an important input to adjust the occupation of these areas.

With constitutional attribution of authority to municipalities to regulate norms of use and occupation of the land, it is paramount that the municipality becomes a *de facto* player in water resource management, in harmony with the guidelines of its river basins. The Federal Constitution/88 defined the establishment of broad local legislation by municipalities. As a result, around 300 municipalities in the State of São Paulo, approximately half of the total, added references to water resource in their local legislation. Amongst the most frequent subjects there are (Barth 1999 p.572): protection and conservation of water resource related to both surface water and groundwater, rationalisation of water use, zoning of flood areas and control of surface water.

However, after an analysis of legislation related to environment and water resource of the six most populated municipalities of the UGRHI 5, being Campinas, Piracicaba, Jundiaí, Limeira, Sumaré and Americana, it is understood that there is still a long way to go in this matter. Improving the adequacy of the master plans themselves could be a start, with the intention of contributing to municipal development. Apart from that, the legislation for use and occupation of land, in light of the master plans, could establish specific guidelines according to areas of internal suitability, including and with regards to the water resource (Marcon 2005).

Such regulation refers to the compatibility of master plans with the legislation of use and occupation of the land, which were frequently defined ahead of these master plans. In this context, the legislation on use and occupation of land does not share a current and integrated approach between the infrastructure sectors of the city, i.e. sanitation, transports, public health, etc. Further, the regulation of some master plans does not address areas of environmental restrictions.

FINAL CONSIDERATIONS

An understanding of interdependency in the integration of water resource management with sanitation, headwaters protection and the use and occupation of the land, among others, is of utmost importance. At the same time, the integration should occur in the quality-quantity water management, shared between CETESB and DAEE, as well as in the consideration of the hydrological cycle, from actions to prevent erosion and silting of water bodies to the development and protection of surface water and groundwater.

The goal of decentralisation, taking into account that water pricing will generate income to be invested back into the PCJ, is highlighted. To some extent this will strengthen the financial autonomy of the River Basin with the implementation of a basin agency, for supporting the PCJ's Basin Committee and will enhance technical independence.

The structure of water resource management, oriented by integration, decentralisation and participation principles, operated by boards and agencies such as CRH, CORHI, COFEHIDRO, CETESB, DAEE and the PCJ's Basin Committee, is already a milestone in Brazilian water resource management.

However, what is expected at present is not only its full operation, but also its continuing evolution. If water pricing was implemented, effective operation of the basin agency would be possible. Considering this context, one should highlight actions focusing on environmental education to enable the management of water resource to be shared by its users and civil society. In this way, greater participation would be achieved not only by enlarging 'votes' from civil society and water users in PCJ's Basin Committee, but also by effectively sharing the management of water resource with local communities. Thus, it would be possible to work to prevent environmental impacts, along with actions taken by the local governments to regulate and ensure local norms to protect the environment, including water resource.

To conclude, it is stressed that the contribution of the National Water Resource Policy and other technical and legal norms should be analysed, so that the application of Law 7.663/91 in the State of São Paulo would move in the same direction as current reflections on the management of water resource in the country as a whole.

ACKNOWLEDGMENTS

Acknowledgments to *Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP* - for its support of the Doctorate of Giuliano Marcon, Thesis *Avaliação da Política Estadual de Recursos Hídricos de São Paulo nas Bacias Hidrográficas dos Rios Piracicaba, Capivari e Jundiaí*, defended in 2005 at *Faculdade de Saúde Pública da Universidade de São Paulo*, Brazil.

REFERENCES

ALMEIDA JR, MORAES FE, SOUZA JM, MALHEIROS TM. *Planejamento ambiental: caminho para participação popular e gestão ambiental para nosso futuro comum: uma necessidade, um desafio*. 2.ed. Rio de Janeiro: Thex/Biblioteca Estácio de Sá; 1999.

[ANA] AGÊNCIA NACIONAL DE ÁGUAS. A *evolução da gestão dos recursos hídricos no Brasil*. Brasília; 2002.

BARAT J. O estado brasileiro como refém das políticas de curto prazo. *Cad FUNDAP* 2002; 22: 62-8. Available on <URL: http://www.fundap.sp.gov.br/publicacoes/cadernos/cad22/dados/Barat.pdf> [2010 May 31].

BARTH FT. Aspectos institucionais do gerenciamento de recursos hídricos. In: Rebouças AC, Braga B, Tundisi JG, organisers. *Águas doces no Brasil: capital ecológico, uso e conservação*. São Paulo: Escrituras; 1999. p.565-99.

CARRERA-FERNANDEZ J, GARRIDO RJ. *Economia dos recursos hídricos*. Salvador: Edufba; 2002.

[CBH-PCJ] COMITÊ DAS BACIAS HIDROGRÁFICAS DOS RIOS PIRACICABA, CAPIVARI E JUNDIAÍ. *Plano de Bacia Hidrográfica 2000-2003: Relatório Final: Fase 3: Plano de Bacia*. S.l.: COPLAENGE Projetos de Engenharia; 2000a.

[CBH-PCJ] *Plano de Bacia Hidrográfica 2000-2003: Síntese do Relatório Final*. S.l.; 2000b.

[CETESB] Companhia de Tecnologia de Saneamento Ambiental. *Relatório de qualidade das águas interiores do Estado de São Paulo 2003 / CETESB* [on line]. 2004. Available on <URL: http://www.cetesb.sp.gov.br/Agua/agua_geral.asp> [2004 May 4].

CONEJO JGL. O sistema paulista de gerenciamento de recursos hídricos e a cobrança pelo uso da água. In: Thame ACM, organiser. *A cobrança pelo uso da água*. São Paulo: Instituto de Qualificação e Editoração; 2000. p.127-34.

FONTES AT, SOUZA MP. Modelo de cobrança para a gestão da escassez de água. *Rev Bras Rec Híd* 2004; 9 (2): 97-114.

[FSP-SPI] Faculdade de Saúde Pública-Sales & Paschoal Informática. *Qualiquantisoft* [software]. São Paulo; 2004.

GONÇALVES AT, ZAINAGHI JÚNIOR G, PORTO IC, PAULO RS. *Estudo das ações do Projeto Gerenciamento Participativo de Mananciais – GEPAM, Parque Andreense, Município de Santo André, 1999 a 2004*. São Paulo; 2004 [Final Year Project – Specialisation in Environmental Management – Faculdade de Saúde Pública / Faculdade de Arquitetura e Urbanismo da USP] [on line]. Available on <URL: http://www.chs.ubc.ca/brazil/Outputs/gepam%20-%20parque%20andreense.pdf> [2004 Aug 12].

KELMAN J. Outorga e cobrança de recursos hídricos. In: Thame ACM, organiser. *A cobrança pelo uso da água*. São Paulo: Instituto de Qualificação e Editoração; 2000. p.93-113.

LEFÈVRE F, LEFÈVRE AMC. *O discurso do sujeito coletivo: um enfoque em pesquisa qualitativa* (Desdobramentos). Caxias do Sul, RS: EDUCS; 2003. (Coleção diálogos).

MARCON G. *Avaliação da Política Estadual de Recursos Hídricos de São Paulo nas Bacias Hidrográficas dos Rios Piracicaba, Capivari e Jundiaí*. São Paulo; 2005. Doctorate Thesis – Faculdade de Saúde Pública, Universidade de São Paulo. São Paulo, 256p. [on line]. Available on <URL: http://www.teses.usp.br/teses/disponiveis/6/6134/tde-21042005-203718/> [2006 Apr 16].

PAGNOCCHESCHI B. Política Nacional de Recursos Hídricos. In: Little PE, organiser. *Políticas ambientais no Brasil: análises, instrumentos e experiências*. São Paulo: Peirópolis/Brasília: Instituto Internacional de Educação do Brasil; 2003. p.239-58.

PEREIRA DSP. A cobrança pelo uso da água e suas repercussões sociais, econômicas e sociais [palestra]. In: *5º Simpósio de Gerenciamento Ambiental na Indústria e NISAM'2002: Ciclo de conferências sobre política e gestão ambiental*; 2002 Sep 2-5. São Paulo. São Paulo: NISAM / Rev San Amb; 2002.

[SRHSO] SECRETARIA DE RECURSOS HÍDRICOS, SANEAMENTO E OBRAS. *Programa de Investimentos para proteção e aproveitamento dos recursos hídricos das bacias dos rios Piracicaba, Capivari e Jundiaí*. São Paulo: Consórcio Figueiredo Ferraz / COPLASA; 1999.

[SRHSO-DAEE] SECRETARIA DE RECURSOS HÍDRICOS, SANEAMENTO e OBRAS. DEPARTAMENTO DE ÁGUAS E ENERGIA ELÉTRICA. *Relatório de Situação dos Recursos Hídricos do Estado de São Paulo*. São Paulo: DAEE; 1999.

[SRHSO-DAEE] *Plano Estadual de Recursos Hídricos: Programa de Investimentos 2000 - 2003*. São Paulo: DAEE; 2000.