REVISTA NORDESTINA DE ECOTURISMO

A PROPOSE FOR THE DELIMITATION OF THE BUFFER ZONE OF THE ITATIAIA NATIONAL PARK, RIO DE JANEIRO, BRAZIL

ABSTRACT

The search for biodiversity conservation and natural resources protection is part of history of Brazil and has been built in different moments and in different ways. At present, one of the ways of minimizing the potential risks caused by human activities that threaten the conservation of biodiversity in our planet, has been the creation of protected areas. However, the integrity of these areas and its effectiveness in fulfilling the functions has been at risk for economic activities and by inappropriate usage of natural resources. There is, nowadays, a global consensus that these conservation units cannot be operated as islands, so management strategies in higher degree should be established, with creation of buffer zones. Such zones should work as filters, preventing that external human activities put at risk the natural ecosystems inside the protected areas. Facing this scenery, nowadays the cartography and remote sensing techniques can represent a tool of high importance in terms of biodiversity management and conservation of protected areas, because they can support, especially, strategies for conservation, environmental management, territorial planning and monitoring, integrating, in a specialized way, information of complex and multi-disciplinary nature. Making use of these remote sensor tools, the present study has as objective the presentation of a proposal for demarcating the buffer zone around Itatiaia National Park, Conservation Unit located at Southeast region of Brazil (southwest region of Rio de Janeiro), in areas of Rio de Janeiro and Minas Gerais state. Apart from fauna, flora and geomorphology heritage, Itatiaia National Park has a great relevance for being the first national park to be created in Brazil. For the achievements of this work, it was used an integrated approach, using tools of visual interpretation of products of remote sensing techniques, considering the following aspects: the incidental legislation, political/social aspects from the region covering the buffer zone (radius of 10Km) and aspects of land usage. Apart from the objectives described before, this work will be able to supply subsidy for future planning and management actions, for medium and long term.

KEYWORDS: Conservation Units; Buffer Zone; Remote Sensing.

UMA PROPOSTA DE DELIMITAÇÃO DA ZONA DE AMORTECIMENTO DO PARQUE NACIONAL DO ITATIAIA, RIO DE JANEIRO, BRASIL

RESUMO

A busca pela conservação da biodiversidade e proteção dos recursos naturais faz parte da história do Brasil e vem sendo construída em diferentes momentos e de diferentes maneiras. Atualmente, uma das maneiras de amenizar os riscos potenciais causados pelas atividades humanas que ameaçam a conservação da biodiversidade em nosso planeta, tem sido a criação das áreas protegidas. Porém, a integridade dessas áreas e a sua efetividade em cumprir as funções têm sido colocadas em risco pelas atividades econômicas e pelo uso inadequado dos recursos naturais. Há, atualmente, um consenso global de que estas unidades de conservação não podem ser operadas como ilhas, devendo ser estabelecidas estratégias de manejo em escalas maiores, com a criação de zonas de amortecimento. Tais zonas devem funcionar como filtros, impedindo que atividades antrópicas externas coloquem em risco os ecossistemas naturais dentro das áreas protegidas. Diante deste cenário, a cartografia e sensoriamento remoto podem representar atualmente uma ferramenta de significativa importância em termos de gestão da biodiversidade, e conservação de áreas protegidas, pois eles podem fomentar, sobretudo, estratégias de conservação, manejo ambiental, planejamento territorial e monitoramento, integrando de forma especializada, informações de natureza complexa e multidisciplinar. Fazendo uso destas ferramentas de sensoriamento remoto, o presente estudo tem como objetivo a apresentação de uma proposta para a delimitação da Zona de Amortecimento do Parque Nacional do Itatiaia (PNI), Unidade de Conservação localizada na região Sudeste do Brasil, em áreas do estado do Rio de Janeiro e Minas Gerais. Além do patrimônio biótico e geomorfológico, o PNI tem grande relevância por ser o primeiro parque a ter sido criado no Brasil. Na realização do presente trabalho utilizou-se uma abordagem integrada, utilizando ferramentas de interpretação visual de produtos de sensoriamento remoto, considerando os seguintes aspectos: a legislação incidente, aspectos políticos/sociais da região abrangida pela zona de amortecimento (raio de 10 km) e aspectos de uso da terra. Além dos objetivos descritos anteriormente, este trabalho poderá fornecer ainda subsídio para as futuras ações de planejamento e gestão, de médio e longo prazo.

PALAVRAS-CHAVE: Unidades de Conservação; Zona de Amortecimento; Sensoriamento Remoto.

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INTRODUCTION

Although Brazil first National Park was created in 1937, the Conservation Units were specifically instituted under the Federal Law nº 9985, 2000, which created the *Sistema Nacional de Unidades de Conservação (SNUC)*.

SNUC defines that the conservation units must have a management plan which embraces the conservation unit area, its buffer zone and the ecological corridors. The buffer zone, in its turn, is defined as being "the conservation unit setting area where the human activities are subjected to specific rules and restrictions, aiming to reduce the negative impacts over the unit".

In this study one integrated approach was used, applying tools of visual interpretation of remote-sensing products, considering the following aspects: the applicable law, social and political aspects of the region embraced by the buffer zone (within a radius of 10 km) and aspects of land use.

METHODOLOGY

Information obtained through bibliographical surveys, mapping surveys, and other field researches were taken for this study development.

The software ArcGis 9.2 was used for analyzing the geographical information and thematic maps generation, as also were the satellite images and the vector data related to the physic-biotic characteristics, all obtained through the data base provided by the Unit administration.

The methodological procedure adopted includes four main stages: (1) The available data survey; (2) Data pre-processing and image geo-referencing; (3) Elaboration of thematic maps; (4) Analysis and final interpretation of results.

In the first stage, one bibliographical survey, one topographic maps acquisition, collection and selection of images about to be processed, besides other digital format (vector files) were taken, that is, secondary data referent to thematic maps like vegetation, lands, road system, urban areas, hydrological system and pre-existing conservation units in the studied area.

In the second stage, it was made the data pre-processing and the selected image geo-referencing. Then, these data were posted in the software (ArcGis 9.2), integrating themselves in different ways (correlating the vector data according to the visualization interest and posterior analysis).

The image selected for the present study was taken from the satellite IRS (bands 234), orbit-point 333/094, passing on September 3rd, 2010. The 23S UTM Coordinates and the Geodesic System 2000 were used. The thematic maps were drawn up in the third stage.

In the fourth and last stage, these maps and other data were analyzed and integrated, and from their interpretation, the proposal considered the most adequate for the Buffer Zone (BZ) was presented.

Besides the inclusion and exclusion criteria, presented by the Methodological Guide (*IBAMA* 2002), during the evaluation of the aspects for the proposal of BZ delimitation for the Itatiaia National Park (INP) presentation, three main criteria were also considered as following:

- Strategic criteria – the minimum distance of the Unit to be kept, concerning the aspects referent to land occupation and use and associated events which may affect the CU, like, for example, urban expansion, deforestation, mining, atmospheric, soil and hydric pollution that must be controlled;
- Operational criteria – the possibility to delimitate this proposal for the buffer zone in lad, seeking when always possible visible geographic landmarks, like rivers, municipal limits, uplands and river basins.
- Ecological criteria – aiming to include the river basins which cross the CU and are important in its protection, forest fragments relevant for the conservation, yet noting the maintenance and/or the feasibility of the ecological corridors and the regional landscape continuation.

Here it must be highlighted that the referring proposal for the INP BZ was based only on the analysis of the satellite images and the criteria currently presented according to the correlated bibliography, not being considered possible plans agreed and articulated by the governmental bodies, private entities and the civil society involved. This is because that is considered as being an exclusive role of the management staff of the referred Conservation Unit, during the revision of the current Management Plan.

Object of Study

The INP is situated in the Southwest region of Brazil, in areas of the State of Rio de Janeiro, in territories of the municipalities of Resende and Itatiaia; and in the south region of Minas Gerais, covering the municipalities of Bocaina de Minas and Itamonte. Nowadays, it occupies one area of approximately 30.000ha, and is delimitated by one perimeter of about 110 km.

Besides the biotic and the geomorphological heritage, the INP presents great relevance because is the first park created under the Federal Decree nº 1.713, of June 14th, 1937 (*IBDF*, 1982). The geological importance of the region is partially due to the Itatiaia plateau elevations, where the Agulhas Negras Peak, with 2.787 meters high, is the fourth higher peak of Brazil. Other peaks like the Couto stone, with 2.682 meters high, and the Prateleiras, with 2.515 meters high, also feature in the plateau.

The region where the INP is inserted is composed by the morph structural units of the Mar Upland, of the Paraíba Valley, the South Plateau of Minas and the Mantiqueira Upland.

The Plan of Emergency Action of INP (*IBAMA*, 1994) reinforces the park value due to its landscape heritage. The peaks and the rivers springs, the fauna and flora exuberance, besides the valleys and slopes, natural pools and waterfalls are spotted. The plateau region is highlighted

mainly for the landscape related to the Agulhas Negras massif and the Campos de Altitude vegetation.

In the INP several springs which form the Aiuruica, Grande, Preto, Marimbondo, Pirapetinga, Lambari and Portinho Rivers are protected. The geology and tectonics of Itatiaia present important natural heritage. Due to its climate, relief and natural beauties, it presents excellent potential for the tasks turned to the public, like mountaineering, interpretation, recreation and environmental education (*IBDF*, 1982).

Nowadays, since the surrounding area of the INP is not delimitated and established, its buffer zone, according to the CONAMA 13/90 Resolution, covers a radius of 10 km. This area covers the municipalities of Itatiaia and Resende in Rio de Janeiro, Itamonte, Alagoa and Bocaina on Minas Gerais and Queluz in the State of São Paulo.

Following, the table 1 informs the total area of the municipalities, their population (according to *IBGE* data of 2000) and the percentage of their areas common with the Itatiaia National Park ones.

Table 1: Municipalities, total area, population and % of the INP coverage area.

MUNICIPALITY	AREA (KM^2)	POPULATION	INP AREA (KM^2)	INP AREA (%)
Resende/RJ	1.113	104.549	46.21	4.15
Itatiaia/RJ	225	24.739	79.56	35.36
Bocaina de Minas/MG	501	4983	56.79	11.34
Itamonte/MG	431	12.197	96.03	22.28

Data Analysis

The current Buffer Zone (radius of 10 km) was the object area of the present study (Figure 1), with the spatial representation considered for the proposal of the new BZ of the Itatiaia National Park. From this area, the process of analysis of the satellite image, jointed with the crossing of the raised mapping information, was taken. These results supported the construction of inclusion and exclusion proposals of determined regions and locations, based mainly on the presented criteria, and according to described below.

As result, following in the Figure 2, there is the thematic map, with the Potential Areas and the Local Hydrography. These potential areas were thus classified because represent areas where forest remaining were identified (with vegetation in several regeneration stages). Because of that, it is considered that these areas deserve one special attention by the involved entities (the three governmental areas) and civil society, always pointing to the protection, maintenance and management actions.

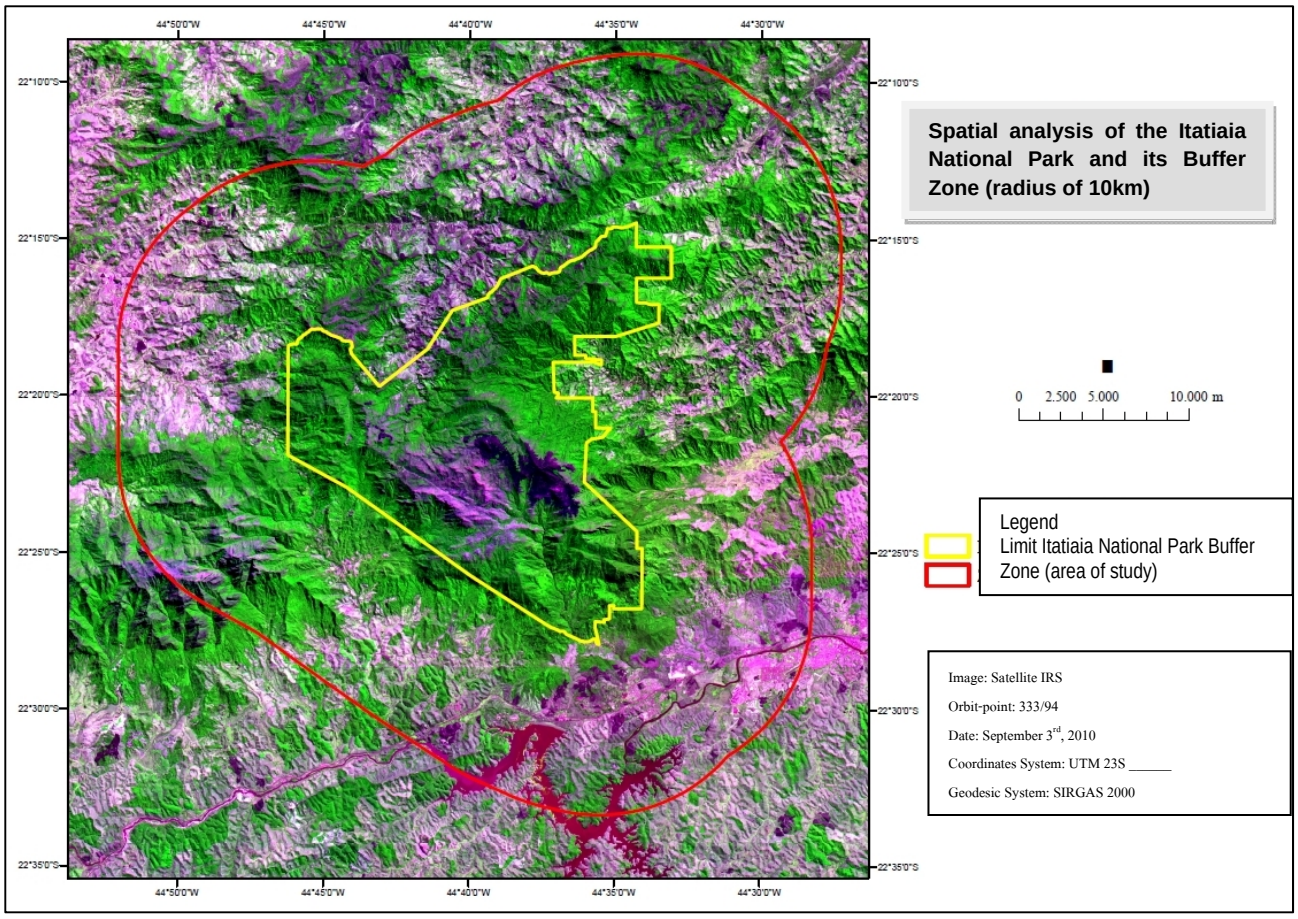

Figure 1: Spatial analysis of the INP and its buffer zone. **Source**: Satellite IRS, 2010.

It is important to highlight that the identification of these potential areas represent one first step for the enablement of diverse environmental actions of collective interest, like the connections with INP (and other forested areas), creation new protected areas, establishment of Legal Reserve and ecological corridors.

The same way, the local hydrography was considered in this spatial analysis which, according to this study author´s understanding, must be also considered due to soil management, protection, land occupation and use ordinance actions, by the actors involved in this process.

The analysis and raised data crossing in the current study resulted in the delimitation of the area of the Buffer Zone according to the map presented by the Figure 3. In the selection for the referred area, in its South portion, in the municipality of Itatiaia (RJ), the new BZ would be doing limit with the Federal Road BR-116, excluding the urban areas located in its old site. The urban expansions cited in this study, named Districts of Nova Conquista and the Africa I and II were included, due to distinct reasons. This, since pertaining to the Penedo Environmental Protection Area (Municipal Conservation Unit), which, according to *IBAMA* (2002) must be included in the BZ, and that one, since it is comprehended that for the same is important to participate of the referred area monitoring, and even with its increasing irregular occupation, must act together with the municipal power for ordinance and contention of actions which may come against the CU objectives.

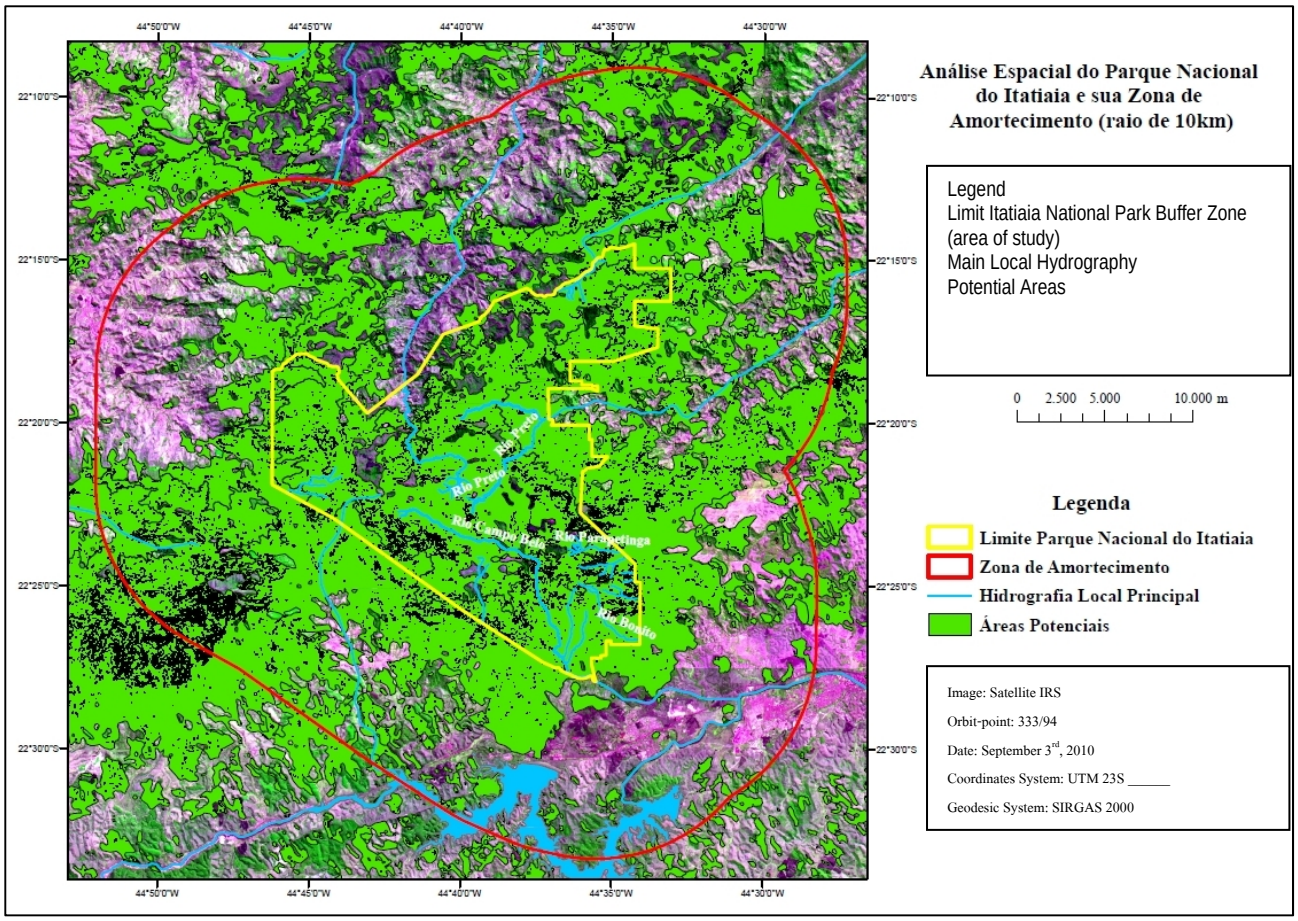

Figure 2: Analysis of the potential areas (vegetation) and local hydrography. **Source:** Satellite IRS, 2010.

In the East and Southeast portion of the INP, in the municipality of Resende (RJ), the State Road RJ-163 (route Dutra/Capelinha) was elected as the geographic landmark of delimitation for the BZ proposed area, including in this portion the Alambrari Upland Environmental Protection Area (Municipal Conservation Unit), which inclusion is also an interest, mainly for the shared management, that strengthens the mutual objectives for guaranteeing the conservation and monitoring the areas which present forest remaining. This delimitation goes along the referred road until Capelinha, after following the same limits of the Mantiqueira Upland Environmental Protection Area (Federal Conservation Unit), until the limit of radius of 10 km (from the current BZ).

Specifically in the East portion, in the State of Rio de Janeiro, in the locations of Visconde de Mauá, Vale das Cruzes, Vale do Pavão, Maringá and Maromba were included by the perimeter managed by the municipality of Itatiaia (RJ), where all the area managed by the municipality of Resende (RJ) was kept.

On the left margin of the Preto River (in the same eastern portion of the INP), in the municipality of Bocaina de Minas (MG), the locations of Santa Clara Valley and Alcantilado Valley were kept. These areas, besides being predominantly rural with little occupation, represent important role as one front wall against the actions which can bring negative impacts to the CU. The shared management in these areas must also prevail, with the involvement of the State and municipal management, and the civil society (inhabitants and particular areas owners).

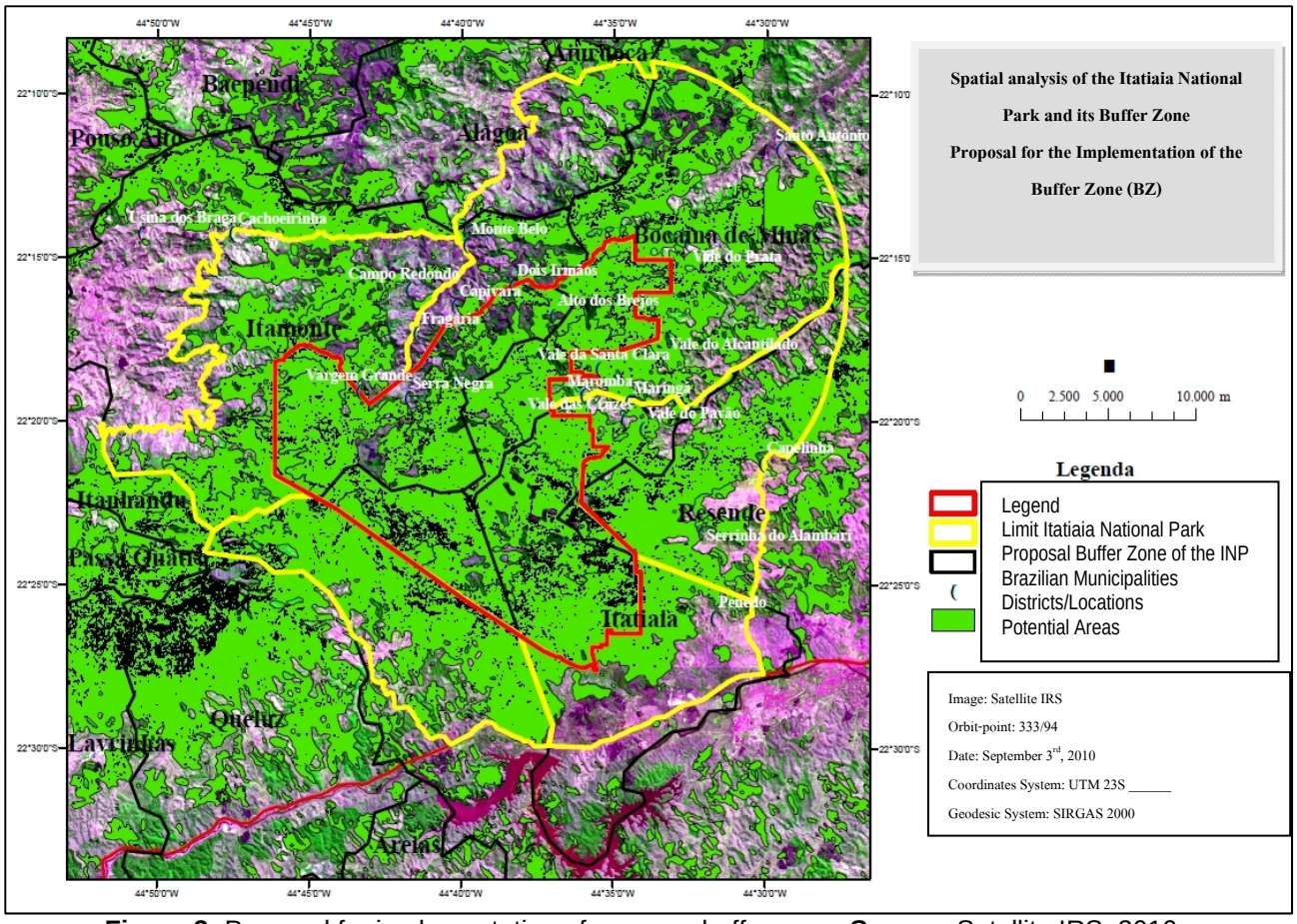

Figure 3: Proposal for implementation of one new buffer zone. **Source:** Satellite IRS, 2010.

In the West and Southeast portion of the INP, in the municipality of Resende (RJ), the proposal for the BZ was delimited using as geographical landmark the Federal Road BR 384 (Rio-Caxambú) until the limit with the municipality of Queluz (SP). The locations Engenheiro Passos and Palmitai, areas considered essential for the CU monitoring, control and protection, were included. However, the municipalities of Queluz (SP), Passa Quatro and Itanhandú (MG), considered non-shareable with the specific interests of the CU, and only supper weighting the INP management control and authorizations, ordinance and license processes monitoring, were excluded.

In the North West and North portions of the INP, the municipality of Itamonte (MG) had is urban perimeter excluded, where the same perimeter of the Mantiqueira Upland of the Environmental Protection Area was used for delimitation. Then, the BZ goes along the road which connects the municipality Itamonte (MG) to the District Monte Belo (route Bocaina de Minas, MG), until find the Airuoca River. In the portion of the rural area of the municipality, the Districts of Vargem Grande, Campo Redondo, Fragária, Capivara, Dois Irmãos and Monte Belo were kept in the proposal. In this region, many potential areas which development actions for protection and maintenance are very important for the INP were identified. It is highlighted here, the Papagaio Upland State Park (State Conservation Unit), which is bounded with the CU in this portion, what brings many benefits for both Units environmental balance. But, even with this Unit presence,

being also of integral protection, the current proposal included only part of that, because geographical landmarks which easy the BF delimitation proposal were not found.

The Northeast and North portion, the delimitation of the BZ proposal goes along the right margin of the Airuoca River, in the municipality Alagoa (MG), where part of its urban area was excluded. It must be highlighted here that in all process of selection and limitation of the BZ propose, when possible physical landmarks were chosen (roads, rivers, municipal limits, etc.), aiming to provide great easiness in the process of delimitation and geo-reference of the area. However, in this portion, it was not possible to identify any reference, being the INP technical staff responsible to refine (if necessary) the field identification and its possible landmarks through one more accurate study.

Following this same direction, on the right margin of the Airuoca River, the delimitation leads to reaching the radius of 10 km, which delimitates the BZ of the INP current nowadays, excluding in the route, the municipality Airuoca (MG). Then, reaching the municipality Bocaiuna de Minas (MG), due to the significant presence of potential areas, with predominantly rural areas with few human occupations, due to the same reasons yet here presented, it was chosen the inclusion of these areas in a whole (the locations of Prata Valley and Santo Antônio), until the radius of 10 km.

FINAL CONSIDERATIONS

The data analyses introduced reveals that the Buffer Zone of the INP, must deserve one special and adequate treatment, considering, mainly, the cities increasing, causing the creation of one area enabled to work, efficiently, as one buffer. And these ones must act protecting the forested areas from the degradation caused by the urban nucleons, like pollution (water, soil and air), deforestation and the anthropic actions which threaten the Unit conservation.

Once delimited the buffer zone of the INP, it is very important that the local and regional planners discuss the local features and define (through negotiations with the involved agents), the adoption of the most adequate strategies for each reality. In this moment, the technical staff responsible for the CU planning must bring the information about the objectives to be reached, the support capacity from the environment and the instruments of the territory management plans. These results must be used as one way to ordinate the land occupation, respecting the environment limits. The tool of this process institutional articulation the conservation units councils, the municipal and regional councils, the hydrographic basins committees, and the other related councils and organizations involved in the process (like tourism, education councils, residents association, non-governmental organizations, etc.) as fundamental agents.

The planners, within the three governmental spheres yet must articulate the integrated management of the landscape to amplify the conservation strategy for the multiple use areas in the

territory, from the National Strategic Plan for Protected Areas (NSPPAs), the Hydrographic Basins Committees (HBCs), the Directory Plans and the Management Plans (MPs).

It shall also be highlighted that its BZ exploration must use the traditional practices, the local lifestyles and the natural resources sustainable management, when always possible, being essential one regular specific, besides the general rule, for each municipality and its influence area, with a detailed description of the habitats types, jointed with the hazards descriptions which can birth problems for the ecosystems, and the proper conservation policies.

It is concluded that the delimitation of the buffer zone of the INP must be beyond one exclusive planning instrument, must be one instrument which promotes the conservation in local scale (incorporated to each municipality political-economic and environmental specificities) as also in regional scale, guaranteeing the integration of the UC to the territory, regulating the land use and occupation and promoting connection between the protected areas, constituting one territory net of biodiversity conservation and the natural resources associated to it in the national scale.

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