Rapid ‘SWOT’ Diagnosis Method for Conservation Areas

RICARDO BRAUNa & AIALA AMORIMb

a GITEC Consult GmbH/KFW/IEF/PPMA, Nucleo de Analise de Sistemas Ambientais (CNPq/UFRJ), Departamento de Recursos Hídricos e Ambientais, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; b Institute of Rural Development, University for the International Integration of the Afro-Brasilian Lusophony (UNILAB), Ceará, Brazil

(Received 18 January 2012; accepted 25 May 2014)

ABSTRACT The population growth and the pressure over natural resources have increased around conservation areas in Brazil. Deforestation has contributed to natural disasters, such as floods and accelerated soil erosion, that have taken place in different parts of country in recent years. These events have taken lives and seriously affected not only the urban sectors but also conservation areas. One of the areas affected by natural disaster has been ‘Ilha Grande’, Big Island State Park (PEIG), the third largest oceanic island in Brazil, which is located in the state of Rio de Janeiro and coordinated by the State Environment Organization (INEA). Although Ilha Grande is one of UNESCO’s Biosphere Reserves, it has been under socio-economic pressure for years. According to the Brazilian legislation, all conservation areas such as Ilha Grande should prepare a master plan for management purposes. Most of these plans are based on secondary data from the literature review, technical surveys and participatory meetings. However, a lack of primary data may lead to improper decision-making. This paper reports on the development of a local diagnosis methodology applied in Ilha Grande to improve the decision-making process for planning reasons. The strengths, weakness, opportunities and threats (SWOT) method was used to combine primary information from field diagnosis and consultation with local stakeholders. The information surveyed was used not only as a baseline for the master plan of PEIG but also to elucidate the vulnerable areas on the island.

KEY WORDS: island conservation area, SWOT rapid field diagnosis, consultation with stakeholders, natural disaster, planning and management

1. Introduction

There is a growing concern about the need to protect biodiversity in many parts of the world but many countries still suffer from unsustainable human developments that directly or indirectly have caused natural disasters affecting not only urban settlements but also important conservation areas (WRI 2003; Nelleman & Corcoran 2010). In the past,
many non-governmental organizations (NGOs) have acted locally to pressure governmental authorities to not only avoid environmental degradation but also create conservation areas. The first conservation areas appeared in 1872 when the US President Ulysses Grant created the Yellowstone National Park for protection and recreation in the States of Wyoming, Montana and Idaho (Dudley 1994). This initiative spread worldwide and most countries now have conservation parks, many of which are assisted by the International Union for Conservation of Nature, headquartered in Gland, Switzerland.

Since the 1980s, Brazil has created conservation areas based on ecological priorities (Agostinho et al. 2005; Capriles 2005). There is now more than 110 million hectares of protected areas in different Brazilian states (Rylands & Brandon 2005). Several conservation areas have been created with the support of the National Strategic Plan of Conservation (Governo Brasileiro 2006). Although the implementation of conservation areas in Brazil represents a great step forward, there is still a great pressure to minimize environmental degradation.

Conservation areas in Brazil are considered live laboratories for educational activities, scientific research, environmental interpretation, recreation and ecotourism (Governo Brasileiro 2000). They can be managed under the national, state or municipal governments based on the National System of Conservation Areas (SNUC).

The SNUC system divides the conservation areas into ‘fully protected’ (e.g. national, state and municipal parks, biological reserves, ecological stations, among others) and ‘sustainable-use reserves’ where controlled social-economic activities are allowed under monitoring schemes (e.g. national forest areas, forest extraction reserves, environmental protection areas, among others) (Rylands & Brandon 2005). Although these areas are well established on paper, they suffer from intense ecotourism (Pedrini et al. 2007), land invasion, misuses of natural resources and all kinds of other pressures (Onaga & Drumond 2007; Nelleman & Corcoran 2010). Brazilian conservation areas require systematic surveys on a permanent basis in order to avoid further degradation. These surveys are basically achieved by field diagnosis, contact with stakeholders, monitoring schemes and operational management strategies.

1.1. Challenge to Achieve Sustainable Management in Conservation Areas

There are over 800 federal and state conservation areas in Brazil situated in various biomes (Rylands & Brandon 2005; ICMBio 2008). As mentioned above, despite the great number of conservation areas most of them lack proper management and strategies to avoid degradation (Capriles 2005; Pedrini et al. 2007). In other words, it is necessary to diagnose and survey not only the ecological integrity of conservation areas but also the infrastructure, the surrounding communities and the areas at risk due to pressures and threats from socio-economic developments. According to the SNUC directive, all conservation areas in Brazil must be managed with the participation of stakeholders directly involved (Braun 2007b). The command-control system through surveillance, monitoring and police power has been one of the solutions to minimize degradation (Pedrini et al. 2007). Another strategy is through partnership with stakeholders in order to develop collaborative actions and sustainable projects (Braun 2007a). A reliable field diagnosis and integrated planning provide knowledge to formulate sustainable actions involving local community in the management process. However, the main question is how to develop a realistic diagnosis to allow better planning and management in a relatively short period of time?

According to the SNUC’s directive, all conservation areas that are created in national territory have a timespan of five years to prepare a ‘management plan’. A specialized NGO or
An environmental firm is contracted by a governmental organization (e.g., State Environment Organization – INEA) in general develops the ‘management plan or master plan’. According to several authors (Moore 1993; Dudley 1994; IBAMA 1997; National Park Service 1998; Director of National Parks 2002; FBCN – Instituto Ambiental 2006; Svolensk et al. 2008), there is a common methodology in preparing a master plan. The first stage is a description of the natural resources and the cultural, historical and socio-economic situation of the conservation area and its surroundings. The next step is the investigation of the land tenure situation followed by a diagnosis of existing problems and threats (e.g., deforestation, illegal hunting and land invasion). Several thematic maps of the conservation area are also developed. There is also a need to map the main stakeholders through participatory meetings and/or local consultations. The final stage is the establishment of different zones and the formulation of specific programmes and projects, such as biodiversity protection, visitor programmes, environmental education, land tenure regulation, restoration of ecosystems, among others.

Despite the fact that management plans in Brazil are mandatory and that they should be done with the best knowledge, there is often lack of primary data. These plans are basically developed utilizing secondary data and the knowledge from park rangers and local stakeholders. The lack of local knowledge affects the decision-making process with regard to the ecological aspects of conservation areas (e.g., endangered fauna and flora), infrastructure status (e.g., state of footpaths, roads and facilities), socio-environmental situation (e.g., modus vivendi of traditional communities), the pressures and threats on natural resources (e.g., deforestation, invasions and criminal fires) and local communities living not only in the surrounding areas but also within conservation areas.

There are important conservation areas in the State of Rio de Janeiro, namely the Desengano State Park, the Three Peaks Park, the Grajaú Park, Tiririca Sierra Park, Cunhambebe Park, Chacrinha Park, White Rock Park and the Big Island State Park (PEIG) (IEF 2008). Some areas have been studied to prepare management plans coordinated by the State Environment Organization (INEA). In some cases, the management plans are co-financed by international institutions, such as the German Development Bank (KFW/GITEC), which has invested in the Ilha Grande State Park (PEIG) under the Atlantic Forest Protection Program.

![Figure 1 Localization of Ilha Grande (Big Island).](image)
The PEIG is localized in the municipality of Angra dos Reis (geographical coordinates: 23°05′ and 23°14′ South latitude and 44°05′ and 44°23′ West longitude), with a distance of 150 km from the city of Rio de Janeiro (Figure 1).

Since the 1990s, the State Environmental Organization (INEA) has put great effort to ensure sustainability in Ilha Grande. However, there are still many problems related to disorganized human activities, which affect the island’s ecological integrity (Braun 2007a). In December 2010, a severe landslide devastated the community of Bananal, killing many people. Bananal is a small village located in the North-western portion of the Island (see more information further in this paper).

1.2. Objectives of the Study

The research presented here sought to develop a methodological procedure for rapid field diagnosis focusing on social-ecological issues as part of the planning exercise of PEIG’s management plan development process. This paper describes how the analytical procedures has been integrated into the planning exercise and how field surveys can not only map ecological sensitive areas but also identify areas of great risk to human settlements in the surrounding areas of the Park.

Based on the above, some learning objectives were established as itemized below.

- to describe how the strengths, weakness, opportunities and threats (SWOT) method was used for rapid field survey, diagnosis and planning in Ilha Grande;
- to combine information from field diagnosis with the information obtained from local consultations with stakeholders;
- to use information from field surveys in the development of the Ilha Grande management plan;
- to analyse the effectiveness of the SWOT method as a tool for local diagnosis and planning of conservation areas;

2. Case Study: The Big Island State Park

The Big Island State Park (PEIG) was established in 1971 with an initial area of 15,000 ha. This area was reduced in 1978 to 5600 ha. In January 2007, a State Decree increased the area of the Park from 5600 ha to 12,052 ha (about 62.5% of the island) (IEF 2008). This strategy was to ensure protection against real estate speculation and to encourage ecotourism in the island. In 2007, the Park was elected through public inquiry as one of the seven wonders of the state of Rio de Janeiro. The island attracts visitors from all parts of Brazil and from other countries (IEF 2008).

Ilha Grande was recognized in 1992 by UNESCO as a Biosphere Reserve (INEA 2010b). This was mainly because of the rich biodiversity and the beautiful landscape and several ecosystems, such as the highlands, the Atlantic Forest (Mata Atlântica), the marine reserve and tropical coastal system (Ministério do Meio Ambiente 2006). The island is composed of several conservation areas, namely the Big Island State Park (PEIG), the Environmental Protection Area (APA) of Tamoios, the Biological Reserve of Praia do Sul, the Marine Park and the Sustainable Development Reserve (RDS) of Aventureiro (INEA 2008). This ‘mosaic’ of conservation areas is now under a new management strategy by INEA to develop participatory planning and management schemes with communities that are based on the island.
2.1. The Social-Environmental Context

The island was inhabited 3000 years ago by the Sambaqui people. Many remains are still found around Ilha Grande such as sharpened stones and polished rocks. Later, the Tupinambás indigenous group occupied the island for hundreds of years, but they were decimated by the Portuguese settlers in the 1600s. French and Spanish pirates also used the island as a harbour to hide from the Portuguese and the Spanish crowns. Historians still claim hidden treasures in Ilha Grande. After this period African slaves stayed on the island to recover from the trip across the Atlantic Ocean before being taken to the slave market in Rio de Janeiro. This period was also marked by the arrival of several farmers who planted sugarcane and coffee. More recently, the island was the base of fishermen and sardine factories in several communities of the Island. In the 1960s, a prison was constructed known as the ‘Brazilian Alcatraz’. This gave way to myths and stories of spectacular escapes (INEA 2008). In the Southern part of the island is the Abrão Village with several small hotels, tourist shops and restaurants. There are also the historical ruins of an old aqueduct and the Lazareto, an aged quarantine station for maritime travellers. These famous monuments are popular tourist attractions.

The park has a flat topography in the southern coastal area and a set of mountains in the centre of the island with the highest altitude at 942 m above the sea level. There are numerous natural streams of good quality water with small pools, rapids and waterfalls originating from the highland forest. There are also salt marshes, swamps and mangroves in certain places of the coast. The Atlantic Forest in Ilha Grande has 2500 species of trees and plants. More than 50% of the forest species are endemic (INEA 2010a). There are 1361 species of mammals, birds, reptiles and amphibians. A recent research demonstrated that there are 567 fauna species that occur exclusively on Ilha Grande (INEA 2010a). The Bugio monkey (Alouatta fusca clamitans) community is very representative. They are known as the ‘howler monkeys’, which can be heard in several parts of the island. There are 25 species of frogs and toads living on the banks of streams and creeks. Very recently, a rare species of frog (Hyloides javier) was discovered in the island (INEA 2010a). Research developed by universities has identified 30 species of snakes, many of which are poisonous. There are also many species of reptiles on the island. The Teiú lizard, for instance, is the largest of its kind, but it is severely threatened by domestic dogs. Dogs also hunt armadillos. This has caused long-term ecological problems in the wildlife trophic chain of the island.

A recent diagnosis identified that 25 fauna species have been introduced in the island with no control (INEA 2010a). A good representative is the small Sagui-marron monkey (Callithrix argentata melanura), which was introduced in the 1970s. This monkey community preys the nest of endemic birds causing a decrease in the bird population. There are now 11 species of birds listed as endangered (INEA 2010a). Another exotic species is the alligator jacaré-do-papo-amarelo (Caiman latirostris) that inhabits the marshland and mangroves of Ilha Grande (INEA 2008). Although small, the alligator community represents a risk for tourists visiting the island (Braun 2007b).

In general, the island has magnificent beaches and rocky shores and cliffs that plunge into the sea. However, the Southern coast of the island has a biological reserve that is very sensitive to human activities. Tourism activities are not allowed on the beaches of the reserve because they shelter a wide variety of threatened crustaceans. The underwater marine life is home of a rich fauna and flora, with many species of fish, amphibians and crustaceans. There are more than 12 species of whales and dolphins in the marine park. However, the
The island also faces problems with many exotic species (e.g. corals, clams, crabs, shrimps, polychaetes and algae) that were brought by ships from other parts of the world and that also has affected the local ecological balance (INEA 2008). These problems are to be dealt with during the implementation of the management plan.

According to the Köppen classification, the climate of the island is tropical hot and humid with no dry season (IEF 2008). The average annual rainfall is 2242 mm, with January being the wettest month and July the driest (Magalhães 2008). The humidity is around 82% and the mean annual temperature is 21°C. The island has a perimeter of 155 km, with 12 km wide north–south and 28 km long east–west, with a total area of 12,052 ha (Figure 1) (INEA 2008).

When the state prison in Ilha Grande was shut down in the early 1990s, hundreds of people migrated to the island to live and explore the tourism business. Presently human settlements are localized around the Tamoios Environmental Protection Area (Figure 2) in the north, north-eastern and north-western parts of island.

The beauty and biodiversity of the island has motivated several Brazilian companies and international institutions to invest on INEA’s protection strategy. There have been investments from large Brazilian companies, such as Petrobras Oil Company and the Vale do Rio Doce Mining Company, to recover the degraded areas in the Park (INEA 2010b).

Landslides in the Atlantic Forest mountainous region are common especially during summer because of intense rains. Many parts of Ilha Grande are characterized by unstructured shallow lithosols, shallow soils with organic coluvial materials that have relatively low fertility, usually occurring on steep hillsides and embankments that makes the vegetation vulnerable to mass movements. The clearing of vegetation, the changes in the water drainage patterns and the soil exposure are the main causes of landslides. Although this is a common problem in Ilha Grande, it is possible to identify the vulnerable areas through field diagnosis.

Figure 2 Human occupation in the coastal area of Ilha Grande.
3. Methodology

This paper describes the importance of conducting rapid field diagnosis through observations and measurements not only to identify areas under risk but also to contact local stakeholders about the causes of environmental problems. The identification of vulnerable areas allows better decision-making for management and planning.

As mentioned previously, the management plans of conservation areas in Brazil are mandatory by the SNUC. Since the mid-1990s many methods have been applied in order to assess conservation area, particular regions or habitats (Hockings 2003). According to Pires (2001), management plans are valuable tools not only to set priorities for actions, but also to guide administrators to manage the integrity of conservation areas. In general, a management plan is an operational document that requires update for the management purposes (INEA 2008). Although this is all very relevant, the administrators of Ilha Grande State Park (PEIG) are still using the old management plan developed in 1993. This has created a gap between the past and the present situation of the island.

In order to evaluate whether a management plan is effective, it is necessary to contextualize not only the vulnerabilities in the management process but also to see if the external pressures and threats are being dealt with in order to minimize degradation (Hockings 2003; Onaga & Drumond 2007). Human developments and natural disasters in conservation areas are very important to consider, especially in sensitive areas such as insular ecosystems where the biodiversity is more vulnerable and isolated from the continent. In these areas, the ecological balance can be very easily affected by all sorts of human pressures. Having said that, this section details the methodological approach adopted in the present study that was organized to follow the objectives.

3.1. Instruments for Field Diagnosis, Planning and Management

The corporate sector has developed various tools to strengthen project management to meet the demands of a globalized competitive market. Efficient analysis and strategic planning are crucial for project management according to the PMBOK Guide (PMI 2004; Pfeiffer 2005). Modern management tools are always used to improve communication, time management, innovation schemes (among others). Some of the tools used for effective planning and management in the corporate sector include the structure analytical projects, the work breakdown structure, project evaluation and programme review, the Plan-Do-Check-Act cycle, the Balanced scorecard, the analysis of scenarios, the life cycle analysis of projects, milestones chart, communication matrix and the SWOT method for strategic planning (Kotler 1999; Jones & Thompson 2000; Barros, Fischer e Associados 2005; Pfeiffer 2005; Svolensk et al. 2008). In recent decades several corporate tools have been borrowed and adapted to serve environmental purposes. Among these tools are the stakeholder analysis schemes, participatory planning and the SWOT planning matrix (Kotler 1999; WWF 1999; Phillips 2000; Instituto Ambiental 2006; Svolensk et al. 2008).

The SWOT method was chosen because it is straightforward and simple to use in comparison to other sophisticated methods, such as the Rapid Ecological Assessment, that depend not only on geographical information systems, but also on overflights and local sampling and mapping of flora and fauna (Sobrevila et al. 1992).

The WWF (1999) quotes that the SWOT method is a strategic tool to organize and store data from conservation areas. Hockings et al. (2000), Phillips (2000) and Balram et al.
indicate the SWOT method as a tool to set priorities for environmental actions in protected areas. Svolensk et al. (2008) and the Instituto Ambiental (2006) in Brazil have effectively used the SWOT method to plan strategic actions in conservation areas such as the National Park of Ilha Grande in the State of Paraná and at the Morro do Diabo State Park in São Paulo State. Miltic et al. (2010) has used the SWOT method to analyse the ecosystems in a conservation area in Serbia for eco-remediation purposes, and the German Technical Cooperation (GTZ) applied the SWOT in planning the Zaranik Conservation Area in Egypt (GTZ nd).

A reliable diagnosis will analyse the strengths, the weaknesses, the risks and the potential opportunities for sustainable actions. According to Braun (2007a, 2011), the SWOT method can be used as a tool for rapid field diagnosis in different types of conservation areas. The information collected can then be used for planning and management purposes in order to subsidize decision-making and the development of a management plans. This has been the case of the Ilha Grande State Park (PEIG), as described below.

3.2. The Application of the SWOT Method

The work developed in Ilha Grande was carried out in three stages between September and December 2007. The SWOT method was applied to diagnose several parts of the Island for planning purposes, as described below.

3.2.1. First Stage – Rapid Field Diagnosis. The rapid field diagnosis was developed in order to collect primary data for analysis through direct field observations, local environmental analysis, measurements of geographic coordinates and local interviews with stakeholders. The selection of specific areas to survey was based on expert opinion. Several documents related to the PEIG were analysed previously in order to know more about existing environmental problems, social conflicts and sensitive areas in the park and the surrounding areas. Box 1 lists some of the indicators and means of registration/measurements considered in field observations based on INEA’s recommendations.

The information registered in the field was selected and subsequently organized into various SWOT matrices according to the geographic location of each visit. The areas visited in the field are seen in Figure 3.

<table>
<thead>
<tr>
<th>Box 1. Field indicators and parameters</th>
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<tbody>
<tr>
<td>• Conditions of trails and signals (Km and meters)</td>
</tr>
<tr>
<td>• Condition of infrastructure / buildings (m²)</td>
</tr>
<tr>
<td>• Water and soil pollutions (DBO)</td>
</tr>
<tr>
<td>• Status of endemic flora and fauna (No. animals / km²)</td>
</tr>
<tr>
<td>• Irregular human settlements (No. of houses above 40 meters quota)</td>
</tr>
<tr>
<td>• Socials conflicts (Population / m²)</td>
</tr>
<tr>
<td>• Tourist attractions and strategic points (Photos / GPS)</td>
</tr>
<tr>
<td>• Areas of risk and pressure on biodiversity (Photos / GPS)</td>
</tr>
<tr>
<td>• Environmental problems (e.g. soil erosion, trash, etc.) (Photos / GPS)</td>
</tr>
<tr>
<td>• Areas of illegal hunting and poaching (Photos / GPS)</td>
</tr>
<tr>
<td>• Introduction of exotic flora and fauna (Photos / GPS)</td>
</tr>
<tr>
<td>• Sustainable community projects (Photos / GPS)</td>
</tr>
<tr>
<td>• Others</td>
</tr>
</tbody>
</table>

Source: Braun 2007a
3.2.2. Second Stage – Local Consultation and Participatory Meetings. Local consultations and participatory meetings with stakeholders were developed simultaneously during rapid field diagnosis. Consultations were carried out based on the interview guide approach and the informal conversation interview method (Kitchin & Tate 2000). The objectives of local consultations and participatory meetings are given in Box 2.

**Box 2. Objectives of local consultations and participatory meetings**

- To identify key stakeholders in Ilha Grande;
- To examine the opinion of stakeholders about the conservation areas and to identify the causes of social-environmental conflicts;
- To identify unknown ecological and historical issues about the island;
- To establish a positive dialogue with stakeholders and to identify partnership opportunities with the state environmental organ (INEA);
- To select the information from stakeholders and to use it to the management plan development process;

Source: Braun, 2007b

Local consultations were developed not only in the areas with social-environmental conflicts (e.g. land tenure problems and illegal hunting) but also in the areas of ecological and historical importance. **Figure 4** shows the areas visited in the field.

Most consultations and participatory meetings with stakeholders were developed with groups of people who represented their communities, such as local fishermen associations, farmers, hotel owners, environmental NGOs, school teachers, craftsman, church pastors, local government authorities, among other stakeholders. Contacts were also made with institutions situated in Angra dos Reis municipality and in the city of Rio de Janeiro. There were two participatory workshops carried out by the State Environment Organ (INEA) and the German Financial Cooperation (KFW/GITEC). The workshops represented a good opportunity to not only interact with community leaders, but also to identify
Figure 4 Map of local consultation and social participation workshops.

Figure 5 Planning scheme of Ilha Grande State Park Master Plan.
pressures and threats, and to discuss potential partnerships and sustainable actions in the island. The information was organized and synthesized into several SWOT matrices that analysed the strengths, the weaknesses, the opportunities and the threats (risks) of each location visited in Ilha Grande (see item 3). Figure 5 exemplifies this process.

Although INEA is making effort to regulate human occupation (see marked area in Figure 2), there are still land tenure conflicts and pressures on the island’s natural environment. The big dot area (Figure 2) indicates the area where the large landslide occurred in January 2010 devastating the Bananal community and killing many people. The natural disaster was caused by heavy rain (above 200 mm) very common during the summer season. Further analysis demonstrated that the ‘land slide area’ was vulnerable to soil erosion due to the natural conditions of the terrain and also due to deforestation, including the misuse of land (Braun 2007a).

4. Results

The application of the SWOT method combined data from field diagnosis and local consultations with stakeholders in several parts of the island as seen in Figures 3 and 4. The information surveyed was used to build the SWOT matrices. Figure 6 illustrates the SWOT structure.

![Figure 6 Structure of the PEIG SWOT matrix.](image)

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
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<tbody>
<tr>
<td>Socio-Environmental</td>
<td>Socio-Environmental</td>
</tr>
<tr>
<td>• Trail used by the local community, very little used by tourists;</td>
<td>• Existence of several houses in the vicinity of the 100 meters route; high number of households below the 80 m route;</td>
</tr>
<tr>
<td>• Several natural water points along the trail;</td>
<td>• Great risk of soil erosion due to inclination of terrain and soil left bare with no vegetation cover;</td>
</tr>
<tr>
<td>• Occurrence of old farm buildings (ruins) and human settlements due to the</td>
<td>• Lack of environmental education of local community;</td>
</tr>
<tr>
<td>occurrence;</td>
<td>Ecological</td>
</tr>
<tr>
<td>• Trail do Bananal/believiers for tourism all year;</td>
<td>• Illegal hunting in the Bananal area;</td>
</tr>
<tr>
<td>Ecological</td>
<td>• Illegalvoices of wild birds;</td>
</tr>
<tr>
<td>• Well preserved vegetation with several endemic species of the Atlantic</td>
<td>• Occurrence of export flora species that affects ecological balance in the Park (e.g. jaqueira, coffee, banana);</td>
</tr>
<tr>
<td>Forest (e.g. Pau D'abra, Fijipeira, Palmeiras in - dracaena, amongst others);</td>
<td></td>
</tr>
<tr>
<td>• Abundance of bird flies that provide food to wildlife; occurrence of several</td>
<td></td>
</tr>
<tr>
<td>species of native birds (e.g. Tangara, Ararastra, Sarcose, Selia);</td>
<td></td>
</tr>
<tr>
<td>• This part of the island is socio-economically with a large number of species of</td>
<td></td>
</tr>
<tr>
<td>flowers (e.g. Mitiro do Andarve, monkey, and many birds observed in the field</td>
<td></td>
</tr>
<tr>
<td>(e.g. Aspang, Pionhães);</td>
<td></td>
</tr>
<tr>
<td>• Occurrence of the Rupão (lower monkey above 200 meters elevation);</td>
<td></td>
</tr>
<tr>
<td>Highest point of the trail at 260 m.</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 7 SWOT diagnosis and planning matrix of Bananal trail and surroundings.](image)
Each cell of SWOT matrix has an analytical function. The first cell (cell 1) is a schematic map of the visited area, including an illustrative photo. In cell 2 is the description of the ‘strengths’ (S) of the area and the potentialities for sustainable actions based on field observations and interviews with stakeholders. In cell 3, there is a list of the ‘weaknesses’ (W) identified in the park and its surroundings; in other words, the existing pressures and threats. In cell 4 is a summary of the ‘opportunities’ (O) for actions to be considered in the management plan. In cell 5 is a description of the ‘threats’ (T) and risks resulting from human pressures, natural events and the physical and environmental conditions of the study area.

The field trips resulted in the elaboration of 19 SWOT matrices covering selected portions of the island (Figure 3). A sample of a SWOT matrix is exemplified in Figure 7. This example was selected because it represents the area that was affected by the natural disaster in Bananal community.

The rapid field diagnosis around the Bananal community identified some of the causes related to the catastrophic landslide. Among them are the disorganized occupation above the 40 m altitude and incorrect trail maintenance in steep area, including deforestation just above the Bananal community. The risk of soil erosion is due to the high inclination of slopes (above 45° angle) and soil fragility. The landslide that devastated the Bananal community is shown in Figure 8.

4.1. Local Consultations

The field diagnosis was complemented with information obtained from local consultations with stakeholders. Forty-four local consultations were carried out using an interview-guided approach (Kitchin & Tate 2000; Braun 2007b). This information was used in the SWOT matrices of each area visited (see maps in Figures 3 and 4). Local consultations were documented in a standard interview sheet, as exemplified in Figure 9.

The information obtained from interviews allowed not only to learn about the stakeholder’s perception of the natural environments of the island, but also to know how they could get involved in monitoring and management schemes of PEIG. The interviews also allowed to map several other issues such as the location of illegal hunting, the identification of old ruins, ancient trees and secret trails, including the ethology of certain animal species (e.g. monkeys and alligators) and the location of archaeological sites of the Sambaqui people (see item 2). As mentioned previously, the local consultations were also important to identify potential partners for the management plan in several communities of Ilha Grande.

5. Discussion

The diagnosis of a conservation area is relevant not only to have a general socio-environmental knowledge about the study area but also to understand what happens locally (Dudley 1994; Governo Brasileiro 2000; Hockings 2003). A good diagnosis also enables better monitoring and management schemes. The SWOT method was used in Ilha Grande in order to diagnose selected areas of the island.

The SWOT method is generally used to develop strategic analysis and planning in large multinational companies, including governmental institutions and regional development plans (Kotler 1999; Jones & Thompson 2000). The SWOT analysis provides the base
for forward planning (Hockings et al. 2000; Miltic et al. 2010). Some authors have adapted the SWOT method to develop strategic plans of conservation areas in different parts of the world (WWF 1999; Phillips 2000; Balram et al. 2004; Barros, Fischer e Associados 2005; Svolensk et al. 2008). As mentioned previously, the SWOT method has been used to analyse local socio-economic and environmental issues (e.g. condition of trails, soil erosion, community issues, illegal hunting, among others) and also to identify proposals for the management plan of the Big Island State Park (PEIG). Additionally, the SWOT diagnosis provided information to monitor and manage adjacent conservation areas of
the Ilha Grande (e.g. Environmental Protection Area (APA) of Tamoios, the Biological Reserve of Praia do Sul, the Marine Park, and the Sustainable Development Reserve (RDS) of Aventureiro). This has demonstrated that the SWOT method can be applied not only at the strategic level but also during the fieldwork at the local level.

It can be argued that to achieve rigorous environmental diagnosis the adaptation and/or combination of methods and information can provide overall better results for spatial
planning because it helps compensate the ‘analysis gaps’ of a single method (Eggenberger 1993). The adaptation of the SWOT method in Ilha Grande areas allowed crossing primary data from the field analysis with the information from local consultations with stakeholders (Figure 5).

The SNUC policy determines that all conservation areas in Brazil should have a conservation management plan. The SWOT methodology applied in Ilha Grande complies with this policy (article 14) regarding the development of a ‘diagnosis and planning’ of conservation areas. The SWOT methodology was positively tested and could contribute with the SNUC policy regarding the protection of other conservation areas in Brazil.

It is important to state that the survey developed did not exhaust all information about Ilha Grande because the fieldwork was limited to the areas accessed by existing trails and by motor boat (Figure 3). The remaining areas were not visited because of lack of accessibility, time, resources and logistics. Another point to take into consideration is that the information that was surveyed in the field was not the kind that requires sampling, laboratory tests and analysis (e.g. classification of soils, classification of water bodies and water quality, taxonomic classification of species, among others). The focus of the diagnosis was to identify physical, social and ecological issues for immediate planning (e.g. degradation of trails, human invasion in the park, localization of old trees and ruins, deforestation areas, exotic species, risk of landslides, among others). Further surveys should be developed in the island as part of the recommendations of the management plan.3

The final management plan of PEIG (INEA 2010a) included some of the recommendations put forward by the SWOT diagnosis exercise. The recommendations are mainly actions related to the maintenance of infrastructure and equipment, the protection of historical patrimony, including collaborative work with NGOs and governmental institutions in several areas such as environmental education and ecological monitoring, among others. Although certain recommendations were taken into account in the final plan, others were excluded due to institutional decision-making. Among them are the development of training schemes on permaculture and agroforestry with local communities, the development of sustainable housing schemes and the implementation of a small botanical garden for educational purposes.

The consultation with stakeholders was essential to learn more about relevant facts of the island for monitoring and management purposes, such as the behaviour of exotic species in the island (e.g. the Sagui-marron monkey that threatens most birds species and ecological control of the alligator community), including positive aspects, such as community developments (e.g. environmental education and recycling activities), illegal acts, among others. These points have been registered and mapped for future interventions by INEA and the forest police. Local consultations have also revealed important historical aspects described previously. Although relevant, the information provided by local population should be reviewed because in most cases the stakeholders consulted are laypeople with limited scientific knowledge.

One of the biggest challenges is to involve community in the sustainable management of conservation areas. The contact with local communities has provided the opportunity to identify potential partners to participate in specific actions in the island. Local interventions normally depend on volunteer work that requires small investments (e.g. environmental education, monitoring operations, ecological guides, among others).

In summary, each SWOT matrix contain synthesized information about the strengths of each location visited, the weaknesses that should be improved to conserve biodiversity, the
opportunities to develop sustainable actions and to involve local stakeholders, and also the threats that should be minimized through preventive/corrective measures. As mentioned previously, it is necessary to develop further surveys to investigate quantitative data (e.g. the number of endangered species, the identification of soil erosion spots, mapping the exotic species, soil sampling, among others). This should certainly complement the SWOT field diagnosis.

6. Conclusions

Important conservation areas such as Ilha Grande require profound understanding of the social-environmental complexities not only to carryout monitoring operations but also to develop long-term strategies for ecological sustainability. The development of rapid field diagnosis is an important tool for the management and monitoring processes of conservation areas. A realistic management plan should be permanently updated not only respond to socio-environmental changes but also to mitigate all sorts of problems that are common to conservation areas. However, as demonstrated in this paper there are important challenges related to the development and validation of rapid field diagnosis and consultation with stakeholders.

The research presented sought to describe an innovative methodological approach to survey primary information for the development of the management plan of Ilha Grande Park (PEIG). The SWOT method was used in Ilha Grande because of the great demand to diagnose selected areas for emergency purposes. Information collected in the field was organized into four SWOT categories: strengths, weaknesses, opportunities and threats. The categorized information should be presented in a clear way in order to avoid misinterpretation in the decision-making process.

Although the SWOT method has provided consistent information for decision-making, the analysis was limited to the areas visited in the field. Lack of time, resources and logistics did not allow surveys in other areas of Ilha Grande other than the ones visited. The data collected were not only restricted to what was observed/measured in the field (e.g. photo registration, key notes, altitude, directions and geographical coordinates) but also to the information obtained from interviews with stakeholders. In other words, the lack of sufficient time and detailed information can be considered a limitation of the SWOT approach in Ilha Grande. However, this does not invalidate the methodology because the purpose was to develop a rapid field diagnosis and not a detailed social-ecological survey of the island. Further surveys and detailed research should be developed for monitoring and management purposes.

The development of field diagnosis without the development of local consultations with stakeholders would narrow the social-environmental analysis of Ilha Grande. As mentioned previously, the combination of methods (field diagnosis, local consultation and participatory meetings) has provided coherent data for decision-making. The integration of local communities in the decision-making process is important to implement preventive measures in order to minimize the risk of ecological disasters such as the one that happened in the Bananal community.

In other words, local consultation with stakeholders was important to identify not only the potential partners for the PEIG management plan, but also to select the opportunities to involve local communities in environmental projects. For instance, the consultation with governmental stakeholders, such as the fire brigade and the forestry police, allowed...
on the one hand, the identification of the weaknesses of the administrative structure in the island and, on the other hand, the selection of strategic opportunities for institutional cooperation. However, not all the information obtained from local stakeholders can be considered academically acceptable because local community lacks scientific knowledge. Further investigation is necessary to verify accuracy of data collected.

The SWOT method has been used in Ilha Grande as a ‘rapid diagnosis tool’ instead of a strategic planning instrument. The local ‘SWOT rapid diagnosis method’ has not been used in other Brazilian conservation areas. This can be considered an innovation in the planning process of the management plan of Ilha Grande (PEIG).

Although recognizing the limitations of the SWOT method, the information surveyed was used as baseline to not only develop the master plan of PEIG but also to monitor several parts of the island. There is certainly much scope for further research on diagnosis methods of conservation areas in order to improve management procedures at the most applicable scale. More studies of this sort should provide a better understanding of how certain approaches are more effective than others. Although experience is still limited, the case study of Ilha Grande has proved that the SWOT method is effective to synthetize qualitative information for forward planning and institutional decision-making. Nevertheless, the method should be applied in different conservation areas to compare results for future improvements.

Notes

1 Brazilian biomes: Amazon Forest, Atlantic Forest, Caatinga (Dry Savannah) Cerrado (Savannah), Pampas (Grassland Plains) and the Pantanal (Wetland).

2 In Portuguese, Parque Estadual da Ilha Grande (PEIG).

3 According to Brazilian legislation, the survey of primary data such as the classification of soils, geologic mapping, identification and taxonomy of fauna and flora (among others) can be developed as specific programmes/projects of the master plan.

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