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INTEGRATED MANAGEMENT OF WATER RESOURCES AND URBAN LAND USE IN KEY FEDERAL LEGISLATION IN BRAZIL

GESTÃO INTEGRADA DE RECURSOS HÍDRICOS E USO DO SOLO URBANO NAS PRINCIPAIS LEIS FEDERAIS BRASILEIRAS

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Abstract

Described herein is an assessment of the level of integration of water resources and land use management as prescribed in key Brazilian legislation: National Water Resources Policy (NWRP), City Statute (CS) and Statute of the Metropolis (SM). Regulatory strengths and gaps were identified using a diagnostic framework derived from the international literature to reflect the key principles and dimensions of integration of water and land use management. The following eight criteria were applied: 1. Integrated strategic agenda; 2. New institutionalism as systemic planning; 3. Information platform of spatial data; 4. Effectiveness of local participation; 5. Relative importance of interests and aspects; 6. Empowerment of the organisational structure; 7. Multi-scale perspective; and 8. Vertical and horizontal integration. It was found that six of these criteria were at least partially promoted in all three policies, with criteria 4 and 8 being particularly strongly promoted, followed by criteria 2 and 5. Criterion 6 was deemed unaccounted for in all three policies, which was interpreted as a bottleneck of implementation of integrated policy. The NWRP was deemed to strongly favour such articulation, while the SM was considered more integration-ready than the CS. The analysis was extended to identify which policy instruments enforce each criteria and how. The study can provide a basis for future policy improvement and exemplifies the application of an assessment tool developed in resonance with modern urban sustainability principles.

Keywords: Integrated Management. Urban Management. Water Resources. Land Use.

Resumo

Analisa-se o grau de integração entre as gestões de recursos hídricos e de uso e ocupação do solo urbano, conforme prescrito pelas legislações federais: Política Nacional de Recursos Hídricos

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(PNRH), Estatuto da Cidade (EC) e Estatuto da Metrópole (EM). Potencialidades e deficiências desta estrutura regulatória foram identificados utilizando um quadro diagnóstico elaborado com base na literatura internacional, que reflete os princípios e critérios chaves da gestão integrada em questão. Os seguintes oito critérios foram aplicados: 1. Agenda integrada de estratégias; 2. Novo institucionalismo como planejamento sistêmico; 3. Plataforma de informações de dados espaciais; 4. Efetividade da participação social; 5. Importância relativa de interesses; 6. Empoderamento da estrutura organizacional; 7. Visão multi-escala; e 8. Integração vertical e horizontal. Observou-se que seis destes critérios são promovidos nas três políticas em algum grau, sendo os critérios 4 e 8 melhor cobertos, seguidos pelos critérios 2 e 5. Não foi identificada cobertura do critério 6 em tais políticas, o que pode ser a origem de gargalos operacionais de integração. Notou-se que a PNRH favorece mais diretamente a articulação entre as gestões, e que o EM é mais voltado à integração que o EC, possivelmente pela maior amplitude de sua escala. Os resultados podem subsidiar o refinamento de políticas públicas voltadas à gestão integrada de águas e solo urbano, a partir desta aplicação de ferramenta de análise desenvolvida em consonância com preceitos modernos de sustentabilidade urbana.

Palavras-chave: Gestão Integrada. Gestão Urbana. Recursos Hídricos. Uso do Solo.

Introduction

Brazil has had to deal with a very high urbanisation rate in recent times. According to IBGE, almost 85% of the population is now concentrated in urban areas (IBGE, 2015a), whereas only 10% of the population lived in urban areas in the end of the 19th century (MARICATO, 2003). This scenario of enhanced urban density increased the demand for infrastructure in cities, as well as for resources to meet such needs. As a result, Brazilian cities in the end of the 20th century faced problems related to water and air pollution, flooding, chaotic traffic and other deficiencies in the urban space that highlight socio-spatial or environmental segregation (MARICATO, 2003) – gaps that demonstrate a lack of alignment between urban management and current needs. It is necessary to map such urbanisation capacity gaps, which are not in line with the new geographical reality and territorial upgrade trends (IBGE, 2015). Among such gaps are matters associated with insufficient integration of various interdisciplinary aspects encompassing urban management.

In Brazil, water resources and river basin management is regulated by the National Water Resources Policy (NWRP) through Federal Law 9433/1997, which also established the National System for Water Resources Management (BRASIL, 1997). On the other hand, public management of land use and occupation aspects in Brazilian municipalities are regulated, at National level, by a Federal Law – named the City Statute (CS) – which established the foundation for urban policy implementation (BRASIL, 2001). This was followed by the Statute of the Metropolis (SM) in 2015 (BRASIL, 2015), which broadens the scope of the CS for metropolitan regions and urbanised regions set by the State. Due to such high level policies having been developed separately, according to a sectional non-integrated logic common to the Brazilian public management structure, it is hypothesised herein that there are important gaps between them, which impair a much needed articulation of urban land use and occupation management, on the one hand, and water resources management, on the other. For instance, Peres and Silva (2010) found that existing management instruments should be better defined and extended in such a way as to favour the rational and sustainable usage of water resources by municipalities. Similarly, Brazil's National Water Agency (ANA) highlighted the importance of reducing the urban impact on water resources by promoting the integration of related management aspects, owing to the interdependency of their instruments and actions (ANA, 2014). This may require a review of current management structure, and primarily of Federal regulation based upon which local instruments are drawn – such as river basin management plans and urban master plans. Such a review require diagnostic studies to identify qualities and possible gaps and drawbacks in current regulatory structure, in such a way as to guide policy update in the desired manner.

In this context, the aim of this study was to characterise the level of integration between water resources and urban land use management in Brazil, as prescribed by Federal Law: National Water Resources Policy, City Statute and Statute of the Metropolis.

Public policies of land use and water resources management in Brazil

Public policies are necessary for the cities' everyday life, as they modify and maintain institutions and citizens' behaviours to obtain a desirable common result. Moreover, they are suitable for a diversity of issues in an overarching manner involving citizens, companies, communities and institutions. Public policies sustain a vast range of sectoral questions that are often intertwined and overlapped. The comprehension of these intersections of roles suggests that most public policies goals must be from economic or urban nature, capable of generating environmental or political consequences (IPEA, 2015).

The way in which the implementation of public policies occurred in Brazilian cities generated a huge urban social debt, represented by irregular buildings, land invasions and shortage of basic needs regarding urban public equipment which Campos Filho (1999) referred to as curative policies deficit.

Land use policy and management guidelines in Brazilian cities are found in the City Statute (CS) in the federal level (BRASIL, 2001). In line with the Federal Constitution of 1988, it determines that the municipality is responsible for managing urban policy aspects (PERES; SILVA, 2010). The main tool of urban land use management is the master plan. However, uncontrolled urban growth has led to a low level of compliance to master plans due to irregular expansions of the city boundaries, irregular occupations by low-income population, constant population growth in urban areas resulting in e.g. reduced water availability and increased flooding. These impacts are, to a considerable extent, caused by deficiencies in management and particularly lack of integration between water resources and land use management (TUCCI, 2004).

Due to the conurbation, these problems often need resolution jointly between cities by means of actions aimed at improving urban infrastructure, such as transport and water supply (ROMANELLI; ABIKO, 2011). Therefore, the Statute of the Metropolis (SM) (BRASIL, 2015) was established to amplify and articulate CS actions at the scale of metropolitan regions, urban agglomerations and small regions instituted by the states. Among other definitions, it prescribed that municipalities inserted in these areas should make their masterplan compatible with the Integrated Urban Development Plan (IUDP) by 2018 (BRASIL, 2015).

As highlighted by Tucci (2004), the NWRP principles were based on the Dublin principles for integrated river basin management: (a) water is a public domain resource; (b) water is a limited resource with economic value; (c) human consumption should have priority over other uses; (d) multiple uses of water resources should be sought; (e) the river basin is the basic unit for planning; (f) decentralised management. The wide agreement about new paradigms which resulted in the NWRP is based on ecosystemic vision, intersectional and integrated management of water resources which would be the foundations for any changes to be consolidated (PIMMEL, 2013). The application of the NWRP happens through a set of instruments aiming at enabling sustainable water resource management (PORTO, PORTO; 2008). Among these are the overarching National Water Resources Plan, State-level plans and river basin management plans (BRASIL, 1997).

However, in Brazil, it is clear that the relationship of the land use planning is segregated from the necessity to protect natural resources, especially water resources (BOLMANN, 2003). Moreover, Bolmann (2003) highlighted that the relationship among spheres of governmental influences is not satisfactory regarding integration, which tends to generate a lack of environmental responsibilities in the city. Hespanhol (2008) claims that water resources management in urban areas has to cope with a new paradigm, turned on conservation and reuse water because the initiative of importing water from distant watersheds to meet the demand of urban growth is largely inappropriate. The city is one of the most important scenarios with interconnected effects, whereas the urban grid structure involved in urban land use planning encompasses in general infrastructure for water supply, energy, communication, transport socio and environmental management (TUCCI, 2008). At the management level it is of paramount importance to consider the interdependence of such urban landscape elements. The focus must be on water management according to the NWRP and all environmental aspects that interfere with it (PORTO; PORTO, 2008; ANA, 2014).

In practice, this demand is blocked by one of the biggest contemporary challenges, because there is no consensus or outlined limit about necessary dimensions for integration (RAN; BUDIC, 2016). Besides that, there are no concepts, methods and a knowledge base well developed covering integration and adaptation to reduce risks of environmental disasters considering global adaptations (DJALANTE et al., 2013).

According to Peres and Silva (2010), reaching a territorially integrated management approach regarding water and land use is needed for instance: to recognise the watershed as planning unit for municipality management, to improve reference terms which guide the minimum content of river basin management plans, to include instruments and specific actions related to urban management into such plans and to consider environmental variables in the land use guideline parameters. There is insufficient articulation of public administration sectors, regarding the majority of the processes of elaboration and implementation of public policy, what hampers its consolidation (SILVA; PORTO, 2003).

Methods

The philosophical line of this research study was the dialectic one, with a focus on assessing the level of integration between the management of water resources and urban land use and a view to indicate possible improvement opportunities. In terms of being a diagnostic study, it was geared towards identifying features, problems, governing aspects and gaps.

The study is related to the development and implementation of public policies, master plans and river basin management plans, which directly influence the water resources and urban land use management. In this sense, this was an applied research study aimed at supporting decision making regarding integrated urban planning including water resources management.

Bibliographic research and documentary analysis (BARDIN, 2010) were used to identify elements not understood or highlighted in the set of publications covered in the literature review. Such methods were applied from the establishment of integration criteria to the analysis of the policy documents.

The criteria for integration analysis were structured to guide urban policy revision and complement existing guidelines (ONU, 2014; JUSTI, 2016; JUSTI & RAUEN, 2016). Such criteria were used in a critical assessment of the CS (BRASIL, 2001), NWRP (BRASIL, 1997) and SM (BRASIL, 2015) herein.

All information thus compiled was organized in a diagnostic framework to form part of a systematic analysis of policy alignment with the integration assessment criteria. Possible integration gaps were identified based on a qualitative scale of the compliance level for the criteria, namely for total, regular or zero compliance. The strategy of associating principles and criteria to analyse integrated urban plans find correspondence in the literature. For example, Grindlay et al. (2010) used a comparative framework between elements in the regional plans and the water plans in a Spanish River basin. In addition, Fidelis and Roebeling (2014) through a diagnostic framework, verified connections and synergies between the system of land use planning and water resources in a river basin in Portugal.

Integration criteria

Pre-defined integration criteria were used herein due to a necessity to develop a universal structure to be used as a reference to guide urban policies revision and complementing the existing guidelines in order to promote sustainable urban development (ONU, 2014). The criteria used to assess the level of integration between water resources management and urban land use management were those proposed by Justi and Rauen (2016), being: 1. Integrated strategic agenda; 2. New institutionalism as systemic planning; 3. Information platform of spatial data; 4. Effectiveness of local participation; 5. Relative importance of interests and aspects; 6. Empowerment of the organisational structure; 7. Multi-scale perspective; and 8. Vertical and horizontal integration. Criteria 1, 2 and 3 belong to Institutional dimension, criteria 4, 5 and 6 to the Political dimension and criteria 7 and 8 to the Territorial dimension. These dimensions are related to the conceptual structure used by Ran and Budic (2016) to approach a similar problem in a European context.

Results and Discussion

Results of the assessment of national legislation made according to the explanation above are compiled in Table 1. In regard to urban land use, out of 56 articles of the CS, eight articles were found to consider, to some extent, the integration criteria of the diagnostic framework. The majority of such articles are included in the general directives, which deal with the general objective of the

urban policy and what falls under Federal responsibility. Other articles form part of the specification of Master Plan requirements.

In the SM, out of the 25 articles, ten were related to the integration criteria, being the chapters that deal with the instruments of development and inter-federating governance the most frequent. Proportionally, the SM has a wider coverage than the CS as to the necessary characteristics for the integration of urban land use with water resources management. This can reflect the necessity to deal with integration not only restricting to the city limits, but also embracing the surrounding area where the municipality is included.

Assessment of the NWRP in regard to the integration criteria showed that, out of its 57 articles, 14 articles were directly relevant to management integration. Half of these comprised the general guideline articles, which mention e.g. the need to articulate Federal government with the States in water resources management for a common interest (BRASIL, 1997). Eight other articles are associated with the diagnostic framework, as detailed further in the following sections.

Criterion 01: Integrated strategic agenda

Assessing characteristics of an integrated strategic agenda in the legislations involved verifying occurrence of values associated with involving water resources management with different public policy domains (KIDD; SHAW, 2007) and with enough agenda integration to allow for strategy development (DJALANTE et al., 2013). The institutional dimension (RAN; BUDIC, 2016) and organizational dimension (KIDD; SHAW, 2007) were considered.

The legislation articles referred to above reflect the current regulatory situation but no specific instruments were identified that strategically connect agendas of water resources and urban land use management. Similarly, instruments mentioned in the fourth NWRP article have not been detailed in the urban policy legislation for this relation. Nevertheless, considering the interrelation of the plans for cities, states and/or regions with the river basin management plans would be highly significant to the integration discussed herein.

However, this assessment confirmed that the integrated strategic agenda criterion, in the CS, is associated with broad scale initiatives, due the fact that this criterion is related to the general guidelines and the principal instrument for the execution of the urban policy, namely the masterplan. This is in line with Ran and Budic (2016) suggestions for practices and strategies to be wide enough to involve all the key stakeholders.

The SM reflects an important concept for water resources management from a perspective of integration – namely for inter-federation governance, as found in the preliminary provisions of article 02, chapter IV. Inter-federation governance is the capacity to share responsibilities and actions among federated entities aiming to manage public functions of common interest (BRASIL, 2015). Conceptually, it approaches the need to share goals and actions to carry out the integrated strategic agenda, in the integration between urban land use and water resources management.

In its chapter 03, the SM includes article six aimed at reinforcing the inter-federation governance principles, which reads that (BRASIL, 2015, p.03) "(...) sharing of responsibilities for promoting integrated urban development" must be observed. In the article seven, the Law references the specific guidelines for permitting the inter-federation governance, amplifying the CS general guidelines, which determines that implementation must occur as a permanent and shared decision-making process; with shared administrative means; establishing an integrated system regarding resource distribution; and performing shared interest of public and common interest functions (BRASIL, 2015).

It is key to establish the means for achieving the inter-federation governance. Thus, some enabling instruments were identified. Chapter IV in the SM deals with these instruments, with article ten describing that there should be an IUDP approved by state law, possibility in parallel with sectional inter-federation plans. Moreover, the municipality must be responsible for sharing its master plan with the IUDP of the territory in which it is located (BRASIL, 2015).

Regarding NWRP, such strategies can be identified widely in the general guidelines for implementation, described in the third article, in establishing the integration necessity of the water resources and environment management, involving all user sectors at all levels and with land use management (BRASIL, 1997). However, how such integration could be accomplished is not prescribed as it depends on local specificities and future detailing.

According to Ran and Budic (2016), it is necessary to use understandable instruments to enable an integrated strategic agenda. This was the main gap identified through the present

assessment of CS, SM and NWRP from the perspective of this criterion. On the other hand, the scope of water resource management plans at the Federal, regional and state levels allows for further detailing and augmentation aimed at achieving and improving agenda integration.

Criterion 02: New institutionalism as systemic planning

Seeking for indication that a new form of institutionalism is taking shape as systemic planning, the CS, SM and NWRP were searched for characteristics of an adaptive capacity of Brazilian institutions – which could evidence stability by means of attempts, and/or need for change encompassing all institutional pillars (BROWN et al., 2009). Such characteristics are in agreement with the urban resilience concept (SHARIFI; YAMAGATA, 2014).

In this sense, the NWRP prescribes an aspect associated with such adaptive capacity – a guideline that water resources management should be adequate to each local reality. The NWRP does not specify differences regarding regulatory, cognitive and normative aspects of adaptation. However, it evidences the adaptation capacity of at least one of the institutional pillars, through the revision of deadlines of some instruments (BROWN et al., 2009). The water resources plans are long-term plans and should have a planning period compatible with that of related programs and projects. In turn, each water allocation grant cannot exceed a thirty-five year limit but it can be renewed (BRASIL, 1997).

One of the CS guidelines is the capacity to avoid and correct distortions of urban growth and its negative impact on the environment. Regarding specifically the capacity of adaptation, prevention and mitigation of environmental disasters, including to extreme hydrological events, an article was included later into the CS by Law no. 12.608/2012. Article 42 of Law no. 10.257/2001 describes the required content of city master plans in relation to registered municipalities with landslide-susceptible areas, floods and/or related geologic or hydrologic processes. It further prescribes the need for such areas to present: mapping of the susceptible areas, planning for preventative actions, drainage measures for prevention and mitigation, guidelines for green area preservation and occupation and compatibility with the water resource management plans.

As well as in the NWRP, the CS does not specify differences regarding regulatory, cognitive and normative aspects of adaptation (BROWN et al., 2009). Nevertheless, it highlighted that the law which promulgated the master plan must be revised at least once every ten years (BRASIL, 2001).

The SM prescribes deadlines for publication and revision of the IUDP and master plan adaptations, as indicated in article 11 (instruments of integrated urban development) and article 21 (final provisions), without covering other relevant aspects for resilience or adaptation capacity. Article 11 defines that the IUDP should be revised at least once every ten years (BRASIL, 2015), which coincides with the established deadline for revision of the municipal master plans according to the CS. Each new revision provides a chance for updating and adapting the plan itself.

Regarding federal action, article 21 of chapter 01 of the SM classifies as administrative misconduct of the entity responsible for an inter-federation governance structure – be it the Governor or other public agent – if it fails to draw and approve the IUDP within three years of the Law coming into effect. This is similar to the obligation for mayors to act as required to adapt city master plans under the same timescale of three years (BRASIL, 2015).

Criterion 03: Information platform of spatial data

This criterion is characterised by the need of existing viable and accessible manners of communication (RAN; BUDIC, 2016), in a way which allows for adequate data management (DJALANTE et al., 2013) in a standardized format, even though it has some interdisciplinary registers (SUTANTA et al., 2010). Regarding NWRP, the fulfilment of this criterion is clear in Chapter IV, article five, in the description of one policy instrument as being the Water Resources Information System (BRASIL, 1997). The instrument has the potential to encompass necessary characteristics for the establishment of a spatial data information platform. However, it is not possible to verify the integration inclusiveness with the urban land use based on the description of the instruments found in articles 25, 26 and 27.

In the CS, in general, the communication ways of the master plans or its integration with the other plans are described in items of a single article, without indicating how data management should happen.

In the SM, among the needs for applying the described provision in the law is article 20 in its prescription of the National Urban Development System. It is expected that this includes a

planning data sub-system to gather general data (environmental, statistical, cartographic and other relevant information) for management and execution of the public functions of common interest. Moreover, all registered information must be geographically referenced (BRASIL, 2015) to facilitate data sharing data with other management spheres.

The SM also prescribes, in article 12 (regarding development instruments) that the creation and supervision process of the IUDP is followed by publicity of produced data and documents via the media as well as by the Public Ministry (BRASIL, 2015).

Criterion 04: Effectiveness of local participation

To achieve the goal of local participation in an effective way, the legislation requires participation and coordination between all institutions and stakeholders, sharing goals and common principles (RAN; BUDIC, 2016), to mitigate the risk of conflict with the local interests (NEUVEL; KNAAP, 2011).

Such characteristics are found in the NWRP, even though this legislation does not prescribe ways to confirm participation effectiveness. The sixth principle in the first article prescribes that water resources management should be decentralized and involve all stakeholders in participation. The third and fourth articles prescribe regional, state-wide and national articulation of users to promote understanding of local needs, for the sake of the common good. The NWRP also prescribes how decentralization should be pursued, starting from the composition of the National Water Resources Council, which must include from representatives of common users to the highest executive level, as well as of the local river basin committee (BRASIL, 1997).

Concerning the effective participation of society in urban management, the CS mentions in a guideline that the Law must have democratic management with participation of a wide range of social segments, from elaboration to execution of plans and projects. Furthermore, there should be social cooperation in the urbanization process, looking for social interests mainly (BRASIL, 2001).

Besides covering such criterion in its guidelines, the CS also prescribes in the first chapter, article 40, that the main instrument of urban policy elaboration, the master plan, should promote public debate and hearings to guarantee social participation. Besides, it includes in chapter four, articles 43 to 45, further specific instruments that must be used to promote democratic city management in several levels (BRASIL, 2001).

In the SM, social participation appears in article six of the chapter about inter-federation governance. It prescribes that participation should be guided by principles such as prevalence of the common good over local interests and urban democratic management. Moreover, the SM highlights in its specific guidelines, article seven, that there should be representative participation of the civil society in the decision making process, in planning and following-up of services that influence common interest (BRASIL, 2015).

Regarding instruments of integrated urban development, chapter IV describes that the process of elaboration, verification and application of the plan must guarantee the promotion of public debate and audiences involving civil society, population and representatives of municipalities located in the metropolitan area (BRASIL, 2015). In its final dispositions, the SM prescribes that the IUDP must ensure civil society participation coordinated by the federal government together with state governments (BRASIL, 2015).

Criterion 05: Relative importance of interests and aspects

Legislation aspects associated with the criterion of relative importance of interests and aspects should promote the balance of influences affecting local conditions, considering that these are sufficiently articulated (ULTRAMARI; REZENDE, 2008). Thus, every theme associated with urban space management should be adequately weighed in each situation.

In the NWRP this criterion is partly found in article 3, item II, which prescribes that management should be adequate to local specificities. It is implicitly recognised that each aspect will have its relative importance properly represented in each situation. In article 7, item III, it stands out that specifications in water resources management plans should anticipate the possible occurrence of conflict to plan future availability and demand, which requires balanced consideration of the relative importance of interests and aspects (BRASIL, 1997).

In the CS no evidence was found of promotion of this criterion. However, the SM contemplates a certain capacity to take local influences into account. Article 6 highlights that a principle of inter-federation governance is the observation of local aspects, which is reinforced by

the principle associated with seeking sustainable development. Article 7 contains specific guidelines for inter-federation governance and prescribes that attention must be paid to the specificities of: '(...) member municipalities of urban territorial units regarding population, income, territory and environmental characteristics." (BRASIL, 2015, p.04).

Criterion 6: Empowerment of the organisational structure

For ONU (2015), gaps in the urban plans will be mitigated when political leadership works together with suitable partnership. Thus, the NWRP, CS and SM were assessed for matters related to the engagement and political participation in the organizational structure (ASHIQ; RAHMAN, 2015).

It was found that these legislations confer authority to public bodies for their implementation, which does not necessarily mean that associated management is carried out appropriately and/or with sufficient management capacity to guarantee a successful organizational structure.

In the diagnostic framework it can be noted that empowerment of the organisational structure was not identified in the national legislations assessed herein. This conclusion was reached because of a perceived lack of concepts associated with political leadership working together with appropriate involvement and partnerships (ONU, 2015), commitment intention and political desire (ASHIQ; RAHMAN, 2015) and good governance (JONKER, 2007). It follows that there appeared to be a significant gap in such federal legislation regarding this criterion, which may cause an insufficient prescription for river basin management plans and urban master plans.

Criterion 7: Multi-scale perspective

The multi-scale perspective involves the capacity of the expected strategies in the legislation to be accessible in different levels concerning physical limits, from the national level to the local (YU, 2014). It also involves the growth potential of projects, which is related to the application of sustainable integration concepts at several intervention scales of plans, programs and projects (THE WORLD BANK, 2009).

In the NWRP, articles 3 and 4 prescribe connections at different levels, in management and planning in a regional, state and Federal scale (BRASIL, 1997). Other characteristics were not identified regarding a multi-scale perspective for the implementation and application of plans, programs and projects.

The CS foresees the articulation at different levels, in a territorial limit sense, which can be seen in the third article, but without expressing in practice how its application should be done at different scales of urban planning.

In the SM, article seven, one of the specific guidelines for inter-federation governance highlights the necessity of alignment with the federal multi-annual plans (renovated every four years), the budget guideline laws and the annual budget of the involved agents, which confers a certain adaptation capacity to each plan established for a territorial unit. Another article associated with adaptation capacity in different levels prescribes an alignment of urban master plans with the IUDP (BRASIL, 2015).

Criterion 8: Vertical and horizontal integration

In regard to the horizontal integration, items two and three of the third article of the NWRP involve the articulation at each governmental level and an adaptability of the water resources management strategy according to local diversity, as well as integration with environmental management (BRASIL, 1997). In terms of vertical integration, this policy seeks to align plans at different scales, according to the fourth item of the third article. Two other guidelines in the same article deal with these two kinds of integration (vertical and horizontal) concomitantly, as they depend upon different government levels to perform management. Water resources management plans can coincide even though their territorial remits differ, as in the land use case and more precisely in cities, estuarine systems and coastal areas. Similarly, article 31 prescribes integration of water resources policies at the federal, state and local levels.

In the CS, horizontal integration is prescribed in the second article regarding related aspects at the same governmental level, in one of the goals about the social function of a city. It prescribes that land regularization and urbanization must consider legislation applicable to low-income areas and the social, economic and environmental situation. The third article establishes

Federal attribution regarding the urban policy of cities, where vertical integration in different governmental levels is required to search common solutions at each planning scale. It promotes cooperation among federal government, states and municipalities to develop and improve further housing and sanitation conditions through efforts to establish guidelines for urban development and in creating and executing national and regional plans for territorial ordering. The fourth article of the CS is also linked to vertical integration, in regard to instruments that form urban policy demonstrating a concern with aligning projects at each planning scale. Among them are the national, state and regional plans, besides the planning of metropolitan regions, urban conurbation and micro-regions (BRASIL, 2001).

As with the NWRP, article 42 in the CS prescribes that the city master plan should be compatible with water resources management plans, which depends on the effectiveness of both types of integration involved in this criterion.

Favorable characteristics to vertical and horizontal integration were observed in the SM. Regarding inter-federation governance, in article 06, one principle emphasises the importance of responsibility-sharing to promote integrated urban development. In the specific guidelines, article seven prescribes: the implementation of a permanent and shared process among all stakeholders, from planning to decision-making; shared ways of administrative organization for matters relevant to the public interest and with an integrated system of resource allocation; cost sharing according to the inter-federation governance structure, agreed by all parts; and alignment with the federal multi-annual plans, budget guideline laws and annual budgets (BRASIL, 2015). It is understood that the sharing context mentioned in such chapter should occur among several sectors and levels of federated entities.

Regarding instruments for urban development integration, article ten prescribes development of sectional inter-federating plans aimed at each region, complementing the master plans alignment and in agreement with plans for the urban territorial unit (BRASIL, 2015).

The urban territorial unit must consider the set of municipalities encompassing urban and rural areas, meeting: guidelines of public functions of common interest, including strategic projects and/or emergency actions; the established macro areas of urban territorial unit; guidelines for urban land use subdivision, use and occupation and inter-sectoral public policies; and the delimitation of areas with urbanization restriction to promote the conservation of cultural and/or environmental capitals (BRASIL, 2015).

In the National Urban Development Policy, the federal government, as prescribed in articles 12 and 14, should support initiatives by states and municipalities to verify guidelines and goals in the multi-annual plans and budget guideline laws. It further highlights that federal support can only be validated in a fully managed urban territorial unit, which implies that the metropolitan region or urban area is formally established and has its own governance structure and IUDP, all approved by State Law (BRASIL, 2015).

Another indication of vertical and horizontal integration is the application of the National Urban Development System, as prescribed in the final dispositions, which includes a planning subsystem of metropolitan data and management coordinated by federal government with participation of the corresponding states and municipalities (BRASIL, 2015).

Conclusion

By applying a diagnostic framework approach it was found that the NWRP, CS and SM meet most of the integration criteria considered in this study. Some criteria were more evident in such legislation, such as the vertical and horizontal integration and effectiveness of local participation criteria. Others were less evident, such as the new institutionalism as systemic planning and the relative importance of interests and aspects criteria. Direct evidence could not be identified in such legislation of the empowerment of the organisational structure criterion. It is implied that any future revision of such legislation could provide for a stronger coverage of such a criterion.

The diagnostic study conducted herein indicated that more significant integration gaps appear in association with promoting effectiveness and/or meeting prescriptions of existing legislation, despite the legal empowerment of municipalities to conduct their environmental public policies. Therefore, it is expected that the social function of cities can also encompass environmental aspects.

Future studies can involve similar diagnostic approaches being applied at the scale of river basins, cities and metropolitan regions, i.e., comprising river basin management plans, urban master

plans and metropolitan development plans. This may contribute to integration improvement of water resources management with land use management in Brazil, as well as further operationalisation of integrated management in public administration bodies. Moreover, such subsidies can contribute to broaden possibilities for urban sustainable management, with a positive impact on environmental quality of Brazilian cities.

Frame 01: Overview of the integration criteria analysis between water resources management and urban land use in the main federal legislation.

Law/ Aspects / Criterion	Land Use Management in an Urban Area				Water Resources Management	
	City Statute		Statute of the Metropolis		NWRP	
	Article	Section	Article	Section	Article	Section
1. Integrated strategic agenda	Art. 2 (III, X)	General Guidelines	Art. 2 (IV)	Preliminary provisions	Art. 3 (III, IV, V)	Action General Guidelines
	Art. 3(II)	General Guidelines	Arts. 6 (II), 7 (I, II, III, IV)	Inter-federating Governance		
	Art. 4 (I, II, III)	Urban Policy Instruments	Art. 10	Development Instruments	Art. 4	Action General Guidelines
2. New institutionalism as systemic planning	Art. 2 (IV)	General Guidelines	Art. 11	Development Instruments	Art. 2 (III)	Objectives
	Art.42 A (II, III, IV, VI)	Master Plan	Art. 21 (I, II)	Final Provisions	Art. 3 (II)	Action General Guidelines
3. Information platform of spatial data	Art. 40 (I, II, III)	Master Plan	Art. 20 (caput 2; 3)	Final Provisions	Art. 5 (VI)	
			Art. 12 (caput 2, II, III)	Development Instruments	Arts. 25, 26 (I, II, II), 27 (I, II, III)	Water Resource Information Systems
4. Effectiveness of local participation	Art. 2 (II, III)	General Guidelines	Art. 20	Final Provisions	Art. 1 (VI)	Plea
	Art. 40 (I)	Master Plan	Art. 12 (caput 2)	Development Instruments	Arts. 3 (IV), 4	Action General Guidelines
	Arts. 43 (I, II, III, IV), 44, 45.	Democratic management of the City	Arts. 6 (I, V), 7 (V)	Inter-federating Governance	Arts. 34 (I, II, III, IV), 35 (I)	National Water Resources Council
					Art. 39 (I, II, III, IV, V).	Watershed Comittee
5. Relative importance of interests and aspects	-	-	Art. 6 (IV, VII)	Inter-federating Governance	Art. 3 (II)	Action General Guidelines
			Art. 7		Art. 7 (III)	Water Resources Plans
6. Empowerment of the organisational structure	-	-	-	-	-	-
7. Multi-scale perspective	Art. 3 (II, III)	General Guidelines	Art. 7 (VI)	Inter-federating Governance	Arts. 3 (IV); 4	Action General Guidelines
			Art. 10	Development Instruments		
8. Vertical and horizontal integration	Arts. 2 (XIV), 3 (II, III, IV, V)	General Guidelines	Arts. 6 (II), 7 (I, II, III, IV, VI)	Inter-federating Governance	Art. 3 (II, III, IV, V, VI)	Action General Guidelines
	Art. 4 (I, II, III)	Urban Policy Instruments	Arts. 10 (caput 1, 3), 12 (I, II, III, IV, V)	Development Instruments	Art. 31.	Public Power Action
	Art. 42 A (VI)	Master Plan	Arts. 13, 14	Federal Action		
			Art. 20 (caput 1)	Final Provisions		

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