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GOVERNMENT OF THE STATE OF SÃO PAULO

Secretariat for Water Supply and Energy of the State of São Paulo—SSE

International Bank for Reconstruction and Development—IBRD

**ENVIRONMENTAL ASSESSMENT REPORT OF THE
PROJECT COMPONENTS**

Mananciais Project

June 18, 2007

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ACRONYMS AND ABBREVIATIONS

APA	Environmental Protection Area
BID	Inter-American Development Bank
BIRD	International Bank for Reconstruction and Development
CDHU	São Paulo State Housing and Urban Development Company
CETESB	Clean Environment Technology Company
COFIEX	External Financing Committee
CP	Counterpart
DAEE	São Paulo State Water and Energy Department
EMAE	Metropolitan Water and Energy Company
FECOP	State Fund for Pollution Prevention and Control
FPEDF	State and Federal District Participation Fund
FPM	Municipalities Participation Fund
GESP	Government of the State of São Paulo
ICMS	Tax on Circulation of Goods and Services
MA	SABESP Business Unit—Production
ML	East Business Unit—SABESP
MN	North Business Unit—SABESP
MS	South Business Unit—SABESP
ONG	Non-Governmental Organisation
PM's	Municipal Governments (Prefectures)
PMBM	Municipal Government of Biritiba-Mirim
PMC	Municipal Government of Cotia
PMD	Municipal Government of Diadema
PME	Municipal Government of Embu
PMEG	Municipal Government of Embu-Guaçu
PMG	Municipal Government of Guarulhos
PMIS	Municipal Government of Itapeverica da Serra
PMJ	Municipal Government of Jujutiba
PMM	Municipal Government of Mairiporã
PMMC	Municipal Government of Mogi das Cruzes
PMRGS	Municipal Government of Rio Grande da Serra
PMRP	Municipal Government of Ribeirão Pires
PMS	Municipal Government of Salesópolis
PMSA	Municipal Government of Santo André
PMSBC	Municipal Government of São Bernardo do Campo
PMSLS	Municipal Government of São Lourenço da Serra
PMSP	Municipal Government of São Paulo
PMSu	Municipal Government of Suzano
RMSP	São Paulo Metropolitan Region
SABESP	São Paulo State Water and Sewerage Company
SEE	State Secretariat for Energy
SERT	State Secretariat for Employment and Labor Relations
SET	State Secretariat for Transport Affairs
SH	State Secretariat for Housing
SJ	State Secretariat for Justice and Citizen Protection
SMA	State Secretariat for the Environment
SOC.CIV.	Civil Society
SADS	State Secretariat for Social Welfare and Development
SAAE	Guarulhos Autonomous Water and Sewerage Service
SANED	Diadema Water and Sewerage Company
SRHSO	State Secretariat for Water Resources, Sanitation and Works
SEMASA	Santo André Municipal Clean Environment Service
SERHS	State Secretariat for Energy, Water Resources and Sanitation

SS	State Health Secretariat
SSP	State Secretariat for Public Safety Affairs
TESP	State of São Paulo Treasury
UGP	Project Management Unit

EXECUTIVE SUMMARY OF ENVIRONMENTAL REPORT

1. INTRODUCTION

1. The aim of this Executive Summary of the Environmental Assessment Report on the Components and Actions of the Environmental Improvement Project of the Alto Tietê Headwaters (the Mananciais Project) is to present the key points of the Project as succinctly and objectively as possible. It is hoped that this Summary will provide useful background for the World Bank and environmental entities as well as for informing public discussion and debate.

2. The overall aim of the Mananciais Project is to contribute to the protection of the headwaters that supply potable water to the São Paulo Metropolitan Region (SPMR)—an area that is extremely short of water resources—by ensuring that the operational control of the headwaters is maintained. It is planned to achieve this by (i) disciplining the present and foreseeable human occupation of the headwaters areas ('territorial ordering/planning') and (ii) improving the quality of life of the population living in the headwaters area, especially through the provision of water supply, sewerage and related urban-environmental infrastructure, and improved housing and public spaces. These two indivisible objectives will be pursued on the basis of a series of interrelated actions.

3. The sustainability of the legally dominated Headwaters Protection and Recovery Areas (APRMs) is of crucial importance. Over the last few decades these areas have been negatively affected by various urban phenomena (slums, irregular settlements, land invasions, etc) and it is now clear that improvements in the standards of urban organisation and the quality of life of the local population will have a direct influence on the survival and sustainability of the headwaters. Such improvements will involve adopting policies which will enable people to access public water supply, sewerage and related services and to enjoy better living conditions—actions which are expected to reduce the negative impacts of pollution of the headwaters and at the same time stimulate social inclusion—thereby gradually but substantially altering the present problematical linkage between urban occupation and the overriding need to ensure that the primary purpose of the headwaters is maintained, *i.e.*, to supply potable water to the SPMR.

2. STRATEGY FOR ENVIRONMENTAL ANALYSIS OF THE MANANCIAIS PROJECT

4. The environmental analysis of the Mananciais Project is based upon two separate but complementary stages: (i) at the *preparation* stage of the Project an environmental analysis was carried out in accordance with IBRD environmental guidelines, based upon information contained in the conceptual studies of the proposed works; (ii) at the Project's *execution* stage, environmental studies on the planned works will be obligatorily conducted in compliance with national and state legislation, Brazil's environmental licensing laws and World Bank environmental guidelines. These will be based on the detailed information contained in the engineering designs that will be prepared for each sub-project intervention during implementation.

5. The studies and the corresponding environmental licenses for each sub-project intervention will be submitted to the IBRD as implementation advances, in accordance with the terms of the Loan Agreement, prior to the corresponding civil works being put out to tender.

3. LEGAL AND INSTITUTIONAL FRAMEWORK

6. The Mananciais Project conforms to national and State laws and norms regarding water resources, the environment, and land use/occupation, in terms of both the planning and management of land located within the headwaters protection areas and the various rules governing the environmental licensing of projects and civil works. In view of the considerable efforts made by the public authorities over the last 20 years to introduce territorial ordering/planning and to ensure the sustainability of the SPMR headwaters, compliance with all the legal requirements is essential throughout the implementation of the Mananciais Project—at the preparation stage and during/following execution—and all the relevant environmental licenses must therefore be obtained.

3.1. Compliance with National and State Legislation

3.1.1. Legal framework

7. Since its preparatory stage, the Mananciais Project has always complied with the conditions and requirements of the policies and laws related to environmental protection and land ordering/use in the SPMR headwaters areas. The following have been of particular importance: the City Statute (Federal Law 10.257/01); State Environmental Policies (State Law 9.509/97); State Water Resources Policies (State Law 7.663/91); the Headwaters Protection Law (State Law 9.866/97); State Laws 898/75 and 1172/76 disciplining land use for the protection of the headwaters, water courses, reservoirs and other water resources and setting out the boundaries of the APRMs; the Guarapiranga Specific Land-Use Law and its respective regulation (State Law 12.233/06 and State Decree 51.686/07); and, finally, the Municipal Master Plans and other local ordinances related to urban and territorial organisation. All the above-mentioned legal documents were analysed during the design and selection of the interventions and were given due consideration at the time the premises and strategies justifying and guiding the Mananciais Project were defined.

3.1.2. Institutional framework

8. During the preparation of the Mananciais Project, the State Secretariat for Water Supply and Energy (SSE) was responsible for coordinating the various studies and organisational tasks, as well as for consolidating the conceptual design of the planned components, sub-components and actions, and was assisted in these tasks by the 'Coordinating Council' comprising representatives of all the executing agencies of the Mananciais Project. The execution of the interventions, supervision of civil works and development of socio-environmental actions will be undertaken by the executing agencies through Local Management Units (UGLs), coordinated and assisted by a Project Management Unit (UGP) within SSE. Moreover, local communities, NGOs, universities, etc, will continue to be involved with Project follow-up and evaluation, especially through meetings in collegiate fora such as the Alto Tietê Basin Committee, the Alto Tietê Agency and SPMR's river basin subcommittees.

3.1.3. Legal and institutional framework for environmental licensing

9. As far as environmental licensing is concerned, the Mananciais Project is in conformity with national and state laws which define the rules and procedures for the licensing and environmental management of interventions and works. The most important of these are CONAMA Resolutions 01/86 and 237/97, SMA Resolution 42/94 (State of São

Paulo), CADES Resolutions 61/2001 and 69/2002 (Municipality of São Paulo), State Laws 898/75 and 1.172/76, the Guarapiranga Special Land-Use Law and its respective regulation, State Law 12.233/06 and, finally, State Decree 51.686/07—all based on the guidelines and criteria enshrined in Brazilian environmental legislation.

10. The State Secretariat for the Environment (SMA) is the licensing body for all the activities and sub-projects involving environmental impacts, with the exception of housing developments, which will be the responsibility of GRAPROHAB (also at the State level) and the projects within the Municipality of São Paulo which will be licensed by the SVMA through CADES and DECONT. Since the proposed works and interventions under the Mananciais Project are not yet sufficiently detailed to enable them to conform to current environmental licensing rules or to the requirements of the World Bank (given that the majority of sub-projects have not yet reached the concept or engineering design stages), the sub-project specific licensing requirements could undergo modifications after the licensing bodies have issued official definitions in connection with the corresponding works and interventions. Throughout the process of preparing and licensing sub-project interventions, public consultations are planned to be held in accordance with national and state environmental legislation requirements.

3.2. World Bank Safeguard Policies

11. The Mananciais Project has received a World Bank environmental Category “A” rating in accordance with the corresponding safeguard policies. The Mananciais Project triggers the following safeguards: OP 4.01—Environmental Assessment; OP 4.04—Natural Habitats; OP 4.11—Protection of Physical Cultural Resources; OP 4.12—Involuntary Resettlements; and OP 4.37—Safety of Dams. The following are highlighted in the context of the triggered safeguard policies:

- **Natural habitats (OP 4.04):** This safeguard involves the Category 1 and Permanent Preservation Areas (APPs) located along the banks of the reservoirs and water courses. These APPs contain a number of stretches of land that have been despoiled by urban occupation, especially by poorly-constructed, low-standard housing. The areas however also contain a number of ‘preserved’ zones, as well as a number of others that could be rehabilitated. The interventions will focus on relocating families and, following their relocation, on the recovery of the degraded local environments and landscapes. In the case of the partially-degraded areas, or those that are still preserved, the strategy will be to protect and preserve them through actions aimed at rehabilitation and the establishment of a number of parks (including linear parks on the banks of the Billings Reservoir).
- **Protection of physical cultural resources (OP 4.11):** In the area covered by the Mananciais Project no archaeological or historical/cultural sites have been identified that would justify special treatment at the stage of the Project preparation. In the unlikely event of materials and items of a scientific-historical interest being discovered, the pertinent national legal procedures will be followed, as well as the rules governing environmental licensing. All the instructions and rules covering the procedures are contained in the Environmental Construction Manual.
- **Involuntary resettlement (OP 4.12):** A Resettlement Policy Framework (RFP) has been prepared in accordance with World Bank guidelines and safeguards (OP 4.12). Individual Resettlement Action Plans (RAPs) will be prepared during Project

implementation, concomitant with the corresponding engineering designs for the intervention and based on the RFP, for each sub-project intervention that involves resettlement.

- **Safety of dams (OP 4.37):** The activities undertaken under the Mananciais Project will not interfere with the safety and operation of the dams used in the reservoirs. The de-silting operations coordinated by SABESP in the Paiva-Castro (Juqueri-Cantareira sub-basin) and the Isolina (in the Baixo Cotia sub-basin) dams, aim to increase the useful life of these reservoirs.

12. Negative environmental impacts are expected to be generated during the civil works construction stage-this may well be the case even when efforts are made to correct entrenched environmental degradation. Appropriate construction criteria and due procedures will be employed in accordance with the Environmental Construction Manual. The overarching environmental impacts of the Mananciais Project civil works interventions have been duly described in the Environmental Assessment Report, containing annexes in which the activities of the respective executing agencies are presented individually. Each annex lists a group of actions, studies and sub-projects aimed at mediating, attenuating and/or counteracting any *negative* impacts of the works and highlighting the expected *positive* outcomes. These actions are also presented in the respective annexes and the Environmental Management Plans (PGAs) of each executing agency.

4. DESCRIPTION OF THE PROJECT

13. The main objective of the Mananciais Project is to contribute to the protection of the metropolitan headwaters and, in parallel, to introduce territorial ordering and to seek to improve the quality of life of the low-income population living in the headwaters area. Given the characteristics of the 'intervention areas' targeted by the Mananciais Project, especially the Billings and Guarapiranga catchment areas (where the negative impacts of human occupation are most apparent), the Mananciais Project plans to undertake a wide range of integrated actions to expand and improve public infrastructure, to improve general social well-being, to preserve the environment, and to conduct technical studies related to water quality and the management of these sub-basins and headwaters. The specific objectives of the Mananciais Project are the following:

- Rectification of the main causes of pollution in the natural water bodies;
- Improvement of the standards of urban occupation;
- Improvement of the quality of life of the population and the attenuation of urban poverty;
- Improvement of the operational performance of public infrastructure services;
- Environmental protection and recovery/rehabilitation of the headwater areas;
- Containment of inappropriate human occupation, and efforts to promote compatibility between land uses and environmental requirements;
- Technical development of the water treatment process; and

- Integrated management of the catchment areas, to include the commissioning of technical studies to support this function.

14. All the Mananciais Project components, sub-components and actions are designed to reflect and respond to the above objectives. Preparatory work was coordinated by the SSE through a Project Management Unit (UGP) and involved a number of different bodies including the State Government, SABESP and representatives of the municipal governments from SPMR's headwater catchment areas. Furthermore, throughout the entire preparatory process, representatives of collegiate bodies and organised civil society were duly consulted.¹

15. The Project's 'Carta Consulta' (federal project approval document) was approved in May 2006 by the External Financing Commission (COFIEX) of the Federal Government's Secretariat for International Affairs.

16. The intervention areas of the Mananciais Project consist of the five headwater sub-basins (Guarapiranga, Billings, Alto Tietê-Cabeceiras, Juqueri-Cantareira, and Alto and Baixo Cotia) that provide potable water to SPMR. Development of the Mananciais Project will involve a series of short, medium and long-term structural and non-structural actions targeted on environmental and social objectives simultaneously, together with efforts to introduce 'territorial ordering' in these areas. The interrelated and integrated objectives reflect a need to address the acute problems in the SPMR headwater areas caused by inappropriate land use and human occupation, frequently involving people living in extreme poverty—problems which have, in turn, grossly undermined water quality in the five catchment areas/headwater systems.

17. Project execution will involve four borrowers (the Government of the State of São Paulo; the São Paulo Water and Sewerage Company, SABESP; and the municipal governments of São Bernardo do Campo and Guarulhos). All four borrowers will sign Loan Agreements with the World Bank. The municipal government of São Paulo will also participate in the implementation of the Mananciais Project with counterpart funding, but will not enter into borrowing arrangements with IBRD. The total cost of the Mananciais Project will be US\$292.3 million, with the four loans accounting for US\$129.0 million of this amount.

18. Project interventions comprise a multidisciplinary group of interventions under four components:

- **Institutional capacity building** (US\$32.95 million, including US \$12.88 million financed by IBRD). The aims of this component include improving the institutional and technical capacities of implementing and other agencies to enable them to coordinate, manage and ensure the sustainability of project interventions on a metropolitan-wide level. The agencies will be expected to contribute to the planning, management and monitoring of the proposed interventions, with particular focus on

¹ The discussions were initiated under the aegis of the Billings-Tamanduatei subcommittee shortly after the conclusion of the Guarapiranga Program, taking advantage of the evaluation of that project. A number of proposals emerged from these discussions for improving and continuing investments in the metropolitan headwaters areas which are now being proposed for roll out to all the SPMR headwater/river basins under the proposed Mananciais Project. From 2001, the discussions led to an agreement between the Sao Paulo State Government and the Japanese Policy and Human Resources Development Fund (PHDR) administered by the World Bank, involving the donation of funds for the preparation of the Mananciais Project.

territorial and urban ordering to ensure more orderly land use and occupation in the headwaters areas with a view to recovering and preserving the strategic water bodies. The component covers the following activities: (i) integrated management of land use/occupation and water resources; (ii) environmental and water quality monitoring; (iii) environmental education and activities related to social promotion and citizenship empowerment; (iv) project management, monitoring, evaluation and dissemination of information.

- **Urban integration** (US \$111.48 million, with US \$12.59 million to be financed). This component aims to improve the standards and lay-outs of urban occupation in the Project intervention areas and to improve the quality of life of the resident population, especially the low-income communities living in informal settlements. Activities under this component include: (i) slum urbanisation; (ii) improvement (urban rehabilitation) of irregular settlements; (iii) recovery of degraded areas and areas at risk from environmental and geotechnical hazards; (iv) involuntary resettlement; (v) preparation of housing plans; (vi) environmental and urban regularisation of settlements; and (vii) socio-environmental supervision for urban upgrading and housing interventions.
- **Environmental protection and recovery:** (US \$25.86 million, with US\$13.34 financed by the IBRD). This component aims to protect and restore natural habitats and sensitive/degraded areas in the Mananciais Project sub-basins, with a view to improving environmental quality generally. The component comprises the following activities: (i) revegetation and reforestation; (ii) urbanisation of public areas through the creation of green and leisure spaces for common use; (iii) the establishment of environmentally protected areas; (iv) rehabilitation and protection of reservoirs and water production systems; and (v) control and monitoring of hazardous substances transported within the region.
- **Integrated water supply and sanitation:** (US\$120.4 million, with US \$88.76 million financed by the IBRD). This component includes actions to reverse the main factors contributing to the pollution of the reservoirs and to expand water supply, sewerage and related services to the population. The activities under this component include: (i) improvements to the wastewater collection and treatment systems; (ii) improvements to the water supply systems; (iii) development of programs to monitor and reduce water losses in selected distribution networks; (iv) technical upgrading and improvement of water treatment processes; (v) upgrading the treatment and final disposal of sludges/wastewaters in the water treatment plants (ETAs); (vi) improvements to the systems for the collection and final disposal of solid wastes generated in urban areas; (vii) diagnostic studies to be conducted on illegal waste-dumping and to provide collection equipment for local government authorities; and (viii) preparation of integrated plans for managing solid wastes.

5. JUSTIFICATION AND CRITERIA THAT INFLUENCED THE MANANCIAIS PROJECT DESIGN

5.1. Area covered by the Mananciais Project

19. With a total area of 5,985 km², the Alto Tietê river basin covers a highly urbanised area containing 35 municipalities and a population of 17.7 million. The Headwaters Protection Areas (APRMs) represent approximately 54% of the total area of the SPMR (4,356 km² of the 8,051 km²) and 73% of the drainage area of the Alto Tietê basin. The

APRMs were created by State Law No. 1.17 2/76, which established their physical boundaries and set forth conditions, norms and land/occupation criteria in line with the environmental function of such areas. The APRMs currently contain 2.2 million inhabitants, with 76% living in the Billings and Guarapiranga catchment areas (conservatively estimated to be at least 1.7 million people²). From the economic and social point of view, the Alto Tietê catchment area is the most heavily industrialised and richest area in Brazil, containing key industrial, commercial and financial concerns of major importance to the country as a whole. The gross domestic product of the area in 2000 amounted to US\$99.1 billion—representing approximately 17% of Brazil's GDP and a per capita income of US\$5,557.

5.2. Water Availability and Water Quality

20. The Alto Tietê basin is characterised by a low-level of water availability vis-à-vis the substantial demands of the metropolis and the numerous ongoing conflicts over water use. The quantitative restriction on the amount of available water is due to the metropolitan region being located at the upstream reaches of the River Tietê, which flows towards the western extremities of the state of Sao Paulo away from the sea. In order to compensate for the water production deficit in the Alto Tietê basin, 31 m³/s are imported from the water source complex formed by the Piracicaba, Capivari and Jundiaí river basins, 1 m³/s from the Baixada Santista catchment area, and 0.5 m³/s from the Litoral basin – feeding the Cantareira, Guarapiranga and Rio Claro metropolitan water production systems, respectively. These inter-basin transfers represent 48% of the nominal capacity of the eight integrated water production systems (Alto and Baixo Cotia, Cantareira, Guarapiranga/Billings, Rio Claro, Rio Grande/Billings, Alto Tietê and Ribeirão da Estiva), which supply water to 99% of the population living in the Alto Tietê catchment area as well as satisfying 15% of industrial demand (factories and other commercial establishments supplement their requirements by drawing on groundwater sources).

21. The constraints imposed by the position of the Alto Tietê basin, together with the complexity of the hydraulic and hydrological regimes resulting from this catchment area's unusual spatial and urban dynamic, has had a significant impact on the behaviour and quality of the surface water bodies. Dense human occupation and the presence of major industries have caused major deterioration of the water quality in the metropolitan region, regarded in 2000-2005 by CETESB (the State Government environmental monitoring body) as one of the worst water quality situations in the entire state.

5.3. Evolution of Human Occupation

22. Approximately 37% of the Alto Tietê catchment area is covered by dense urban sprawl. Despite a decline in population levels over the last few decades in SPMR (in 1991-2000 demographic growth stood at 1.61% per annum), population numbers in the headwaters areas continue to expand at a considerable pace, especially on the city fringes—in contrast to the relative demographic decline in the main economic hubs of SPMR.

² The population projections in the present Environmental Assessment Report estimate for year 2021 a population of just over 2 million inhabitants for the sub-basins of the Billings and Guarapiranga. These projections are currently under revision, being based upon the most recent updates undertaken by the PIR/SABESP and the SEADE Foundation.

sources) in the event of the need to locate substitutes for the SPMR headwaters that are currently at risk;

- The dramatic urban scenario characterised by disorderly and intensive population growth in the area, very low average family incomes, defective housing standards, and a significant lack of public services and infrastructure;
- Public interest in preserving the relevant water bodies and the wider objective of improving the quality of life for people living in the SPMR;
- Given the size of the areas and the many and varied responsibilities involved, the need for an inter-institutional and multidisciplinary approach, with joint efforts required by a wide range of bodies, and including the cooperation of different government secretariats, cooperation between state and municipal governments, etc;

25. The lessons learned during the Guarapiranga Program executed in 1993 -2000 pointed to the crucial need to forge a link between *water resources* and the *urban land use*, based on a strategy of providing ongoing investment in urban infrastructure and environmental preservation.

26. The areas of main focus of the Mananciais Project are the Billings and Guarapiranga sub-basins, both characterised by extreme levels of urban poverty, high population density, environmental degradation and pollution. The Mananciais Project acknowledges that the land use and occupation problems derive from a regional and metropolitan dynamic, reflecting a combination of public investment and private market factors. The type of disorderly human occupation affecting the reservoir areas is directly related to the evolution and distribution of income, although this involves macroeconomic issues at a national level—obviously outside the remit of both regional and local governments.

27. The areas targeted by the Mananciais Project are well-established urban reservoirs of major importance for the continued supply of water to the metropolitan region. The vicinity of the reservoirs is now occupied by a large number of predominantly low-income settlements and slums (although a number of more upmarket developments also exist). The worst impacts on the reservoirs (particularly in the case of the Guarapiranga—and now also for Billings following the introduction of new rules for pumping water to the reservoir from the Pinheiros River) are caused by the wastewater and diffuse pollutant loads originating from the thousands of dwellings throughout the reservoir drainage areas which suffer from completely inadequate urban and/or water supply, wastewater and related urban-environmental facilities and structures (such as drainage, solid waste management, etc).

28. The multidisciplinary concept of the Mananciais Project addresses a number of key questions. The experience of the Guarapiranga Project is largely replicated, meaning that part of the budget of the Mananciais Project will be earmarked for expanding the water supply and sewerage infrastructure (particularly wastewater systems), slum urbanization and urbanistic improvements for low-income settlements. These actions will impact directly on the quality of life of the population and, at the same time, help to reduce the pollution loads entering the reservoirs by intercepting wastewater or by improving the collection and final disposal of solid wastes. Moreover, the Mananciais Project will invest in environmentally protected areas such as parks, linear parks (running alongside the reservoirs and water courses) and other public leisure areas of social/community value.

29. In addition to the above interventions, the Mananciais Project will also seek to undertake innovative structural and non-structural actions, particularly those related to the management of the areas concerned. Some of these actions are derived from exposure by the public authorities to the invaluable experience of the Guarapiranga Project, as well as from more general lessons learned in recent years in the course of responding to infrastructure demands in densely populated, low-income, and hitherto irregular, disorganised areas.

30. In parallel with the expansion of wastewater systems, one of the decisions adopted by the Mananciais Project will involve establishing a series of treatment devices in creeks/tributaries before they flow into the reservoirs. This measure, already planned for a number of the catchment areas, clearly reflects the need to address the headwaters pollution problem seriously—quite simply, more needs to be invested now, both quantitatively and qualitatively, than in any other parts of the metropolitan area that are not actively engaged in producing water for public supply. It is also worth noting that in the Billings and Guarapiranga reservoir basins, and also in part of the Alto Tietê/Baixo Cotia sub-basins, the traditional domestic sewerage structures are even less efficient than usual, resulting in residual effluent loads that create major hazards in the water bodies. It has been observed that (i) families are less inclined to connect to sewerage systems, and (ii) a more complex interrelationship exists between the wastewater and microdrainage systems (both inside dwelling units and in the system for which the public authorities are directly or indirectly responsible). Similarly, experience and surveys indicate a substantial urban runoff issue which calls for specific treatment as an urgent priority.

31. The Mananciais Project also aims to invest in wastewater infrastructure systems that have already been established, since the problems that have been detected in these systems interfere in the day-to-day operation of the sewerage networks, trunk collectors, lifting stations and interceptors. The catchment areas require a range of design and operating standards to be adopted that will improve the outputs of the systems without undermining the aforementioned need for additional structural works to be undertaken for water pre-treatment (i.e. in the creeks).

32. Finally, the Mananciais Project plans to upgrade the water treatment works (ETAs), drawing on the studies and lessons learned from the Guarapiranga Project.

33. The strategy of the Mananciais Project is firmly based on the following:

- Joint participation by a number of different state and municipal public entities with a remit to address the multifaceted aspects of urban problems and water quality;
- Integrated management of the headwater areas to ensure application of the laws that specifically concern water matters and the river sub-basins;
- Public investments to be made in sewerage, drainage and solid waste infrastructure;
- Urbanisation of certain settlements by addressing directly the problem of 'informally' occupied land;
- Providing structures to pre-treat water bodies by controlling urban diffuse loads and effluents not collected by the conventional wastewater systems;

- Investments to be made in technical improvements with a view to upgrading the water treatment stations in order to raise their capacity to deal with critical situations affecting raw water quality.

34. The Mananciais Project acknowledges the metropolitan-wide importance of the headwaters issue. An overarching strategy of the Mananciais Project is to foster institution building, within the confines of the particular type of federalism such as exists in Brazil, and to construct a legal/judicial framework that will bolster cooperation among the various state and municipal stakeholders by applying a series of jointly approved rules. By agreeing on an appropriate distribution of responsibilities, the Mananciais Project will also help to overcome problems caused by the absence of a well-defined hierarchy of normative and executive powers in large metropolitan regions such as São Paulo.

35. Giving the complex situation faced by the Mananciais Project, a broad range of interventions has been planned which will reflect an equally broad involvement and distribution of executive responsibilities.

6. ENVIRONMENTAL ASSESSMENT

6.1. Main Benefits and Results of the Project

36. The principal environmental benefits and results expected from the Mananciais Project are associated with the maintenance of the operational control of the metropolitan headwaters, with a view to ensuring the continuation of the public water supply, and at the same time to improving the quality of life of the population living in the targeted areas.

37. The key specific benefits and results of the planned interventions are:

- The reduction of pollution loads flowing into the water bodies and reservoirs and the maintenance of water quality, bearing in mind the projected population growth in the area. The reduction of pollution will be measured by employing environmental and water quality monitoring indicators. The following initiatives are closely related to this particular intervention:
 - Implementation of the environmental improvement system, especially in the Billings and Guarapiranga catchment areas, through establishing systems for collecting and treating wastewaters and providing for adequate disposal of solid wastes. Furthermore, to effect improvements to, and strict monitoring of, the water quality of the tributaries and reservoirs by reducing the amount of organic loads and quantities of nutrients entering the water bodies.
 - Slum urbanisation, rehabilitation of irregular settlements, removal and resettlement activities in the Guarapiranga, Billings, Juqueri-Cantareira and Alto Tietê catchment areas. This initiative will include improvements to the water supply, drainage, wastewater, garbage collection, etc, as well as geotechnical containment measures and road/access paving improvements, in a major effort to ensure better environmental quality (particularly focused on better monitoring of water pollution and the causes of environmental degradation).

- As a result of the interventions designed to improve the coverage and efficiency of the garbage collection services, the diffuse pollution loads flowing into the tributaries and reservoirs will be reduced. In the Guarapiranga sub-basin the present dumpsites can be rehabilitated and/or made into sanitary landfills according to PDPA guidelines. This will produce a significant decline in the pollution loads originating from waste and leachate permeating into the ground.
- Improvements in environmental quality and the quality of life of the resident population will result from:
 - Improved public services and infrastructure for the population as a result of the physical urbanisation of slum areas and irregular settlements, removal and resettlement, producing a better quality of life for the residents. These effects will be measured on the basis of 'customer satisfaction' and opinion polls.
 - Improvement of urban housing standards and financial and socio-environmental appreciation of the occupied land and properties, which will lead to the incorporation of low-income areas into the fabric of the 'normal' city. The impacts of this process will be analysed by socio-economic research methods (hedonic pricing methods, etc).
 - The resettlement activities will reduce or at least eliminate environmental and geotechnical risk situations (homes perched on dangerous slopes, housing occupying areas of preservation alongside reservoirs and other water bodies, etc) and will assist in the recovery of degraded areas, thereby improving both the quality of the water and that of the lives of the people benefiting from resettlement.
 - The establishment in the Grajaú neighborhood of the Citizen Integration Centre (CIC) will directly benefit part of the population living in the Billings and Guarapiranga sub-basins. The CIC Fixed Post (Posto Fixo) at Grajaú also aims to prevent and resolve social conflicts at source by providing services to the population such as: the issuing of official documents (Compulsory Identity Card, Professional Employment Document, miscellaneous certificates, etc), consumer protection (PROCON); a special Civil Claims Court; family legal assistance; a workers' advisory facility; community policing and police station; a social guidance and assistance unit; counselling for young people released from FEBEM (the young offenders' institution) and their families; leisure and cultural activities, etc.
 - It is expected that the civil works connected with parks, the revitalisation of leisure areas and the recovery of degraded areas will help to avoid unauthorised 'invasions' and occupations and will allow the introduction of more disciplined land occupation and the protection of the environmentally sensitive areas of importance to the sustainability of the headwaters. Completion of the actions concerned with re-greening and tree-planting will lead to substantial environmental improvement in these areas, particularly in the Category 1 areas and APPs on the banks of the Billings and Guarapiranga reservoirs.

- Recovery of the degraded areas will reverse the advanced stage of deterioration of the natural resources, particularly on the banks of the Billings (the arms of the Cocaia, Bororé, Lavras, Alvarenga, etc) where accumulated domestic garbage and rubble will be removed, thereby improving the topography of the areas as well as protecting the banks of the various creeks.
- Recreational and leisure activities will be considerably improved for the benefit of people living in the slums and irregular settlements (by installing public squares and leisure areas), and along the banks of the reservoirs. Sailing and other water-based sports (which are particular intensive on the two reservoirs) will certainly benefit from improved water quality and the reduction of macrophytes and other aquatic plants.
- Improvement of the technical and institutional capacities of agencies and others dealing with environmental and territorial management will result from the implementation of Environmental Development and Protection Plans (PDPAs) for the sub-basins covered by the Mananciais Project. Juridical and institutional development will include progress on the approval and implementation of specific land-use legislation related to the PDPAs. The actions concerned with strengthening institutional, technical, technological and management capacity (including environmental monitoring and inspection and enforcement of the measures governing land use and occupation) will involve liaison between the different agencies responsible for actions undertaken within the headwaters areas. This will lead to progress and improvements in the management of the catchment areas (through updating of the PDPAs, working with Information Systems and mathematical models for correlating land use and water quality, master plans, municipal legislation, etc). The following are also planned: the training of technical staff, acquisition of new technical equipment, dissemination of information, introduction of environmental education, and the undertaking of a wide range of activities aimed at improving knowledge about the headwaters.

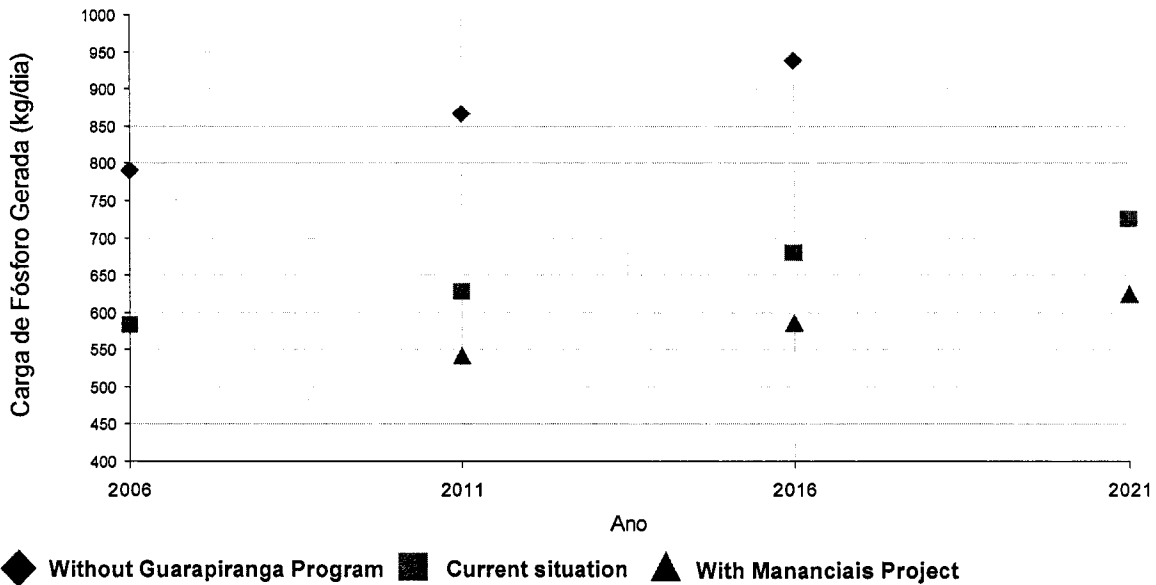
38. From the point of view of the Project benefits on water quality, it is worth highlighting the projected phosphorus loads likely to be generated in the period 2006-2021 (see Figure 0.2 below). In this diagram, three different scenarios are presented (commented on in the Environmental Assessment Report) which represent the *current* situation, the situation *without* the predecessor Guarapiranga Project, and the situation *with* the Mananciais Project. All the values were calculated by using the MQUAL 2.0 model, employed to establish the correlation between land use, pollution loads generated, and water quality.

39. The amount of phosphorus generated in 2006, considering the present population and wastewater infrastructure, is about 580 kg/day. This is 27% less than the approximately 800 kg/day amount expected (for today) if the Guarapiranga Project had not been executed. For year 2021, the forecast, based on the present situation, is 725 kg/day, which amounts to 275 kg/day less than if the Guarapiranga Project had not been undertaken, compared with a load of 625 kg/day that would be generated assuming the Mananciais Project were implemented.

40. The scenarios presented in Figure 0.2 could vary in the event of alterations in the operational standards of the water and wastewater systems or if further population growth and density increase occur in the irregular settlement. Considerations such as these would almost certainly alter the shapes of the pollution curves and interfere with the future scenarios

arising from execution (or simulated non-execution) of the Guarapiranga Project or the Mananciais Project.

Figure 0.2. Evolution of Phosphorus Loads Generated in the Guarapiranga Basin



41. The investments in water treatment in the Alto da Boa Vista ETA, as well as the dilutionary effects of the reversions of the Taquacetuba and Capivari/Monos on the Guarapiranga reservoir, will contribute to ensuring Guarapiranga's continuing use as a raw water body for potable supplies despite the phosphorus load that is currently generated being almost double that estimated at the time that the Specific Land-Use Law for this headwater was elaborated. Failure to have implemented the Guarapiranga Project would certainly have led to a far worse situation in terms of its pollution than that observed today.

6. 2. Main impacts of the Project

42. The environmental assessment describes the positive and negative impacts of the Project interventions and the mitigating measures identified in the form of a series of annexes, prepared according to the respective executing agencies. The agencies include the following: (i) the Government of the State of Sao Paulo (SSE, SMA and CDHU); (ii) the Sao Paulo State Water and Sewerage Company (SABESP); and (iii) the Municipal Governments of São Bernardo do Campo, Guarulhos, and Sao Paulo. The following table provides details of the main impacts of the Project.

Table 0.1. Summary of environmental impacts resulting from the physical interventions of the Project

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<p>1) Management tools (support, follow-up, monitoring and implementation) and strengthening of management systems in the intervention areas</p> <p>Works planned:</p> <ul style="list-style-type: none"> • Citizenship Integration Center, Grajaú (Guarapiranga) • Establishment of the Environmental Education Reference Center (Guarapiranga and Billings) • Civil works connected with the establishment of Ecology and Citizenship Promotion Centers 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • improved environmental and social quality • improved cleanliness and elimination of contaminants in the surrounding areas (CIC—<i>Reciclagem de Atitude</i> Project etc.), • reduction of visual pollution and degraded areas <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> • improved access for citizens (especially those in the lower income bracket) to the justice system and other public services; • enhancement of community forms of organisation • transformation of urban space resulting in value appreciation • improvement of community education • improved quality of information and social assistance • improved security (Community Policing) • number of socio-cultural events increased and opportunities provided for improving social contact and well-being • direct/indirect jobs and income generated by the civil works • increased awareness by the population of the need to protect the headwaters 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • accumulation of solid residues and effluents arising from the construction sites • silting up of downstream areas (caused by civil works) • noise and atmospheric pollution (dust and particles) • vegetation removed to make way for civil works <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> • discomfort for the population residing in the vicinity of the works (accessibility problems, etc.) • during operation of the CIC, intense movement of heavy vehicles and people causing discomfort to the inhabitants of the surrounding area, as well as causing local traffic congestion; • speculation and rising prices related to properties earmarked for commercial/ services purposes near to the CICs

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<p>2) Urban restructuring and recovery</p> <p>Works planned:</p> <ul style="list-style-type: none"> • Civil works targeted at slums urbanisation and urban revitalization (Guarapiranga and Billings) • Relocation of families from the category 1^a areas (Grande Alvarenga) • Rehabilitation works in the category 1 areas vacated as the result of relocation of families (Grande Alvarenga) • Urban and environmental upgrading works in the settlements • Construction work connected with the new Housing Units (<i>Unidades Habitacionais</i>) 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • better water quality in the creeks, canals, etc resulting from the removal of wastewaters and pollution loads (from the target location and downstream areas) • improvement of environmental health conditions • reduction of pollution and other factors causing degradation of local flora and fauna • protection and recovery of Category 1 areas and APPs (particularly on the banks of the Billings and Guarapiranga reservoirs) • improvement and monitoring of water run-off and drainage to avoid accumulation of water and garbage • elimination of geotechnical and environmental risk situations <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> • improvement in accessibility, habitability and security and more opportunities provided for social contact • improved garbage collection system as a result of better access to localities that were previously not served • improved sanitary conditions and quality of life for the population • reduction of contamination and waterborne diseases caused by wastewaters and a concomitant reduction in health costs • improved potable water quality and distribution, with better control over leaks) • reduction of insects and vectors attracted by accumulated water and garbage • territorial and urban ordering, with consequent improvements in living standards • property price appreciation in the target areas and surrounding neighborhoods 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • Soil run-off into the water courses undermining water quality during the civil works phase; worsening air quality (dust and particles); accumulation of garbage and rubble causing visual pollution in the streets; vegetation removed or flattened to make way for streets/roads • obstruction of the drainage networks by soil, garbage or rubble affecting the water run-off system <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> • discomfort for pedestrians and local people and restricted access for vehicles during the works phase (given the narrow width of the alleyways in the slums) • noise and vibration experienced during the works phase caused by earthmoving equipment and other machinery • bad odors experienced during the construction works from the wastewater networks and from pollutants converging on certain points (before the interconnections).

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<p>3) Environmental Preservation and Recovery actions</p> <p>Works planned:</p> <ul style="list-style-type: none"> • civil works aimed at urban revitalisation and recovery of degraded areas (Guarapiranga, Billings and Alto Tietê) • works connected with the establishment of parks (Parque Nove de Julho—Guarapiranga; Linear Parks—Billings; Ribeirão Pires and Rio Grande da Serra Parks) • revegetation of the banks of the Billings Dam • rehabilitation of degraded areas and urban revitalisation • construction of plants for removal of pollution loads (Guarapiranga, Billings, Alto Tietê, Juqueri Cantareira and Alto and Baixo Cotia) • establishment of wetlands in the watermeadow of the River Parelheiros / Itaim • Guarapiranga catchment area desilting of the Isolina Superior (Cotia) and the Paiva Castro (Cantareira) reservoirs infrastructure for applying algicides in the Paiva Castro Reservoir 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • reduction of the pollution loads flowing into the Guarapiranga, Billings, Taiaçupeba and Paiva Castro Reservoirs (including reduced nonpoint loads) • recovery and restoration of the ecological functions of the Category I areas and the APPs (Permanent Preservation Areas) in order to ensure improved environmental quality • creation of environments to assist maintenance of the biodiversity • the value of the socio-environmental resources of the catchment area acknowledged and more community awareness regarding sustainable use of the headwaters areas • improved aesthetic and environmental aspects of the landscape • ecological equilibrium achieved with the extension of permeable green areas which contribute to minimising the effects of flooding in the rainy seasons and improving the local environment and ecosystem • recovery of the degraded areas with a view to ensuring balanced natural conditions in the affected areas • reduction and/or elimination of environmental degradation (erosion, pollution, etc.). • elimination of geotechnical and flooding risks by undertaking civil works related to geotechnical consolidation, the construction of channels (to aid water flow in the creeks) or straightening of the banks of the creeks <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> • modification of the present uses of the reservoir banks leading to improved quality of life of the population • income and direct/indirect jobs generated during the works stage 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> • Soil run-off into the water courses undermining water quality during the civil works stage • degraded air quality (dust and particles) during the works phase due to presence of heavy earthmoving vehicles and other machinery • garbage and rubble accumulating on the streets, and effluents from the construction sites causing problems, including visual pollutionsediments, manure and fertilizers reaching the public roads/streets, drainage networks (as the result of tree-planting in the urban areas) or the Billings dam (resulting from revegetation work) in the course of planting in the urban area (e.g. sidewalks and squares) and in category 1^a areas—APPs, causing water quality degradation as well as having negative effect on environmental quality <p><u>Socio-economic context:</u></p> <ul style="list-style-type: none"> • social discontent arising during the containment works (recovery of degraded areas with possibility of provisional relocations) • discomfort caused to residents and pedestrians and restricted vehicle access during the works phase <p>noise and vibration during the works phase, caused by earthmoving equipment and other machinery that could affect the structure of properties in the affected area.</p>

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<ul style="list-style-type: none"> • civil works to be undertaken to construct parks in the vicinity of the Paiva Castro (Sistema Cantareira) and Isolina (Sistema Cotia) reservoirs • treeplanting in the Grande Alvarenga urban areas • civil works in Grande Alvarenga to urbanise and revitalise public areas and to construct leisure facilities for community use • establishment of parks in the Headwaters Protection Area—Grande Alvarenga • revegetation of the banks of the Billings Reservoir in the 50 metre wide buffer strip and in the inhabited areas—Grande Alvarenga works to rehabilitate degraded areas—Grande Alvarenga 	<ul style="list-style-type: none"> • improvement of human and environmental health conditions • urban improvements and property price appreciation in the areas of intervention • socio-environmental improvement and recreational and leisure areas extended (squares, green areas accessible to the public, etc.) • improvements in social well-being and more social contact leading to lower levels of urban crime • residents encouraged to feel that they belong to their neighborhoods and to the city, thereby creating bonds of affection for the area • possibility of creating an integrated system of parks and green areas for leisure, etc in the headwaters area • acknowledgement by the local population that public spaces contribute to environmental balance (producing good prospects for the longer term sustainability of the interventions and appropriate maintenance and care of the equipment/installations provided for use by the public) 	

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<p>4) Environmental clean-up actions Works planned:</p> <ul style="list-style-type: none"> Transforming dumpsites into sanitary landfills in the municipality of Embu-Guaçu) Rectification of the clandestine solid waste dumps in the Billings catchment area Debris retention system to be installed at the Alto da Boa Vista Water Treatment Station (ETA)—Guarapiranga Reservoir Fitting of tubular modules in the decanters; sludge removal from the ETAs; installment of lime storage facilities and wash water recycling systems Expansion of the wastewater systems (networks, collectors, etc.), enlargement and operational upgrading of the Mairiporã ETE (elimination of wastewater leaks, etc) Expansion of, and improvements to, the water supply systems (reservoiring, distribution networks, etc) in the Shangri-la and PAT Prosnear sectors 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> significant reduction of the pollutant loads in the creeks with a reduction in pollution levels in the reservoirs, resulting in improved quality of water for public consumption (following the construction of water supply and wastewater infrastructure) improvement of environmental and social quality in the areas situated downstream from the nutrient removal plants reduction of visual pollution, odors and other factors impacting negatively on the water resources of the targeted areas improvements in physical, hydrological and hydrodynamic conditions in the reservoirs, resulting in better operational conditions and increased water production capacity in the sub-basins targeted by Project actions removal of inert sediments and/or organic matter causing problems for water capture and environmental equilibrium better control of algae blooms with improved application of algicides increased prospects for rehabilitating aquatic life in the watercourses and improving the ecological conditions necessary for maintaining biodiversity in the reservoirs and contributing to environmental balance less likelihood of aquatic and macrophyte plantlife proliferating with the attendant health risks caused by insects and vectors <u>Socio-economic impacts:</u> improvement of environmental conditions and water quality (correct management of leachate and reduction of contamination by irregularly dumped waste) 	<p><u>Physical and biotic impacts:</u></p> <ul style="list-style-type: none"> accumulation of solid residues and effluents arising from the construction sites affecting the landscape and water quality solid wastes from the construction sites silting up of parts of the downstream area noise and atmospheric pollution (dust and particles) cause by earth moving, trucks , heavy vehicles and other machines vegetation covered over on the banks of the creeks and landscape re-shaping as the result of construction and channeling work works causing risk of sludges entering the creeks unless appropriately removed and transported to landfills or other disposal areas (re: the nutrients removal plant) geotechnical risk of collapse and geological risk of contamination (re: remedial work on the Alvarenga dumpsite and construction of the Embu-Guaçu sanitary landfill) degradation and contamination of the soils caused by wastes in the disposal areas (re: landfills) interference with the aquatic fauna (fish and benthonic organisms) caused by removal of sediments from the bottoms of the Isolina and Paiva Castro reservoirs temporary increase of suspended solids and disturbance of organic material (as the result of

PROJECT COMPONENT	POSITIVE IMPACTS	NEGATIVE IMPACTS
<ul style="list-style-type: none"> Remedial works to rehabilitate the Alvarenga dumpsite area (<i>Lixão do Alvarenga</i>) 	<ul style="list-style-type: none"> improved appearance of the landscape and better air quality reduction of scavenging on the dumpsites and recovery, maintenance and monitoring of the physical installations of the landfills aimed at controlling and eliminating sources of ground contamination and water pollution reduction of operating costs and expenditure on chemicals to control algae florations (algicides used in the reservoirs and other products for treating raw water) direct/indirect jobs and income generated during the works phase improved human and environmental health alternatives created for the appropriate and controlled management of sludges from the ETAs targeted by the project (ETA ABV, Rio Grande, Taiacupeba, etc.) improved quality of life and social contact resulting from better sanitary conditions (following the removal and treatment of wastewaters) public water and wastewater services improved, particularly in the low-income areas (slums and irregular settlements) reduction of infant morbidity and mortality rates, generating savings on health and medical costs reduced risk of contaminated fish and less likelihood of fishermen and other users of the reservoirs, watermeadows and rivers (children, sports enthusiasts, swimmers, etc) being exposed to waterborne diseases investments attracted to the region by new opportunities in the services area price appreciation of urban land improvement in water production and distribution operating conditions and the wastewater systems improved through technical upgrading (stemming overflows, and repairing defects in the systems, etc) 	<p>dredging sediments from the bottoms of the reservoirs) affecting water quality</p> <ul style="list-style-type: none"> generation and accumulation of solid residues (sludge) as the result of dredging sediments from the bottoms of the reservoirs, causing nuisance odors and attracting insects and vectors unless the sludges are correctly collected and taken away during the works, the risk of sludges entering the creeks unless adequately disposed of (re: the Mairiporã ETE) <p><u>Socio-economic impacts:</u></p> <ul style="list-style-type: none"> comfort and social wellbeing of the population living in the vicinity of the civil works disturbed by limited accessibility increased operational costs due to need to use chemical products, to remove and transport sludges, costs of electricity etc. inconvenience caused to pedestrians and local vehicle traffic by modifications to the access routes caused by the civil works being undertaken possibility of work-related accidents need for tipping areas and transport of surplus materials increased operational and monitoring costs during the landfill operational and maintenance phase

7. ALTERNATIVES FOR ADDRESSING THE WATER SUPPLY PROBLEMS IN THE SPMR

43. With the aim of contributing to a more wide-ranging environmental assessment, the present document examines, in addition to the Mananciais Project, other possibilities for confronting the problems associated with the supply and distribution of water in the SPMR, as follows:

- *The possibility of tapping underground water by subtracting from wells and aquifers in the SPMR.* Despite this being a relatively inexpensive alternative (low maintenance abstraction of good-quality raw water), sustainable exploitation of aquifers can be constrained by two factors: the amount of water extracted cannot exceed the re-charging, and the flow capacity of the wells, which should be capable of ensuring an adequate supply from a reasonable depth. Other limitations include (i) the possibility of impacts on the surface water courses by limiting their source inflows; (ii) difficulties in establishing a safe yield caused by uncertainties associated with the characteristics of the aquifer, particularly its re-charge capacity; (iii) improper exploitation of the wells, thereby increasing the costs of obtaining the water; (iv) the existence of a large number of wells with water at lower levels, whose handling or centralised control could be difficult and costly in an area as large and diversified as the SPMR; and (v) problems caused by the leaching of contaminated water at the deeper levels of the aquifers as the result of deficient monitoring and operation.
- *Tapping water availability in more distant catchment areas not subject to human occupation as the result of urban sprawl.* In the event that the current water production systems do not benefit from improvements in their operational control and/or in the event of an abrupt decline in water quality in the SPMR headwaters, the need exists to anticipate using the water available in the river basins neighboring on the Alto Tietê, such as the Alto Juquiá, Rio São Lourenço, Paraíba do Sul, Médio Tietê and Ribeira do Iguape. This process would encounter a number of difficulties, including the problem of obtaining permission for rights of use and the high costs (and inevitable social and environmental impacts) involved in the implementation and operation of the systems. It has been estimated that the costs could exceed R\$ 6 billion, in addition to substantial operating costs amounting to approximately R\$ 657 million per year.
- *The viability of promoting the removal of a substantial part of the population living in the headwaters catchment areas with the aim of restricting the further spread of the built-up area to these locations.* This type of solution suffers from severe limitations, particularly: (i) the requirement for large areas to receive the 'transferred' families; (ii) difficulties likely to be encountered by the public authorities to mount an integrated resettlement exercise of this size; (iii) the high costs of the exercise, estimated at between R\$11 and R\$15 billion; (iv) juridical-institutional problems related to land ownership legalisation, particularly in cases where property and land regularisation processes are underway.
- *Direct actions on the rivers and creeks flowing into the headwaters reservoirs and the adoption of more sophisticated water treatment techniques:* These measures demand a systemic approach and cannot be therefore viewed as isolated solutions. The Mananciais Project envisages such actions (wetlands, pollution load removal plants, improved water treatment technologies, and sludge/wastewater removal from the

ETAs, etc) as a complementary solution to the planned interventions, bearing in mind their important role in reducing pollution loads and the need to be consistent with the remaining actions aimed at providing water and wastewater infrastructure and slum urbanisation. The direct interventions in the water bodies do not envisage substituting the collection and disposal of wastewaters which are crucial for improving the health and quality of life of the resident population. The main objective is to ensure the improvement of the quality of the water bodies by employing complementary technical methods.

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1. Actions and measures included in the EMP

44. The Environmental Management Plan (PGA) contains a series of preventive, mitigating and compensatory measures to counteract the possible negative impacts that have been identified, given that the main thrust of the Mananciais Project concerns socio-environmental recovery while correcting and mitigating the many problems and vulnerable situations identified.

45. The actions of the PGA are therefore complementary to the Mananciais Project components—all the mitigating actions and measures planned in the context of the Mananciais Project were included in the Project's individual component parts. The following is a summary chart of PGA actions. The costs involved in PGA/mitigating measures are included in the budget of the Mananciais Project components. The details of the individual PGAs for each executing agency are presented in Annex I to VII of the EIA report.

Table 0.2. Summary description of programs, sub-programs and projects comprising the Environmental Management Plan

Executing entity: SSE –Secretariat for Water Supply and Energy of the State of São Paulo	Actions included in the PGA	Values* (US\$ millions)
<p>Programs</p> <p>Support, follow-up, monitoring and implementation tools (management)</p>	<p>Technical Support for the operation, integration and updating of the management instruments (GIS and PDPA), monitoring of land use and occupation and steps to ensure that land conforms to current legislation (Itapeerica da Serra, Embu and Embu-Guaçu); Citizenship Integration Center (CIC); conceiving, developing, structuring and providing the institutional framework for the technical tools required to ensure support for managers in the local municipal administrations located within the headwaters areas of the Juqueri-Cantareira (São Paulo, Guarulhos and Mairiporã), Billings (São Paulo, Santo André, São Bernardo do Campo, Diadema, Rio Grande da Serra and Ribeirão Pires), and Juqueri-Cantareira (São Paulo, Guarulhos and Mairiporã) catchment basins; environmental education, monitoring, technical and operational support following the conclusion of the civil works and follow-up with the communities post-occupation; project management; studies undertaken on the user and beneficiary population, including sampling survey applied to all 5 catchment areas covered by the programs; mobilization and support actions related to projects carried out by civil bodies; management system operation; information network in support of management; technical conception, structuring and establishment of the information network in support of management; public dissemination of management system; annual international seminars to be held on water resources and urban development; independent environmental audit; upscaling economic activity, entrepreneurship and social inclusion; development program focused on compatible economic activities; employment generation and revenue to be generated for directing to environmental protection; management of the Alto Tietê Headwaters Project interventions.</p>	15,110.92
Urban restructuring and recovery	Establishment of areas for community use—recovery of degraded areas; project and civil works related to urban revitalization and recovery of degraded areas in the Guarapiranga and Billings sub-basins	2,103.71
Environmental clean-up actions	Projects and civil works aimed at constructing the sanitary landfill in the municipality of Embu-Guaçu and an assessment to be prepared of the operational and support capacity of existing landfills; identification and evaluation of where and how clandestine solid wastes are disposed of in the Billings sub-basin; acquisition and maintenance of urban cleansing equipment for cleaning public areas and for assisting with collection of urban solid wastes in the Billings sub-basin	3,939.74
TOTAL*		
Executing entity: SMA—State of São Paulo Environment Secretariat		
Support, follow-up, monitoring and implementation tools (management)	Capacity-building for environmental agents; capacity-building workshops for the new Specific Land-Use Laws; Itinerant Exhibition; Environmental Education Reference Center; collection of educational videos on water and the environment; <i>Antena Verde</i> project on environmental education through radio broadcasts; implementation of a system of environmental enforcement in the Guarapiranga and Billings catchment basin linked to the integrated inspection system of the Alto Tietê basin headwaters; improvement of physical installations aimed at establishing an Environmental Inspection System concerned also with land use and human occupation in the Guarapiranga, Billings, Alto Tietê-Cabeceiras and Juqueri-Cantareira catchment basins; conceiving, developing and executing the Land Use and Occupation Monitoring Program employing satellite images, field supervision and an Integrated Communications System to facilitate contact between environmental inspection agents; monitoring of environmental quality.	4,639.10

Environmental Preservation and Recovery actions	Civil works to establish the Parque Nove de Julho, covering 26.9 hectares; studies, designs and civil works connected with the establishment of parks along the Billings Dam in the municipalities of São Paulo, Ribeirão Pires and Rio Grande da Serra, covering an area of 767,000 m ² (76.7 ha); designing and executing revegetation of the banks of the Billings dam; design and works for recuperating degraded areas and revitalizing urban areas in the municipality of São Paulo (to cover 3.6 hectares); Plan for Controlling the Transport of Dangerous Loads (including coverage of the Guarapiranga basin)	4,931.73
TOTAL*		9,570.83

Table 0.2. Summary description of programs, sub-programs and projects comprising the Environmental Management Plan (Continued)

Programs	Actions included in the PGA	Values* (US\$ millions)
Executing entity: PMSBC—São Bernardo do Campo Municipal Government: CDHU—Housing and Urban Development Company		
Urban restructuring and recovery	Slum urbanisation in the Guarapiranga and Billings sub-basins in locations to be defined after conclusion of the PDPA Resettlement of 1,350 families (housing units to be constructed by CDHU)	31,915.86
TOTAL*		31,915.86
Executing entity: SABESP—São Paulo State Water and Sewerage Company		
Support, follow-up, monitoring and implementation tools (management)	Development of technical instruments (for management); hydrodynamic models of Guarapiranga, Rio Grande, Taiacupeba, Jundiá, Biritiba, Paiva Castor and Atibainha reservoirs; system to support decision-making and oversight for the integral operation of the headwaters of the metropolitan mains transmission system; environmental education and monitoring (including post-works)	7,240.30
Environmental Preservation and Recovery action	Pollutant Loads Removal Plants; Parelheiro Wetland; debris retention at the intake area of the Guarapiranga water treatment system; management plans (Capivari, Rio Claro, Morro Grande); removal of macrophytes; desilting of reservoirs (Paiva Castro and Isolina); infrastructure installed for applying algicides; establishment of parks (Paiva Castro, Atibainha, Cachoeirinha and Isolina); improvements to the Santa Inês Lifting Station (ESI)	11,795.76
Environmental clean-up actions	Improvement of the water treatment processes (automation of the ABV ETA, ETA Rio Grande, ETA Rio Claro, ETA Guaratá, and the Alto and Baixo Cotia ETAs, including improvements and repairs to the filtration etc processes; installing sludge removal systems in the ETAs; Wash Water Recovery Systems; installing water supply systems (PAT PROSANEAR and Shangri-la); development and/or extending the wastewater elevator plants; extending the wastewater collector network (network collectors, pumping lines, etc.); expanding the Mairiporã ETE; Technical Training; operational optimisation and upgrades (Control); elimination of overflows.	96,053.81
TOTAL*		115,089.87
Executing entity: PMSBC—São Bernardo do Campo Municipal Government		
Support, follow-up, monitoring and implementation tools (management)	Environmental education; monitoring and inspection; integrated planning; monitoring of erosive processes and sediment production development program related to compatible economic activities; employment generation and the generation of revenues to be earmarked for environmental protection; control of clandestine solid garbage dumping.	2,339.75
Urban restructuring and recovery	Preparation of surveys and programs concerned with residential uses/resettlement; slums urbanisation; relocation of category 1 areas and recovery of the unoccupied areas during relocation of category 1 areas; regularization and urban/environmental upgrading of the settlements; socio-environmental follow-up to urban and housing interventions.	22,490.89
Environmental Preservation and Recovery actions	Urban greening; urbanisation of public areas—creation of squares and leisure amenities; establishing parks and conservation units; revegetation; recovery of degraded areas (low-cost interventions on hillsides, slopes and sediment-producing areas—Rio Grande and Taquacetuba catchment area); controlling the transport of dangerous	5,276.93

loads.		
Environmental clean-up actions	Bringing the Alvarenga dumpsite up to standard; acquisition of solid waste collection equipment; establishing the Ecological and Citizenship Centers; Plan for the Integrated Management of Solid Wastes.	4,939.86
TOTAL*		35,047.43

Table 0.2. Summary description of programs, sub-programs and projects comprising the Environmental Management Plan (Continued)

Executing entity: PMSP—São Paulo Municipal Government		
Support, follow-up, monitoring and implementation tools (management)	Establishment of 4 Environmental Education Centers	1,391.88
Urban restructuring and recovery	• Urbanization of 15 slum settlements in the Guarapiranga and Billings sub-basins; • Urban recovery of 4 irregular settlements	43,216.75
TOTAL		44,608.63
Executing entity: PMG—Guarulhos Municipal Government		
Support, follow-up, monitoring and implementation tools (management)	Study aimed at broadening the Environmental Education Program and acquisition of materials and equipment for the program; study on the creation, regulation and introduction of municipal inspection/enforcement in the catchment basin of the Cabuçu, for the underground headwater and the Tanque Grande sub-basin; a study on developing and establishing the SIG; acquisition of equipment and software for the SIG, together with training; acquisition of equipment for the Central Laboratory.	1,616.18
Environmental Preservation and Recovery actions	Study on the creation and recommendation of the municipal APA (Tanque Grande sub-basin); designs and civil works for the municipal park (Tanque Grande sub-basin); designs and works for the Environmental Education Center (Tanque Grande sub-basin); a study for the creation and regulation of the municipal APA (Lagoa Azul/Lavras sub-basin); design and works for the municipal park (Lagoa Azul/Lavras sub-basin); study on upscaling exploitation of the subterranean headwater.	804.69
Environmental clean-up actions	Project for undertaking works aimed at the general repair of the Tanque Grande ETA; design and works on the Ururuquara and Lagoa Azul/Lavras water supply system; technical, economic, environmental feasibility studies on the Engordador and Borracha sub-basin; preparation and execution of the Lagoa Azul / Lavras Loss Reduction Control Program; design and works on the Lagoa Azul / Lavras Wastewater System.	7,522.28
TOTAL		9,943.15

8.2. Project Environment Management System

46. There will be a local management unit (UGL) created within each executing agency to coordinate, manage and supervise all its activities under the Project, to undertake the Project's financial management, accounting and procurement, and to interface with both the state government's coordinating project management unit (PMU) and with the World Bank. The PMU will be responsible for the overall accompanying of all the Project's activities and results, allowing for a consolidated and integrated picture of the physical and financial advances and the overarching results of the Project. The PMU will thus be directly responsible for carrying out those Project activities within SSE, as well as being an overall coordinator and reviewer of all of the other executing agencies' activities under the Project.

47. Each of the UGLs, as well as the PMU in its capacity as executive coordinator of SSE's actions under the Project, will have a Socio-Environmental Management System ('*Sistema de Gestão Sócio-Ambiental*', SGSA) for management of all Project social and environmental actions, with the intention of ensuring that the following are adhered to: (i) all the relevant environmental legislation; (ii) all the triggered World Bank safeguards and related guidelines; and (iii) all the other environmental commitments described in each agency's legal Project instruments (loan agreements, project agreements, *etc*) concerning the environmental impact mitigating and attenuating measures identified. Each executing agency's SGSA will be integrated into the Project's Management System ('*Sistema de Gestão do Programa*'), which will comprise:

- i A Technical-Social-Environmental Coordinator in the PMU and in each UGL, responsible for: (a) the coordination of all technical-social-environmental activities under the Project for each of the executing agencies; (b) accompanying the environmental licensing procedures for each activity; and (c) verifying that the Bank's safeguard policies and guidelines, and related requirements of the loan agreements and other Project legal instruments, are being followed.
- ii Executive units, embedded in each executing agency, with responsibility for: (a) the implementation of the EMP activities; (b) complying with environmental licensing procedures; and (c) adhering to the Bank's safeguard policies and guidelines, and any other related requirements under the Project's legal instruments.
- iii Environmental supervision of works interventions, through which supervision, verification and guidance will be provided on all aspects related to environmental impacts, in strict accordance with the related actions of the EMP and with the Environmental Construction Manual (see Annex IX of the EAR). This environmental supervision role also includes the preparation of monthly reports on the socio-environmental status of all Project activities, which the PMU will submit to the Bank with copies to all the executing agencies. The PMU will, furthermore, prepare every two weeks socio-environmental management/status plans for each Project activity.

48. The following diagrams present, in the form of fluxograms, the different actions and institutional responsibilities under the Socio-Environmental Management System, including the attributions/responsibilities with regard to environmental licensing, with regard to the implementation and management/coordination of the EMP, and with regard to resettlement activities.

Figure 0.3. Institutional Responsibilities and Actions - SGA

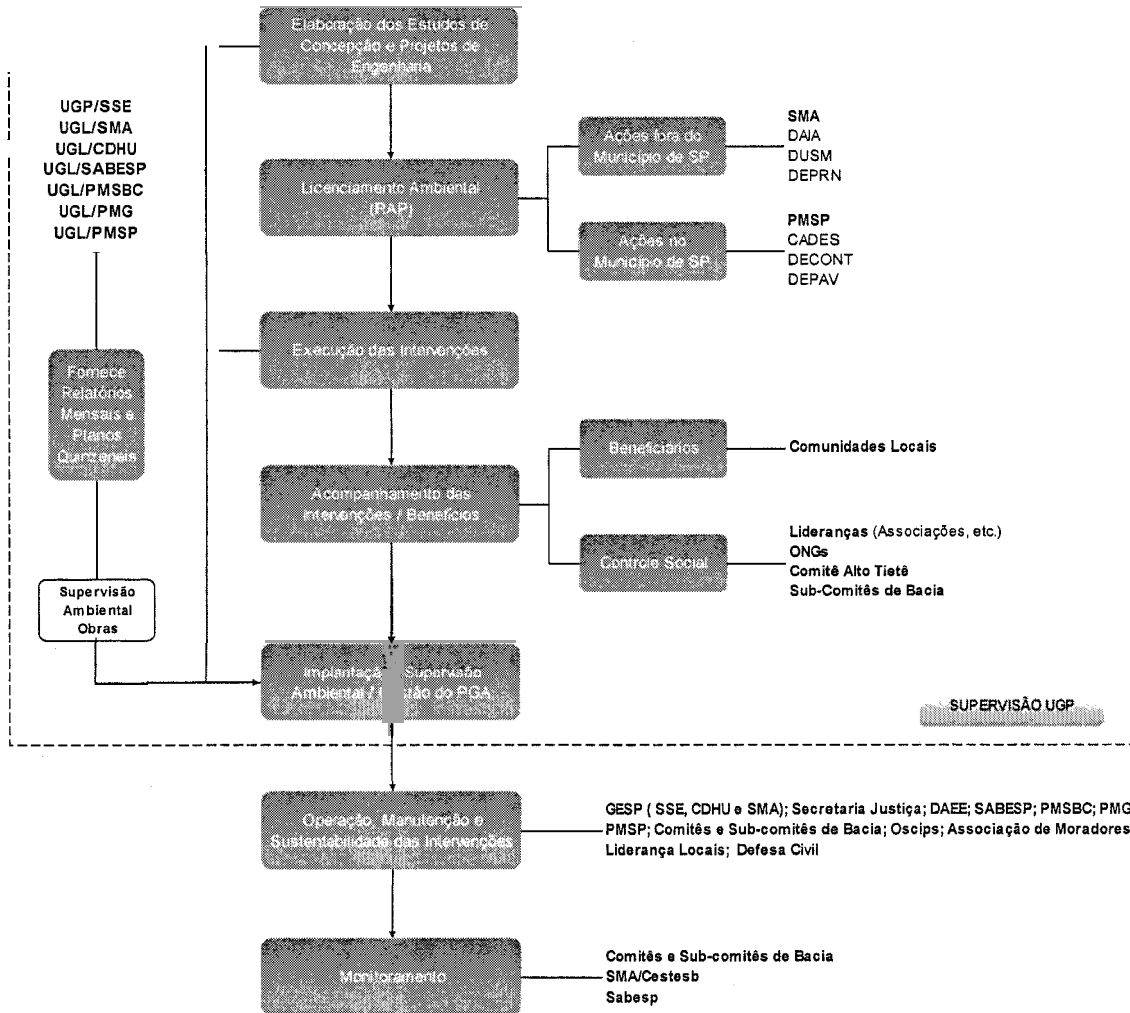
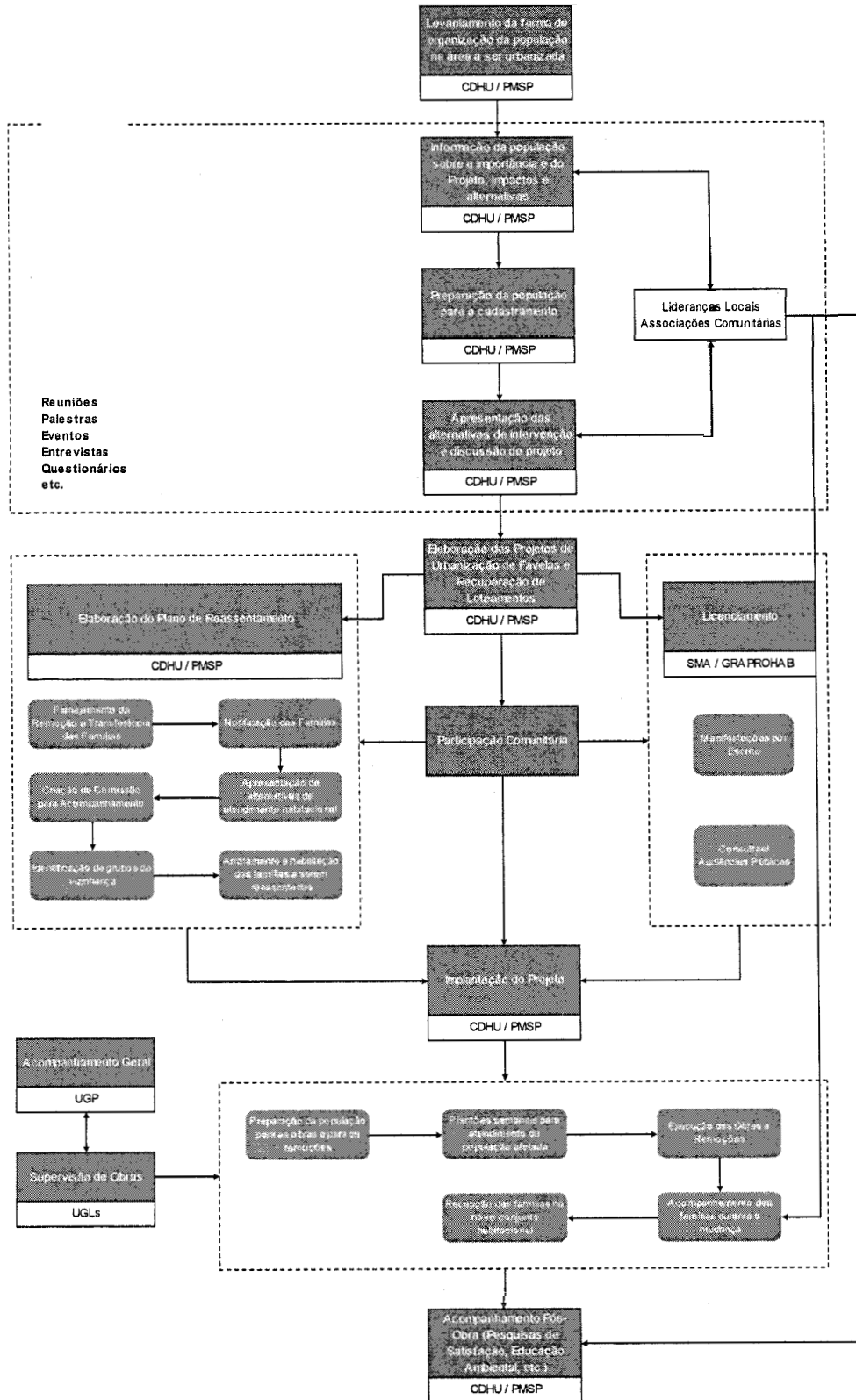


Figure 0.4. Institutional Responsibilities with Respect to Involuntary Resettlement



9. PUBLIC HEARINGS

9.1. Project Preparation Phase

49. The preparation of the Mananciais Project contemplated a series of public consultation exercises conducted in the Billings-Tamanduateí, Cotia-Guarapiranga, Alto Tietê-Cabeceiras and Juqueri-Cantareira sub-committees respectively during the period from January 2004 to December 2006 (all open to the general public).

50. The purpose of these meetings was to present and discuss the ideas and proposals for structuring the Mananciais Project components and for the executing agencies and the community in general to identify the requirements and conditions regarding the feasibility/prioritisation of the planned series of interventions.

51. A number of public hearings were also held during the final stage of Mananciais Project preparation, with the aim of presenting and discussing the present environmental report, the resettlement framework, the social assessment report, the analysis of economic feasibility, and other documents concerned with the process of approval and proper implementation of the operation with the IBRD. In this regard, two additional public consultations were held in the Billings and Cotia-Guarapiranga subcommittees on 4 June 2007.

9.2. Project Implementation Phase

52. Both Brazilian environmental legislation and the Bank's safeguards policies establish the requirement of communicating with civil society and other stakeholders in the preparation and execution of Project activities, and of involving these groups in the decision-making processes throughout preparation and implementation, informing them of the results achieved and, as necessary, having them participate in questions related to environmental quality and the quality of life of the population affected by Project interventions.

53. In this respect, the PMU and the UGLs of each executing agency will implement a system for communicating and consulting with the public, which will include the following activities:

- Participation in the ordinary and extraordinary meetings of the respective river basin sub-committees and of the Alto Tietê River Basin Committee.
- Creation of a communication space to allow the public and other interested parties to access Project documents, including the Project's umbrella Environmental Assessment Report, Resettlement Policy Framework and Social Assessment Report, the environmental reports and resettlement action plans for sub-project interventions, and the periodic implementation progress reports, etc.
- The undertaking of annual Project evaluation seminars, with the primary objective of presenting and discussing the Project's results and progress, open to interested stakeholders from government, non-government, public and community groups, and providing these groups with the opportunity to present their views on these issues.

54. Through communication spaces to be created under the Project (website, etc) and also through the different events that the Project will sponsor (for example, the periodic seminars,

the PMU and the UGLs will provide in good time material and documentation that support the discussion concerning Project implementation and results in formats that allow public and other stakeholders to fully understand the issues involved and progress achieved, including folders, brochures, copies of reports, press releases, etc – making these available in both printed and electronic format.