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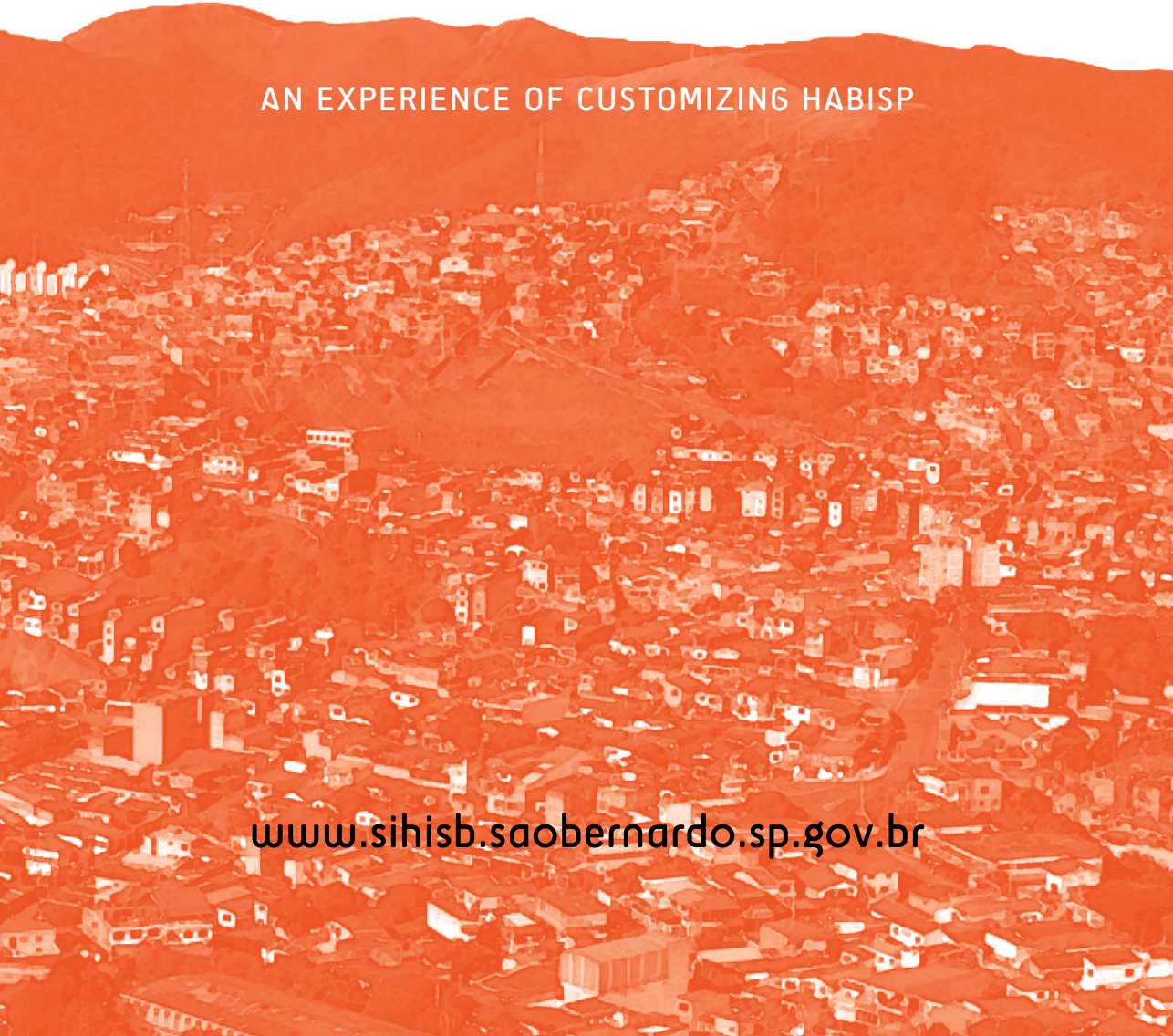
Information System for Social Housing in São Bernardo do Campo

AN EXPERIENCE OF CUSTOMIZING HABISP



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AN EXPERIENCE OF CUSTOMIZING HABISP

São Bernardo do Campo, 2013

Banco Mundial

Aliança de Cidades
Cities Without Slums

PREFEITURA DE SÃO PAULO

SÃO BERNARDO DO CAMPO
Uma cidade cada vez melhor de se viver

Photo: Wilson Magão. Collection: Secom/PMSBC.

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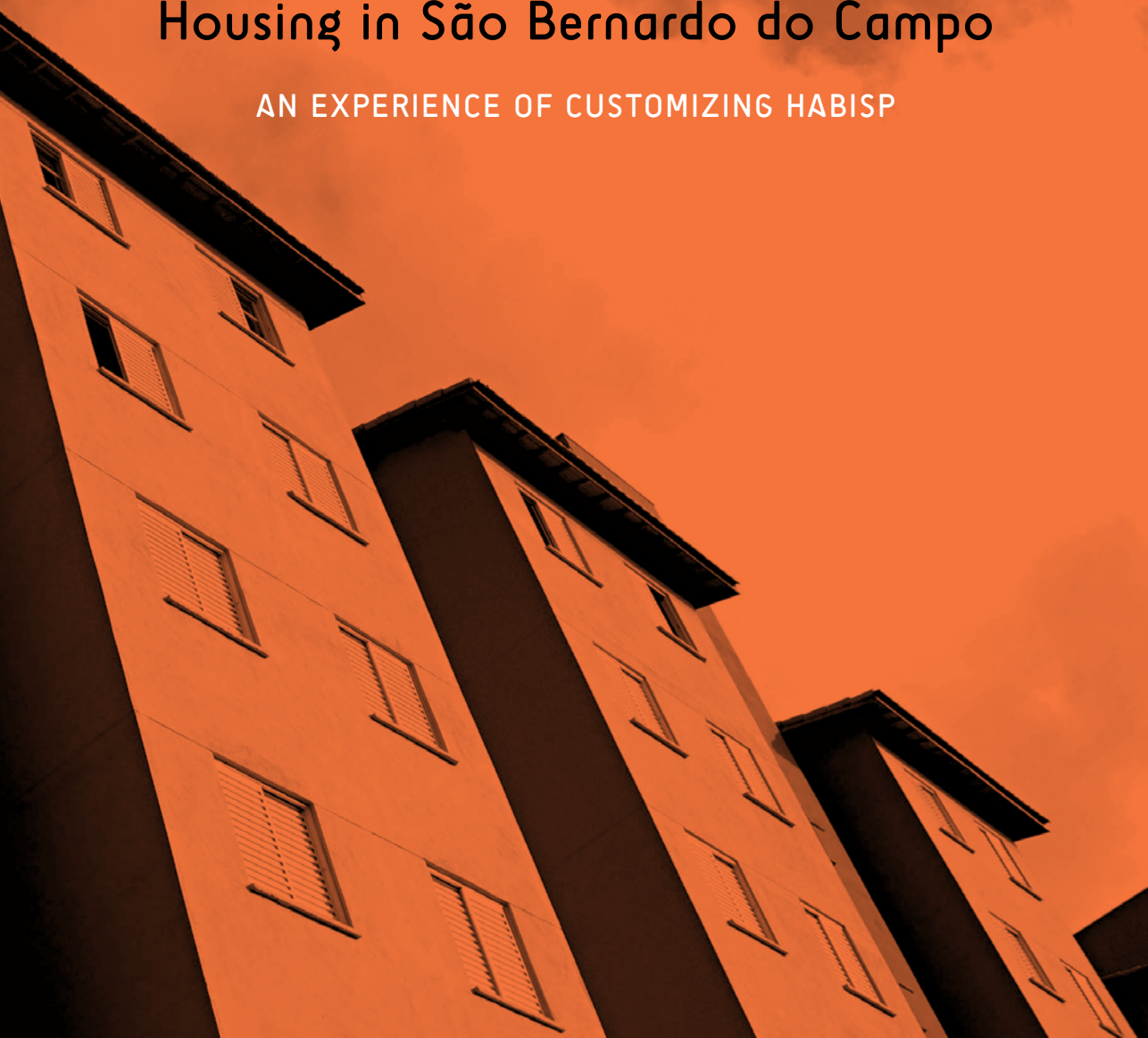

Luiz Marinho
MAYOR OF SÃO BERNARDO DO CAMPO

The Information System for Social Housing in São Bernardo do Campo (SIHISB), presented in this publication, is part of a comprehensive housing policy that has been implemented in the city since 2009, when we began our current term in the Municipal Government.

The housing issue has already been given high priority in our government program during the election period, and it has kept being high priority our present administration. In the Government, based on the guidelines issued by the discussion process of the 2010-2013 Participatory PPA, we have faced the challenge of putting this issue as one of five major characteristics of our first term, working to ensure dignity to families, from the implementation of a housing policy that has considered interventions based on the logic of a structured strategic planning.

We have spared no efforts to face this challenge, even when budget issues have imposed limits on us. We have treaded paths beyond our borders. And here, I would like to take this opportunity to highlight the outstanding partnership with the federal government during the administrations of former President Lula and the current President, Dilma Houssef.

I have no doubt that the result achieved by us has a lot to do with how we have started this work. The Housing Policy planning, which began in 2009, has been marked by a diagnosis based on appropriate instruments that enables us to know the real extent of the problem in the municipality, and to structure local interventions on various fronts of the Housing Secretariat.

Two studies have decisively contributed to the development of this diagnosis and the definition of strategic actions: the *Mapping of Precarious and/or Irregular Settlements* and the *Municipal Risk Reduction Plan* – MRRP, both drafted in 2009 and 2010. And following the path to adhere to the National Social Housing System completed in 2011, the Local Social Housing Plan (PLHIS) – a municipal instrument targeted at being the instrument of municipal adoption of the National Social Housing Policy actions.

We have structured six programs in PLHIS to meet the housing demands of production, urban upgrading, regularization, and risk remediation, besides undertaking institutional and normative actions to ensure the essential conditions for the development of management actions.

The *Social Interest Housing Information System in São Bernardo* – SIHISB is housed in the Institutional Development Program of PLHIS, aiming to increase the institutional management capacity of the housing sector.

We have attributed to SIHISB the reduction of an important part of the obstacles on the lack of systematic information about the problems and

actions that we have encountered at the beginning of our current term. And that has contributed to the best result we have achieved. The System has stripped and revealed the real city on which we have concentrated. For several years, this city has treated as invisible one-third of the households located in informal or precarious settlements.

In the first four years of our government, our housing policy has fulfilled the dream of more than 40,000 families in more than 100 areas, when we added the interventions in Social Housing Production, Urban Upgrading, Land Tenure Regularization, and infrastructure works in risk areas. The production of 5, 280 new housing units has been initiated, and of these more than 3, 200 have been delivered. The ongoing works of favela upgrading have benefited 10 areas with more than 3, 000 families, regularizing and making the housing solution sustainable where families have already resided. Over 17 thousand families will benefit from the actions of the current Land Tenure Regularization program, drawn on the formulation and revision of the legal framework of the municipality. In the face of such massive actions, SIHISB has also represented an important tool for more efficient management, especially by ensuring faster solutions to the internal administrative processes.

With such features, the SIHISB viability, which had the partnership with the city government of São Paulo and the Cities Alliance as its starting point, has also needed an intersectoral action within the city government, involving areas of information production and management that today have comprise the System.

For these reasons, we have much to thank the partners who have made this experience possible: to the Sehab team of Municipality of São Paulo, the authors of the pioneering System, for the partnership and support throughout the implementation process; and to the Cities Alliance and World Bank, which supported us in the experience systematization and in the formulation and dissemination of its tools, so the customization could be useful to other institutions.

New challenges lie ahead, both because the information relating to the precarious settlements are very dynamic and require constant updating, and by our desire to implement the advanced content modules in SIHISB, such as the HABISP ones, which you have not been inserted into SIHISB yet. But the consolidation of this 1st Phase of SIHISB is already an important institutional advancement that, we hope, will contribute with other municipalities to structure their inclusive and democratic housing policies, and further strengthen the National Social Housing System.

José Floriano de Azevedo Marques Neto
HOUSING SECRETARY MUNICIPALITY OF SÃO PAULO

The Municipal Housing Secretariat of the Municipality of São Paulo (SP-Sehab), with the support of key partners such as the Cities Alliance and the World Bank has diagnosed the precarious settlements of the city using planning tools developed exclusively for this purpose, as Information System for Social Interest Housing (HABISP).

HABISP gives to public managers information about housing and the socioeconomic status of the population living in precarious settlements. The HABISP system has also been used in the preparation of the Municipal Housing Plan (PMH), which proposed interventions supported by technical criteria for a period of 16 years (2009-2024).

The HABISP system has been recognized as an appropriate tool for public planning in the housing sector. This recognition has resulted in the recent articulations and agreements, which aim at the HABISP implementation in other municipalities of São Paulo, such as São Bernardo do Campo, which customization process has generated SIHISB, issue of this publication.

Aware of its role and the need for innovations in public management, the Municipality of São Paulo, through Sehab-SP, is willing to its contribution to address the problem of Social Interest Housing in our country.

Photo: Fabio Knoll

William Cobbett
GENERAL MANAGER OF CITIES ALLIANCE

For over a decade the Cities Alliance and the Municipality of São Paulo have enjoyed a close partnership, which has supported the Municipality in developing a citywide slum upgrading programme, and also sharing its experience internationally. One of the key results of this successful partnership has been the creation of HABISP, an innovative social housing information system.

The experience of São Paulo has shown the importance of providing government bodies with the right management mechanisms and tools to address their urban challenges. HABISP provides access to objective, up-to-date data on urban and socio-economic conditions in the city – valuable information that allows public managers and decision makers to better plan and prioritise their public investments.

The Cities Alliance believes in the potential of HABISP to serve as a critical component in city planning. By making a range of city information available to the public, it helps increase transparency in the decision-making process. More than just a database, the very creation of HABISP reflects a commitment to build more inclusive policies, marked by transparency and social participation.

Against this background, the Cities Alliance was delighted when the Municipality of São Bernardo do Campo approached São Paulo to share the

experience of HABISP. From the outset, São Bernardo showed considerable interest in learning from its neighbouring municipality, pledging to document the process of knowledge transfer so that other municipalities in Brazil could also benefit from its experience. By systemizing its process of learning from São Paulo, São Bernardo has made a valuable contribution in that area.

We would also like to recognise the Housing Superintendency of São Paulo for its dedication to providing São Bernardo with essential information for decision-making during the development its own Housing Information System, the SIHISB.

We would like to acknowledge the wide range of partners throughout the process: The World Bank, the Federal University of ABC, the Metropolitan Planning Agency of the State of São Paulo-Emplasa, as well as the Housing Secretariat of the Ministry of Cities and the Technical Assistance Department of CAIXA. We now hope to see these partners collaborate in the dissemination of the knowledge presented in this publication.

We hope the result of this cooperation will inspire other municipalities in the metropolitan region of São Paulo, in other cities in Brazil – and internationally – to develop their own systems as they seek to make their cities more inclusive, with decent affordable housing for all citizens.

Deborah Wetzel
WORLD BANK DIRECTOR FOR BRAZIL

The municipality of São Bernardo do Campo – city with over 765,000 inhabitants - is an essential part of the Metropolitan Region of São Paulo, which has over 20 million inhabitants and faces significant urban challenges. The provision of affordable housing has been among these challenges, taking into account the land valuation, provision of services, and improved quality of life for the 325,000 people living in precarious and informal settlements. In this context, the municipality of São Bernardo do Campo has been a pioneer in the development of best practices in the housing and favela development areas.

This publication documents a milestone in a long-term commitment to the development of innovative financing, planning, and implementation, in order to improve the delivery of services and living conditions in the *Grande São Paulo* (Greater ABC Region). The publication is based on the activities undertaken by the Housing Secretariat of São Bernardo do Campo (Sehab) and offers step-by-step guidelines to customize and implement a housing information system, which is considered highly innovative. This system has been initially developed for the city of São Paulo, result of a partnership among the municipality of São Paulo, the Cities Alliance, and the World Bank, through a technical and financial support. The system, known as HABISP, has continuously generated social, economic, legal, and urban data on informal settlements, and provided mechanisms to systematically prioritize the modernization of housing and settlement programs.

The creation of the SIHISB System – the name given to the system in São Bernardo do Campo – through the HABISP capacity and technology, reflects construction processes and collaborative sharing of knowledge. As

mentioned earlier, the HABISP System (managed by the Municipality of São Paulo) has been developed with the financial and technical support from the Cities Alliance and the World Bank, and has provided free-of-charge data and information to residents of São Paulo and other cities in the metropolitan region of São Paulo.

This publication also provides detailed instructions of how other municipalities can adopt the System, as well as the flexibility to customize it, according to the particular needs of the municipality and its context. This progress should allow the affordable dissemination and replication of the System – an important innovation since the HABISP program has been associated with increased efficiency and intersectoral coordination in the delivery and management of social programs in Sao Paulo, helping to increase public funding for urban development totaling USD$ 2.1 billion in 2011.

The World Bank's support for the work relating to this publication, as well as the development of the HABISP and SIHISB systems, is based on a commitment to the whole country, and focuses on providing integrated and often multi-sectoral solutions for the development of the country, according to its own needs. The increasing efficiency in the public and private investments for the expansion of affordable housing and the improvement of living conditions of low-income and vulnerable groups are among the priority areas of the Bank's investment. This publication will be of great value and a guide for municipal authorities and policymakers in Brazil and around the world that seek to integrate a comprehensive understanding of the informal settlements and vulnerable populations in housing policy and planning.

Jardim Pinheiros.
Collection: Secom/PMSBC.

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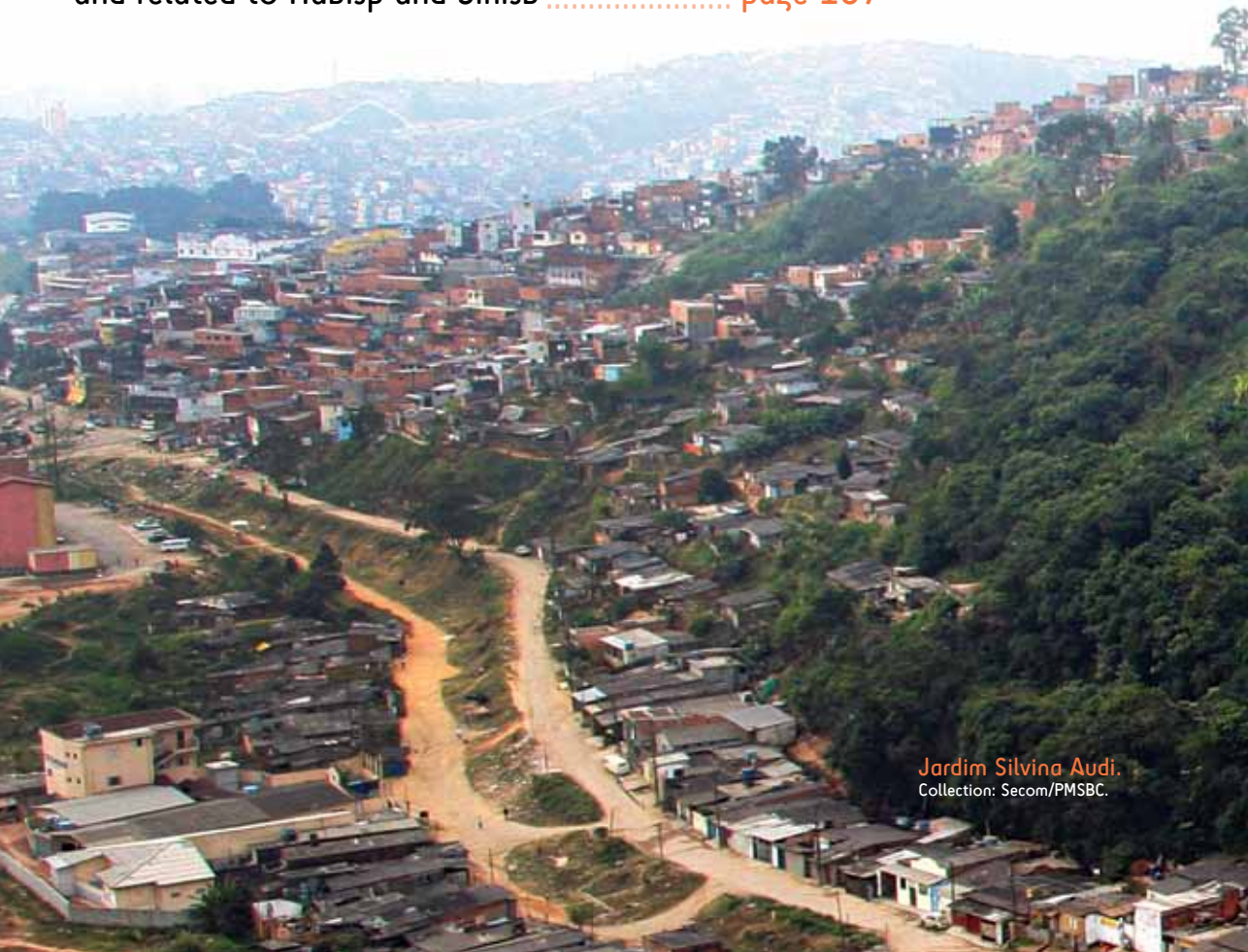

Jardim Silvina Audi.
Collection: Secom/PMSBC.

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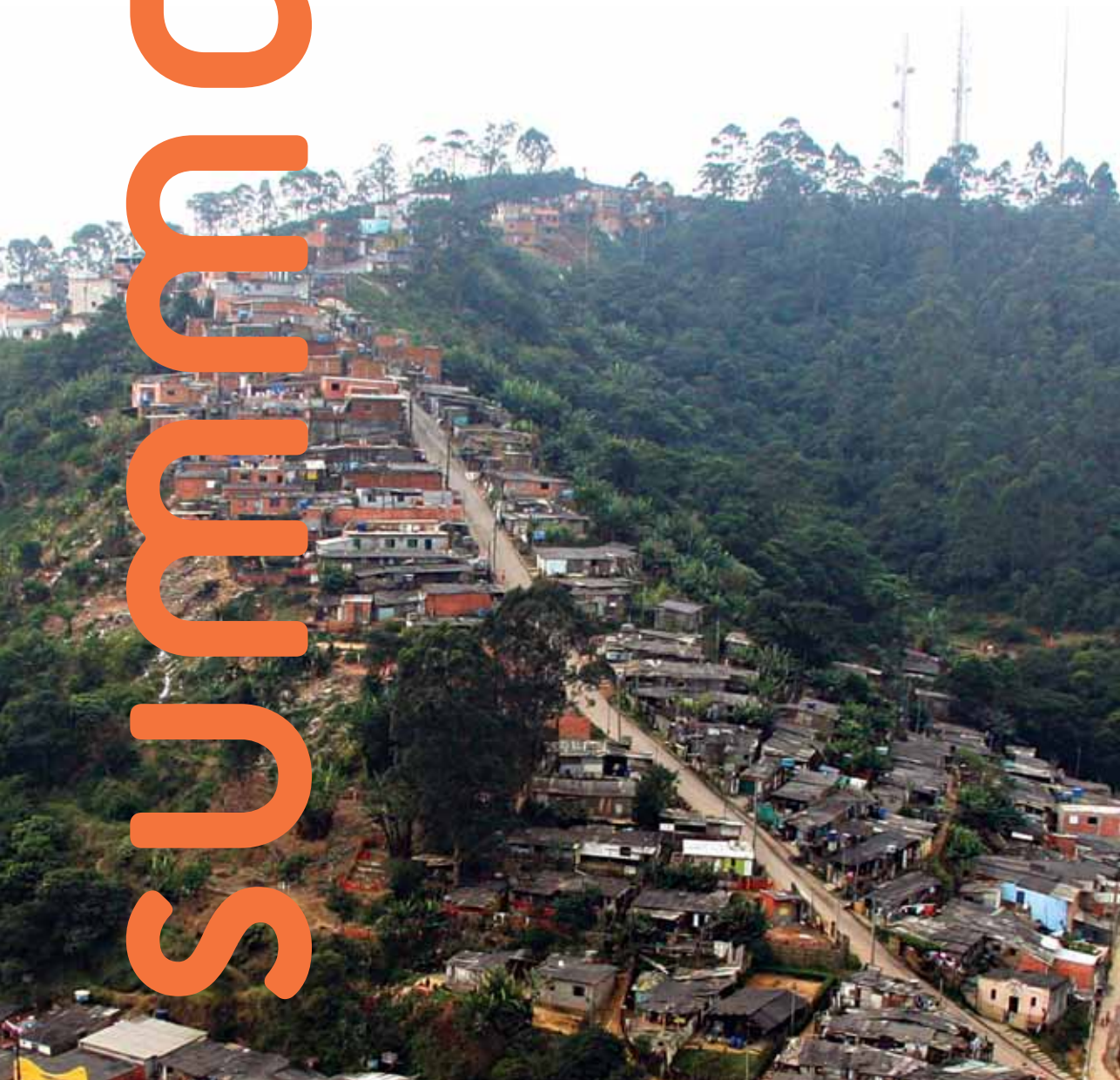

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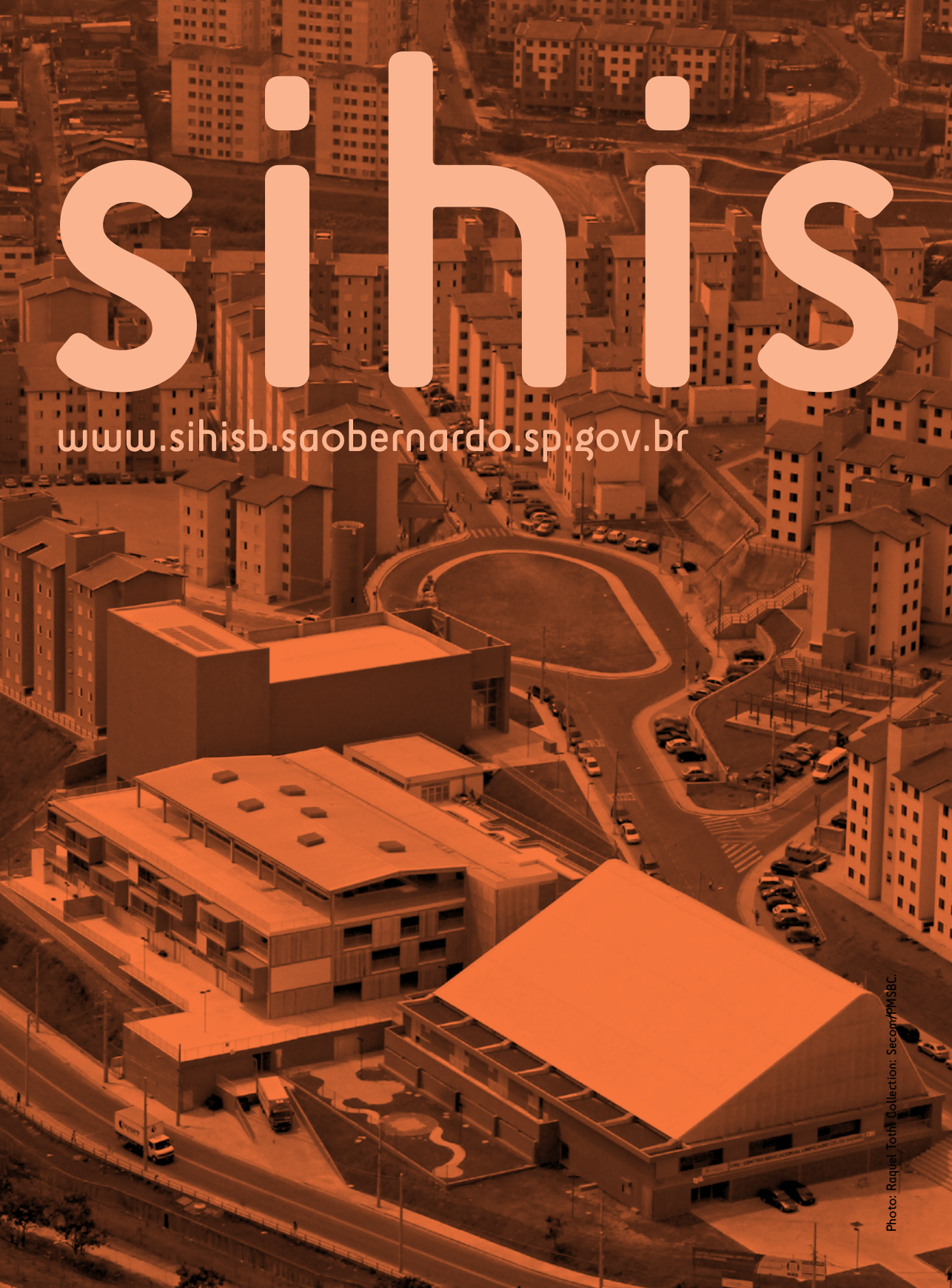


Photo: Raquel Toth Collection: Secom/PMSBC.

Chapter 1
Information, planning and management: cooperation agreement between Habisp and Sihisb

Making decisions is the biggest challenge of the whole management process, especially when it comes to public policy. After all, between social demands and infrastructure of any municipality, state, or country, there have always been urgent issues that require the managers, technical staff, and population discernment, in order to establish priorities for action based on transparent criteria. However, to insure that these criteria are established, there must be accurate and reliable data comprising objective information, which are essential to the process of action planning and interventions, finally facilitating and optimizing the management of technical, human, and budgetary resources, providing citizens with better services and quality of life.

This search for an efficient management is not characteristic of only the municipalities such as São Bernardo do Campo, but a rather recurrent and contemporary challenge in the cities of Brazil and the world, so international agencies, as the Cities Alliance and the World Bank, have raised efforts to contribute to the formation and dissemination of strategies. This is where the Information System for Social Housing in São Bernardo do Campo (SIHISB) story comes from, reported throughout this publication from the experience developed in São Paulo, with the development of the Information System for Social Housing in the City of São Paulo (HABISP).

The HABISP publication in 2006 generated an important debate on the housing issue in that municipality, making public the information about the precarious settlements and the about need to structure a Housing Policy able to have medium-term and long-term actions to address a problem that turned out to be of enormous magnitude. Since then, the experience has become a reference in Brazil and São Paulo's project partners – Cities Alliance, World Bank, and even the Ministry of Cities – started to recommend similar initiatives in their documents and projects to other municipalities.

However, in order to successfully replicate something of this nature, all the peculiarities and demands of the new location needed to be identified and understood. And this was the first step taken by São Bernardo do Campo in the direction of building its information system for the precarious settlements.

1.1 The São Bernardo do Campo particularities and the São Paulo model

The city of São Bernardo do Campo, which integrates the Metropolitan Region of São Paulo (RMSP)[1], celebrates its 460th anniversary in 2013[2] and currently has a population of 765, 203 inhabitants (Brazilian Institute of Geography and Statistics – IBGE, 2010 Census) distributed in their 406.18 square kilometers.

Historically, the city gained national coverage during the period of industrial expansion in Brazil, in the 1950s and 1960s, especially concerning the metallurgical and automotive industries. At that time, the entire region called Grande ABC[3], as well as the other cities in the Metropolitan Region of São Paulo (RMSP), attracted thousands of migrants from various parts of the country in search of job and employment opportunities. Such expansion spurred tremendous growth in these regions, and, at the same time brought challenges faced by municipalities, such as the housing issue.

A study of the municipal Gross Domestic Products (GDPs) presented by IBGE in 2008 shows that São Bernardo do Campo is now the eleventh municipal economy of the country, ahead of many state capitals. However, the Social Vulnerability Index (IPVS, 2000) of São Paulo State indicates that 14.9% of the population is within the groups of high and very high social vulnerability. Recent surveys have also indicated that one third of the households is located in precarious and/or irregular settlements.

Moreover, the environmental characteristics of the area are among the particularities of São Bernardo do Campo in the RMSP: more than half of the municipality is characterized as Environmental Protection Area (APA), whether by the presence of the Forest Reserve of the Serra do Mar State Park, or by constituting the Water Source Protection Area in the Metropolitan Region of the Billings reservoir under the State Legislation.

Due to this characteristic, by the end of 2008, the housing issues were directly linked to the Housing and Environment Secretariat, without a specific housing secretariat. The municipality did not have a specific policy for housing either, or even a housing plan for the most urgent demands. No data on the issue were updated and systematized, and the municipality had no consistent actions to address the problems and to meet the demands of the families.

Given this scenario, before adopting a housing information system as it was in São Paulo, the São Bernardo municipality had to internally restructure itself. From 2009, with the establishment of the Municipal Housing Secretariat (Sehab-SBC), information could begin to be organized, and plans, projects, and actions could be more effectively developed in the social housing and urban development areas, without losing sight of the environmental issues, which were worked together with the technical teams of the Municipal Environment Secretariat.

1. The urban conurbation formed from the geographical boundaries of the state capital is named the Metropolitan Region of São Paulo. It is the largest metropolitan area in Brazil, comprising 39 municipalities, which together account for about 20 million inhabitants. They are: Arujá, Barueri, Biritiba Mirim, Caieiras, Cajamar, Carapicuíba, Cotia, Diadema, Embu das Artes, Embu-Guaçu, Ferraz de Vasconcelos, Francisco Morato, Franco da Rocha, Guararema, Guarulhos, Itapevi, Itapecerica da Serra, Itaquaquecetuba, Jandira, Juquitiba, Mairiporã, Mauá, Mogi das Cruzes, Osasco, Pirapora do Bom Jesus, Poá, Ribeirão Pires, Rio Grande da Serra, Salesópolis, Santa Isabel, Santana do Parnaíba, Santo André, São Bernardo do Campo, São Caetano do Sul, São Lourenço da Serra, São Paulo, Suzano, Taboão da Serra, and Vargem Grande Paulista.

2. The city of São Bernardo do Campo was founded on August 20, 1553, five months before the founding of the city of São Paulo (January 1554), the state capital.

3. Grande ABC - or ABC Paulista - is the name given to the region formed by the cities of Santo André, São Bernardo do Campo, São Caetano do Sul, Mauá, Ribeirão Pires Rio Grande da Serra, and Diadema. The ABC acronym comes from the Santo André, São Bernardo, and São Caetano names.

Map: Aramis Horvath Gomes (Sehab/PMSBC).
Source: Mapping of Precarious and/or Irregular Settlements

Two basic studies were primarily conducted to know the situation and housing needs of São Bernardo do Campo: the Mapping of Precarious and/or Irregular Settlements, and the Municipal Risk Reduction Plan (PMRR), between 2009 and 2010.

The Mapping of Precarious and / or Irregular Settlements was the starting point for the formulation of the Local Social Housing Plan (PLHIS), because it showed the portrait of the housing instability of the municipality and allowed to think and to plan the local housing actions with the essential information sector and spatially organized in the territory. The PMRR, in turn, deepened the knowledge – within the settlements – concerning the risk situation to be faced. Knowledge of the size and nature of the problem confirmed the importance of establishing a short-term and long-term municipal planning, with different modalities of interventions consistent with the identified problems.

The current Sehab-SBC database has originated from these studies, along with information about housing developments and their databases. The diagnosis of the size and nature of the problems has confirmed the importance of establishing a municipal short-term and long-term planning, with different types of interventions and consistent with the identified problems. For this, the most urgent task was to systematize the data, and the HABISP system model, implemented by the municipal government of São Paulo, has showed up a good practice to be shared.

Having its set up started in 2005, HABISP has georeferenced information of social, economic, legal, and urbanistic data on precarious settlements in the city of São Paulo, besides owning an Intervention Prioritization System of the Housing Policy. In late 2010, the continuously improved system had already demonstrated efficiency in the management process.

Inspired by this example, and with the support of the Cities Alliance[4], the municipal government of São Bernardo do Campo took the initiative to propose to the municipal government of São Paulo a partnership, with a view to implementing a system related to HABISP in the municipality. Through the Cities Alliance, the negotiations for the Technical Cooperation Agreement signature began, and after a few months of preparation of the Work Plan and the administrative details, in June 2011, the agreement was signed between the Municipal Housing Secretariat of São Bernardo do Campo (Sehab-SBC) and the Municipal Housing Secretariat of São Paulo (Sehab - SP).

1.2 Cooperation Agreement between Habisp and Sihisb

The partnership between São Bernardo do Campo and São Paulo, supported by the Cities Alliance, was the first partnership held for customization of the HABISP System, according to the availability of the human resources, infrastructure, and database of the municipality of the Grande ABC.

HABISP was a pioneering information system specifically developed for social housing in Brazil, and the transfer of this technology to São Bernardo do Campo was something relevant not only to the involved municipalities, but also to the Cities Alliance and the World Bank, because in addition to supporting the projects in the two cases, such a success would ensure the

4. The Cities Alliance is a global partnership for urban poverty reduction and the promotion of the role of cities in sustainable development <www.citiesalliance.org>.

Signature of the Technical Cooperation Agreement – July 2011.
Photo: Wilson Magão. Collection: Secom/PMSBC.

experience dissemination to hundreds of municipalities in the country and the world, according to each specific local situation.

Through this cooperation, the São Paulo municipal government has been committed to the transfer of the HABISP knowledge and work methodology, including the availability of the source code, the methodology of the information-system architecture development, the use of web mapping and of the work with spatial data for the composition of the Social Housing information system. On the other hand, São Bernardo do Campo has undertaken the responsibility to share the immediate improvements that were to be derived from experience, with the Municipality of São Paulo and other partners in the project; it would make available the deployed system to other cities, and would document the experience by systematizing the customization process, in order to contribute to the spread of the System in other Brazilian cities, which already have been done with the support of the World Bank through the Cities Alliance.

In São Bernardo do Campo, the Information System for Social Housing in the City of São Paulo (HABISP) was renamed the Information System for Social Housing in São Bernardo do Campo (SIHISB). Aside from the nomenclature peculiarities, SIHISB was structured with HABISP's same goal of democratizing the local housing information, as well as supporting the planning and implementation of the short-term and long-term policy able to balance the housing demands in the city.

Among the Cooperation Agreement provisions that deal with object and responsibilities of the involved parties, clause 2 has offered an unprecedented knowledge exchange, by developing, producing, and promoting technical support for the implementation of the System. Thus, a joint interagency would be structured for the viability of the established goals, such as providing necessary information and data to monitor and assess achievements and efficiently conduct all activities, within the appropriate administrative practices.

Sehab of São Bernardo do Campo has also undertaken the responsibility to provide a specific technical team for the progress of work, as well as

to acquire the necessary software for implementation, documentation, and proper functioning of the System, while Sehab of São Paulo has made available all information and key documents for its customization.

Aiming to achieve the maximum-success proposal, the cooperation agreement between HABISP and SIHISB has further stated that the System implementation would be organized in a Work Plan divided in two levels: (1) implementation and customization of HABISP in São Bernardo do Campo; (2) documentation of the process and construction of the HABISP dissemination methodology.

Level 1 had to be divided into two stages, due to its complexity. In the first stage, the experts appointed by the municipalities would focus on implementation of the System, organization of the database, and dissemination of information, really delimiting what data and information would feed the System. The activities for the execution have been organized from the formation of the working group, which then has started to focus on the items below:

- Definition of the information scope of the settlements;
- Definition of the strategy accessibility / permissions;
- Definition of the data model with metadata;
- Customization of the map;
- Preparation of alphanumeric and cartographic databases;
- Installation of the map;
- Customization of the homepage;
- Installation of the homepage;
- Definition and implementation of the (simple) spatial analysis;
- Carrying out an event for the dissemination of information produced at Level 1 - Stage 1.

In the second stage of Level 1, the main objective was related to the Housing Policy orientation, in order to systematize and disseminate the existing information on the precarious and/or irregular settlements, entering, in the System, the criteria for prioritizing these settlements for intervention purposes. At this stage, the activities have been organized as follows:

- Definition of criteria for prioritization;
- Insertion of the prioritization rules in the System;
- Definition and implementation of the (complex) spatial analysis;
- Definition of the strategies for accessibility;
- Carrying out an event for the dissemination of information produced at Level 1 - Stage 2.

In parallel to these activities in Level 1, a process for documentation and information exchange has been designed so that Level 2 activities could be met, mainly aiming to disseminate this knowledge developed and shared with other stakeholders.

For this, the Cooperation Agreement has indicated the construction of a virtual space that would allow stakeholders to adhere to the HABISP terms of use, having access to the source code and to the documentation for installation and use. This virtual space should enable the formation of a community that would gather professionals interested in contributing to the conceptual and technological improvement of the System, making a commitment to pass on to other members the new knowledge on the subject and the enhancements in its source code.

For these activities, the carrying out has been organized as follows:

- Process of documentation and construction of the HABISP dissemination methodology;

The SIHISB launch event – June 2012.
Photo: Wilson Magão. Collection: Secom/PMSBC.

- Creation of the dissemination interface;
- Provision of the code;
- Preparation of the operating instructions;
- Carrying out an event for disseminating the information produced in Level 2.

The Cooperation Agreement between the municipal governments of São Bernardo do Campo and São Paulo was signed on July 12, 2011. The works immediately began, and a year later, on June 25, 2012, SIHISB was officially released to the public in a ceremony held at the Main Hall of the Municipality of São Bernardo do Campo, presided over by the mayor of the municipality, with the presence of Municipal Housing Secretary of São Paulo, Municipal Housing Secretary of São Bernardo do Campo, the technicians who participated in the work, and representatives of the Metropolitan Planning Company of São Paulo State (Emplasa).

At that time, the successful customization of an instrument that facilitated the action planning for housing has stood out, and, therefore, has improved the planning of urbanistic interventions performed in the two municipalities. Thus, the metropolitan-scale results could be seen in an integrated way, bringing benefits that could overcome the geographical boundaries of the cities of São Paulo and São Bernardo do Campo. In this context, the constant support of the Cities Alliance and the World Bank in the whole process has played a remarkably preponderant role concerning the insurance of interaction with other municipalities.

In July 2012, SIHISB had completed its first implementation phase, which already made available to the technicians a series of unprecedented resources for the intervention organization and planning. However, as HABISP has provided other modules and more sophisticated tools, Sehab-SBC has been committed to maintain a continuous improvement of the System, with the launch of new thematic modules from an action agenda, as will be presented in Chapter 3 of this publication.

Today, SIHISB has already served the fundamental interest of democratizing information to residents and has internally contributed for the management of work processes of São Bernardo do Campo.


sihis
www.sihisb.saobernardo.sp.gov.br
Photo: Fabio Knoll. Collection: Sehab/PMSP. Source Book Habisp

Chapter 2
Habisp: a planning tool[5]

The challenge posed by Sehab-SP to the team that has undertaken the Information System for Social Housing in the City of São Paulo – the HABISP – was born of the immediate demand to improve the management tools to an extent appropriate to the needs and time with existing resources, enabling, above all, the democratization of access to information and transparency in the decision-making processes, increasing the municipality ability to diagnose problems and provide agile solutions with great effectiveness.

Thus, equating desires, needs, financial resources, and time was perhaps the greatest merit of the team that has undertaken the HABISP System. The decision to do so was a response to the need for reliable and systematic information directed to planning actions of the Municipal Housing Secretariat of São Paulo.

In December 2005, the Municipality of São Paulo signed a Technical Cooperation Agreement with the Cities Alliance to develop the project entitled "Strategies for planning, financing, and implementing the Housing Policy and Sustainable Urban Development", in which the System was the main municipal counterpart – at the time, the second initiative between São Paulo and the Cities Alliance[6].

The second phase of the project – in which the HABISP system has been designed – has consolidated and extended the results of the first, by introducing a set of tools for strategic planning, which converged to the preparation of the *Plano Municipal de Habitação* – PMH[7] (Municipal Housing Plan). It has begun with a series of planning workshops, more intensely attended by the Habi (Low-Income Housing Superintendence) and Resolo (Department of Regularization of Informal Land Subdivisions) technicians, and, at times, the Cohab (Metropolitan Housing Company) technical staff.

Among the four challenges listed during the strategic planning, two were directly related to the collection and organization of data and information: to tailor the product to suit the demand characteristics and to prioritize interventions.

5. Organization: Eliene Corrêa Rodrigues Coelho e Elisabete França. Text: Eliene Corrêa Rodrigues Coelho.
6. The first cooperation took place between 2001 and 2004. It resulted in the preparation of technical inputs to the so-called "Bairro Legal Program".
7. The PMH is accessible at: <www.habisp.inf.br/doc>.

Considering the complexity of housing problems and the multiplicity of initiatives and programs in the various spheres of power – local, state and federal – HABISP has been designed to aggregate different geographic, physical, social, economic, and legal data and information on each irregularly or precariously occupied area. This has mainly resulted in increased security in data sources, standardization of accumulated knowledge, cross-checking of several actions taken or planned for a certain area, and, especially, its use as a resource to represent information in cartographic databases that generate maps, thereby helping in the definition of priority areas for intervention.

The integration of geospatial and registration information coming from various sectors in a single environment access through the World Wide Web has been an important advance for the public administration. The first version of the System was released in June 2006 (just six months after the beginning of the team set up). Two main policies guided its development:

1. The use of the System as a tool guiding the planning assistance to the precarious settlement by the technicians of the municipal administration, with the challenge of continuously maintaining and updating it with data and information relevant to decision-making processes.

2. The need for such data and information to be widely accessible to the Sehab-SP technicians, who are responsible for managing and operating the Housing Policy in São Paulo, as well as social agents interested in its carrying out.

2.1 System Development Process

The adopted development model has come from the basic concepts of agile methodologies[8], with the insertion of smaller projects of limited scope and partial deliveries, in order to streamline the service provision, and has been adapted to the needs of Sehab-SP and of the Information technology team hired to carry out the work. The approach has simplified the beginning of the System development work. In July 2006, Sehab's technicians used an early version of HABISP, which facilitated further development, because the feedback from the users served as a lever for the development process.

After five years, the current system has been quite different from the original one with respect to the amount of data and information, and to available applications and employed technology. In its first version, HABISP had registration information only about the favela, a geographical interface based on Autodesk MapGuide (proprietary software responsible for serving the maps on the Web) and two databases, the Oracle Spatial (responsible for storing geographic or spatial data) and Microsoft SQL (responsible for storing the non-geographic or non-spatial data). The main programming languages were the C Sharp and C++ on a .NET Framework, software solution basically running in Windows platform.

8. The term "agile methodologies" became popular in 2001, when 17 experts in software development processes, representing the Scrum, Extreme Programming (XP) methods and others established common principles shared by all these methods. Then, the Agile Alliance was created and the Agile Manifesto was established, which key concepts distinguish: (1) individuals and interactions, rather than processes and tools; (2) executable software, instead of documentation; (3) customer collaboration, instead of contract negotiation; (4) quick response to changes, rather than plans (SANTOS, MSD, 2004).

Currently, the System is very heterogeneous in terms of the employed technology, combining proprietary databases (Microsoft SQL) with open-source alternatives (Postgre SQL), a non-relational database – CouchDB -, and a communication interface with the database (library of the SQL object-relational mapping for the Python language programming) – SQLAlchemy. Approximately 50% of the System was rewritten in the Python language programming (Pylons Framework) for Linux. An architecture based on layers and functions was designed to enable successive changes in different parts of the System without a great impact on the others.

There are three main layers: the first, represented by the database managers and the databases themselves; the second, called Model, responsible for serving the data for the application; finally, the third is the application itself, where the System codes are capable of materializing features that are manifested in the interface, also represented by codes. The heart of the System is the Model because it has a purpose (and ability) to represent the abstract concepts of the real world.

HABISP has suffered significant increase in components and structure, and, consequently, in its complexity, as well as the redirection of the initial technology supported by market solutions to current components with open source. The HABISP interface has also undergone significant changes. The home page, currently in the third version, has evolved from a list of links to a communication interface with the user, with a trend to be reinforced. In its current version, this page has provided news on housing, ongoing projects, and important publications and references for social housing and urbanism.

The map also has undergone major changes since the first interface, based on Autodesk MapGuide to the OpenLayers[9] current library. The initial (geometry editing and layer viewing) functions have become more sophisticated, and the map has gradually become the main access point for both viewing and for editing of data and information.

When we talk about HABISP, we are always referring to a constantly changing environment. If we compare the initial System interfaces (homepage) and its geographical interface (map), in Picture 1 and 2, we find the representative transformations undergone by the System, in the years 2006, 2008, and 2010. Currently, HABISP has consisted of the following subsystems:

- Map: Interface for viewing and editing data and alphanumeric and geographic information. It contains layers related to the Precarious Settlements and other maps for the characterization of the housing precariousness, prioritization indicators, zoning, and environmental issues. Altogether, there are about 280 layers available for consultation.
- Intervention Prioritization System: Panel for configuration and calculation of the indicators that make up the intervention prioritization index.
- Housing Registration: It contains information about the property, the family, and people who live in areas subject to Sehab's intervention. The other assistance-related systems (Land Regularization, Housing Assistance Funds, Social Partnership, and *Cartão Habitacional* (Housing Registration Card) obtain data on the beneficiaries in the housing registration system.
- System for issuing Land Tenure Regularization titles: It is a system that aggregates information coming from the housing registration and from

9. OpenLayers is a JavaScript open source library, which provides an application-programming interface (API – Application Programming Interface) to build web-based geographic applications. The OpenLayers can get data from different resources, such as Web Map Service, Web Feature Service, Google Maps, OpenStreetMap, Bing Maps, Yahoo! Maps, MapServer, GeoServer, KaMap, WorldWind Servers, besides having support for GeoRSS, navigation either by mouse or by keyboard, addition of markers, and selection of layers (OpenLayers, 2007).

the map, along with information entered into the System's interface itself, ultimately issuing the ownership-title type to which each family is entitled.

- System for issuing Funds for Housing Assistance: A system that controls the issuance of money to support the social housing. Housing assistance modality used to assist at-risk families or that need to be removed from areas where there are upgrading or implementation of public facility projects, or other public interest works[10].
- System for issuing permits for the Social Partnership program: It allows control and issuance of permits offered to families who fit the Social Partnership system.
- System for issuing Cartão Habitacional (Housing Registration Card): It issues cards with data of registered families in the housing programs.
- System for contract registration: It makes it possible to track the progress of the contracted works and other contracts related to Sehab's projects.
- Document Archive and Library: Registration and control of the document archive system and of the Sehab library. It contains approximately 11,000 scanned documents, which so far has been only available for internal access.

The first version of HABISP, of July 2006, showed basically the imported data from various databases that Sehab kept in list format, for navigation. Without integrated search feature, the search minimally required knowledge of the type of settlement to be consulted.

Source: <www.habisp.inf.br>, own elaboration.

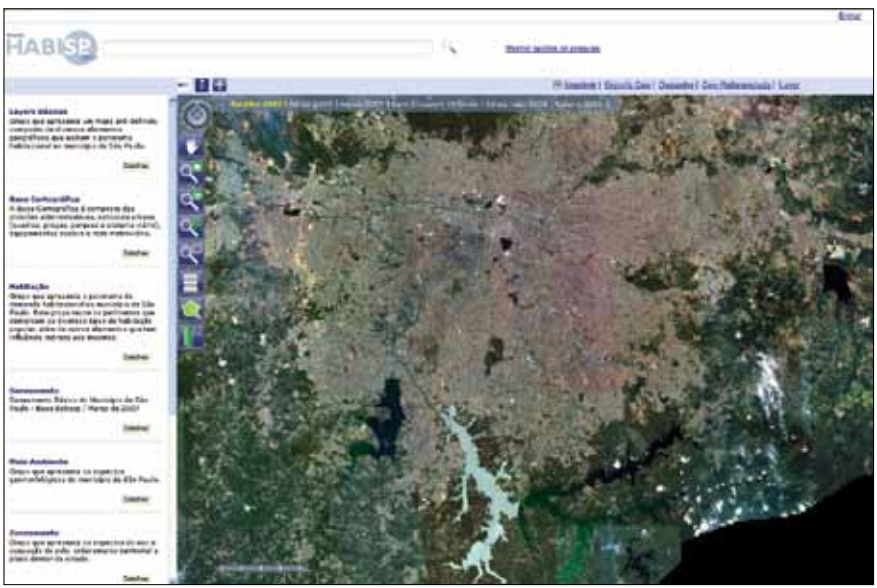
10. Such services are in accordance with Decree No. 51,653, of July 22,2010, Ordinance nº 323/SEHAB 2010.

In the September 2008 version, HABISP won an input interface still with few resources; however, it was a more orderly interface. The search feature was not yet integrated and followed the concept of the previous version. New features already appear, such as the prioritization system and issuance of concession titles.
Source: <www.habisp.inf.br>, own elaboration.

The 2010 version has several improvements over the previous interface:
- Integrated search – search engine based on the Solr component, able to find any indexed element in the database.
- News posts relevant to the social housing.
- More communicative layout and preparation for the English and Spanish versions.
- Integrated access control (based on OpenLDAP software).
- More content organization and increase of the available documents.

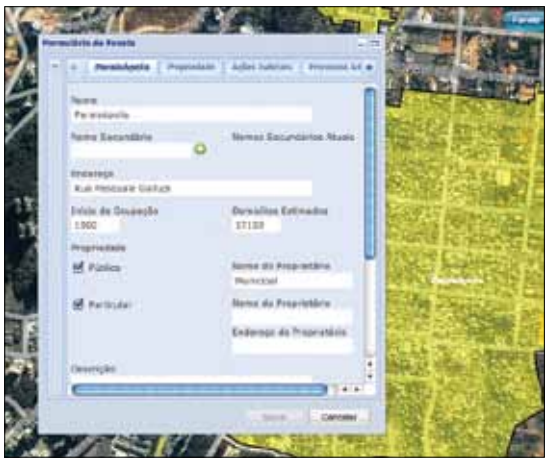
Source: <www.habisp.inf.br>, own elaboration.

The first version of the map had few features, apart from the data by the map guide. It lacked its own searching and browsing system; the browsing was performed from the list of favelas available on the home page of the site. The drawing tools were limited to the creation and deletion of polygons.
Source: <www.habisp.inf.br>, own elaboration.



The 2008 version brought little progress in relation to the previous interface, and the organization of the layers. But it initiated the map concept as a central point of searching and updating information.
Source: <www.habisp.inf.br>, own elaboration.

The 2010 version has indeed representative advances: an integrated search system (based on Solr component) for spatial navigation, search of settlements, streets, risk areas, etc., and another system for the search of available layers, a control layer that enables more efficient ordering of the overlaying layers and the transparency control.
The access control makes it possible to monitor individually viewing and editing of layers; the edition has more refined features such as vertex deletion. In this version, one can directly edit attributes on the map, without the need of two editing points as in the previous version (data on the site and geometry on the map).
Other features: geometry download; export images in JPEG, PDF and GeoTIFF formats; permalink that can send a link with the representation of active layers and geographical position visible on the screen, control of raster layers, zoom scale, and others.
Source: <www.habisp.inf.br>, own elaboration.



2.2 What is Habisp?

Although HABISP has the ability to store and process geographic data, it is not a Geographic Information System (GIS), but rather, for the most part, a management information system, serving the planning, control, and decision-making functions, condensing the information obtained from information obtained from the transaction-processing systems with routine and exception reports. The fundamental difference between HABISP and a GIS is that in HABISP, the space operations – mathematical calculations using geometries – are processed in databases beforehand and, then, made available for consultation, while GIS has the intelligence and the ability to automatically process this information, whenever required.

The generation of thematic maps, for example, which is one of the basic applications of GIS software; they have been created in HABISP with the integration of map publication layer with the Database. The developed routines load the spatial data, originally in shapefile format, correlating them with socioeconomic data, stored in the relational database (through a join operation[11]) and transporting them to the spatial database. From there, one can create a thematic map and make it available in the interface. But because they are static representations, after generating the map, if there is any data or attribute change in the source research, the process must be redone, in order to make the change visible on the map.

The key to the process generation of thematic maps has been the standardization for the implementation of cartographic products to be loaded into the database, which has allowed some process automation, leaving only the basic tasks to be manually performed, such as shapefile[12] and validation of configuration maps. The standardization of the cartographic products has also facilitated the process of generating descriptive specifications of a lot, alley, area, and perimeter used in the land regularization program.

The routine of specification generation is an spatially-enabled database script[13], which contains the rules necessary to read the geometry of the lot and its adjacent geometries, and to (graphically and literally) present the result of spatial analysis to the interface. The concession title issued by the Land Tenure Regularization System is an example of integration between the HABISP various systems. It has gathered information coming from the housing registration, the regularization system itself, and the map system (more specifically the spatial database), as the specifications of the lot and sketch of the lot. The title document consists of four pages, with a cover sheet, three pages of the document text, and an attachment with the sketch of the lot.

As the generation of specifications, other spatial analyzes prepared with (albeit simple) overlaying layers are processed in the database and made available to the consumer interface, such as: (sub-municipality, district, and regional) location analysis; area calculation; and indicators, such as average income (currently calculated on the map of the 2000 IBGE census sectors). Both Oracle and PostgreSQL support this type of operation.

11. Join (to): gather (to). It represents the join operation data originating from different sites on a single point by a single entity that correlate them.
12. Shapefile is one of the file formats for the GIS (Geographic Information System) software. It is quite usual and read at most GIS. What we call shapefile is actually composed of three files: one in Shapefile shape format (.shp), in which the geometries are stored; one in Shapefile attribute format (.dbf), in which are stored the data and attributes of geometries; and one in Shapefile shape index format (.shx), which makes indexing the geometry for easy viewing and searching.
13. Script: Old English *scrit*, Latin *scriptum* (something written), from *scrībō* ("write").

PREFEITURA DO MUNICÍPIO DE SÃO PAULO

Número de controle: 800110010002/1

TERMO ADMINISTRATIVO DE CONCESSÃO DE USO ESPECIAL PARA FINS DE MORADIA

Aos 5 dias do mês de junho de 2008, no Gabinete da Superintendência de Habitação Popular, situado na Rua São Bento, 405 - 11º andar – Prédio Martinelli, de um lado, a **PREFEITURA DO MUNICÍPIO DE SÃO PAULO**, pessoa jurídica de direito público interno, neste ato representada pelo Senhor Secretário Municipal de Habitação e pelo Senhor Superintendente de Habitação Popular , doravante denominada **CONCEDENTE**, e de outro lado, , RG: , CPF: , doravante denominado(a) **CONCESSIONÁRIO(A)**, com fundamento no artigo 183, § 1º da Constituição Federal, no artigo 4º, inciso V, alínea "h", do Estatuto da Cidade, na Medida Provisória n.º 2.220, de 4 de setembro de 2.001, na Lei Municipal n.º 13.514, de 16 de janeiro de 2003, na Lei Municipal nº 14.665, de 08 de janeiro de 2008 e no Decreto Municipal n.º 49.498, de 16 de maio de 2008, celebram o presente **TERMO DE CONCESSÃO DE USO ESPECIAL PARA FINS DE MORADIA**, de acordo com as seguintes cláusulas e condições:

CLÁUSULA PRIMEIRA - Do domínio municipal

A CONCEDENTE é titular do domínio do imóvel denominado "Alcides Quintar", situado na Rua Alcides Quintar/ Rua Manuel Agreda, originário do antigo espaço livre nº 44M configurado no croqui nº 105750 do arquivo do Departamento Patrimonial da Secretaria dos Negócios Jurídicos.

CLÁUSULA SEGUNDA - Da posse do imóvel objeto de concessão

A CONCEDENTE constatou, pelo processo administrativo n.º 200801300971, que o(a) CONCESSIONÁRIO(A) ocupava parte da área mencionada na cláusula primeira para sua moradia e de sua família, ininterruptamente, há mais de 5 (cinco) anos, anteriormente a 30 de junho de 2001.

CLÁUSULA TERCEIRA - Da descrição do imóvel objeto de concessão

A área ocupada pelo(a) CONCESSIONÁRIO(A) possui 54,28m² (cinquenta e quatro metros e vinte e oito centímetros quadrados), está identificada como lote n.º 800110010002 na planta anexa, faz frente para a Rua Alcides Quintar, e assim se descreve e caracteriza:
Partindo-se do ponto 1, alinhado com a Rua Alcides Quintar na extensão de 5,19 m (cinco metros e dezenove centímetros) até o ponto 2 e segue confrontando com o LOTE 8001010010003 na extensão de 11,14 m (onze metros e quatorze centímetros) até o ponto 3 e segue confrontando com o Imóvel nº 700 da Rua Pilar do Sul com nº de Contribuinte Municipal 138.097.0021 na extensão de 4,84 m (quatro metros e oitenta e quatro centímetros) até o ponto 4 e segue confrontando com o LOTE 8001010010001 na extensão de 10,54 m (dez metros e cinquenta e quatro centímetros) até o ponto 1, ponto inicial da descrição deste lote onde fecha a poligonal..

CLÁUSULA QUARTA - Da outorga da concessão de uso especial para fins de moradia

A CONCEDENTE, pelo presente instrumento, outorga ao(à) CONCESSIONÁRIO(A) a concessão de uso especial do imóvel descrito na cláusula terceira, no qual está edificada sua residência, a título gratuito, para fins de sua moradia ou de sua família.

CLÁUSULA QUINTA - Do prazo

A presente concessão de uso especial para fins de moradia é outorgada por prazo indeterminado, nas condições previstas neste termo.

Lot descriptive specification and a concession title issued by the HABISP system.
Source: <www.habisp.inf.br>.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO

CLÁUSULA SEXTA - Das obrigações do(a) CONCESSIONÁRIO(A)

Pelo presente termo, o(a) CONCESSIONÁRIO(A) obriga-se a:

a) - não utilizar a área para finalidade diversa da residencial;

b) - não ceder ou locar o imóvel a terceiros;

c) - não permitir que terceiros se apossem do imóvel, dando conhecimento à Prefeitura de qualquer turbação;

d) - arcar com as despesas e encargos que vierem a recair sobre o imóvel, inclusive tarifas e tributos.

CLÁUSULA SÉTIMA - Da transferência do direito de concessão de uso especial

A presente concessão de uso especial para fins de moradia é transferível por ato "inter vivos" ou "causa mortis", devendo o interessado requerer a transferência na Superintendência de Habitação Popular, nos termos do artigo 16 e seguintes do Decreto Municipal nº 49.498 de 16 de maio de 2008.

CLÁUSULA OITAVA - Da extinção da concessão de uso especial

A concessão de uso especial ora outorgada extingue-se, de pleno direito, se o(a) CONCESSIONÁRIO(A):

a) - conferir ao imóvel destinação diversa da determinada na cláusula quarta supra;

b) – adquirir a propriedade ou a concessão de uso de outro imóvel urbano ou rural.

CLÁUSULA NONA - Do registro em Cartório de Registro de Imóveis

Neste ato, as partes autorizam o registro deste instrumento junto ao Cartório de Registro de Imóveis competente, nos termos do § 4º do artigo 6º da Medida Provisória nº 2.220, de 4 de setembro de 2001 e do parágrafo único do artigo 13 do Decreto Municipal nº 49.498, de 16 de maio de 2008.

CLÁUSULA DÉCIMA - Da condição especial

A CONCEDENTE assegura ao(à) CONCESSIONÁRIO(A) o direito à concessão de uso especial para fins de moradia, nas mesmas condições previstas neste termo, em local a ser determinado pela CONCEDENTE, se houver necessidade de utilização da área descrita na cláusula terceira para fins de urbanização, de acordo com o disposto no artigo 5º, inciso II, da Medida Provisória nº 2.220, de 4 de setembro de 2001.

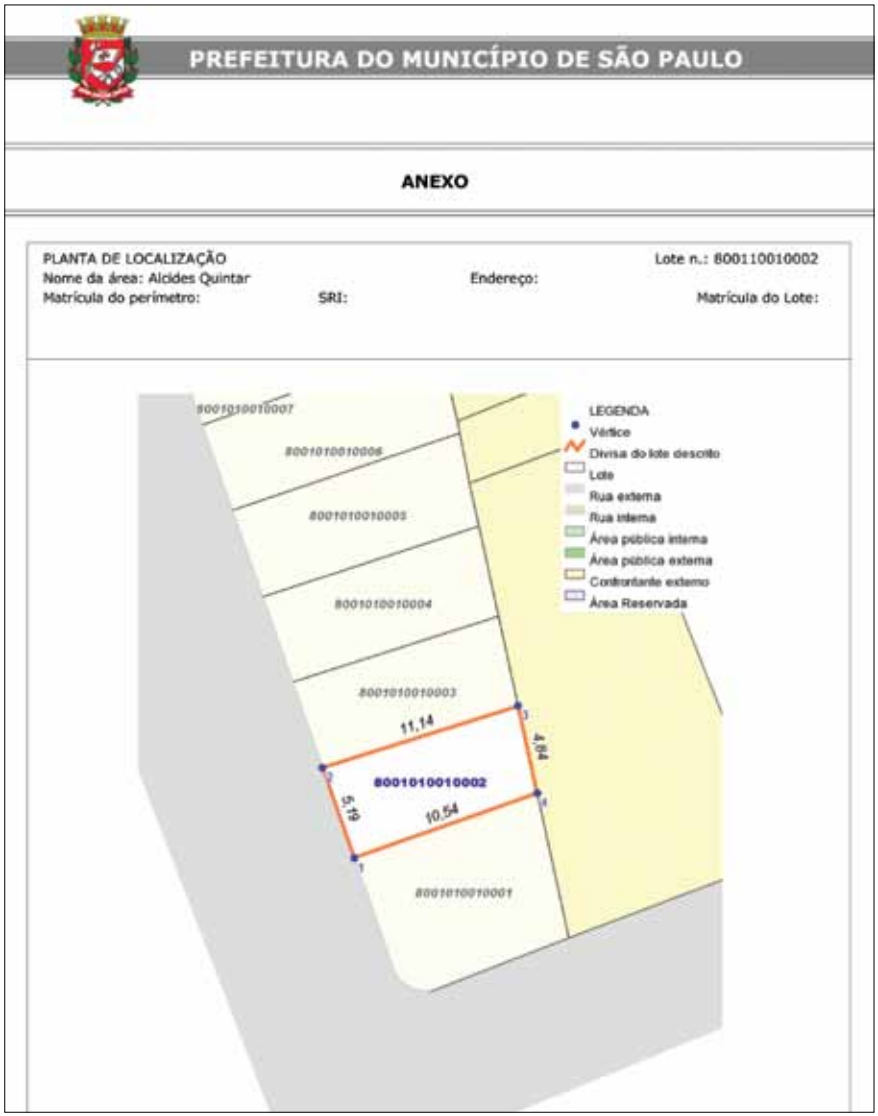
Finalmente, o(a) CONCESSIONÁRIO(A) declara, sob as penas da lei, que não é proprietário(a) ou concessionário(a) de outro imóvel urbano ou rural, e que sua situação sócio-econômica enquadra-se como de baixa renda, segundo os critérios da CONCEDENTE.

E para constar, eu, , lavrei o presente Termo, em 2 (duas) vias de igual teor e para o mesmo fim, que vai assinado pelas partes.

Pelo(a) CONCESSIONÁRIO(A):

_____

Lot descriptive specification and a concession title issued by the HABISP system.
Source: <www.habisp.inf.br>.



Lot descriptive specification and a concession title issued by the HABISP system.
Source: <www.habisp.inf.br>

2.2.1 The map interface

It is also on the map that the settlement registrations are performed, and new geographic features and attributes to these features are edited and created. From the map, one can search the desired features or layers (currently using a Solr[14] component).

The technology-based map is the OpenLayers library, with about 60% of the currently existing application referring to the development of this library own code. GeoServer[15] and MapServer[16] are used for availability of web maps. MapServer's function is to serve the maps in WMS format; it communicates with the spatial database (PostGIS, in the case of HABISP), reads the description of one (or more) geographic feature(s) and transforms it/them into an image that is returned to the code and shown in the interface.

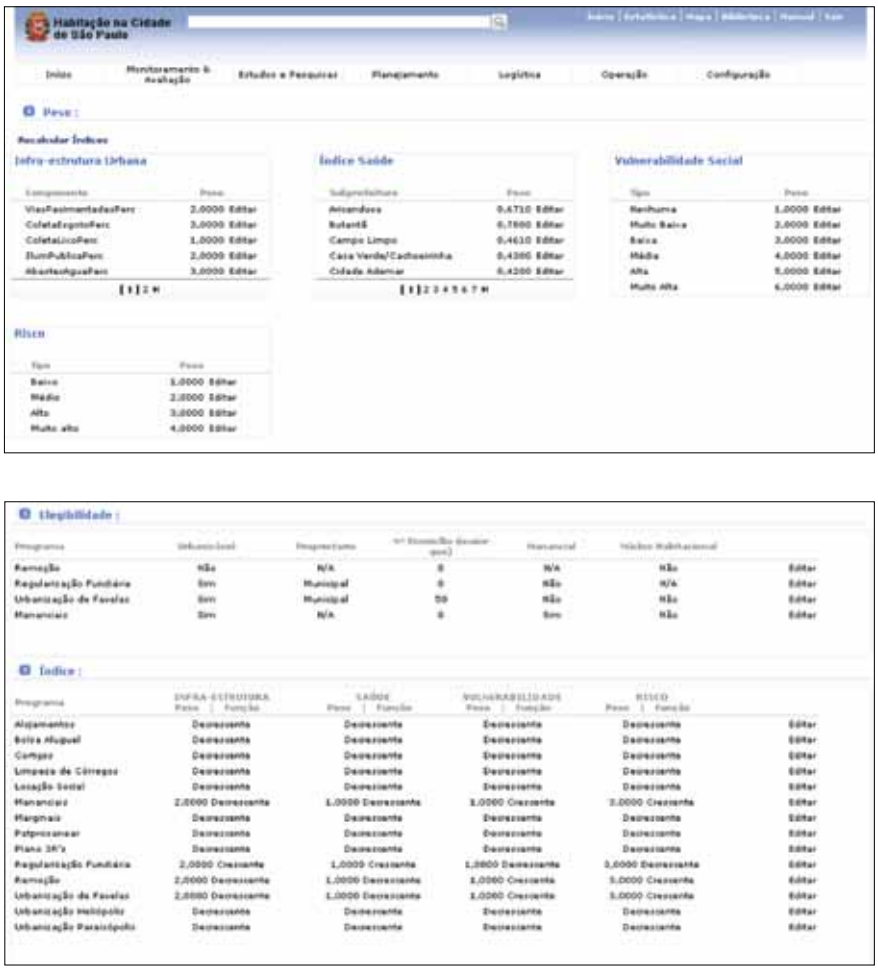
All layers existing in HABISP are stored in the MapServer. In the case of GeoServer, it communicates with the database, reads the description of a feature, and returns to a file in Geography Markup Language (GML), which is interpreted and processed by OpenLayers, returning to a file in WFS-T (vector) format, which can be edited.

The key component of the map is, undoubtedly, the OpenLayers. It is able to read and speak different protocols within the parameters of international Open Geospatial Consortium (OGC) for GIS applications, which enables HABISP to make use of any application that is based on the same parameters. The OCG is an international voluntary consensus standards organization, with

14. Solr is an open source enterprise search platform. Its major features include full-text search, hit highlighting, faceted search, dynamic clustering, database integration, and rich document (e.g., Word, PDF) handling, provision of distributed search and index replication. It runs as a standalone full-text search server within a servlet container such as Apache Tomcat. Solr can be tailored to many types of application without coding, and it has a plug-in architecture to support more advanced customization (The Apache Software Foundation, 2007).
15. GeoServer is an open source, maintained by the Open Planning Project, which allows the development of web mapping solutions, integrating diverse repositories of geographic data. GeoServer is developed with a full implementation of the Map Service (WMS), Web Coverage Service (WCS) and Web Feature Service-Transaction (WFS-T), which follows the Open Geospatial Consortium (OGC) specifications. GeoServer's focus is ease of use and support for open standards, in order to enable rapid sharing of geospatial information (GeoServer, 2011).
16. MapServer is an open source development environment for building spatially enabled Internet applications. It is not a full-featured GIS system; instead, it stands out on the presentation of spatial data (maps, images, and vector data) on the web. Besides allowing view GIS data, MapServer allows geographic image maps that can direct users to content. It was originally developed as part of the ForNET Project by the University of Minnesota (UMN), in cooperation with NASA and the Minnesota Department of Natural Resources (MNDNR). Currently, the project is housed by the TerraSIP Project, jointly sponsored by NASA and UMN, and a consortium of land management interests (OSGEO Foundation, 2008).
17. The English verb "to render" has been used in computer graphics, meaning to convert a series of graphic symbols in a visual archive. On the web, this process occurs when the browser has already received a new page, but the screen will be gradually formed.
18. Cache is a device for quick access, internal to a system, which acts as an intermediary between an operator of a process and the storage device to which the operator accesses. The main advantage in using a cache is to prevent access to the storage device – which can be time consuming –, storing data in faster access ways (MetaCarta, 2006).
19. MapProxy is an open source proxy that performs caches, accelerates, and transforms data from existing map services, and serves any desktop or web GIS client. It acts as a tile cache solution, but it also offers many new and innovative features like full support for WMS clients. MapProxy is actively developed and supported by Omniscale; it is released under the Apache Software License 2.0, runs on Unix/Linux and Windows and is easy to install and to configure (OMNISCALE, 2010).
20. TileCache is an implementation of the protocol WMS-C developed by MetaCarta. TileCache provides a Python-based WMS / TMS server with pluggable caching mechanisms and rendering backends. TileCache requires write access to a disk, the ability to run Python CGI scripts, and WMS ones wants to be cached. With these features, one can create his/her own local disk-based cache of any WMS server, and use the result in any WMS-C supporting client, like OpenLayers, or any TMS supporting client, like OpenLayers and worldKit (MetaCarta, 2006)

which more than 280 organizations worldwide collaborate, encouraging the development and implementation of open standards for geospatial content and services based on called Abstract Specification - describing a basic data model representing geographic features. The most important OGC standards are: 1) Web Map Service (WMS); 2) Web Feature Service (WFS); 3) Web Coverage Service (WCS); 4) Catalog Service for the Web (CSW) ; 5) Simple Features (SFS): Structured Query Language (SQL); and 6) Geography Markup Language (GML) (Open Geospatial Consortium, 1994-2012).

With regard to images and orthophotos, to be efficiently worked, the original images (received to start the system) were processed in a pyramid structure, to then be "rendered"[17] in the interface in tiles and stored in cache[18] by two components responsible for this function: MapProxy[19] and TileCache[20]. In terms of content, the following images and orthophotos of the 2002, 2003, 2007, and 2008 years are available:



Weight configuration screen. Prioritization System.
Source: <www.habisp.inf.br>.

1. IKONOS satellite image of the year 2002 – acquired by the state government of São Paulo to support economic and social diagnoses of the Water Source Program, in the phase of request for funding from the World Bank. With spatial resolution of 1 meter in the panchromatic sensor and 4 meters in multispectral one, the images cover the full extent of the Metropolitan Region of São Paulo (RMSP).
2. Orthorectified photos of the year 2003 – flight hired by Sabesp yielded to Sehab in the context of work on the Sehab /Sabesp agreement. Along with the images, the cartographic products derived from aerophotogrammetric restoration were also ceded. Flight scale of 1:8,000 meters and final scale 1:2,000.
3. Orthorectified photos of the year of 2007 – flight acquired by Sehab from the Base Aerofotogrametria Company files. Flight scale of 1:15,000 meters and final scale 1:5,000.
4. Orthorectified photos of the year 2008 – flight hired by Sehab conducted in 108 areas inserted in the Land Regularization Program of Public Areas. These orthophotos were also brought back for fieldwork, and later, specification documents were generated and concession titles were issued. Flight scale of 1:3000 meters and final scale 1:500 meters.

The files that give rise to the layers available for viewing from the map servers are generated in map file format, read by the MapServer and GeoServer. These layers can be classified as single or compound. A single layer consists of a single file in shapefile format, loaded into the database. A compound layer consists of several grouped shapefile files. This is a configuration file that describes to the servers the rules of how the layers should be displayed in the interface.

2.2.2 Intervention Prioritization System

Regarding the prioritization of interventions, the strategy selected by Sehab-SP has arisen from the generation of indicators that would provide answers, as settlement upgrading degree, population vulnerability, geological conditions, etc., and that could also be combined into a single (prioritization) index. For that, HABISP and its Prioritization System have been used.

The Prioritization Index is a composite indicator that adds other indexes by means of a weighting method focused on the importance of an indicator, compared to the others that compose the index. The weighting model uses weight 3 for the risk index, and 2 to 1 for infrastructure vulnerability and health. The used indices have different origins. The risk is based on the mapping of the landslide and undermining risk, originating from a survey conducted by the Fundação de Apoio à Universidade de São Paulo (FUSP), in partnership with the *Instituto de Pesquisas Tecnológicas* – IPT (Institute for Technological Research), first held in city in 2003, and updated in 2010.

There are two principles for the choice of indicators that make up the Prioritization Index: (1) the protection of the population life and improved living conditions to acceptable levels, and (2) protection of the socially vulnerable population. HABISP has been prepared to perform statistical and geographic calculations of each indicator. It has a logical matrix that is configured to calculate the weights of each of the indices that make up the System, so as to enable the administrator to interact and validate the process, and to adapt it to cyclical changes that influence the decision-making process.

2.3 The Habisp development cycles

Three important moments should be highlighted in the HABISP and the Prioritization System development. The first moment happened when the design and principles of foundations were established. The intense involvement of the SEHAB-SP technical staff was closely related to the data updating on housing demand within the design with the Cities Alliance.

The second moment happened after updating the demand data, and involved a thought construction for the planning with the analysis of the collected information, the creation of the indicators, indexes and the Prioritization System. The "side effects" related to the two experiments were the integration of teams and review of work procedures.

Its drafting process has resulted in changes in the SEHAB-SP modus operandi, paving the way for the consolidation of a vision in which the programmatic actions should be integrated not only within their departments, but also in the territory. Based on the certainty that the social housing issue means a spatial phenomenon, it has been decided that a concrete representation of the socio-environmental precariousness should be built, in order to grasp its actual territorial distribution in the city.

This transformation, which started the HABISP development and its Prioritization System, has been consolidated with the definition of the *Perímetros de Ação Integrada* – PAI (Perimeters of Integrated Action) and pragmatically materialized in the Urban Planning developed for the PAIs, and specific upgrading projects for each settlement.

The Urban Planning aims to analyze the potentialities and challenges in the region and integrate other plans and projects prepared by the municipality in various departments – road projects, transport, large-scale infrastructure, public facilities, parks, etc. And, from the perspective of respecting the territory preexistence, it aims to make proposals and / or adjustments to these projects to enhance the potentialities, to minimize weaknesses, and to promote the local economic and social development, without "giving up" the permanence of families within the perimeter being studied and an upgrading project geared to the specific needs of each population, but with the concern to offer a good architecture to all residents of city of São Paulo.

The third moment happened in an interval time in which the municipal plan went through a process of incubation. HABISP turned, then, to the development of management systems for some programs or actions, such as the issuance of special use concession for housing[21]. After that, a new planning cycle began the detailing of the MHP actions and the deployment of new features on the map to be updated as the Perimeters of Integrated Action, and the geological risk mapping.

The HABISP utilities that subsidize the planning and overall management of the Housing Policy have not been exhausted in the process of drafting the Municipal Housing Plan. Other design levels within smaller space, such as upgrading projects, have found very valuable support in the collection and processing of information about people, families, and households in each settlement, especially when these tasks can be performed in a short-time span and with greater reliability.

21. Services related Land Tenure and Regularization and Urban Upgrading of Public Spaces.

Conjunto Habitacional Nova Silvina.
Photo: Wilson Magão. Collection: Secom/PMSP.

This is the case of the survey and processing of data contained in the registration and research instrument used by the Housing Secretariat. These data have completed the characterization of living spaces in which the problems of inadequate housing are treated. One of the HABISP latest developments has created the possibility of applying electronic questionnaires through the use of mobile computing devices that allow the direct validated-data transmission to the correspondent database in the System. This evolution has reduced the time between the research application and its processing for the production of indicators that support the analysis and planning of the urban and social interventions taken place in each area.

The simplification of this process has also facilitated the diversification of instruments for data collection, so that they can tailor to the specific objectives of each survey. Starting from an analysis of the need to collect primary data at each stage of the project in a given living space, and taking into account the specific features of the programs implemented by Sehab-SP, the data have been established that would enable the research objectives to be achieved in all these occasions and those that responded to these objectives.

This analysis has resulted in a proposal formed by a set of relevant issues applicable to each stage, allowing a more rational ratio between the costs and benefits of data collection. Special mention deserves to be given to the development of specific instruments to assess the impacts of each of the Sehab-SP programs, according to its objectives and focus of action, following a design that addresses three common axes: housing and urban integration, social inclusion, and resident's satisfaction[22].

In parallel to this process, the system management team has worked for the benefit of a significant improvement of procedures of data sealing, collection, review, and validation, through the adoption of more effective control mechanisms. As a result of these adjustments, the procedures contained in the manuals have been reviewed and updated. All these measures have substantively incremented the reliability of the data collected with the new instrument.

In fact, these measures have been derived from the employed philosophy, from the central idea of systematizing data and information on the demand for social housing, and democratizing access to this information. Mainly, equipping the technical staff and the public officials with appropriate, specific, quantitative and qualitative knowledge on this demand, based on the need to plan and prioritize public investments. This philosophy can change appearance, be redone, gain new applications, aggregate modern versions, and add other analysis models, but it has been always directed to steer the System development and improvement.

22. The evaluation axes follow the guidance of the Ministry of Cities. *Matriz de Indicadores para Avaliação do Pós-Ocupação dos Projetos Piloto de Investimento e Intervenção em Favelas*. Available at: http://www.cidades.gov.br/images/stories/ArquivosSNH/ArquivosPDF/Avaliacao/AVALIACaO_DE_POS_OCUPACaO. Access data: June 2, 2010.

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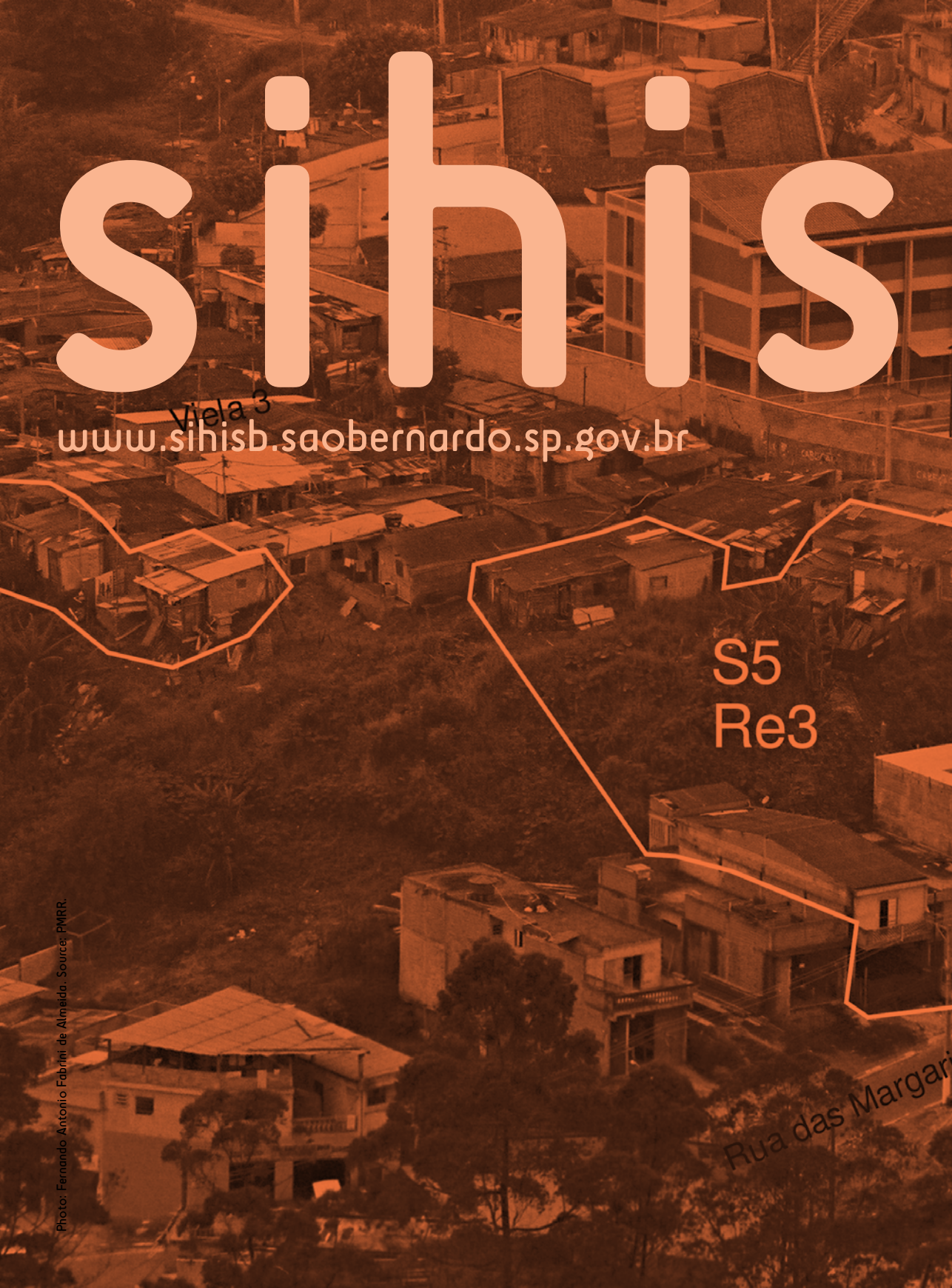


Photo: Fernando Antonio Fabrini de Almeida. Source: PMRR.

Chapter 3
Sihisb: the re-elaboration of the existing experience from the São Bernardo do Campo conditions

As explained in previous chapters, the implementation of the Information System for Social Housing in São Bernardo do Campo (SIHISB) has been carried out through a technical cooperation for the customization of HABISP – the information system developed and coordinated by the municipality of São Paulo – with the support of the Cities Alliance and the World Bank.

As in HABISP, the System works via web, from storage and processing of alphanumeric and geographic information relating to social interest settlements of the municipality, to families registered by the government for housing assistance, and to actions of land regularization project developed by the Municipal Housing Secretariat.

SIHISB has been created with the general objectives of: systematizing the available information on social housing in the municipality to support the planning and execution; monitoring the municipal social housing programs; and democratizing access to information by citizens. At the same time, the following specific objectives have also been established:

- To organize and systematize available data on precarious and/or irregular settlements in the municipality;
- To organize and systematize available data on Housing Policy interventions underway in the municipality;
- To organize and systematize the available data on the records of assistance service in Housing Policy interventions underway in the municipality;
- To facilitate the movement and access to information about social housing to other municipal bodies;
- To democratize access to social housing information to citizens and popular technical entities in general.

From these principles and objectives, the first basic steps for structuring SIHISB in São Bernardo do Campo were developed, in line with management strategies that were being implemented from the development of the *Plano Local de Habitação de Interesse Social* – PLHIS (Local Social Housing Plan).

The PLHIS in São Bernardo do Campo[23] was elaborated between the years 2010 and 2011, after the reorganization of the housing actions of the municipality, with the establishment of the Municipal Housing Secretariat, and the creation of the Municipal Housing Fund and the Municipal Housing Council between 2009 and 2010. This Local Housing Plan followed the guidelines developed by the National Housing Plan, coordinated by the Ministry of Cities.

Thus, actions in the municipality were outlined with the aim of enabling solutions to issues related to housing, such as adequate housing for low-income people (up to 3 minimum wages). This has primarily included the families living in precarious and/or irregular settlements, through upgrading processes and various programs in an integrated intervention process between the actions and the resources of the three spheres of government, in particular the inclusion and access to resources of the *Sistema Nacional de Habitação de Interesse Social* – SNHIS (National Social Interest Housing System).

To equate the housing problems of São Bernardo do Campo, the PLHIS has proposed short-term, medium-term, and long-term actions, in a period extending from 2011 to 2025. Thus, the activities have been subdivided into stages that cover issues vital to the performance of the contract: Methodological Proposal, Housing Diagnosis, and Action Strategy.

These steps have resulted in the development of programmatic lines and organization of intervention programs facing different housing challenges in the municipality. Divided into three main areas, the program lines have been structured in programs and sub-programs, which articulate coordinator, operator, and financial agents, and public and private housing promoters:

- LPA 1 – Urban Integration of Precarious and/or Irregular Settlements: it covers the programs: (1) Program for Integrated Upgrading and Precarious Settlement Regularization; (2) Program for Land Tenure Regularization of Consolidated Irregular Settlements and Housing Projects; (3) Municipal Risk Reduction Plan; (4) Program for Supervisory Control and Prevention of Irregular Settlements and Densification of Occupied Areas.

- LPA 2 – Housing Production: it includes only the Housing Production Program (production of new units).

- LPA 3 – Institutional Development: it includes the Institutional Development and Participative Management Program.

The Information System for Social Housing in São Bernardo do Campo (SIHISB) is inserted into the LPA 3 and is one of the priority projects of the Institutional Development Program, whose goal is to increase the ability to manage housing projects and programs; to encompass personal development actions, continuous training of technical teams, and continuous formulation of new instruments; and, above all, to promote transparency in the management of institutional actions and interaction with society.

3.1 Dimensioning the problem: the Sihisb foundations

From the definition that the institutional development was one of the foundations for implementing the Local Plan for Social Housing, and in view of the relevance of a reliable and innovative information system that could optimize such actions, the foundation had to be built. That is, the databases had to be established and the extent of housing problems of São Bernardo do Campo had to be mapped and diagnosed, so that SIHISB could become an information tool for the efficient and transparent planning of the management actions.

The Mapping of Precarious and/or Irregular Settlements and the mapping of risk areas of the municipality for the elaboration of the Municipal Risk Reduction Plan, held between 2009 and 2010, accomplished this mission.

The Mapping of Precarious and/or Irregular Settlements proposed to meet the housing problem of the municipality in its various dimensions, identifying and characterizing the precariousness, quantifying the households in precarious and/or irregular settlements, and dimensioning the quantitative housing deficit.

The study, prepared by FUNEP[24], has characterized the municipality settlements as to the physical-environmental, socioeconomic, and land aspects, and ranked them in relation to the standardization of the problem typology. The settlements have also been considered from their intervention priority degrees, in order to support solutions to housing issues in all areas.

Surveys were performed on: (I) physical and environmental data in the settlements; (II) internal information to the city government and other public agencies; (III) socioeconomic data; and (IV) qualitative information with community leaders. All of these surveys were driven by previously detailed methodology and procedures and employed tools (or scripts) suitable for the application and registration of collected information.

In total, the mapping revealed the existence of 261 precarious and/or irregular settlements, totaling 86,820 households. Of these settlements, 155 (60%) were classified as favelas and 106 (40%) as irregular settlements. 3,429 housing units in 11 irregular housing projects, which are not characterized as precarious, supplement the municipality irregularity.

The mapping resulted in the definition of the typologies to classify settlements mapped into categories of similar housing problems and to allow the definition of subsequent interventions demanded by the problem typology (see table). This action was strategic for defining the scope of work of the Housing Secretariat in the Housing Policy and its integration with other secretariats.

Improving the diagnosis and characterization of areas, the Municipal Risk Reduction Plan (PMRR), based on historical and field verification, has selected 95 of the 261 precarious settlements to more accurately assess the potential risk associated with landslides, undermining, flooding, and waterlogging that characterized them.

23. This Local Plan for Social Housing followed the guidelines developed by the National Plan for Social Housing, coordinated by the Ministry of Cities.
24. Prepared by the Research, Education and Extension Support Foundation (FUNEP) between 2009 and 2010, under contract with the Municipal Housing Secretariat of São Bernardo do Campo.

Chart – Employed Typology of Problems

Typology 1 – Settlements consolidated without urbanistic or property regularity:

- Satisfactory level of basic infrastructure;
- Adequate parceling and housing that just need regularization.

Typology 2 – Partially-urbanized irregular settlements, with defined parceling:

- They need specific infrastructure works that do not require removal;
- Their land regularization is independent of such works;
- They may shelter inadequate housings.

Typology 3 – Partially-urbanized irregular settlements (5% to 7% of units), with defined parceling:

- They are consolidated, but they need occasional infrastructure works;
- Their land tenure regularization is independent of such works, but demand punctual removals, generally by mapped risk situations;
- They may shelter inadequate housings.

Typology 4 – Feasible irregular and precarious settlements:

- They present risk situations and total or partially lack of infrastructure (involving at least 40% of removals);
- They demand complex and expensive upgrading works and a significant removal percentage;
- They demand changes in the land parceling;
- The regularization depends on the works.

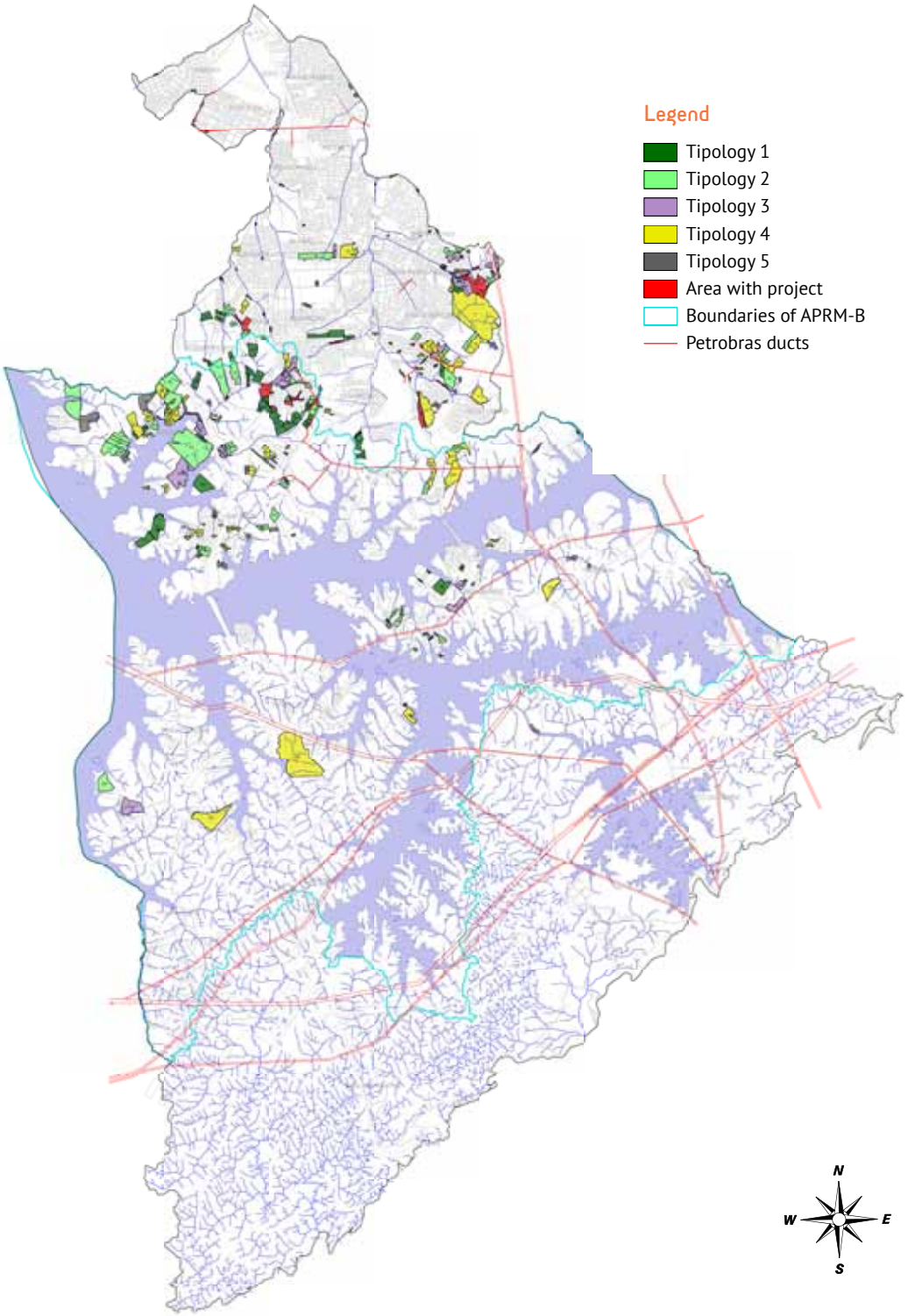
Typology 5 – Non- feasible irregular settlements:

- They cannot be consolidated because of legal or physical-environmental restrictions;
- They present mapped risk situations.

Typology 6 – Irregular housing projects promoted by the government:

- Their approval and licensing are completed or in progress;
- They have good level of consolidation and infrastructure;
- The regularization intervention does not depend on any investment in works or on small interventions.

Photos: Sehab/PMSBC collection. Source: Mapping of Precarious and/or Irregular Settlements



Precarious and/or Irregular Settlements by the problem typology.
Map: Aramis Horvath Gomes (Sehab/PMSBC). Source: PLHIS, 2010.

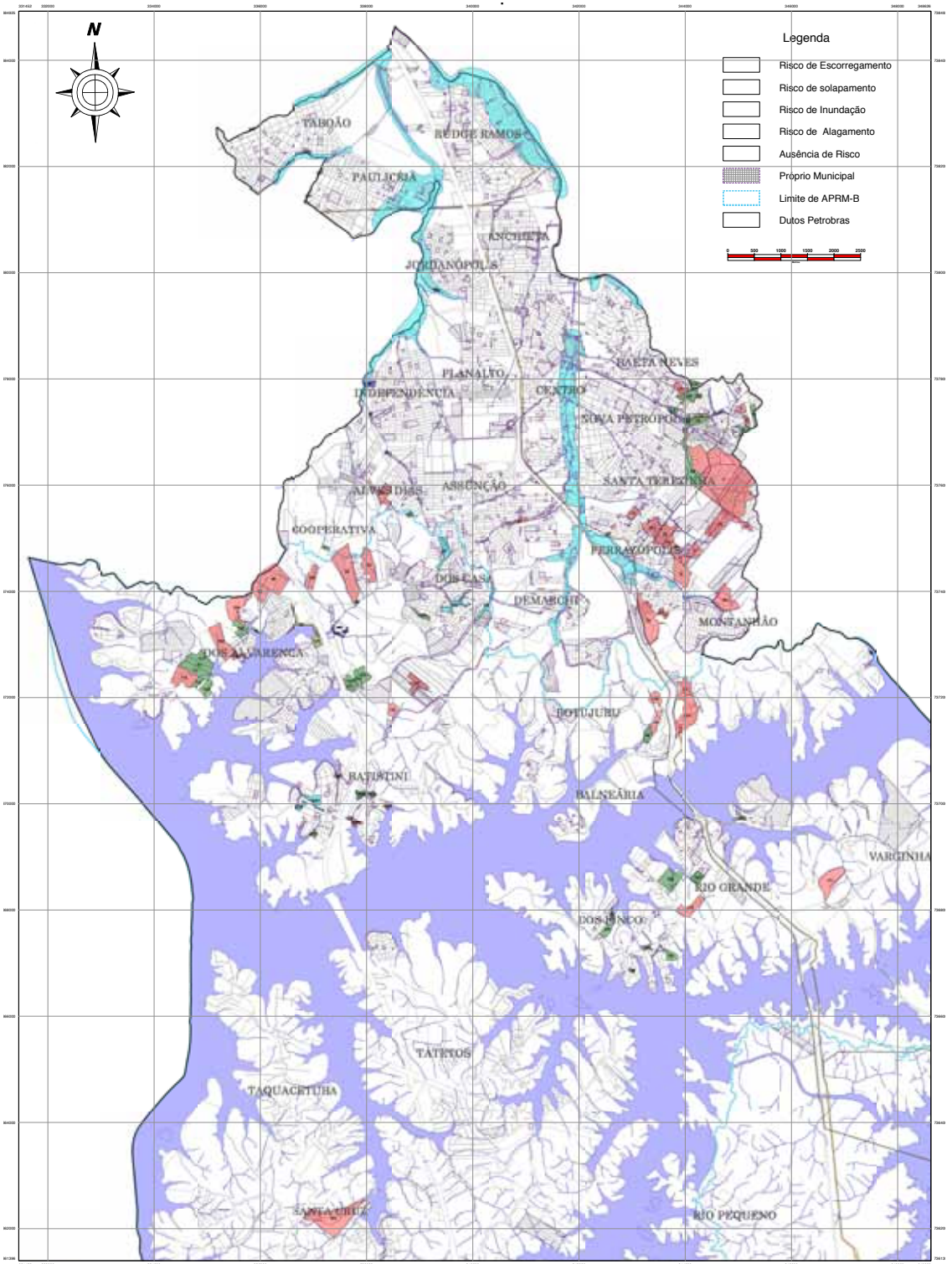
Presentation of PMRR to society.
Foto: Wilson Magão.
Acervo: Secom/PMSBC, 2010.

The surveys have specifically expressed analyzes of: (a) current conditions of geological and geotechnical risk to which the 95 studied areas are subjected; (b) structural interventions to eliminate, reduce and/or control these geological and geotechnical risk situations; (c) the cost estimates for each risk area identified; (d) the actions, projects, and programs consistent with interventions to reduce risk and the alternative sources of funds to be raised for this purpose; (e) a suggested intervention priority scale for the studied geological and geotechnical risk situations; (f) a proposal for the strategic management, reduction, and eradication of geological and geotechnical risk areas identified in the municipality.

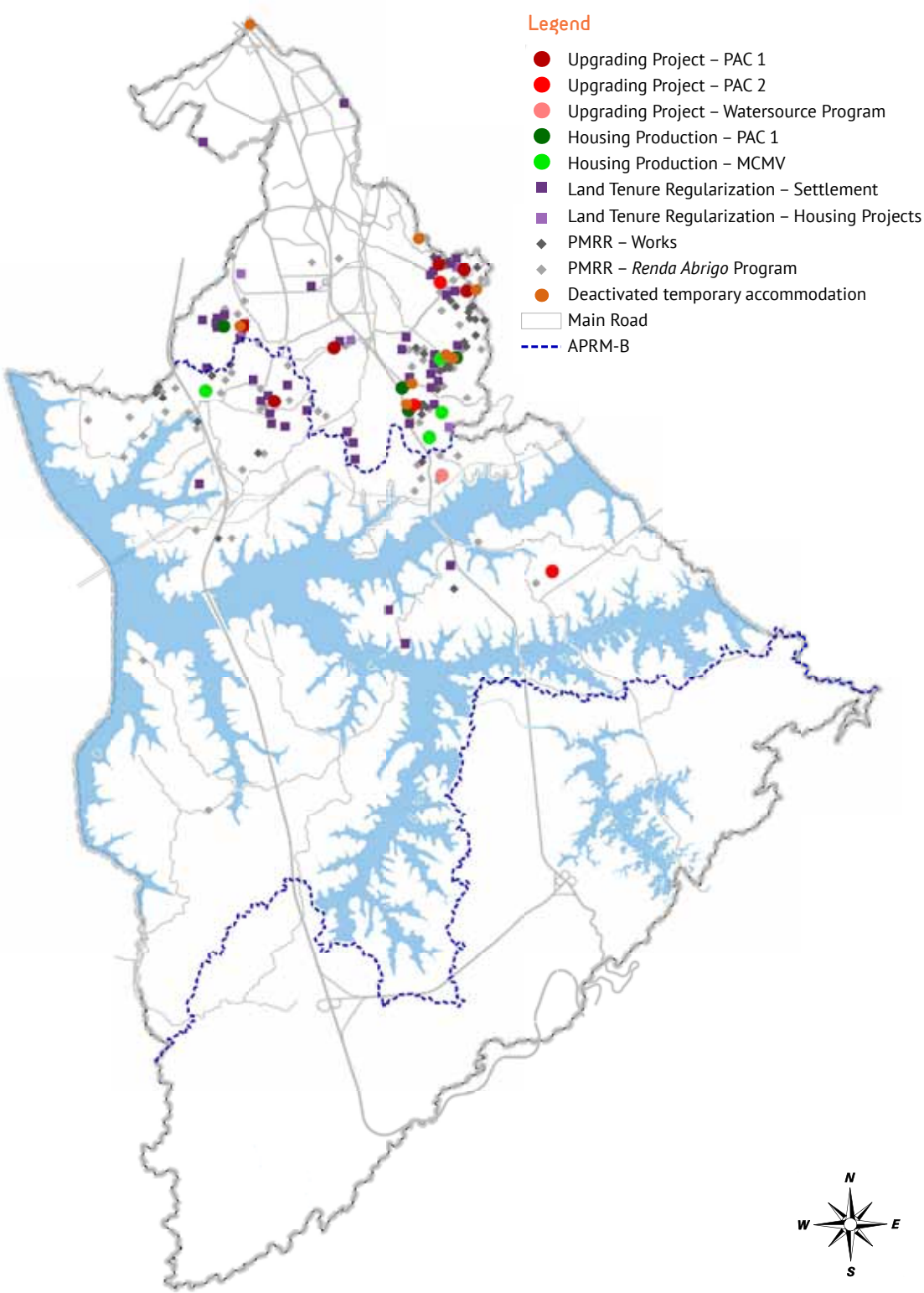
In the 95 studied areas, 203 risk sectors were identified, analyzed, and delimited, encompassing 2,910 buildings, i.e., 6% of dwellings in these areas. In 37 areas, the risk to the dwellings was classified as low or nonexistent. 15 very-high-risk sectors were identified, associated with landslides, with 233 buildings; 2 very-high-risk sectors associated with stream margin undermining, with 4 dwellings; 75 high-risk sectors, associated with landslides, with 1,029 buildings; 5 high-risk sectors associated with undermining, with 38 buildings; 7 high-risk sectors, associated with flooding, with 326 dwellings. 1.279 buildings are at average-risk situation, of which 850 related to landslides, 20 to undermining, 213 to flooding, and 196 to waterlogging.

These 95 areas mapped in the PMRR context concentrate 49,279 dwellings, that is, 56% of dwellings located in irregular and precarious settlements of the municipality. And to ensure security to the population, the removal of a total of 1,587 dwellings was suggested, either due to risk situation or inadequate physical space, which corresponds to 54% of dwellings of the risk sector.

Based on this information, a cost estimation of structural interventions recommended for all identified sectors has been created. In addition to these interventions, the PMRR has suggested several non-structural actions to control risks, with a series of measures related to urban policy, urban planning, legislation, civil defense plans, and education that have been guiding the Municipal Risk Reduction Plan.



Areas with risk sectors identified by PMRR.
Mapa: Aramis Horvath Gomes (Sehab/PMSBC). Fonte: PMRR, 2010.



Intervention Actions of Housing Policy.
Map: Aramis Horvath Gomes (Sehab/PMSBC, 2013).

Conjunto Habitacional Nova Silvina.
Photo: Wilson Magão. Collection: Secom/PMSBC.

All data collected by the mappings of the precarious settlements and risk areas have subsidized the organization of the database that gave rise to SIHISB, especially in the composition of one of its main modules, the Map Module. Other aspects of the surveys, aggregated to the possibilities available from the SIHISB development, have provided new readings and interpretations of the different settlement situations, undoubtedly, leading to the continuous improvement of intervention planning.

3.2 The Sihisb technical structuring process

The proposal for the SIHISB implementation in São Bernardo do Campo has followed the overall restructuring of the social housing work in the municipality. From the creation of a specific file to address the issue, old information could be added and updated, and new mapping and family registration in substandard housing could be performed, which could help in the creation of efficient planning to meet the population demands.

However, beyond the initial data to support the foundation and information systematization, the technical and methodological principle had to be the starting point, and, in this regard, the HABISP system - continuously tried and improved - has showed to be a model that can be replicated in São Bernardo do Campo.

Technically, the HABISP customization process for the SIHISB structuring was suited to the structuring needs and possibilities in São Bernardo do Campo, which has resulted in the Work Plan, - proposed in the Cooperation Agreement -, being adapted to the local conditions. Thus, the activities are organized from the following steps:

Step 1 – Preparatory activities for the operation of the System

- Institutional articulations with internal and external partners;
- Setting up and training of the technical team responsible for developing the System;
- Organization and processing of alphanumeric, spatial, and housing database existing in the municipal government and in the Municipal Housing Secretariat;
- Analysis of the informational prerequisites, infrastructure, systems, and

software available at municipal government and the Municipal Housing Secretariat;
- Data processing for start of System operation.

Step 2 – The System development and implementation
- Decision making on technology options needed for initial design of the System.
- Content definition of thematic modules;
- System design and web design of its website;
- Data organization and formatting for feeding the modules and provision for internal and Internet consultation;
- Public Release.

Step 3 – Post-implementation: users' usage, maintenance and advancements:
- Monitoring, maintenance, and continuous review;
- Development of new thematic modules;
- Support to internal users and the general public, with workshops and trainings.

The data storage and information generation, such as social indicators, spatial analysis, and maps have made the Program a tool for planning and monitoring the Housing Policy in the Municipality of São Bernardo do Campo.

Through <www.sihisb.saobernardo.sp.gov.br> website, one can view the housing map of the city, being able to select from which areas one wants more information. Besides this map with free access to citizens, the System has other operational modules, with restricted access to the municipal government, with technical forms of the mapped precarious and/or irregular settlements in the city, data from the registered families linked to the Housing Secretariat actions, as well as information on the implementation of the programs operated by the same Secretariat (as detailed below).

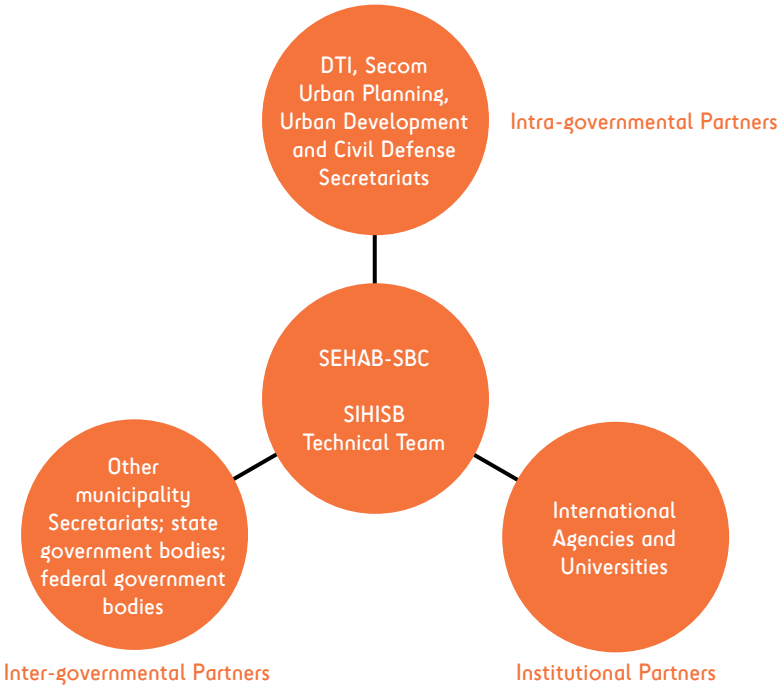
3.2.1 Step 1 – Preparatory activities for the operation of the System

3.2.1.1 Institutional articulations with internal and external partners

For the initial activities could be developed, enabling the operation of the system, the coordination with various stakeholders and (social, institutional, intra and intergovernmental) partners had to be carried out, an essential step for the successful development of the System.

Sehab-SBC started the institutional articulations in the first semester of 2011, with a view of establishing the necessary conversations that would consequently enable the project development. These intra and inter conversations encompassed the preparation of a work proposal, built with the support of internal partners (particularly the Department of Information Technology of the Municipality of São Bernardo do Campo – DTI-SBC) and external partners, as the Municipal Housing Secretariat of São Paulo and the State Housing Secretariat of São Paulo, the National Housing Secretariat, Ministry of Cities; the National Technical Assistance Management of the *Caixa Economica Federal* – CAIXA (Federal Savings Bank); World Bank; Cities Alliance; and *Universidade Federal do ABC* – UFABC.

The diagram below shows the partners involved in the project:



Within the intra-governmental government, Sehab-SBC has articulated actions with the *Departamento de Tecnologia da Informação* – DTI (Department of Information Technology), the *Secretaria Municipal de Comunicação* – SECOM (Municipal Communication Secretariat), and Urban Planning Secretariat, Urban Planning Secretariat, and Urban Service Secretariat.

The DTI is the sector responsible for information technology within the municipal administrative structure. This articulation has intended to enable the infrastructure and technological support for the SIHISB implementation. The partnership has been needed to support decision-making on the technological paths to be followed in the architecture and implementation of the System, which has required choices about aspects related to:

- Available technology, software and programs that could be purchased by the municipal government, and professionals existing in the structure of the Municipality for the development of the System, as well as possible consultants to be hired;
- System language according to its implementation, maintenance, and replicability potentialities and limitations.

The partnership with the Municipal Communication Secretariat (SECOM) has been fundamental to jointly define the aspects of the dissemination of the SIHISB information on the Internet, as the standardization and the parameters of the municipality for the data dissemination, since the SECOM is the body responsible for the information coordination and dissemination of the whole structure of São Bernardo do Campo to society in general.

The other intra-governmental partnerships for the SIHISB implementation have been conducted between Sehab-SBC and the Urban Planning Secretariat, Urban Service Secretariat, and Urban Safety Secretariat. This articulation has aimed to feed the System with information on urbanistic aspects of the municipal urban planning, data of the urban drainage network, and control of risk situations of the municipality.

Regarding the intergovernmental partnerships, they have been established with the Municipal Housing Secretariat of São Paulo, state housing management agencies, and federal agencies operating under the social Housing Policy.

The Municipal Housing Secretariat of São Paulo has established the technical cooperation with Sehab- SBC for the customization of the HABISP System. This cooperation has included the transfer of knowledge developed in São Paulo for the Municipality of São Bernardo do Campo, thus enabling the spread of this experience, which has resulted in the SIHISB implementation.

Other municipalities interested in developing a similar system can establish partnerships with those that have already performed and advanced studies and tools that enable such construction, establishing and registering these knowledge exchanges that improve governance at various levels.

As for intergovernmental partnerships, they can also be established with state management agencies. In the SIHISB case, there is a dialogue with the World Bank and Cities Alliance to disseminate this experience between São Paulo and São Bernardo do Campo to other municipalities in the state of São Paulo.

In addition, the federal housing management agencies – National Housing Secretariat, Ministry of Cities, and Caixa Economica Federal (CAIXA) – have followed the SIHISB development and have support the System before the Alliance of Cities, as well as the dissemination of this experience.

Finally, the institutional partnerships established for the SIHISB implementation have aimed to finance the project and to disseminate knowledge gained through experience in customization. For this, the city of São Bernardo do Campo has had international agencies and universities as interlocutors.

With support from the Cities Alliance and the World Bank, São Bernardo do Campo has agreed to carry out the registration of the experience documentation and systematization of the HABISP customization process in the municipality; it has also made a commitment to share with the Municipality of São Paulo and the other project partners the lessons learned from the experience.

The *Universidade Federal do ABC* (UFABC) has also joined the team of the project partners, supporting customization and dissemination of knowledge accumulated through the SIHISB implementation process. The beginning of this partnership took place in August 2011, when the city of São Bernardo do Campo and the UFABC sponsored a workshop to discuss the theme entitled "Production and Information Management about Deficit and Precarious Settlements in the Metropolitan Region of São Paulo."

This activity was the beginning of the articulations to prepare the System and the SIHISB work in Sehab-SBC, with debates about the production of information on housing precariousness, where specification methods were also discussed, including the presentation of Mapping of the Precarious and/or the Irregular Settlements by the PMSBC and HABISP by the PMSP.

Representatives from the university and the municipal and state managers of São Paulo attended the event, bringing together many parties involved with the housing planning processes.

Presentation of the Municipality of São Bernardo do Campo in the workshop.
Photo: Ana Akaishi. Source: PMSBC, 2011.

3.2.1.2 Setting up the technical team

Concomitantly with these activities and initial articulations, the assemble of a technical team responsible for the System design has been initiated, as well as a number of other tasks related to the work planning for the System implementation and to the process of decision-making on technological options for the System construction.

The process of this team structuring for the SIHISB implementation in São Bernardo do Campo has included consultants, staff members of the Housing Secretariat, and the Department of Technology, Information and Modernization of the Administration Secretariat.

In the step of assembling the consulting technical staff for the SIHISB development, the HABISP coordination, essential partner for planning the initial stages of the System, has suggested hiring at least five specialized professionals for the beginning of the works, estimating the necessary number of hours per month.

Profissional	Hours/month
Web Designer	80
Systems Developer	120
Systems Analyst	120
Network Analyst in Geoprocessing	80
Database Administrator	120

- The Web designer is the professional responsible for the design and construction of user interaction within a system that is used in web browsers. The Web designer produces a visual layer of the System that will be used by the developer to enable viewing and data interaction with the user.

- The Systems Developer is the professional responsible for transforming the System specification into instructions, called "source code, which are performed by the computer according to a logic that reflects the problem according to the user's understanding. The Developer performs his/her activities in constant contact with the Systems Analyst and he/she is responsible for maintaining the source code and its documentation during the System development, and the final product of his/her work will be the source code and its documentation.

- The Systems Analyst professional is responsible for the connection between the problem and demand defined by the user in its context and the development team. He/She translates the requirements and rules set by the user to describe a particular process for specifications to be implemented by the development team. He/She is responsible for the validation of the logic used by the developer and for the validation of the data model designed by the Database Administrator. For a system like SIHISB, the Systems Analyst needed to have experience in systems using web mapping.

- The Network Analyst in Geoprocessing is the professional responsible for the processing of spatial data used in the System and the preparation of the shown maps. He /She will help the DBA in modeling of spatial data and integration with alphanumeric data, and he/she will also work with the Web designer in making the graphical interface for the map.

- The Database Administrator – DBA Professional is responsible for defining the data structure that stores the data generated and used by the system. The DBA analyzes the software specification and the problem context by transforming this knowledge into a data model that is built into the Database Management System (DBMS). The DBA produces instructions for creating this data structure (scripts) and builds the database environment if it does not exist.

In planning the works, it has been decided that the consultants would work outside the Municipality, with weekly meetings to discuss the progress of work. It was subsequently established a work basis, with computers with access to the network for each consultant within the Housing Secretariat, so the work has begun to be internally carried out.

The project coordination was the responsibility of the Sehab-SBC Office, in charge of the project within the Municipality, attended by an architect and urbanist professional to provide support for knowledge about the Housing Policy of the municipality. Sehab-SBC has also offered a technician from the Secretariat Office, responsible for the Mapping database, to accompany the team in the works. For the development of each specific module, the consulting team has had the active participation of the technicians responsible for the information.

In addition to these Information Technology professionals described above, in the case of São Bernardo do Campo, the team counted with an urbanist consultant, who accompanied the SIHISB entire implementation process, with the goal of documenting the process and detailing the methodology adopted for the System dissemination.

The Department of Information Technology (DTI) from the Administration Secretariat has actively participated in the whole process of system development, providing the Network Analyst for the Development of Geoprocessing Systems and Database Administrator, who were responsible for the support and the monitoring process.

Note that local governments wishing to implement housing systems related to the one in São Bernardo may have teams working within and outside the Municipality, in full-time or part-time jobs.

In the beginning of the SIHISB work, the HABISP team trained consultants to use the repository of multiple versions of the source code. In addition, there were meetings in São Bernardo Municipality between the SIHISB technical team and the HABISP analyst developer, who explained about the System architecture and the use of MapServer and GeoServer to the other hired consultants.

3.2.1.3 Data organization and processing

The working procedures of the specialized team of the project to operate SIHISB have primarily consisted of a data organization and processing, performed as follows:

I. Organization of existing database in São Bernardo do Campo, which had as starting points: the data update of the Mapping of Precarious and/or Irregular Settlement in the municipality and compatibility with the Civil Defense System.

The existing database organization consisted of updating all data in the research entitled the Mapping of Precarious and/or Irregular Settlement in the municipality performed in 2009/2010, which included checking and verifying information by all departments of the Secretariat, as well as in the update of risk data with the Civil Defense System and the update of the part referring to the risk in the Susceptibility Study.

II. Data processing and standardization of Sehab's actions

The existing data in a public or private organization prior to a system implementation have been usually found in disconnected formats and structures, sometimes even reflecting the dominance of the processes that

created them. This was the Sehab case, where a specific department often controlled activity through Excel spreadsheets, while the other had the same control on access files with an interface (mask) for the data release, and also a third department had data forms organized as Word files.

The data processing and standardization is essential before the initial charge in the System. This procedure involves the standardization of names and concepts, typography (abbreviations, capitalization, word stress, etc.), table formatting, conversion of file formats, and other items that prevent direct charge of the data.

So, in a first instant, there has been the approach and understanding of the IT consultants with respect to existing pieces of information, and how they would work with them. For this reason, this stage of the work has consisted of meetings with the various areas of the Secretariat that held the information, followed by the work of standardization and file conversion.

III. Data processing and loading

Following the steps of survey, modeling, and validation of data to feed SIHISB, the subsequent step involved data processing and loading. The data relating to the precarious and/or irregular settlements of the city have already been standardized on an Excel spreadsheet at Sehab, containing the main used administrative data, requiring only the typographical standardization and formatting for importing into the System, i.e., for loading the System. The registration of the families in the intervention areas was initially distributed in Excel spreadsheets with different structures and a partial spreadsheet containing summary data for all areas; because of that, a work was done to consolidate these data, which subsequently enabled their loading in the System.

After the work of data consolidation and standardization, the data loading was performed by importing spreadsheets in Excel to an intermediate structure in the database, and from this intermediate data structure, transfer operations to the final structure were executed. The import from spreadsheets to the database was made using the native Oracle DBMS tools and the process of data transformation was performed using standard techniques for manipulating data in a database.

3.2.1.4 Analysis of informational prerequisites, infrastructure, systems, and software

The SIHISB team has made use of the infrastructure and systems already available in São Bernardo do Campo, specifically the resources developed by the Department of Information Technology (DTI) and by the Municipal Housing Secretariat itself, minimizing purchasing costs of new systems and new hiring of professionals, making greater use of technology already installed and the expertise of the municipal technical staff.

As the current housing policy has already been organized for the preparation of the Mapping of the Precarious and/or Irregular Settlements in the municipality, and that this action has contributed to the preparation of the Local Social Housing Plan (PLHIS) and the *Plano Municipal de Redução de Riscos* – PMRR (Municipal Risk Reduction Plan), the subsidies needed to feed the publication of such data and democratization through the housing information system has already been consolidated, facilitating the creation of the SIHISB bases.

By the logic of Local Housing Policy, the production of information about the precarious settlements, in its various dimensions, has enabled the SIHISB

Três Marias Housing Project.
Photo: Wilson Magão. Collection: Secom/PMSBC, 2012.

team to take the next step, which was the implementation of an information system that would organize and systematize the data, and would facilitate the access by managers and by civil society.

The following tables have detailed the information, infrastructure, systems, and software requirements used by São Bernardo do Campo for the SIHISB implementation. Note that other governments interested in implementing related systems can draw inspiration from this process. However, they will make use of informational and technological bases that are available or they can make available. The basic information for the implementation of housing systems can be found not only in the secretariats that operate in this area, but also from the secretariats of Health, Social Care, and Administration, where they usually have the control over the urban data stored in data systems on urban taxes, among others

Schematic Table:
List of the informal prerequisites for the Sihisb implementation

INFORMATIONAL PREREQUISITES FOR IMPLEMENTATION OF HOUSING INFORMATION SYSTEMS – LEVELS OF INFORMATION	DESCRIPTION OF INFORMATION AVAILABILITY IN SÃO BERNARDO DO CAMPO FOR THE SIHISB IMPLEMENTATION
General spatial and alphanumeric information already existing in the Municipality and the Municipal Housing Secretariat	• The **Geo Portal** has been developed by the Municipality of São Bernardo do Campo with the main objective of provision and dissemination of the statistical, cartographic, and planning information to citizens, and public and private agencies. In the same database, one can access the statistical summary of the city called "Data Summary" that contains the statistical returns and historical surveys of the city and covers the programs and activities of the various secretariats of the Municipality. Data and information are provided by secretariats and are organized, systematized, and consolidated in this annual publication, according to the following themes distributed by chapters: history, geography and environment, demography, economics, public finance, education, culture, health, housing, social development, sport and leisure, infrastructure, public safety, transport and roads, communication, and politics and government.
Specific spatial and alphanumeric information – such as housing precariousness or irregularity, risk, susceptibility, and housing and urban related issues available in the organs of the Municipality and the Municipal Housing Secretariat	• The **Mapping of Precarious and/or Irregular Settlements in the municipality of São Bernardo do Campo** has identified, delimited, and mapped all existing precarious settlements in the municipality in 2009, through the general information on location, and on physical environment, land use, socio-economic and risk issues. The characterization of the city settlements under this mapping is related to urban-housing typologies that refer to the type of action developed within the current Housing Policy in the municipality. • The **Local Social Housing Plan** was established in 2011 after the release of the above-mentioned mapping, which, in turn, had given the basis for the design of the housing needs of the municipality, which were calculated, budgeted, and planned according to this plan timeframe. The PLHIS has embodied the measures, guidelines, and actions of the municipal administration of São Bernardo, in the social-interest-housing field socially agreed upon during the drafting of the plan. • The **Municipal Risk Reduction Plan – PMRR of São Bernardo do Campo** was drafted in 2010, in addition to the mapping above. This plan has provided information on planning guidelines for civil protection and accident prevention in rainy periods, establishing the degree of risk as a criterion for prioritizing actions of the Local Social Housing Plan, as the intervention in precarious settlements, especially in Risk Mitigation and Emergency Action, Upgrading, and Housing Production programs.
Existing **socioeconomic** information available in bodies of Municipality and the Municipal Housing Secretariat	• **The existing socioeconomic data of the families benefited from the *Renda Abrigo* Program** (Low-Income Housing Assistance Program), included in the Municipal Risk Reduction Plan that aims to provide monetary assistance to support the implementation of emergency removals of families occupying houses interdicted for being at-risk,

INFORMATIONAL PREREQUISITES FOR IMPLEMENTATION OF HOUSING INFORMATION SYSTEMS – LEVELS OF INFORMATION	DESCRIPTION OF INFORMATION AVAILABILITY IN SÃO BERNARDO DO CAMPO FOR THE SIHISB IMPLEMENTATION
	or to support the removal of transitional housing in non-feasible areas under the integrated upgrading projects. • **Data of the Use Permit, Receipt, Commitment, and Responsibility Agreements**, which are documents issued by the Municipality to beneficiaries of housing developments, who signed the document agreeing to meet their obligations in the use of the housing unit, which will be repealed with the titration of the unit definitive title and the amounts to be paid, under the Funding and Grant Policy.
Further information available at the Municipality that has not been fed in SIHISB (however, they are detailed on the right side, due to their relevance and possible future insertion into the System).	• The **Susceptibility Geotechnical Mapping in São Bernardo do Campo**, elaborated in 2012, has pointed adequate areas and with restrictions on occupation, which are useful in the local planning, serving not only for purposes of urban occupation, but also for other uses. It has searched the cartographic interpretation of the layouts of the terrains of the whole municipal territory, according to their conditions of developing certain processes. The cartographic delimitation has happened from knowledge of the mechanisms of the considered geodynamic processes and the characteristics of physical environment that constrain or lead to its development. • The **Social Vulnerability Mapping and Integration of the Precarious Settlement Bases of the São Bernardo do Campo Municipality**, developed in 2011, has summarized the social vulnerability profile of informal settlement areas of the municipality. The data regarding the socioeconomic profile of the families residing in all the precarious settlements of municipality have comprised the summary of each settlement. It is the existing database for each family/property registered in housing programs and projects in areas of intervention of the Housing Secretariat. The information registration has identified and described all households and resident families, commercial buildings, and institutional-use properties in the area. The survey has been developed by interviews carried out with the beneficiary families and each housing unit has been assigned a unique identification number (*selo*). • For the 27 areas of the city where there are housing intervention (as in September 2012), the level of information available is different from that survey for the precarious settlements, according to the cited Mapping of Precarious and/or Informal Settlements. For these areas, the available data have been primarily more detailed, because a work plan is prepared for each intervention area, which is submitted for CAIXA's approval. The work plan includes: information on the situation found in the area, urban-housing situation, land-tenure situation by sector, socio-economic and organizational situation of the population, intervention proposal in the area, and the beneficiary population.

Schematic Table:

Prerequisites of available and necessary infrastructure, systems and software for the SIHISB implementation

PREREQUISITES FOR IMPLEMENTATION OF HOUSING INFORMATION SYSTEMS – INFRASTRUCTURE, SYSTEMS, AND SOFTWARE	DESCRIPTION OF INFORMATION AVAILABILITY IN SÃO BERNARDO DO CAMPO FOR THE SIHISB IMPLEMENTATION
Infrastructure in the Municipal Government bodies	• The **Department of Information Technology (DTI)** is responsible for all physical and hardware infrastructure in the municipality. The existing infrastructure in the DTI comprises application servers, database servers, and communication infrastructure (networks).
Systems and software in the Municipal Government bodies	• In **São Bernardo do Campo Municipality**: – The **application platform is standardized with the Linux operating system** (CentOS distribution) and the application servers are available for 'virtualization' and deployed in a secure network environment (with demilitarized zone: DMZ devices, firewall, and proxy server, which ensure greater efficiency and System protection). – The service **database is provided by the DBMS** – Oracle Database Management System – installed with redundancy and high availability (Real Application Clusters – RAC) features distributed in three physical servers; the spatial data are stored in Oracle DBMS through its Spatial extension that supports spatial data formats. • Conversely, the **Municipal Housing Secretariat (Sehab-SBC)** has worked with spatial files using GeoMedia, stored in Oracle Database, which can be converted into shapefile format, compatible with the system used by other areas of the municipal government. A server allocated at the Secretariat Office manages its spatial database. – A **database of socioeconomic entries** and information from the mapping are in Microsoft Excel format. – The **digital cartographic base used by Sehab** involved creating a mosaic with existing images on the QuickBird and the 2007 Emplasa pictures. This mosaic incorporated 21 scenes and four satellite aerial photos into a single geo-referenced file, allowing the crossing with other spatial information – containing vector and geospatial information – and there are data overlays. – The **Digital Terrain Model (DTM)** of São Bernardo do Campo, and used by SEHAB, was also drafted in the ArgGis 9.3 Program, with contour lines equally spaced 5 meters. One can overlay this model over the image mosaic to obtain spatial analysis. – A **digital database** of housing was designed based on information obtained in the Mapping of the Precarious and/or Irregular Settlement of the city and the identification of risk areas of the PMRR. The software used in this project was the ArcGis 9.3, compatible with GIS GeoMedia, already in use by the Municipality. The use of spatial analysis tools available in GIS programs - for construction of geographic information systems – enables consultations of single or multiple attributes.

Upgrading of Jardim Esmeralda Settlement.
Photo: Wilson Magão.
Collection: Secom/PMSBC, 2012.

Regarding the technical resources to implement the System, preliminary activities have also consisted in mapping the infrastructure in the computer systems and software available in São Bernardo do Campo. For this, the partnership with the Department of Technology, Information and Modernization, reporting to the Secretary of Administration, has helped understand and measure the limits and potential of the SIHISB implementation.

3.2.2 Step 2 – The System development and implementation

3.2.2.1 Technology options required for building the System

The decisions about architecture and platforms for web system have typically involved four aspects: the operating system, the web server, the System Management Database, and the Language Development. For systems using web mapping, as is the case with SIHISB, a fifth aspect is present, that is, the definition of Map Server.

The choices for each aspect are influenced by factors such as: financial resources, available manpower, and ease of System expansion, among other aspects. In general, the decision about one aspect will influence the decision on other, for example, choosing a Linux operating system precludes the use of a development language associated with the Windows Operating System (.Net).

In the context of the SIHISB system, the decision on the operating system, web server, and database management system has been conditioned by existing availability in DTI. The existing infrastructure (Linux operating system, Oracle System Management Database) has conditioned the decisions regarding technology used in two circumstances: the option for language development and for the map server, and both have been made in accordance with the guideline of using open source solutions, as shown in the following tables. At the end of the comparative analysis between the existing possibilities, the Java language and GeoServer server have been chosen.

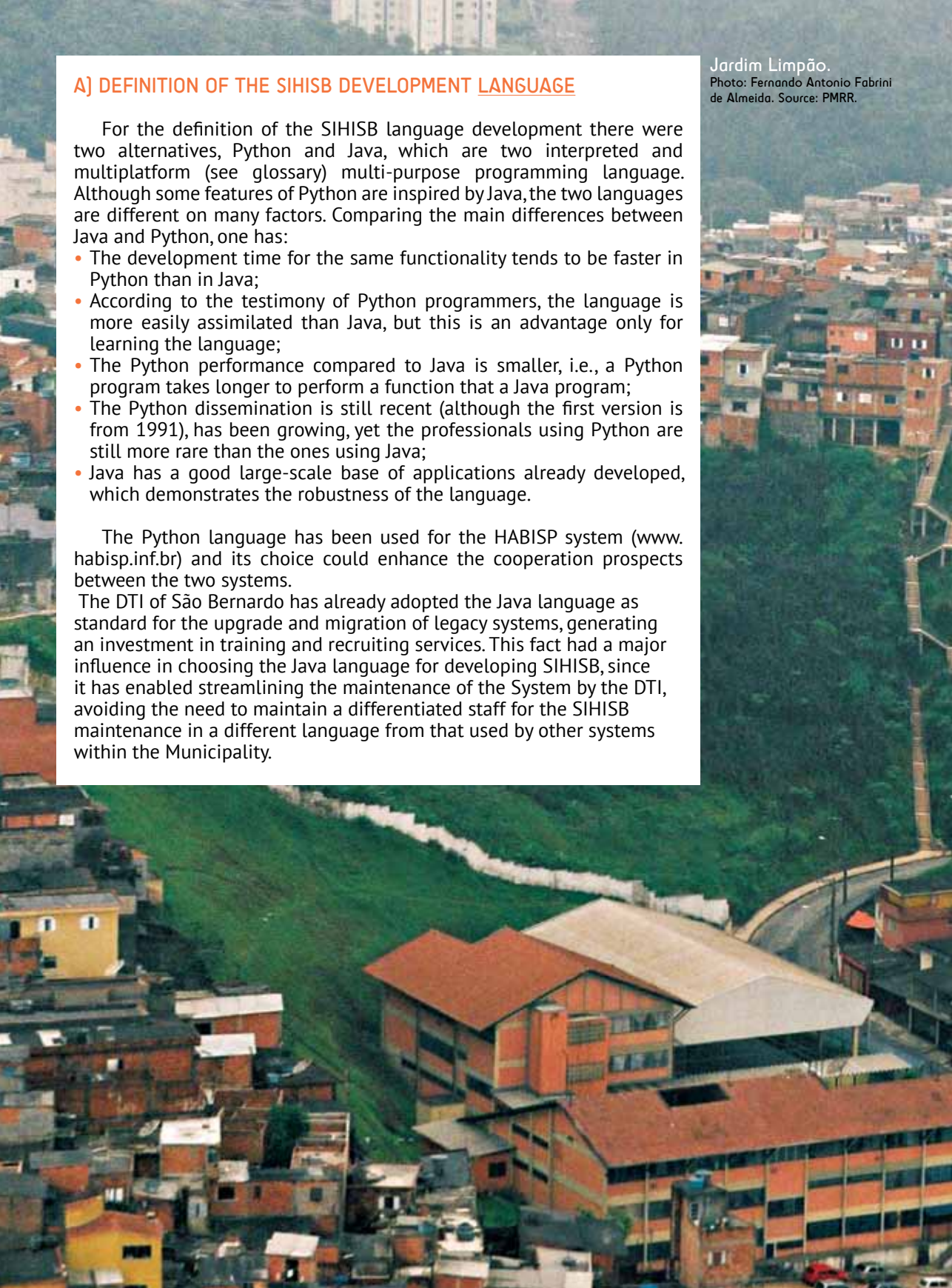
A) DEFINITION OF THE SIHISB DEVELOPMENT LANGUAGE

For the definition of the SIHISB language development there were two alternatives, Python and Java, which are two interpreted and multiplatform (see glossary) multi-purpose programming language. Although some features of Python are inspired by Java, the two languages are different on many factors. Comparing the main differences between Java and Python, one has:

- The development time for the same functionality tends to be faster in Python than in Java;
- According to the testimony of Python programmers, the language is more easily assimilated than Java, but this is an advantage only for learning the language;
- The Python performance compared to Java is smaller, i.e., a Python program takes longer to perform a function that a Java program;
- The Python dissemination is still recent (although the first version is from 1991), has been growing, yet the professionals using Python are still more rare than the ones using Java;
- Java has a good large-scale base of applications already developed, which demonstrates the robustness of the language.

The Python language has been used for the HABISP system (www.habisp.inf.br) and its choice could enhance the cooperation prospects between the two systems.

The DTI of São Bernardo has already adopted the Java language as standard for the upgrade and migration of legacy systems, generating an investment in training and recruiting services. This fact had a major influence in choosing the Java language for developing SIHISB, since it has enabled streamlining the maintenance of the System by the DTI, avoiding the need to maintain a differentiated staff for the SIHISB maintenance in a different language from that used by other systems within the Municipality.



Jardim Limpão.
Photo: Fernando Antonio Fabrini de Almeida. Source: PMRR.

B) DEFINITION OF THE SIHISB MAP SERVER

For the SIHISB map server, two alternatives have been comparatively analyzed: MapServer and GeoServer.

1. The MapServer server was developed by the University of Minnesota (UMN), in cooperation with other U.S. government agencies and it is the primary server maps used by HABISP.

2. The GeoServer server began at the Open Planning Project (TOPP), as part of a set of tools for government transparency and it has been now maintained by the Open Source Geospatial Foundation (OSGeo).

To use the MapServer with Oracle on Linux environment, the MapServer compilation against the Oracle drivers (OCI) has to be done. This is necessary because the incompatibility of licenses that do not allow the MapServer binaries to be distributed with support for Oracle Spatial.

During the survey of the procedures for the MapServer compilation, the chain of dependencies for compilation was found to be extremely extensive, requiring about 14 software libraries. These dependencies are required to successfully compile the MapServer and the versions compatibility between the libraries must be brought into line.

For SIHISB, two unsuccessful compilation attempts have been made, due to the downloading unavailability of one of the libraries and compatibility errors between the used libraries. In a more detailed assessment, it has been noted that these difficulties could be overcome and a successful compilation achieved, but more time would be needed for research and testing, and the procedure could not be easily replicated in future compilations – which would have a negative impact in one of the design goals: ease of the experience reproduction in other municipalities.

Given this scenario, two alternatives were possible. The first is the use of a specific server – MapServer for Windows – since there are available compilations in Windows with the possibility of activating the Oracle (MS4W and OSGeo) support. Such a solution would have an impact on the uniformity of the system architecture and infrastructure maintenance. The second alternative would be to use another map server that would meet the OGC standards. The GeoServer is fully compatible and certified according to the OGC standards, and it is able to meet the demand generated by the use of the System. According to a comparative performance presented by OSGEO Projects at FOSS4G 2009 (WMS Performance Shootout 2009), the GeoServer performance is comparable to MapServer on Linux environment.

The solution taken by the SIHISB staff was the use GeoServer map server because it offered advantages in terms of infrastructure uniformity, ease of installation, platform independence (the same compilation can be installed in both Windows and Linux), and ease of administration providing a web interface for monitoring and administering the server.

3.2.2.2 Implementation of prioritized modules in the first stage of Sihisb

SIHISB has been structured in order to organize and make available information on social housing in São Bernardo do Campo, not only to publicly disseminate them, but also to disseminate it internally to the Housing Secretariat and to the own structure of the municipal government, facilitating the organization and control of data essential to the management of municipal Housing Policy.

In this sense, the sets of information collected, grouped, arranged, produced, and uploaded within SIHISB can be understood in the light of a general division of thematic modules. Note that in reality, this thematic division is presented here only to facilitate the System understanding and the dissemination of related experience. In practice, the logic of programming

Schematic Picture: the Sihisb implemented Modules – content and forms of access

THE SIHISB THEMATIC MODULES: CONTENT AND FORMS OF ACCESS

* Module A - Map: it shows the mapped settlements with the following information:
- Settlement location in the city, even as the occupation of the Área de Proteção e Recuperação de Mananciais do Reservatório Billings – APRM-B (Water Source Protection and Recovery Area of the Billings Reservoir);
- Number of mapped or registered housing units;
- Type of settlement and settlement typology in the Housing Policy, which is what indicates a housing solution that applies to each area;
- Property situation, whether public or private;
- Housing Policy Program of the municipality where the settlement is inserted and its hiring stage, if this is the case;
- Judicial encumbrance if the settlement has Public-Interest Civil Action (ACP), Conduct Adjustment Term (TAC), Police Inquiry (IP), Public Prosecutor's Office Protocol (Prot. MP), or Administrative Proceedings (Proc. Adm.).

Module A also contains the boundaries of the neighborhoods, of the regions of the Municipal Participatory Budget, of the hydrographic basins, of the water-source area limit, blocks, main roads, and public space names.

* Module B – Mapping of Precarious and/or Irregular Settlements: it shows the technical forms of the settlements that have been mapped and can be constantly updated with new information.

* Module C – Family registration for the Project (linked to Housing Policy interventions): it shows data from families that are registered and linked to the SEHAB interventions and it enables registering the assistances to the registered family made on the Secretariat balcony.

* Module D – Family registration for the Renda-Abrigo Program: provides the information of the families assisted by the Renda-Abrigo Program operated by the Municipal Housing Secretariat.

Montanhão.
Photo: Fernando Antonio Fabrini de Almeida. Source: PMRR.

and System construction does not exactly occur in fragmented manner in modules. Although the module visualization works independently, the information contained in the System results in a set of data that, in the final analysis, forms a single system.

One can say that the SIHISB thematic modules are subdivided between the interactive map of settlements (public access) and the modules (internal access to the Municipal Housing Secretariat), in which contained information required in the municipal management on Mapping of the Precarious and/or Irregular Settlements of the city, the family registration in housing projects, the registration of the municipal *Renda-Abrigo* (Rental Assistance Program), the documents the land tenure regularization process in the city, besides the projects and housing developments of the Secretariat.

In the first phase of the SIHISB deployment, the first four mentioned thematic modules were developed. Currently, the last two modules are being implemented, as detailed in the tables below.

It is worth mentioning that the homepage for the system (Home Page <http://sihisb.saobernardo.sp.gov.br/sihisb/index2.jsp>) was structured as a common access point to internal users of the System and to the public in general and, though it does not have its content dynamically controlled, it was designed to allow the review and update of the displayed information, as well as the additional information and material for download.

A. MAP MODULE

How has the module been implemented?

A map implementation, which included information about the precarious settlements of the municipality and its boundaries, has been planned since the beginning of the SIHISB project development. As in the HABISP case, the preparation of the SIHISB map has been one of the key points of this information system, which is intended to be public accessible.

The Map Module has directly dialogued with the content of the other modules of the System, but especially with the information on Precarious and/or Irregular Settlement (presented in the following item) Module.

While all other system modules are eminently CONTENT MODULES, the map module is embodied in a SUPPORT MODULE for the spatialization of information transferred by other thematic modules.

Note that not all the contents of the modules will be geo-referenced in the Map module. However, with regard to the Precarious and/or Irregular Settlements of the city and their attributes are indeed and completely overlaid on Map Module of the System.

The implementation of this module in SIHISB has provided the crossing of a large amount of data used on daily basis of the Housing Secretariat, through the spatialization of the irregular-settlement boundaries related to its alphanumeric attributes. This has enabled different data correlations and overlays of maps with great potential for supporting the municipal planning in the housing sector.

What is the module basis of information?

Information produced under the Mapping of Precarious and/or Irregular Settlements of the city of São Bernardo do Campo – conducted through fieldwork that used GPS, and later tied the field results to aerial photographic survey of the municipality, defining the boundaries of settlements in the design of the city blocks – was the database for creation of the Map Module within SIHISB. In this module, the Mapping information is overlaid on its alpha-numeric attributes, on a base map of the city, containing the municipal boundary, neighborhoods, limit of the Water Source Protection and Recovery Area (APRM), Participatory Budgeting (OP) regions, main roads, hydrography, public spaces and squares.

The Map Module construction has been only possible because the PMSBC has a corporate Geographical Database (DB), through which the responsibility information from various Municipal Secretariats are integrated into a single georeferenced system, and it can be read by other systems integrated with the same DB – the already mentioned GeoPortal.

The spatial database had the data generated through fieldwork in the Mapping as input, with the completion of a registration form for each settlement, which contained the information described below:

Area Name: name of the settlement.
OP region: Participatory Budgeting region where the area is.
Location: neighborhood where the area is.
Mapped UHs: number of housing units counted in the field visits, within the limits of the settlement.
Types of Urban-Housing Situation: it refers to the type of settlement within the PLHIS.
Water Source: if the settlement is within the APRM or not (yes/no).
APP (Permanent Preservation Area): if it is within the APP (yes/no).
Vulnerability: classification within the Social Vulnerability Index.
Geomorphological Feature: description of morphological features of the area.
Zoning: zoning of the area within the Master Plan.
Type of settlement: classification by settlement type (favela/irregular settlement/ irregular housing project).
Property Situation: if the area occupied by the settlement is public or private.
Judicial encumbrance: if the settlement has Public-Interest Civil Action (ACP), Conduct Adjustment Term (TAC), Police Inquiry (IP), Public Prosecutor's Office Protocol (Prot. MP), or Administrative Proceedings (Proc. Adm.);
Intervention/Program: program in which Housing Policy is included in the settlement.
Stage of intervention: which stage this intervention is.
Date of occupancy registration by the Municipality: occupation date of registration of by the PMSBC.
Resident occupancy date: date of occupation of the area according to the residents.
Land tenure Regularization: if there is process of land tenure regularization for the area (yes/no).

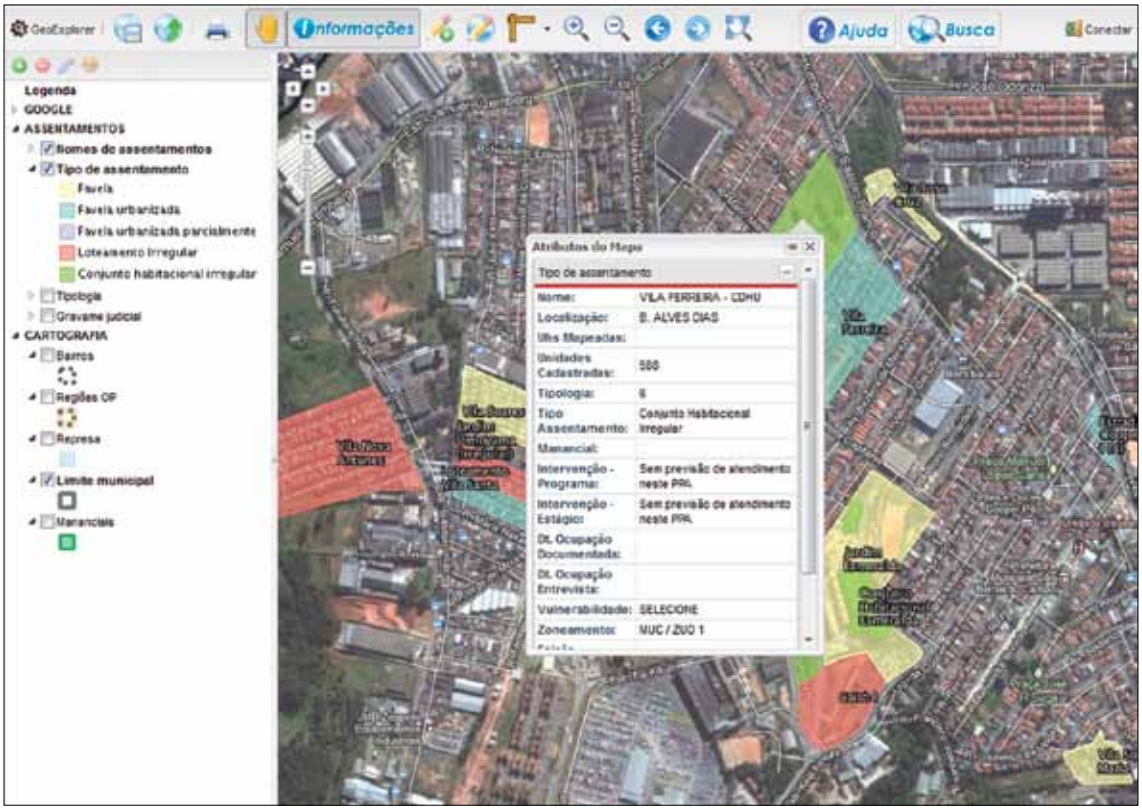
How has the module been used?

The external access to the Map module has been done through the homepage (URL) http:// www.sihisb.saobernardo.sp.gov.br>.

On the "Map" tab of the website, the user can choose to directly access the map, or view a specific area through search, by name of the settlement, district, participatory budgeting region or street name, and a new tab is opened in the browser.

On the left corner of the map, there is a list of layers that can be turned on or off. The user can turn on or off satellite images or Google base map; he/she can turn on or off the layer of settlements by type of settlement, typology, or judicial encumbrance. Still, the user can turn on or off the "Cartography" layers: neighborhoods, OP (Participatory Budget) regions, reservoir, municipal and water-source protection area boundaries.

Other buttons for user interaction are on the top side of the map. An area length or width can be measured through the button with the image of the ruler in the same bar in the figure above. Other commonly used tools are also available there, such as: zoom in and out (magnifying glasses), pan (hand), whole map (magnifying glass with arrows), and backward or forward (arrows), and search a settlement by its name, street, neighborhood, or OP region.



Picture 1 – Image of the Map module taken from website.
Image: Aramis Horvath Gomes (Sehab/PMSBC).
Source: <www.sihisb.saobernardo.sp.gov.br>.

The layout of the tools was designed to be as self-explanatory as possible and similar to other commonly used applications, such as Google maps. Even so, a "help" button is available, which explains each mapping tool.

For the **internal user,** the access is with the same URL, in the 'registration' and 'password' fields. But note that this user can only see the settlement forms, without authorization for editing.

The **editor user,** besides the functions mentioned above, can create a new settlement polygon or edit an existing polygon. The user may also, in addition to all the external user features, edit the mapping layers by clicking with the right mouse on the layer to be changed. Zooming over the selected layer is possible, as well as removing the layer, and changing its properties and styles.

Still on the map, the **administrator user** controls all the functions described above, and have permission to insert new layers, or manage the polygon editing made by the editor user.

How has the module been designed?

In constructing the SIHISB Map Module, all data generated by the registration forms of the Mapping of Settlements have been tabulated and inserted as attributes of spatial data of the System. So, when clicking on a settlement on the map, the SIHISB user has access to a range of information about the System; some pieces of information, however, have been restricted to the authorized users of the System (as discussed below).

The Map Module has been designed to directly engage with the Settlement Module. Users who have permission to edit the Map Module can draw or edit a new settlement, using the drawing tools installed there. It is worth noting, however, the insertion of new alpha-numeric information in the settlement registration screen is not allowed without a polygon boundary of a designed settlement, so that the spatial and alpha-numeric data are always tied the settlement design. The system has been designed so that, when saving the design of a new settlement, or editing the design of an existing settlement, a page (i.e., a URL) appears on the rescue screen, so the user can immediately work on settlement register[25].

As the System has granted public access, the kinds of access to this module had to be planned.

There is external access of the general public, who only sees information on the map, and there are three types of internal access users, as described below:

- Internal User Access: Access to servers from all the secretariats, who can view the map with the details of the settlements, can print thematic maps, preview and print information from the settlement forms. This permission may be one or more modules, depending on the definition being made.

- Editor User Access: Access to the Housing Secretariat technicians authorized to edit data, enabled by the server registration number. The user may have permission to edit one or more modules.

- Administrator User Access: Access to the Housing Secretariat technician authorized to manage the data, the person who has full access to the information system for printing, editing, and managing edited information, and can create users and grant permissions. There is only one registration empowered to administer this module.

25. It is noteworthy that even regarding the data covered by the Map Module, a step for further improvement of the System is planned, through which a series of spatial analysis can be facilitated. Therefore, future plans include the making of the thematic maps of settlements, according to the main demands of work within the Housing Secretariat, so that some information can be viewed or printed with agility. This applies, for example, the thematic map that relates settlements typology and type with property situation and judicial encumbrance.

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

The map module has been implemented using the GeoServer map server. The GeoServer server began at The Open Planning Project (TOPP), as part of a set of tools for government transparency and it has been now maintained by the Open Source Geospatial Foundation (OSGeo), which provides the mapping service following the Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS) specifications of the Open Geospatial Consortium (OGC) standards organization. The Geoserver was developed in Java and runs as a web application deployed on Apache Tomcat web server.

The GeoServer map server has the function to access spatial data stored in the Oracle DBMS and convert these data into images (maps) to be viewed by the user in a web browser. The Geoserver acts as an intermediary between the user interface in the browser and the data in the database, receiving requests for maps, running these requests, and sending responses back to the browser that displays this data to the user.

The user interaction was implemented using the GeoExt library. GeoExt is a JavaScript library that incorporates two other libraries, ExtJS and OpenLayers. OpenLayers is a JavaScript library that provides functionality for asynchronously interacting with a map server (AJAX), allowing a fluid interaction with the map, with zoom and pan functions, for example. ExtJS is a JavaScript library that offers components for composing graphic interfaces in a browser that simulate desktop interface elements, such as floating menus and menu bars.

All features implemented on the map, including the search engine and display of the settlement attributes use requests standardized by the OGC specifications and processed by Geoserver.

The Map Module is integrated with SIHISB through the menu structure on the SIHISB page and through the common data structure stored in Oracle DBMS, which serves the forms for the settlement viewing and editing, and the layer of settlements that appear on the map interface.

How could this module be replicated?

The preparation of the Map Module as support for the provision of the interactive and geo-referenced content of the other modules of the housing system, in particular those dealing with the precarious and/or irregular settlements of the city, requires the existence of A DATABASE ON PRECARIOUS AND/OR IRREGULAR SETTLEMENTS OF THE CITY and A SPATIAL DATABASE.

As for the other modules of the system, this one in particular will require decisions concerning technology choices and access to the module.

The construction of this module, as already stated above, has allowed the sharing of information in a geo-referenced housing platform, which, in turn, has enabled the crossing of spatial data and analysis that have great potential to support the planning in the housing sector.

B. MAPPING OF THE PRECARIOUS AND/OR IRREGULAR SETTLEMENT MODULE

The construction of this module, as the name suggests, has been based on spatial and alphanumeric information related to the precarious and/or irregular settlements in the municipality of São Bernardo. These data in turn have been arranged, within a table in the Map Module environment (shown in the previous item) and shaped in technical file format in this specific module, as described below.

Why has the module been implanted?

The option for this module implementation in SIHISB is closely related to how the Municipal Housing Policy has been built on the existing local management. Sehab-SBC has made efforts to a further the knowledge of the local housing situation, as in the case of the study commission for the Mapping of the Precarious and/or or Irregular Settlements of the city, understood as support to the project management of informing the public action and increasing the planning capacity in the housing sector.

All these efforts to understand and to map the local reality has been happening in a constant update process, considering the permanent revisions that settlement mapping has undergone, not only with respect to the area quantification, but also in its qualification and its framework in typologies that support the interpretation of the housing problem in the city, and above all, inform about the local government actions.

The creation of this module has reinforced Sehab-SBC's goal to socialize information on the local precariousness and irregularity, internally and externally to this body, improving the information flow within government structures, contributing to a public action that is more adherent to the municipal situation.

Note that the usefulness of this module creation has been justified by the fact that information about the precarious settlements has been daily requested by all departments of Housing Secretariat, especially by the Land Regularization Board of Directors, by the Secretariat Office, and by the Housing Program and Project Board of Directors. Other agencies of the municipality – usually the departments – have asked for information on settlement boundaries, or scanning of areas (if they are mapped or not), or general information about the settlements, as the number of housing units, and urban and land physical feature, if the area is in the project, etc. The main requests have been from *Secretaria de Gestão Ambiental* – SGA (Environmental Management Secretariat), which have requested information collected in the field of water supply, sewage system, etc.; *Secretaria de Orçamento e Planejamento Participativo* – SOPP (Participatory Budget and Management Secretariat), Urban Planning Secretariat (SPU), and Urban Service Secretariat (SU), which have used information mapping in the data forms of risk areas and monitoring.

Various areas of the Housing Secretariat and other municipal secretariats have demanded information concerning risk. In SEHAB-SBC, the Department of Land Regularization has needed information of the existence of risk in areas with ongoing land regularization action, and they have requested further inspections in some cases. The Department of Housing Programs and Projects has demanded risk information in areas with intervention projects. The Social Work Division has brought new risk-information on specific situations raised by social workers in the field, information that has been checked by the monitoring sector and included in the database. The Office of the Housing Secretariat has made requests for inspection, according to ongoing processes of containment works.

Also about the information on risk, other secretariats within the Municipality have had demands, such as the Urban Service Secretariat (SU) that has sought risk information to assess the possibility to enforce some contention works. The Participatory Budget and Management Secretariat (SOPP) has periodically requested information regarding the risk of specific situations, usually raised in the field by the Citizen Participation Agents.

The update of data that feed SIHISB, such as information about the settlements in the city, can daily take place, due to the permanent presence on field of Housing Secretariat technical team in these settlements, particularly in view of conducting registrations for development of housing projects. Formally, this update on the settlement has been scheduled to be performed at the time of the next PLHIS review, of the own mapping, and of PMRR.

What is the basis of information module?

The source of information used to develop this module has already existed within the Housing Secretariat and has been prepared by the strategic instruments of the Mapping of the Precarious and/or Irregular Settlements and the Municipal Risk Reduction Plan (PMRR).

The Settlement Mapping database was located at the Housing Secretariat Office, responsible for managing and updating information of this mapping. The format of alphanumeric data was in Excel, and the georeferenced map in shapefile manipulated by the same technician. It is also worth noting that the model of the summary forms of settlements has served as the basis to structure what would form the information document of each area to be displayed in the System.

The PMRR alphanumeric database was located in the public folder of the Civil Defense server, which was periodically updated. The Sehab technician responsible for monitoring settlements with risk sectors, who has usually accessed this database, could also perform the update.

How has the module been used?

The SIHISB Settlement Module has two interfaces: the map that contains specialized information of settlements, and the search on “Settlements” tab with restricted access, where an information form with the general characterization of the area can be viewed.

On the SIHISB map, one can view the map of city of São Bernardo on the central screen. The user can click on a settlement to have interactive and quick access to its data.

On the SIHISB map, access to settlement data is given by clicking with the mouse on one of the settlements. Thus, a screen is displayed in table format with information regarding the researched settlement. The data available for display are as follows:

Settlement Name: Identification name of the precarious and/or irregular settlement.

Location: Neighborhood where the precarious and/or irregular settlement is located.

Mapped Housing Units: Number of housing units considered in the mapping of the precarious and/or irregular settlement.

Registered Units (if there is ongoing project): Number of registered housing units.

Typology of Urban Housing Problem:

TYPOLOGY 1 – Settlements consolidated without urbanistic or property regularity with satisfactory level of basic infrastructure, parceling, and adequate housing, which just need regularization.

TYPOLOGY 2 – Partially urbanized irregular settlements with defined parceling that need specific infrastructure works that do not require removal. The land regularization is independent of such works.

TYPOLOGY 3 – Partially urbanized irregular settlements with defined parceling, which are consolidated but need occasional infrastructure works. Their land tenure regularization is independent of such works, but demand punctual removals.

TYPOLOGY 4 – Feasible irregular and precarious settlements that present risk situations and full or partial lack of infrastructure; they demand complex and expensive upgrading works, a significant removal percentage, besides changes in the land parceling. The land tenure regularization depends on the works.

TYPOLOGY 5 – Non-feasible irregular settlements that cannot be maintained where they are, in their entirety, due to legal or physical-environmental restrictions.

TYPOLOGY 6 – Irregular housing projects: promoted by the Government with the completed or in-progress approval and licensing; they have good level of consolidation and infrastructure. The land tenure regularization does not depend on any volume of investment in works.

Type of Settlement

UPGRADED FAVELAS – Housing units that illegally occupy publicly or privately owned land, which have already gone through the upgrading process, however they still have shortage of essential public services. They are inhabited by low-income families.

PARTIALLY UPGRADED FAVELAS – Housing units irregularly occupying (publicly or privately) land property belonging to others, which have experienced partial upgrading process, with part of the occupation disorderly arranged in a dense way, and lacking essential public services. They are inhabited by low-income families.

IRREGULAR SETTLEMENTS – Precarious settlements, with regular road plan and land-plot division that did not meet one or more of the legal, technical, and administrative proceedings of licensing or implementation; or that they were commercialized through real estate agent and/operator without any compliance requirements of the approval process.

IRREGULAR HOUSING PROJECTS – Housing projects promoted by the

Government that have good level of consolidation and infrastructure, but their approval and licensing process have not yet been completed.

Location in relation to the water source area: Precarious and/or irregular settlement located in the Área de Proteção e Recuperação de Mananciais do Reservatório Billings – APRM-B) (Water Source Protection and Recovery Area of the Billings Reservoir).

Intervention Program (if any): Programmatic Intervention Line that is inserted within the Local Social Housing Plan (PLHIS).

Intervention stage: Intervention stage where the settlement is.

Documented occupation date: date of occupation of the settlement evidenced by documentation in the archives of the municipality.

Occupancy date obtained in interviews: Starting date of occupation informed by the leadership of the area, through interview during the mapping of precarious and/or irregular settlements.

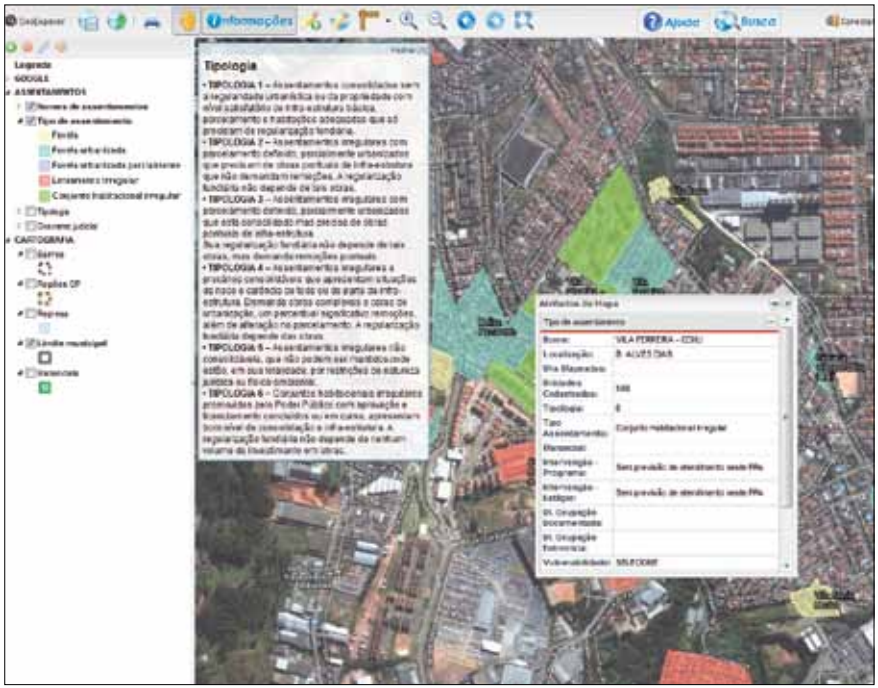
Vulnerability: The inability of people or households to take advantage of the opportunities available in different socio-economic areas to improve their welfare state or prevent their deterioration. The Índice Paulista de Vulnerabilidade Social – IPVS (Social Vulnerability Index of São Paulo State) classifies social vulnerability in the following groups: No vulnerability; Very Low Vulnerability, Low Vulnerability, Average Vulnerability; High Vulnerability, Very High Vulnerability.

Zoning: Zoning is an instrument of action used in Master Plans. It is the division of the city to different guidelines for the use land and occupation by urbanistic parameters.

MACRO-ZONING – Macrozona Urbana Consolidada – MUC (Consolidated Urban Macro- Zone); Macrozona de Proteção e Recuperação do Manancial – MPA (Environmental Protection Macro-Zone); Macrozona de Proteção e Recuperação do Manancial - MPRM (Water-Source Protection and Recovery Macro-Zone) composed of two macro-regions; Macroárea Urbana em Estruturação – MURE (Urban-Structure Stage Macro-Zone); Macroárea de Manejo Sustentável – MMS (Sustainable Management Macro-Zone).
ZONING – Área de Recuperação Ambiental – ARA 1 (Environmental Area Restoration); Área de Restrição à Ocupação – ARO (Restricted Occupation Area); Zona Empresarial Restritiva – ZER 1 (Restrictive Business Zone); Zona de Usos Diversificados – ZUD 1 (Diversified Use Zone).

Morphological Feature: Description of the relief shape or appearance.

Judicial Encumbrances: Judicial Encumbrance is a burden, obstruction, or impediment established by a body linked to the Ministry of Justice that restricts the actions of the owner, government agencies, and third parties about a particular property. Ação Civil Pública – ACP (Public Civil Action); Termo de Ajuste de Conduta – TAC (Conduct Adjustment Agreement); or Repossession.



Picture 2 – Mapping module image taken from website.
Image: Aramis Horvath Gomes (Sehab/PMSBC).
Source: <www.sihisb.saobernardo.sp.gov.br>.

The searches on a specific settlement may be made through the homepage by clicking on the "open map" option on "Search". One can search by the settlement name, by area of participatory budgeting, by public place, or by neighborhood. Upon completion, the user is automatically directed to the map where, by clicking on the settlement, he/she has information in table format (pictured above).

Although this information is available for viewing on the map, it is restrictively provided in technical-form format of each settlement.

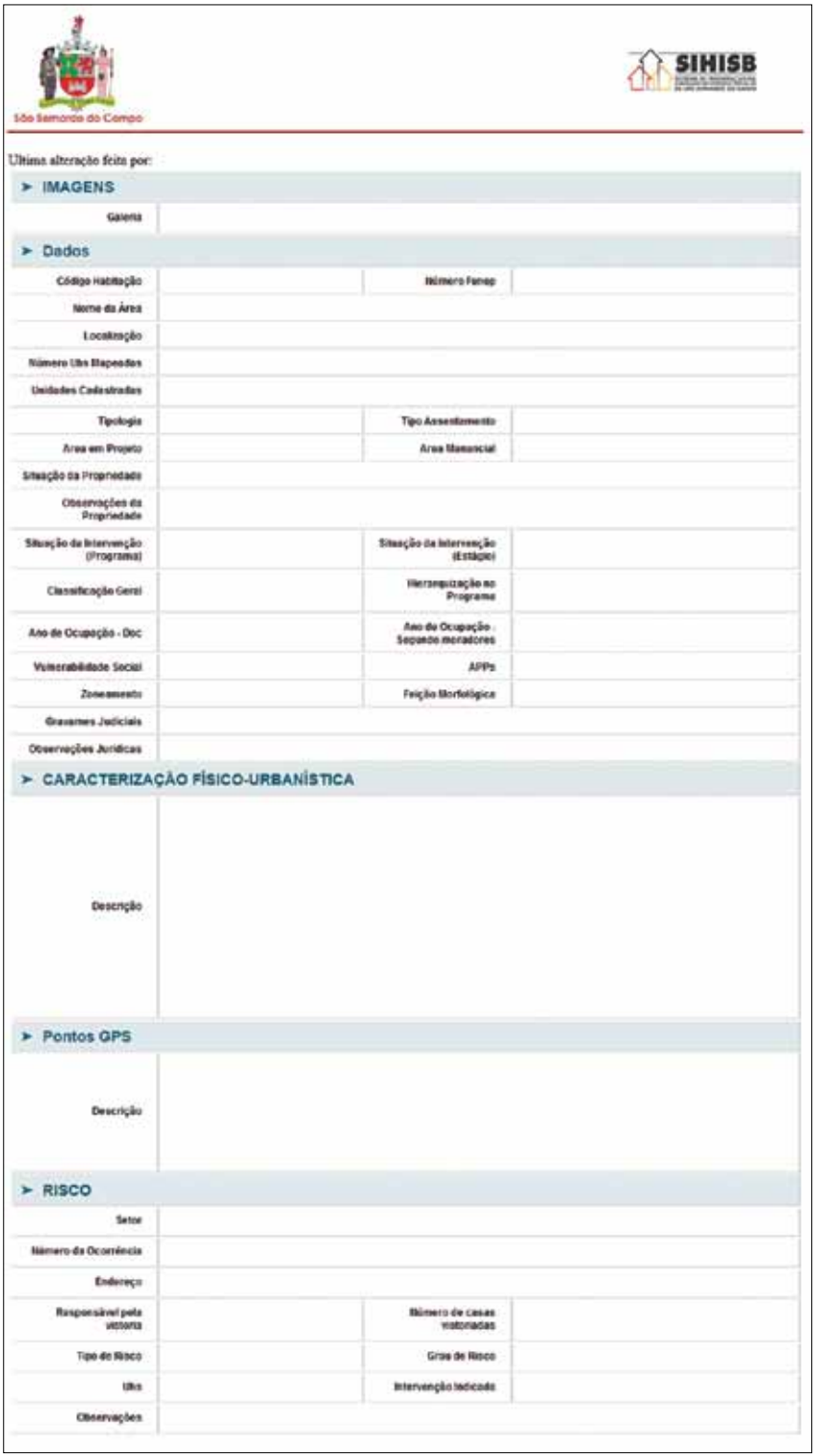
Access is allowed only to certain government official identification number that can start the search for information on "Settlements" tab. By clicking on this tab, a screen appears that allows searching by name of the urban area or by the FUNEP number, or by neighborhood where it is located, as illustrated in the figure below.

The reference number for the settlements is based on the FUNEP code, created under the study of the Mapping of Settlements in the city. This code type appeared on the mapping work to sort the surveyed areas. A great part of the settlement has received reference names in several different municipal secretariats.

Picture 3 – Homepage of the Module of the Precarious and/or Irregular Settlements.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

When entering some of this information for search, the results are shown below, where one can click to open the researched settlement form, and possibly edit the data or just print.

The existing information in this module in form format is illustrated in the following picture, and it includes information that can be viewed through the map, in the item named *Data*; it also contains pictures of the field visits to the area in item named *Images, urban and physical characteristic;* with information on the location, boundaries and access, urban-environmental characteristics and infrastructure, conditions of buildings and the surrounding conditions, and coverage of equipment and services in the item named *Physical-Urban Specification*; and delimitation of the settlement perimeter with the GPS points on item named GPS points. When the settlement has risk sectors, the case number, address, responsible for the inspection, the number of inspected dwellings, risk type, risk level, number of housing units, and indicated intervention and observations are included in the item named *Risk – information about the sectors*.



São Bernardo do Campo

SIHISB

Ultima alteração feita por:

➤ IMAGENS

Galeria	

➤ Dados

Código Habitação		Número Fenap	
Nome da Área			
Localização			
Número Lts Mapeados			
Unidades Cadastradas			
Tipologia		Tipo Assentamento	
Area em Projeto		Area Matricial	
Situação da Propriedade			
Observações da Propriedade			
Situação da Intervenção (Programa)		Situação da Intervenção (Estágio)	
Classificação Geral		Hierarquização no Programa	
Ano de Ocupação - Doc		Ano de Ocupação - Segundo moradores	
Vulnerabilidade Social		APPs	
Zoneamento		Feição Morfológica	
Gravames Judiciais			
Observações Jurídicas			

➤ CARACTERIZAÇÃO FÍSICO-URBANÍSTICA

Descrição	

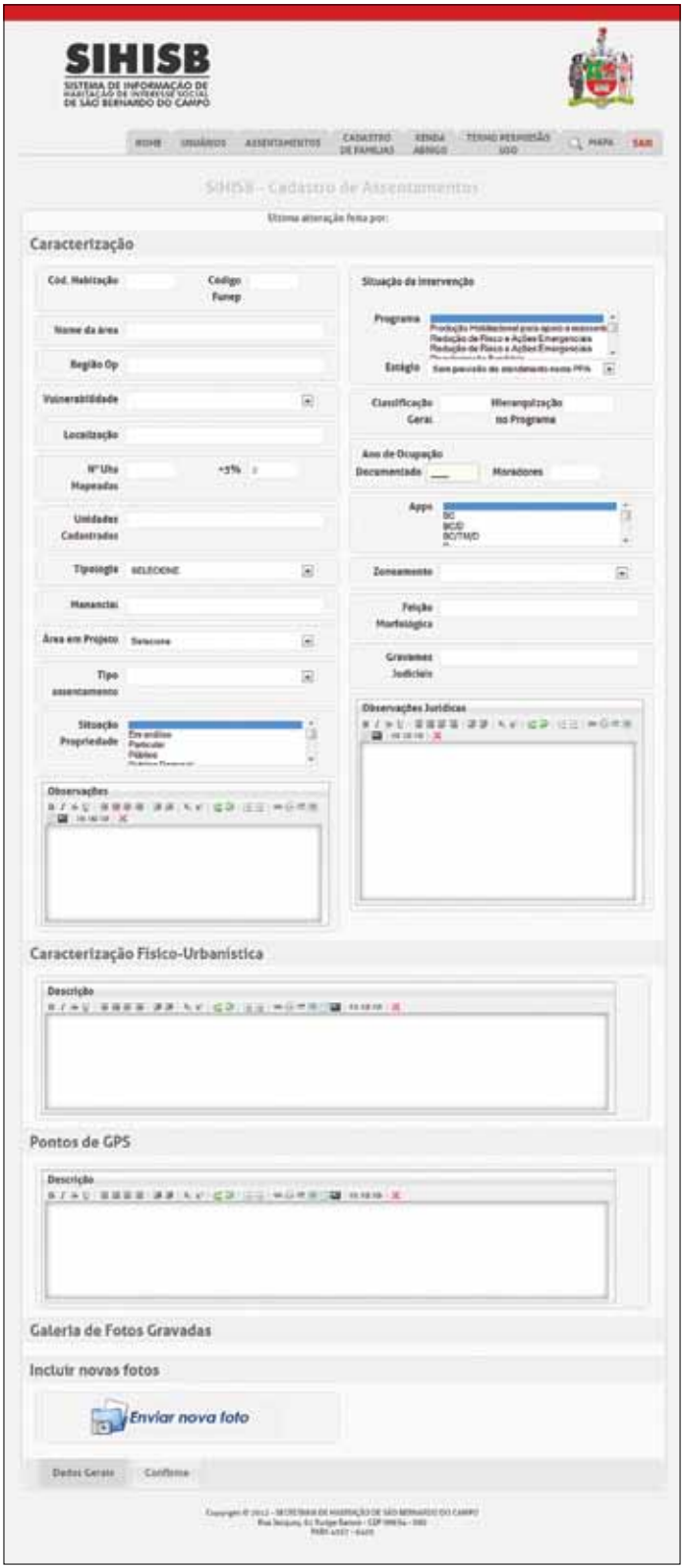
➤ Pontos GPS

Descrição	

➤ RISCO

Setor			
Número da Ocorrência			
Endereço			
Responsável pela vistoria		Número de casas vistoriadas	
Tipo de Risco		Grau de Risco	
Lts		Intervenção Indicada	
Observações			

Picture 4 – Page for printing the Settlement file.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.



Picture 5 – Page for data editing in the Precarious and/or Irregular Settlement Module.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

For users who have permission to edit, this same form appears on the screen, with options to be changed. Some fields, such as Vulnerability, Typology, and Area under Project, Settlement Type, Property Situation, Program, Stage, and APPs provide closed options for filling out; in the rest of fields, one can insert or edit a free text.

How has the module been designed?

The decision of the implementation of Settlement Module has been present from the beginning of the process. The Mapping of Precarious and/or Irregular Settlement and the PMRR instruments, previously mentioned, have included a data series that bring a comprehensive characterization of the settlements. Therefore, it has been decided working with existing data in SEHAB and not to produce any additional data to enter the System.

To facilitate the search for settlement and articulate it with the way the municipal administration has been consolidating its decision-making processes through participatory budgeting, another search field tied precisely to the OP region has been added in this module. Each OP region has encompassed several neighborhoods and settlements.

The information Settlements module has been restricted to employees nominated by the secretariats with access control administered by the Housing Secretariat, for printing and/or editing.

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

The SIHISB Development has followed, for all modules, the MVC (Model, View, Controller) principle, implemented using Java technology (Java EE, Servlets and JSP). MVC is a design pattern for computer applications originally formulated in the 1970s by Trygve Reenskaug *.

The MVC pattern provides separation between the information representation and user interaction with it, i.e., the process of interaction with the data is, from the software point of view, separated into components responsible for parts of the interaction. The 'Model' component is responsible for the business logic and the interaction with the database (also called a "persistence layer"). The 'Controller' component is responsible for mediating user interaction converting his/her actions into commands directed at 'Model' or 'View'. The 'View' component is responsible for presenting data to the user.

SIHISB makes use of the MVC pattern using the following components: Servlets, JSP, Beans, and DAO Java technology. The 'Model' layer is built with DAO and Beans components; 'View' layer is built using JSP and HTML components; 'Controller' layer is built with Servlet component. In a simplified way, one can exemplify the concept as follows:

1. the user interacts with the web page, 'View' layer (JSP, HTML);
2. interaction is interpreted by 'Controller' layer (Servlet);
3. persisted (stored in database) by the 'Model' layer (DAO, Beans).

* Note: According to http://heim.ifi.uio.no/ trygver ~ / themes / mvc / mvc-index.html>.

Dwellers discuss upgrading projects of Areião, Vila dos Estudantes, Monte Sião and SABESP Settlements.
Photo: Boldarini Arquitetura e Urbanismo, 2012.

How could this module be replicated?

The choice of a thematic module on settlements is central to any municipal system of housing information that intends to be focused on the social interest theme, pursuant to the current federal Housing Policy.

The construction of settlement modules in housing information system requires:

- Decision making about technology options, systems, and software to be used;
- Decision about the access levels to the module: if data loaded on it will be allowed to internal and external public sector of the Municipality; who the end users of the module are; which degree of disclosure is desired, i.e., the definition of who is allowed to download, manipulate, and review data for this module;
- A minimum basis of spatial and alphanumeric information on the precarious settlements of the city, and optionally on topics related to the socio-spatial issue of the city settlements (urban, legal, environmental issues, etc.).

Note that with regard to data on precarious and/or irregular settlements of the city, the ideal is that these have been municipally produced, as it is notorious the limitation of national sources to cover the real dimension of precarious settlements in the Brazilian municipalities and to spatialize these settlements in the municipal territory.

The census data that underlie the discussion of qualitative and quantitative housing deficit in the Brazilian municipalities have resulted in numbers far short of the reality of our cities, without accuracy of location within sectors used for research purposes by the IBGE.

Therefore, information systems need to based on municipally-produced housing data, either with the rigor with which they are captured in systems like HABISP and SIHISB, which relied on previous financings to update data in favelas and irregular settlements in their cities, or with more simplified mappings, estimated from crossing locally available data with aerial photos available on the web, for example.

C. HOUSING REGISTRATION FOR PROJECT MODULE

Why has the module been implemented?

The housing register module is module containing information about families served in operations undertaken by the Housing Secretariat in São Bernardo do Campo. This module has been designed from a domestic demand of the Secretariat, in order to load, in SIHISB, the data already produced by Sehab-SBC about the assistance provided by it. For its preparation, preliminary interviews have been conducted with officials responsible for tabulating the data on those assisted families.

The outlined demand has explained the need of online access to information of registered families in housing programs, via *Cadastro de Pessoa Física* – CPF (Individual Taxpayer Registration), giving more agility in the SEHAB service and in the provision of the necessary information for the progress of projects, and preventing a family to be assisted more than once, over others not yet benefited.

What is the basis of information module?

For the construction of this module, the compulsory filling fields of the registration form have been internally discussed in SEHAB, taking as a basis, the information contained on paper forms and existing Excel tables built by companies providing services to PMSBC, at the time of registration of irregular housing for relocation. Other complementary fields have been included, as it will be shown later.

At first, the information considered the following aspects essential for building this module:

Settlement: settlement code.
Serial number: identification number of the property to be removed, if any.
Registration number: the registration number of this family within the Housing Secretariat.
Project: project name where the family will be assisted.
Name of primarily responsible person: name of the head of the family.
CPF (Brazilian Social Security Number) and RG (ID) + State: document numbers of the first and second persons responsible for the family.
Bolsa Família (Family Allowance) Program: if they are registered in the *Bolsa Família* Program (yes or no).
Assisted: if they receive *Bolsa Família* benefit (yes or no).
Number of Social Enrollment: Registration number, if is registered in the Bolsa Família Program.
Phone: Contact phone number.
Name of the second responsible person: Second person responsible for the family.
Address: Current address of the family.
Time living in the house: Length of time the family resides in this property.
Time living in the area: Length of time the family resides in the settlement.
Time living in the city: Length of time the family resides in the municipality.

Dwellers discuss upgrading projects of Areião, Vila dos Estudantes, Monte Sião and SABESP Settlements.
Photo: Boldarini Arquitetura e Urbanismo, 2012.

Note that the settlement code used on these forms is the same used in the settlement registration, so the crossing between these two data registrations via database is possible, generating new information. The *Número de Identificação Social* – NIS (Social Identification Number) works here as a code so that, if necessary, enable the crossing of this registration with the family registration served by the federal *Bolsa Família* program. As to information on the second person responsible for the family is part of these data, so as not to lose the record of registered family in case of death or separation of the primarily responsible person.

During interviews with government officials who have worked the information on assistance to families, inclusion of other fields in this register was needed, through which the attendance of families held at the assistance counter of the Housing Secretariat could be recorded. The registered families can go to the assistance counter to ask questions and to update information, for instance. In order to follow up this process, a field has been included to record the history of the counter assistance to the registered families.

Thus, a text-type field has been included, which has allowed the information insertion, in accordance with the assistance given within the Secretariat. The assistance employees have been trained to enter the assistance date in the text, in order to have a history of the citizen's requests.

As the assistance is carried out in most cases by social workers, the need to enter information that would allow referrals to other areas within the PMSBC has been raised, according to the type of assistance best suited to the situation of each registered family. Anticipating possible changes in the structure of registered families while they await for housing assistance, other data entry fields have been planned, as listed below:

Assistance description: information about the assistance.
Family Composition
Registration Number: the same number described in the preceding paragraphs for the purpose of connection tables.
Name: name of the family member.
Family Relationship: what the relationship with the person who has primary responsibility for the household.
CPF (Brazilian Social Security Number) and RG (ID): document number of the family member.
Income: if she/he work, what amount of income.
Family: if there is more than one family cohabiting the dwelling, it specifies of the family ties.
Sex: female or male.
Age: age of the family member.
Race: race of the family member.
Education: education of the family member.
Occupation: if working, unemployed, or a student.
Disabilities: if the family member has any disability (yes/no).

How has the module been used?

Having all the information previously worked by the municipality and those inserted at the time of preparation of the Housing Registration Module under SIHISB, the resulting layout of this module has been configured as shown in the following picture.

Picture 6 – Screen of the Housing Registration Module.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

The housing register module can be consulted and/or edited. Because it contains information on income and number of personal documents, the viewing of this record is limited to a small group of government officials, who daily deal with this information.

Picture 7 – Project-Search Screen of the Housing Registration Module.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

For information search, the internal user who is logged into the system must go to the "Family registration" tab, and choose "Search/Edit". In the new screen, the user simply enters the CPF he/she wants to find or choose a name from the settlement.

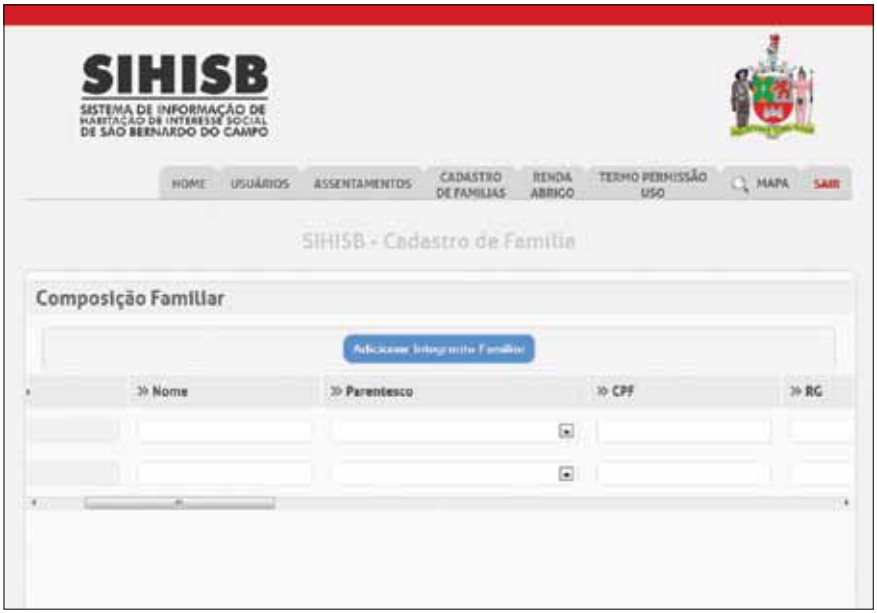
If one uses the first option for the search, he/she will receive the registration containing that entered CPF in return, registered in any position - as a first or second person responsible for the family, or as a family member. If the user chooses to perform the search by area, he/she receives in return all CPFs registered in a particular settlement.

Once the user finds the registration that he/she looking for, the user just clicks on the printer to view or print the information about the citizen.

If the user has permission to edit, he/she can enter new data via the "Register" command to "Family registration" tab, as the following figure. Or, if the user wants to edit an existing registration, he/she just clicks on the pencil picture that appears next to the picture of the printer on the right side of the screen, when finding the searched CPF.

Some fields must be entered only as numbers; others are chosen in a list of information previously entered into the database, as in the "yes" or "no" fields and Federation Unit – UF, to avoid a wrong typing of a attribute. There is also the possibility of entering information in text format for the description of the assistance. For the family composition fields, with the TAB key on the keyboard, the user inserts new rows into the table to register a new the family member. When finished filling out the fields, the user must click on "Confirm" to save the changes.

Picture 8 – Housing Registration Forms of Project.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.



Picture 9 – Housing Registration Forms of Project.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

Picture 10 – Housing Registration Forms of Project.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.

How is the module developed?

The decision-making process throughout the development of this module has essentially consisted in the step of formatting the registration form that refers to the choice of the information that has appeared in the housing registration, from the survey and the discussions carried out within the Municipal Housing Secretariat, with a view to expand and to provide online registration that has been already operated in this government body.

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

The Housing Registration Development followed the MVC (Model, View, Controller) principle, implemented using Java technology (Java EE, Servlets and JSP). MVC is a design pattern for computer applications originally formulated in the 1970s by Trygve Reenskaug. The MVC pattern provides separation between the information representation and user interaction with it, i.e., the process of interaction with the data is from the software point of view, separated into components responsible for parts of the interaction.

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In a simplified way, one can exemplify the concept as follows:

1. The user interacts with the web page, 'View' layer (JSP, HTML);
2. Interaction is interpreted by 'Controller' layer (Servlet);
3. Persisted (stored in database) by the 'Model' layer (DAO, Beans).

How could this module be replicated?

The preparation of the family registration module linked to housing programs and projects of the municipal government has minimally required the existence of a comprehensive cadastral database that is fed by data forms with uniform fields, charged in unique setting in the system, to be only internally available to the local government, organizing the families assisted by the Municipality and the streamlining of the assistance process.

The creation of this single registration data bank within the Housing Secretariat of São Bernardo, when SIHISB was implemented, has had the potential to optimize the control of the family housing assistance, increasing the Secretariat control on the management of these processes and avoiding that the duplication of registration would impair a fairer and more effective housing assistance.

D. FAMILY REGISTRATION IN THE RENDA-ABRIGO (RENTAL ASSISTANCE) PROGRAM MODULE

Why has the module been implemented?

The *Renda-Abrigo* is a municipal program designed to enable housing to low-income residents by granting pecuniary aid for rent in an emergency and transitional situation. This aid has been given to families who need to be relocated from at-risk housing units, or even during transitional housing removals from non-feasible areas as part of integrated urban development or public interest projects.

The *Renda-Abrigo* is a PMSBC program operated by the Housing Secretariat, with payment through the Finance Secretariat. In 2006, the PMSBC Department of Informatics created a family registration system on the Rental Assistance Program, which was established in 2007 as a tool for software development called Genexus, accessible only to public officials responsible for registration and/or payment of families. This System feeds a database linked to the payment system of the Finance Secretariat.

Throughout the SIHISB preparation, in interviews with the various areas of Housing Secretariat, a great demand for information on the payments of the Rental Assistance program could be established in certain settlements or regions of the Participatory Budget. Since the access searches through the system developed in GeneXus could not be released - there are only registration information editor users in this system - it was decided to create a *Renda-Abrigo* Program module within SIHISB, which is mainly focused on consulting the program data.

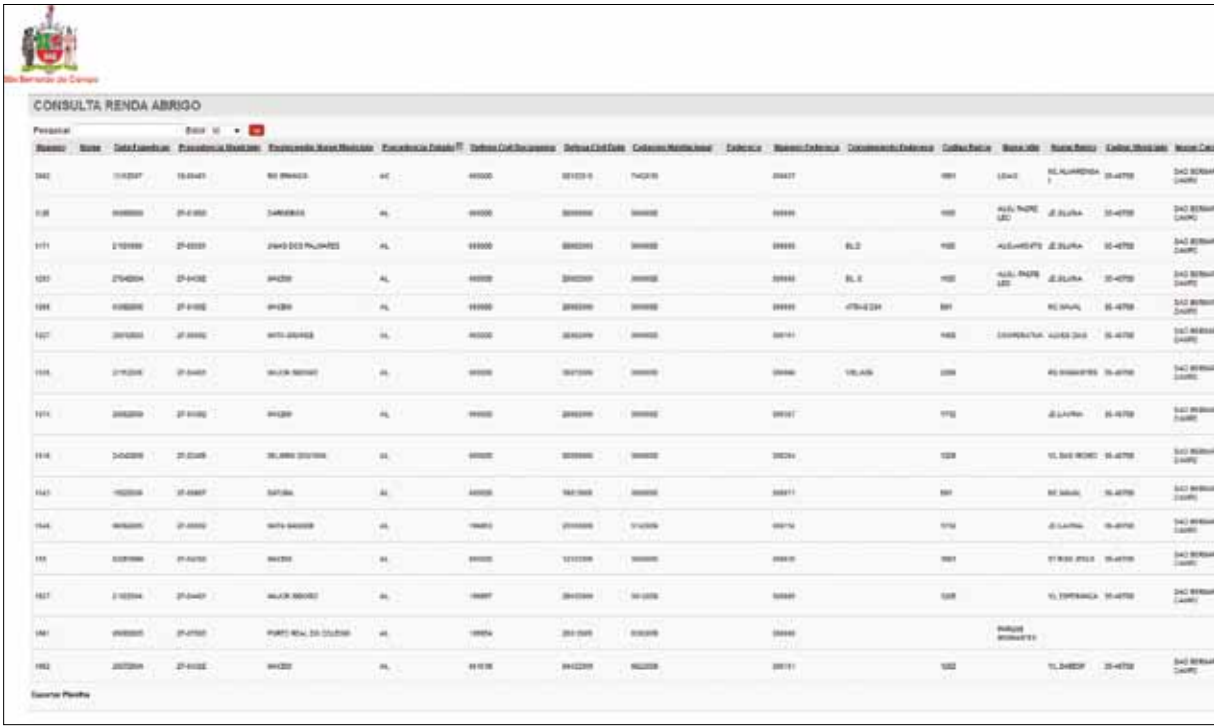
What is the information basis of the module?

Thus, the *Renda-Abrigo* Program Database has been replicated within the SIHISB data schema, and currently, this system internal user can make inquiries about residents who are registered in the program, while he is in the System.

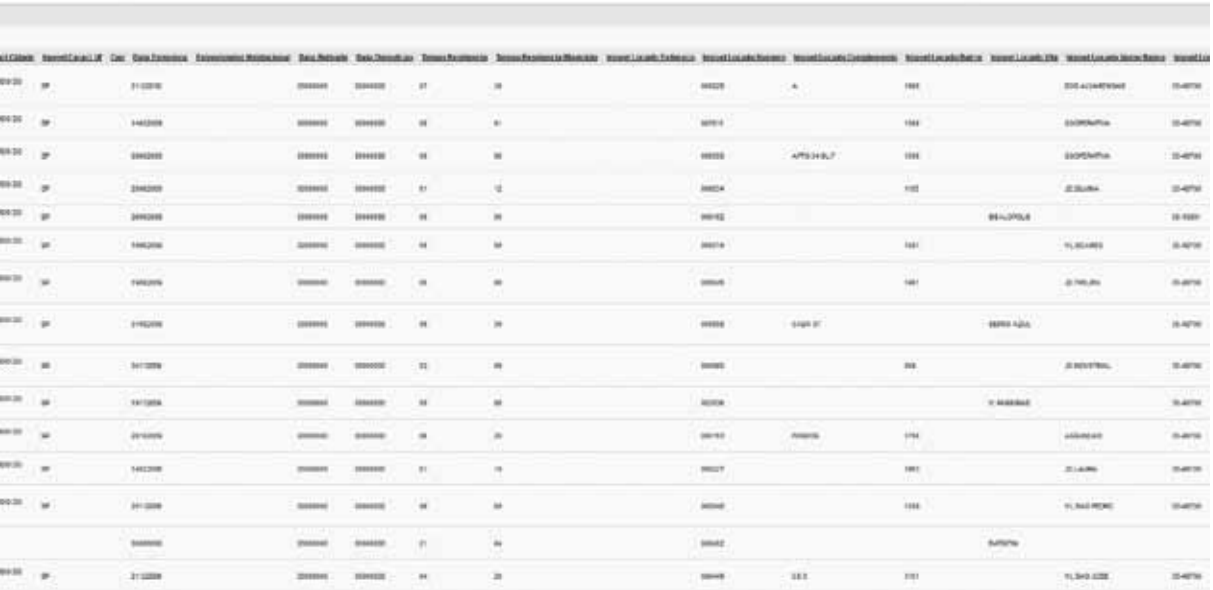
In this module, any field listed below can be searched:

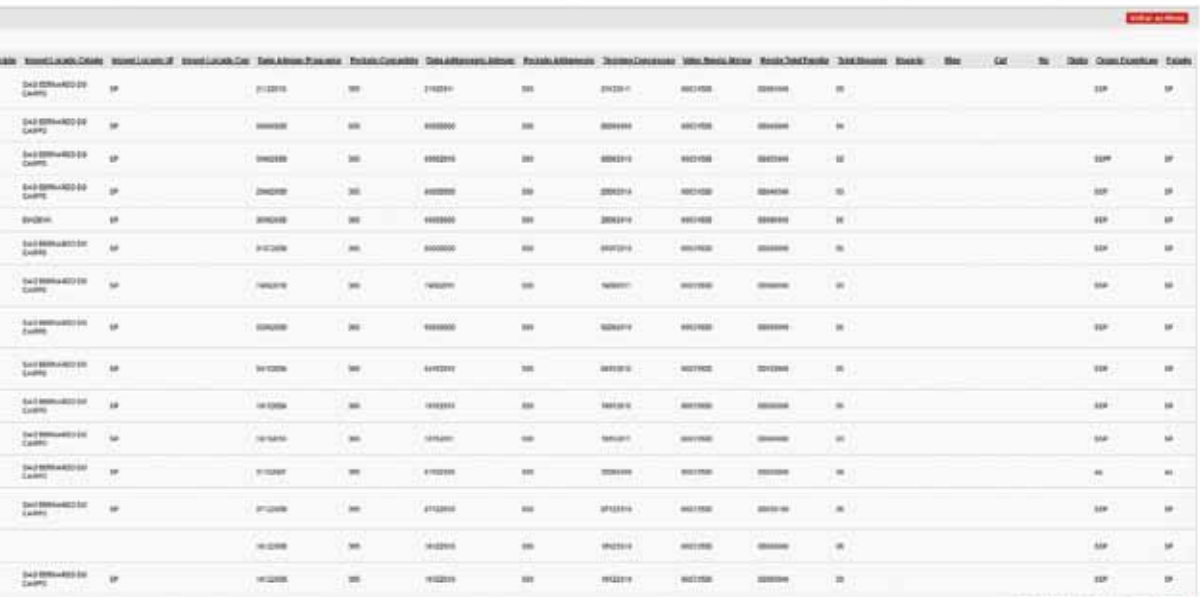
Vila dos Estudantes
Photo: Fernando Antonio Fabrini de Almeida. Source: PMRR.

Registration Number: number of registrations within the *Renda-Abrigo* Program.
Name: benefited name.
Citizen's Municipality: IBGE code of the municipality of origin of the head of the family.
Citizen's Municipality Name: municipality of the head of the family.
Civil Defense Document: number of occurrence in Civil Defense.
Housing Registration: number of housing registration at the Housing Secretariat.
Address/Number/Supplement: address of property to be evacuated.
Neighborhood Code: neighborhood code according to the Department of Finance data.
Settlement Name: name of the settlement or project location of the house to be evacuated.
Neighborhood Name: name of the neighborhood location of the house to be evacuated.
Municipal Code: IBGE code of the municipality location of the house to be evacuated.
Municipality Property: name of the municipality location of the house to be evacuated.
Property UF: state of the location of the property to be evacuated.
Zip Code: zip code of location of the property to be evacuated.
Date of Interview: interview with the head of house.
Civil Defense Date: date reported by the Civil Defense.
SEHAB Interviewer: name of the interviewer, an official of the Housing Secretariat.
Removal Date: removal date of the family to be relocated.
Demolition date: date of demolition of the property to be evacuated.
Time of Residence in the Municipality: residence time of this family in São Bernardo do Campo.
Rented property address/number/complement: address of the rented property.
Neighborhood Code: neighborhood code of the rented property, according to the Secretary of Finance data.
Settlement Name: name of the settlement or the housing development of the rented property.
Neighborhood Name: name of the neighborhood of the rented property.
Municipality Code: IBGE code of the municipality where the rented property is.
City: municipality where the leased property is.
Granted Period: time of the Rental Assistance benefit.
Date of Benefit Extension: date extension of benefit.
Extension Period: new benefit period.
Rental Assistance Agreement: Rental Assistance term for pecuniary aid
RA Value: value of pecuniary aid
Total Family Income: total income of the benefited family.
Dweller Total: number of dwellers in the residence.
User: government official who registered the family in the Genexus system.
Mother: Name of the mother of the head of family.
CPF (Brazilian Social Security Number)/RG (ID)/Digit Issuing Agency/State: Documents of the head of the family.



Picture 11 – Screen of Family registration for the Renda-Abrigo Program.
Image: Herman Charles Christ.
Source: <www.sihisb.saobernardo.sp.gov.br>.





How has the module been used?

The *Renda-Abrigo* Module is simple to use. Once logged in, the user simply enters a search word in the "Search" tab and all results related to this search will be listed on-screen response.

The user can search for information by any of the existing fields in the database of the *Renda-Abrigo*, listed in the item above.

The return screen, as shown in the following figure, can be printed or exported to the *.PDF or *.XLS format. In the latter option, data can be manipulated in EXCEL application, and the user can tabulate and organize the data he/she wants the best way to meet the demand of this information.

How has the module been designed?

The decision-making process throughout the development of this module has eminently consisted on replication of the *Renda-Abrigo* Program Database – before only housed within the Municipal Finance Secretariat – within the data schema of the SIHISB system, as described in item 1 above

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

This module has been developed using the "Oracle Application Express" (Oracle APEX) platform. The Oracle APEX platform is a tool for rapid development in a web environment that works seamlessly to Oracle DBMS and is a no-cost option available for all versions of Oracle DBMS. Its purpose is to provide a tool for declarative development in a web environment, enabling the creation of applications using configuration wizards, without the need for direct production of source code. In a conventional web application where there is need to produce the source code to manually control the application, the use of a rapid development tool enables the creation of an application without the need for direct creation of source code, using pre-formatted structures (templates) and configuration wizards that support the application logic definition. The Oracle APEX offers these facilitators; however, for being integrated as a solution to the DBMS Oracle, any application developed using Oracle APEX can only be deployed in environments where the DBMS Oracle is available.

As previously stated, for the composition of the *Renda-Abrigo* Module, the replication of the Database existing in the PMSBC has been requested, fed by an application developed by the Department of Technology, Information and Modernization at the PMSBC in Genexus, accessible only to government officials responsible for registration and/or payment of families. This system feeds a database linked to the payment system of the Finance Secretariat. In the case of income under the SIHISB module, its development in APEX allows a read-only database program managed by the DTI. Therefore, a copy is periodically made of the Rental Assistance program database that is shown on screen searches of SIHISB.

How could this module be replicated?

As seen in SIHISB, the preparation of the Family Registration Module of temporary rental situation, such as the *Renda-Abrigo* Program of the PMSBC, has depended on unified database with common fields of beneficiaries' forms fed in an environment of municipal housing system that articulates with the system of the Department of Information Technology – DTI of the municipality.

As it turned out, the replication of this database of the *Renda-Abrigo* Program – previously existing in the PMSBC – within the framework of the SIHISB system, has facilitated the management of information about the program, which despite being funded from another municipal secretariat, is operated by Sehab.

On systems that intend to related to SIHISB and HABISP, data reproduction of programs that have not necessarily been coordinated by the Housing Secretariat can facilitate the operation of the latter, if the information in question is indispensable to the Housing Secretariat, as in case presented here.

3.2.3 Step 3 – Post-implementation: monitoring, maintenance, and innovations

3.2.3.1 Monitoring and maintenance of the modules already implemented

All modules already implemented in SIHISB have been constantly monitored and they must undergo permanent updates, meeting the demands of continuous users. Each of these modules has specific purpose and monitoring their use in the immediate post-launch of the System demonstrates how the teams have incorporated the tool.

Using the Map Module, for example, has proven useful for the sharing of the information about the precarious settlements of São Bernardo do Campo to the public in general. Students, journalists, researchers, and others who want to know any settlement of the municipality may find it in this module, and meet its social characteristics, and the typology and infrastructure classifications.

Concerning the Sehab-SBC internal user, through this module, they can access more specific information. Today, all teams have used this module, especially the Land Tenure Regularization one, besides the own staff of the Office of the Secretariat, and the management team of works and projects. The main demands of these units concerning the content of this module are related to the settlement boundaries, the environment, the typologies, and the forms with information that feed it.

Other secretariats of the Municipality have also used information in the Map Module for area verification (checking if certain settlements are mapped or not), general information on the already mapped settlements, as the number of housing units, and urban-physical and land characteristics, areas in project, etc. The main demands have come from the Environmental Management Secretariat (SGA); Participatory Budgeting and Planning Secretariat (SOPP); Urban Planning Secretariat (SPU); and Urban Service Secretariat (SU) – using map information in the forms of risk areas and their monitoring.

Module B, Mapping of Precarious and/or Irregular Settlements, has had a gradual increase in its use by the users, as people, especially the technicians, need the tool and have been trained to use it. It has already been proved its

importance for searches internal to the Housing Secretariat and for the other secretariats and the public in general.

Sehab-SBC's technicians, especially the architects of the Department of Housing Programs and Projects, have consulted the SIHISB through the map, in day-to-day work, to check the polygonal of the settlements, and verify the aerial images and print them. This information has subsidized the management of technical projects for which they are responsible.

The Settlement Information Module has specifically helped handling cases that reach the Secretariat and responses to requests forwarded by other areas of the municipality, for example, demands the Urban Planning Secretariat (SPU) on official name of street and search of the settlement typologies, as well as information demands of the Participatory Budgeting and Planning Secretariat (SOPP) and the Communication Secretariat (SECOM), to meet the general public.

In the latter case, for example, SECOM has repeatedly referred to the Sehab-SBC, to use such information to subsidize news on the social housing subject. With this, we can say that the information about qualification and quantification of precarious settlements – which has already been disclosed and disseminated by Sehab-SBC in dialogue with the government and society – has intensified and become even more transparent as it has also been expressed in SIHISB. After all, information is available to anyone who can and/or wants to access it through the Internet.

Among the next steps, in order to have better performance, it is worth to mention that professional training workshops have been planned, which are related to the use of the System, for the Sehab-SBC technical team and other secretariats of the Municipality, in order to expand the use of restricted modules created for the largest possible number of technical professionals. So everyone can have accurate and reliable information at hand, for the progress of the work.

As to the information contained in Module C, Housing Registration for Project Module, it has been repeatedly requested by the Social Care Duty team, by the project technical team and social management of the Housing Secretariat, serving as subsidies for the preparation of responses to internal memos and letters to this Secretariat body. The publication of information and details of this registration is forbidden to third parties. The Housing Secretariat has only informed other agencies of the Municipality on the registration status when relevant, because confidentiality of the family data has to be maintained.

In the case of the Sehab-SBC domestic sectors, the requested information has been related to the registration number of a specific person who is in the social care duty assistance, or it serves to check those people registered in specific areas. There have also been internal demands for registration information in areas where there are upgrading projects and housing production of the Secretariat.

Other municipal secretariats such as the Social Development and Citizenship Secretariat (SEDESC) and the Education Secretariat, which have worked very closely to residents in a precarious situation, have recurrently needed to know whether or not these residents have been included in the Sehab-SBC registration.

Information in this module has been updated from the records made by companies hired for this purpose and the project teams within the Secretariat that are in charge of the registration of affected families in their covered perimeters. The various registrations used by companies hired by Sehab have worked at different times with non-standard information.

Vila Esperança Housing Project.
Foto: Wilson Magão.
Acervo: Secom/PMSBC, 2012.

With the SIHISB implementation, these registrations have been standardized and loaded into the System in its standard form. To facilitate the management of this information, the teams will be responsible for migrating data information on the areas managed by them to a general and "universal" database that feeds SIHISB.

Finally, among the modules already in operation, a team of its own has coordinated Module D – Family Registration in the *Renda-Abrigo* Program Module, with a database system developed by the DTI-PMSBC. Sehab-SBC has not coordinated the construction and editing of this database. SIHISB has only replicated the information contained therein, to facilitate the routine operationalization of the teams operating the program.

Updating the database of the *Renda-Abrigo* Program has been constant and determined by the flow of new appointments in the Program submitted by the Civil Defense or the Design/Works Team (for the implementation of fronts of works).

In Sehab-SBC, the demands for information about the *Renda-Abrigo* data have primarily arisen from the need to consolidate the total numbers of the Program to calculate the budget of assistance to the Program's beneficiaries and their social monitoring.

Other municipal have repeatedly requested this module information, as the Secretariat of Participatory Budgeting and Planning (SOPP) for the control of the Municipality Budget, and the Communication Secretariat (SECOM), for the disclosure of the number of people benefitted from the Program on articles of the *Jornal of the Município*.

3.2.3.2 Innovations and expansion planning of the System

After launching the initial four of the SIHISB modules described earlier, Sehab-SBC has worked in the development of two more modules to be integrated into the System: Land Tenure Regularization Module, and Sehab's Housing Development and Project Module, as detailed in the following sections.

E) LAND TENURE REGULARIZATION DOCUMENT: TERMO DE PERMISSÃO DE USO – TPU (RIGHT OF USE AGREEMENT) MODULE

Why has the module been designed?

The "Right of Use, Reception, Commitment and Accountability of Housing Unit Agreement" – TPU grants (to residents assisted by the Housing Policy of the city of São Bernardo do Campo) housing units, by way of the right to use until the institution of the condominium of a housing project, and the unit titles[26].

For the Municipal Housing Secretariat, it is extremely important to have control of families residing in housing projects. The record of each person who has received a housing unit enables control of any transaction of purchase and sale that has taken place in this period. In the final process of regularization, when issuing the registration of individual apartments, these data are consulted and used.

The TPU module has derived from discussions within SIHISB for the implementation of a future registration on housing demand, which the Secretariat has planned to display on the System. Moreover, it is necessary because the volume of units and titles delivered by Sehab-SBC has gained significant proportion to the point of needing a system that would bring together information of the number of visits made by the government. From conversations for the elaboration of such a module (not yet developed in SIHISB), the creation of the TPU module has become feasible, which would be clearly drawn from the creation of a database containing forms with TPUs granted to licensees of the housing units provided by Sehab, to ensure them security of tenure of their dwellings, while these residents wait for the condominium implementation of the housing project where they live, or the definitive unit titles.

As stated before, this module development has been under way. Its structure has already been developed; the Housing Secretariat still needs a more detailed definition of how to load the information on the data form that will feed the database and the technicians who will be responsible for this procedure.

It is worth noting also that the Land-Tenure Regularization Division of Sehab is in the process of finalizing the design of a program of subsidy for regularization. Within this new perspective that has been generated, the TPU module database should undergo some adjustments to compile information of this relevant municipal program that has been taking shape.

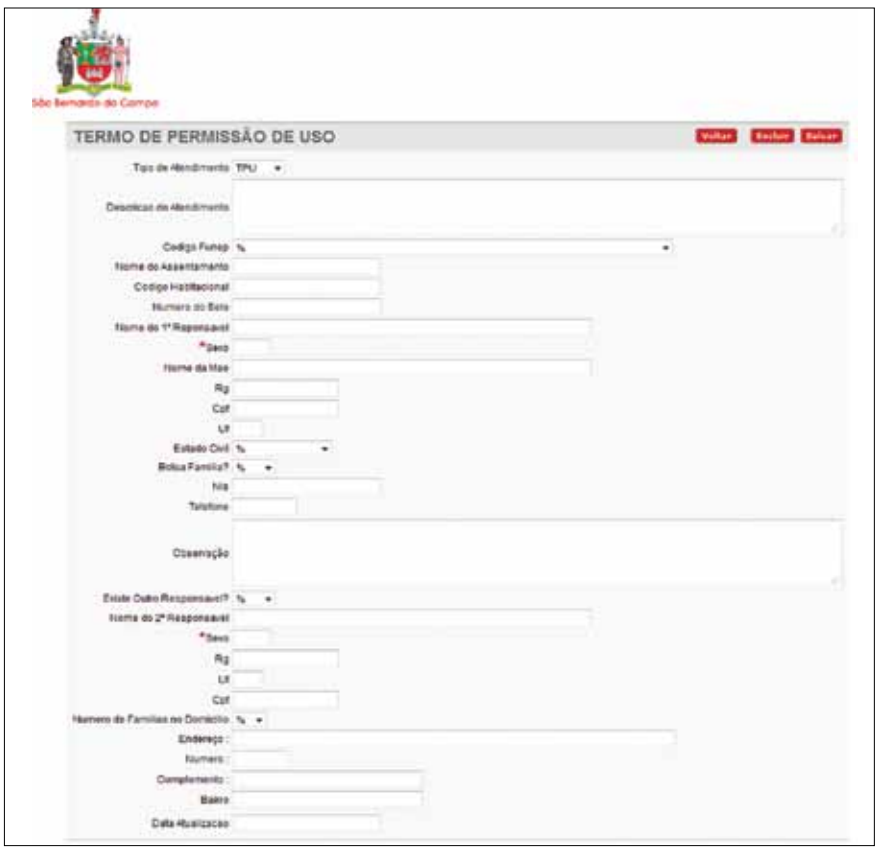
What is the basis of information module?

The information comprising the feeding the data form in this module has mostly referred to fields already used within the current assistance registration existing in the Social Work department of Sehab.

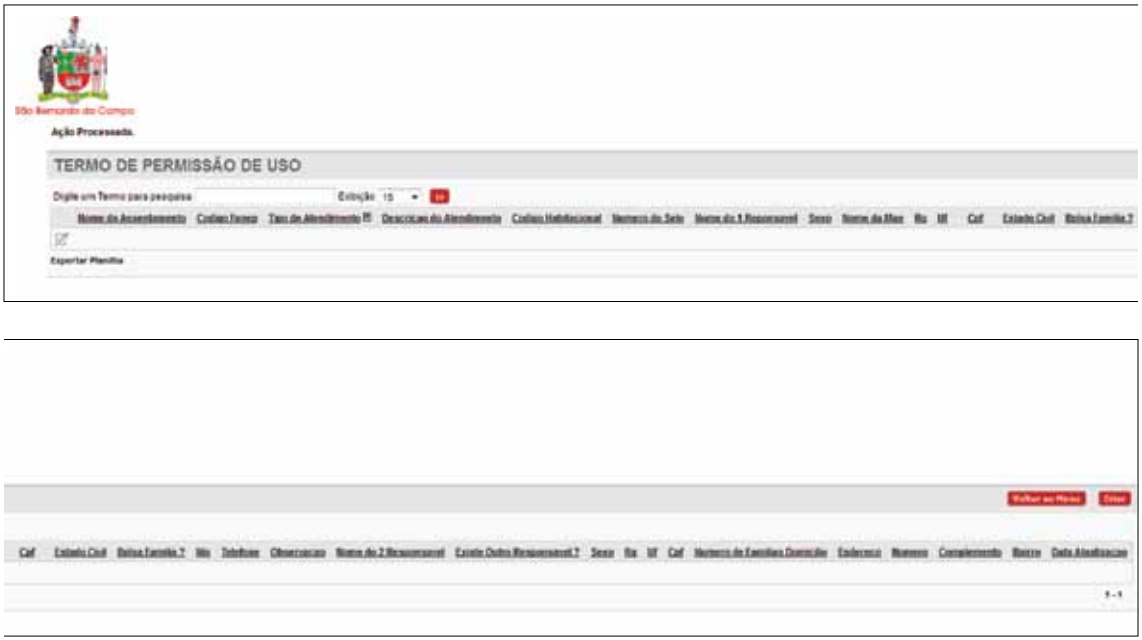
The following figure shows the fields to be loaded to feed the database that will gather information about the TPUs granted to residents. As one can see, the fields that feed the form are as follows:

26. The Municipal Decree 17.917/2012 establishes duties and responsibilities of licensees of the Agreement.

Description of housing assistance: description of the modality of assistance given to the family in question
FUNEP code: reference number for the settlements
Settlement Name: where the family lives
Housing Code: code used by SEHAB
Serial number: identification number of the property
Name of primarily responsible: name of family member
Sex: male or female
RG (ID), CPF (Brazilian Social Security Number), State, and Marital Status: document data of the primarily responsible member.
Bolsa Família (Family Allowance Program): information on receiving assistance from *Bolsa Família* and what percentage in relation to family income
NIS: *Número de Inscrição Social* (Social Insurance Number)
Phone: contact telephone number
Notes: general information one wishes to enter
Information about other responsible family member: name, sex, ID, State, CPF of other responsible family member.
Number of families at home:
Housing Address:
Date of form update:



Picture 12 – Screen of Land Regularization Module, TPU under construction.
Image: Herman Charles Christ.
Source: SIHISB, 2012.



Picture 13 – Screen of Land Regularization Module, TPU under construction.
Image: Herman Charles Christ.
Source: SIHISB, 2012.

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

As the Rental Assistance module, this module has been developed using the Oracle Application Express (Oracle APEX) platform. The Oracle APEX platform is a rapid web application development tool that works seamlessly to Oracle DBMS and is an option available at no cost for all versions of Oracle DBMS. Its purpose is to provide a tool for declarative development in an environment enabling web-building applications using configuration wizards without the need for direct production of source code. In a conventional web application there is a need to produce the source code to manually control the application; the use of a rapid development tool enables the creation of an application without the need for direct creation of source code, using pre-formatted structures (templates) and configuration wizards that support the definition of the application logic. The Oracle APEX offers these facilitators, however, for being integrated as a solution to the DBMS Oracle, any application developed using Oracle APEX can only be deployed in environments where the DBMS Oracle is available.

F. HOUSING DEVELOPMENT AND PROJECT MODULE

Why has the module been designed?

The Housing Development and Project module refers to the tracking history of housing projects undertaken by Sehab. It is noteworthy that in the current municipal administration, Sehab has maintained systematic monitoring of the whole process of creation, approval, and implementation of their projects, since the moment a letter of inquiry for approval is sent to the funding agencies and throughout its physical and financial execution. This monitoring will be much easier, from its insertion into the SIHISB structure, allowing an increase in management, standardization, and control of such information by the Secretariat.

As already explained, the development of this module has been underway. The structure of the form that will feed the database has been already developed. The Housing Secretariat still needs a more detailed definition of how to load the information on the forms, how often it will be held, and the technicians who will be responsible for this procedure.

What is the basis of information module?

The project follow-up tool that has served as the base for mounting the Housing Development and Project Module in SIHISB was the control spreadsheet of the *Gabinete de Gestão Integrada da Caixa Econômica Federal* – GGI (Office of Integrated Management of CAIXA), which is a standard monitoring instrument (in Excel format) of the Sehab projects, based on which CAIXA has periodically monitored Sehab's ongoing actions.

The follow-up format of the CAIXA projects in the GGI aims to give greater speed and agility to implementation supervision of the Secretariat works, in order to monitor barriers and maintain understandings and procedures in the face of diversity of issues that impact the project execution.

These data forms have been created to organize and facilitate accountability and information for monitoring the progress of the CAIXA projects with the GGI, and the Housing Development and Project Module has been created based on existing information in them.

The data form with information on the SIHISB Housing Development and Project Module – just like its present design – is shown below. As seen, the fields that feed this database hold much relation to those already present in the accountability spreadsheet to GGI.

The fields of the Housing Development and Project Module refer to related information:

- the identification of housing development;
- the stage of contracting resources;
- the stage of contracting works and services;
- the development of projects and approvals;
- the progress of actions;
- its physical and financial execution;
- a gallery of images of the development – project and photos.

Sehab-SBC considers that for the implementation of this module, the data currently present in the GGI spreadsheets will be loaded into a standard form created within the SIHISB environment – the Housing Development and Project Module. After this initial data load, Sehab will be organized to permanently update the following up of the developments and projects already loaded, and data entry of new housing developments and projects to be contracted[27].

TECHNICAL DESCRIPTION OF THE DEVELOPMENT PROCESS

The developing of the Housing Development and Project Module has followed, as well as Settlement and Family Registration modules, the MVC (Model, View, Controller) principle, implemented using Java technology (Java EE, Servlets and JSP). MVC is a design pattern for computer applications originally formulated in the 1970s by Trygve Reenskaug. The MVC pattern provides separation between the information representation and user interaction with it, i.e., the process of interaction with the data is from the software point of view, separated into components responsible for parts of the interaction.

The 'Model' component is responsible for the business logic and the interaction with the database (also called a "persistence layer"). The 'Controller' component is responsible for mediating user interaction converting his/her actions into commands directed at 'Model' or 'View'. The 'View' component is responsible for presenting data to the user.

SIHISB makes use of the MVC pattern using the following components: Servlets, JSP, Beans, and DAO Java technology. The 'Model' layer is built with DAO and Beans components; 'View' layer is built using JSP and HTML components; 'Controller' layer is built with Servlet component.
In a simplified way, one can exemplify the concept as follows:
1. he user interacts with the web page, 'View' layer (JSP, HTML);
2. interaction is interpreted by 'Controller' layer (Servlet);
3. persisted (stored in database) by the 'Model' layer (DAO, Beans).

27. Unlike the case of the data of the Land Regularization Module – TPU, which is still scheduled for a database standardization of the Secretariat TPU, for subsequent loading of the first data in the system, the Housing Development and Design Module HAS already counted with this standard database.

Três Marias
Housing Project.
Collection: Secom/PMSBC.

3.3 The current state and future challenges of Sihisb

About a year after the SIHISB release, the main technical and institutional results, directions, and challenges to be faced by its management can be evaluated. After all, the activities related to the implementation of a system do not end with its availability for use.

From a managerial perspective, we evaluate this period of SIHISB's post-release under two distinct aspects: the benefits attached to the planning of actions and interventions in the social housing context in the municipality, and the directions and technical challenges with which the municipality should work so that the System can be always innovative and effective.

These two attributes must be constantly on the expectation horizon of the System's managers, since from its creation to its use by various departments and citizens in general new demands must inevitably arise, which will require more sophisticated tools, leading a process of continuous improvement of technological resources. The more possibilities of knowledge, the greater the demands and requirements are in relation to technical resources. Therefore, the more accurate and efficient these resources are, the better management as a whole.

Among the benefits aggregated to planning, the Information System for Social Housing in São Bernardo do Campo has proved to be very effective in guiding the government action. SIHISB has made possible an overview of the housing problem in the city for both the public managers and the society itself, featuring a complete diagnosis, characterizing each settlement, its set of problems, their types, and relating each one to an intervention type. With this, government and society can jointly identify intervention and shared data.

Among the challenges that the SIHISB management must face, it has become very clear the importance of a greater internal

Vila São Pedro
Photo: Fernando Antonio Fabrini de Almeida. Source: PMRR.

dissemination of the possibilities that the System tools have provided for the teamwork optimization. Though used since its implementation by various organs of municipality of São Bernardo do Campo, it has been more frequently accessed by the Municipal Housing Secretariat, for organization purposes of the work processes and information searches about the local housing programs.

SIHISB's increased use by other municipal secretariats and departments can further streamline other assistance processes to residents.

For the population in general, SIHISB has served as the basis for consultation on the precarious settlements, increasing the information transparency and the interaction between government and society.

Among the technical challenges that SIHISB management must face, the System's monitoring and maintenance are essential. This work is done by the Department of Information of São Bernardo do Campo (DIT) and it includes: the maintenance of physical servers that host the System; data backup copies; and correction of defects not detected during development. The development of new modules and the crosschecking information through spatial analysis have also been planned.

For all that, despite the improvement needs inherent in any contemporary system, we can say that - either by streamlining internal administrative processes, or by making available the systematized information regarding the precarious and housing programs and projects – SIHISB has made the management of social housing in São Bernardo do Campo more effective.

The overall balance of a year's work is very positive, both from the perspective of the planning process as the internal development of the S ystem and its tools, which encourages us to disseminate this experience and to share information that will lead other municipalities to develop related systems, as can be seen, in a didactic way, in the following chapter.

sihis

www.sihisb.saobernardo.sp.gov.br

Image: Wilson Magão. Collection: Secom/PMSBC.

Chapter 4
How to develop a housing system in your municipality? Notes for customization system related to Habisp and Sihisb

From the experience of the HABISP customization, which resulted in SIHISB implementation in the municipality of São Bernardo do Campo, one can deduce some basic steps for future deployments of local housing systems in other municipalities interested in systematizing and publicizing the sector information.

The development of experiments related to HABISP and SIHISB has required clarity in the planning of the work process and a commitment to a set of activities and institutional linkages that have enabled such project.

The reports presented here have demonstrated that the implementation process of housing systems requires development activities that take place in three basic stages of work:

- Stage 1 – Preparatory activities for the System operation;
- Stage 2 – Development and implementation of the System;
- Stage 3 – Post-deployment: monitoring, maintenance, and innovations.

These steps have indicated the need for a permanent effort from municipalities interested in developing a housing information system in the preparatory stage to its execution and throughout its development, and, of course, after its implementation, keeping the System constantly updated, so that it can serve as a source of current information for residents and government officials working as operators of housing program in the city.

4.1 Stage 1 – Preparatory activities for the operationalization of the System

The implementation of housing information systems depends on preparation activities for its architecture and installation, from the organization of data available in the municipal government to the assessment of the infrastructure and installed systems likely to be used by the government.

Schematic Table: Overview of activities for implementation of housing information systems

1. Organization of alphanumeric and spatial database, as well as the existing housing in the Municipality and in the Municipal Housing Secretariat or department (In the absence of data, this activity presupposes their production for the purpose of the System installation).

2. Provision of infrastructure installed at the existing housing in the Municipality and in the Municipal Housing Secretariat (or department) for implementation and functioning of the System.

3. Provision of systems installed at the existing housing in the Municipality and in the Municipal Housing Secretariat (or department) for the System implementation.

Interaction with social, institutional, intra and intergovernmental actors

To these initial tasks, an intense collaboration has to be added with various actors who, coordinated by the technical staff of the housing system, are essential for the system viability.

In general, the coordination with social, institutional, and government actors aims at the exchange of experiences, the availability of data, infrastructure, systems, and resources for the project.

The experience of implementing SIHISB has demonstrated that partnership with certain actors can contribute to the System development.

Jardim Silvina Housing Project.
Foto: Wilson Magão.
Acervo: Secom/PMSBC, 2012.

Schematic framework: Indicative relationship of actors to be articulated for the architecture and implementation of the housing information systems

POSSIBLE INTRA-GOVERNMENTAL PARTNERSHIPS
With sector responsible for information technology within the municipal administrative structure
With department responsible for communication within the municipal administrative structure
With secretariats having jurisdiction over urban and housing issues
POSSIBLE INTERGOVERNMENTAL PARTNERSHIPS
Secretariat of another municipal government willing to develop technical cooperation for the development of its housing system in another municipality
State agencies responsible for management of the Housing Policy
Federal agencies responsible for management of the Housing Policy
POSSIBLE INSTITUTIONAL PARTNERSHIPS FOR TECHNICAL AND FINANCIAL SUPPORT TO IMPLEMENT DESIGN CUSTOMIZATION OF THE HOUSING SYSTEM
International agencies
Universities and Research Institutes

Note that the framework of the indicative articulations related from the SIHISB experience has only served as a basis for planning of the preparatory activities for the implementation of the housing information systems in other municipalities.

Obviously, the possible agents to be contacted vary according to the local and regional housing and urban management. These may eventually end up by being broader and narrower than the experience of São Bernardo do Campo.

Likewise, the schematic frames below, which indicate the basic information, infrastructure, and systems to be made possible by the implementation of such housing information systems, must be properly fitted to the availability of elements in each municipal reality.

Schematic Table: Relation of available general, specific, socio-economic, and alphanumeric information, necessary for the implementation of the housing information systems

General spatial and alphanumeric information existing in the Municipality

Specific spatial and alphanumeric information – as precarious or irregular housing, risk, susceptibility, and themes that are tangent to housing and urban issues - available in the Municipality bodies

Socioeconomic information available in the existing in the Municipality bodies

Schematic Table: Infrastructure, systems, and software available in the Municipality bodies and the Municipal Housing Secretariat, necessary for the implementation of the housing information systems

Infrastructure	Related to the (web and map) servers to be used to shelter the housing system
Systems	Related to operational and database-management systems to run the housing system
Softwares	Related to (free or not) software already available and/or to be purchased for the development and the housing-system operation

The São Paulo and São Bernardo cases have demonstrated the existence of a series of prerequisites and informational technology that have enabled the SIHISB implementation.

It is known that few municipalities in Brazil can easily count with full range of data and infrastructure. Therefore, São Bernardo's effort in the preparatory activities for the SIHISB implementation concentrated on gathering these inputs. In their absence, other municipalities interested in creating the housing information systems will have to perform these data prior to production and necessary infrastructure availability.

Concurrently or prior to the completion of the activities described above (available data collection, infrastructure, and systems, as well as institutional linkages), the System technical team responsible for its design and implementation has to be gathered. This team will be comprised of professionals with expertise in information technology (IT). As in the case of São Bernardo, the shortage of such professional will be common in the framework of other local government in the country. These professionals will probably have to be outsourced from local administrative structures.

PROFILE OF TECHNICAL STAFF OF THE HOUSING INFORMATION SYSTEM

specialized professional in information technology (it) in the following areas:

- Software developer analyst, system analyst, database administrator, web designer, and network analyst in geoprocessing

+

- Municipality staff

In general, the created technical team has the following initial tasks: organization of information collected and produced for Internet consultation; mounting of the map to be used as the base map in the System; and preparation of the site where the System will be hosted. It must be noted that the course of these activities will happen with the initial decision-making regarding the content that will be made available and technology aspects of the System.

INITIAL ACTIVITIES OF THE TECHNICAL STAFF OF THE SYSTEM

- Organization of the information already produced and collected for consultation on the Internet;
- Mounting of the map to be used as a cartographic basis in the System;
- Preparation of the site where the System will be hosted;
- Decision making regarding the module contents and technological aspects of the System.

During the work planning process and during the execution of the initial tasks, all technical team should document the procedures and steps adopted for the performance of these work stages.

The initial processes of decision making about architecture and platforms for a web system typically involves choices about:

(I) Operating System – OS (e.g., Linux, Windows);
(II) Web server (e.g., Tomcat, IIS);
(III) Database Management System – DBMS (e.g., Oracle, MySQL, SQL Server);
(IV) Language Development (e.g., PHP, Java, .Net);

For systems using web mapping, as is the case with HABISP and SIHISB, a decision on a fifth aspect has to be taken:

(V) Map server (e.g., Geoserver, MapServer)

It should be noted, as already explained above, that each option for a particular type of system and server has been constrained by factors such as availability of financial resources and manpower, among other things (as seen in the SIHISB case, in the technical description frameworks of development processes of each of its modules). Moreover, the choice for a type of system or server will influence the decision on other aspects of the system being developed.

Once this preparatory stage has been carried out, the System technical staff can proceed to the development stage of the System itself, which will also require a technological decision-making process and the decision making on the subject contents that will comprise the System.

4.2 Stage 2 – Planning the System

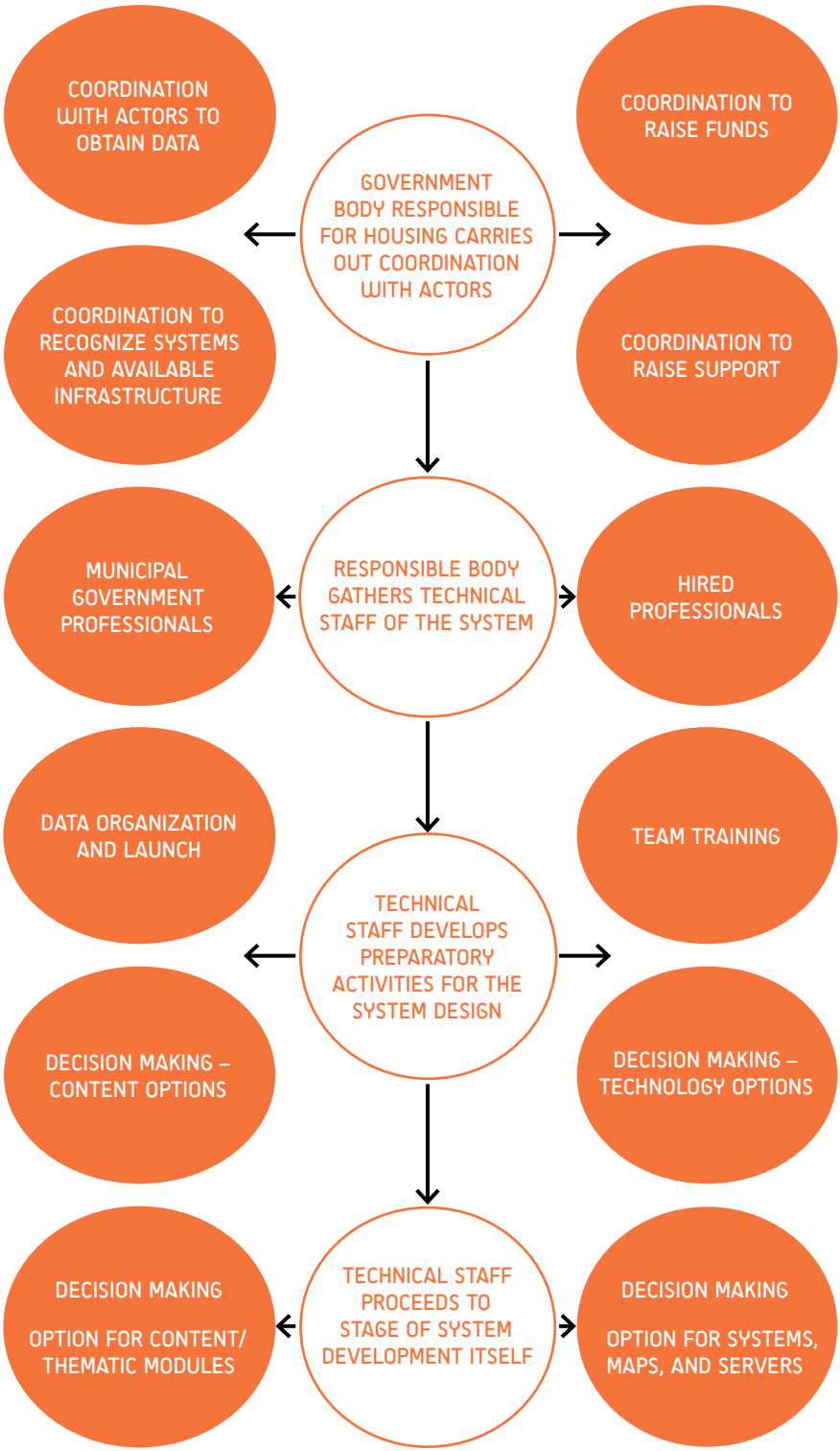
The decision making before the development of any housing system consists in planning and defining the content to be loaded into it. We call these content here as thematic modules to facilitate the understanding that each of these blocks will require gathering data, an interface, a particular load, and access authorization to specific users in the System. That is, we have divided the housing systems in thematic modules, just to facilitate the understanding of the planning and implementation process of systems, according to the their different contents. In practice, these thematic modules are not separated in the operation of the System itself.

This, therefore, does not mean that these modules have been entirely designed in isolation. In fact, part of the planning system has been globally made, some of it being designed to meet the requirements and routines that each data loading and availability will require. In practice, all these thematic modules comprise a single System.

The description of HABISP and SIHISB has showed that the contents to be released to the users may be of quite different kinds, ranging from alphanumeric and geographic information about the social housing settlements, to the current policy to information about the population assistance registration and the programs and projects developed by the government in question.

Obviously, this list of thematic modules to be defined for the system is not limited to those proposed in the experiences of the systems presented here; they are as diverse as one desires.

Schematic Diagram: Diagram of the preparatory and planning stages, of housing information systems



It is worth remembering that every option for providing thematic data will require a technological decision making involving the following choices:

- Data to be used to expose the issues one wants to publicize – internally or to the public in general. To feed a housing system, the choice of such data will need to internally standardize the routine systematization of reports of the municipal government body where such data have been produced (in case this process has not been standardized yet).
- How to make such display – with which user interface. This choice will require a system architecture and web design that meets the specific display requirements of each module.
- Type of user that will have access to these data. This choice will require the authorization in the System, according to the access type envisaged each thematic module.

In general, the different types of access to the system thematic modules are mediated by internal, editing, and administrator users:

Types of users and access to the system

- Internal User: Access to government officials from all departments, who can visualize the map with the details of the settlements, can print thematic maps, preview, and print the information from data forms of the settlements. The permission to internal user may be to one or more modules, depending on the definition to be made.
- Editing User: Access to the Housing Secretariat technicians authorized to edit the data, qualified by the server registration number. The editing user may have permission to edit one or more modules.
- Administrator User: Access to Housing Secretariat technician authorized to manage the data. This user has full access to the information system for printing, editing, and managing the edited information, and can create users and grant permissions. There is only one registration empowered to administer this module.

Of all system modules, the module containing the map of the social interest settlements associated with various kinds of information about them is the one that has ultimately embodied the goal of implementing a local housing system that is intended to be georeferenced.

It is precisely this module implementation has that enabled the sharing of information on the housing issue to the public in general.

Within the housing information system, an interactive map with information about the local precarious and irregular settlements is the tool that allows the greatest interface with the public in general. It is the instrument that allows the socialization of the georeferenced information of the sector, enabling that not

only government technicians work with a common and precise information about the settlements in the city, but also that the society recognizes the municipal territory, thus interacting in the planning of the public housing action.

Obviously, the development of the interactive map of precarious and/or irregular settlements of the city, requires the existence of: ALPHANUMERIC DATA BANK ON PRECARIOUS AND/OR IRREGULAR SETTLEMENTS OF THE CITY and A GEOGRAPHIC DATABASE WHICH ALLOWS THE LOCATION DEMARCATION AND, EVENTUALLY, DEMARCATION OF THESE SETTLEMENT PERIMETERS.

The other housing system modules will correspond to the needs to display, for the external or internal public to the municipal government, data that characterize the local housing and urban problems and disseminate information on current municipal politics.

These modules may have the dimension of information socialization that subsidizes a greater knowledge about reality and current policy, and that also collaborates in the organization and management of problems and the urban and housing programs.

In this sense, the higher the precision, accuracy, and up-to-dateness of information loaded in the System, the greater adherence to reality of the produced data, and therefore, the greater potential for guided action and local planning in the sector.

4.3 Step 3 – Post-deployment: monitoring, maintenance, and innovations

Finally, it is worth remembering that the activities for developing housing systems do not end with its development for the first release. The HABISP and SIHISB experiences have demonstrated that the release of these systems have just been the starting points for their improvements.

Both HABISP and SIHISB have highlighted the need to maintain the work of the system technical team, even if with a few hired technicians, to facilitate the resolution of any faults in the System, give support external users, deliver training to internal users, and, eventually, create new modules, and expand and revise the displayed contents.

At the end of the day, the implementation of local housing information systems of social housing consists of transparency initiative regarding of the municipal management, as its way of conducting and managing the urban policy, which is translated into an important channel of information on the reality of our cities, to which every citizen is entitled.

Final considerations

The HABISP customization experience by the SIHISB implementation has highlighted the importance and the need to search for integrated solutions to metropolitan challenges, such as the housing issue.

About two years after the start of work, the main lesson of this experience is about the importance of the information systematization to expand the management capacity of public entities and their ability to undertake interventions, and to interact productively and positively with society in issues involving social housing – which is the System theme addressed here.

In this sense, this publication intends to be an incentive for other government agencies to develop information systems that, after meeting the needs and possibilities, can have a positive impact on the housing action, encouraging greater institutional coordination and integration of activities with other agents, strengthening internal partnerships in the municipalities, or even allowing external partnerships built from content sharing.

The effort to systematize the available information is, in itself, a management organizer because it enables to establish the importance of each intervention action of the government, to identify what needs to be improved and what may eventually be discarded. Thus, the actions are optimized and qualified based on accessible and properly treated information.

This System customization and implementation experience has also showed that the use of new media for information puts the administration of public affairs on another level: transparency before society. This has reinforced democratic principles of management, enabling greater citizen participation, as well as the control and supervision of government actions.

Similarly, the use of technological tools has required a proper management system and has demanded an institutional commitment, which includes training and provision of the technical team for its management

and, subsequently, enhancements and innovations of these tools so that they become increasingly sophisticated and meet the changing needs of the users over time.

Throughout its lifetime, a system needs improvement, and corrective and preventive actions for its continued operation. HABISP, for example, that today has many tools and sophisticated and advanced features, has undergone several updates and improvements over six years. This requires an institutional commitment to the issue of adequate, updated, and accessible information, because the more this System is used by multiple users, the greater the need for more sophisticated tools, which leads to a process of continuous improvement concerning its technological resources.

The customization experience done by São Bernardo do Campo has showed that the System components that have more identity with the needs and possibilities of each city and place can be selected. Although HABISP and SIHISB are the systems' reference offered here for the customization experience, the selection of modules for each municipality must be based on the ones that best meet local needs. No need to start big. The important thing is to start with what is most necessary and feasible for the public manager that wishes to develop his information system.

Therefore, the information that is systematized here has provided tools to municipalities that willing to go down that particular road of improving management of the Social Interest Housing Policy, through the establishment of an accessible information system.

It is worth mentioning that, in this process, cooperation between municipalities and other partners is crucial to improve the public management processes, especially those related to work experiences, disseminating knowledge that is applied and developed for social housing. This interaction among the public authorities has optimized the invested resources and allowed thinking in partnership with other levels of government. This is the main objective of this publication.

Glossary

.Net or .net: an initiative of Microsoft, which seeks a unique platform for the development and implementation of systems and applications. Any code generated for .NET can run on any device that has a set of Unified Libraries (framework) for such a platform, and it runs on a Common Language Runtime – CLR (language-independent execution environment) interacting with a framework.

Ajax: methodological use of technologies like JavaScript and XML, provided by browsers to make Web pages more interactive for the user, using asynchronous requests for information. It was initially developed by Jesse James Garret scholar, and later by various associations.

Alphanumeric information: information in the form of text or numbers.

Apache Tomcat Web Server: a Java web server developed by the Apache Software Foundation, distributed as free software within the renowned Apache Jakarta project, being officially endorsed by Sun.

Application server: one server providing an environment for the installation and execution of certain software and applications, centralizing and dispensing installation on the client's computers.

Beans: software components written in Java programming language that can be reused within the same application or in other applications.

Browser: a web browser is a browser, a computer program that enables its users to interact with virtual documents of the World Wide Web, also known as web pages.

Compilation: the act of grouping instructions written in a language intelligible to one or more files, whose content was converted into a form that can be directly stored and executed by a computer.

Customization of the system: adapting an information system existing to the needs of the new user and/or client.

DAO (Data Access Object): standard for data persistence that enables separating business rules from access rules to the database. In an application using the MVC architecture, all the functionalities of databases, such as getting connections, mapping Java objects to SQL data types, or executing SQL commands must be made by DAO classes.

Database Management System (DBMS): (software) application responsible for providing the functionality of handling and maintenance of data stored on a computer. The DBMS has specific capabilities for storing data in a structured way and not only with the files on a computer.

DMZ: demilitarized zone created for network security, located between the internal and external network.

Firewall: a computer network device that aims to apply a security policy to a particular network point.

GeneXus: a knowledge representation-based, development tool, mainly oriented to enterprise-class applications for the Web applications, Microsoft Windows and smart device platforms. The developer describes an application in a high-level, mostly declarative language, from which native code is generated for multiple environments.

GeoExt Library: a JavaScript library that provides groundwork for creating rich web-mapping applications with interfaces.

Geographic information: cartographic information.

Georeference: to make known the location coordinates of a spatial information.

Geoserver: open source software maintained by the Open Planning Project (main maintainer), which serves as a development environment for building web mapping, integrating diverse repositories of geographic data with high performance and simplicity.

Google maps: a web mapping service developed and distributed by Google. com from an open source technology.

Information system: term used to describe a system that covers people, machines, and/or methods organized to collect, process, transmit, and disseminate data that represent information to the user and/or client.

Information technology: the knowledge area responsible for creating, managing, and maintaining information management across devices and equipment for access, operation, and storage of data, in order to generate information for decision making.

Interpreted languages: usually a program is stored on a computer in a format in which the instructions therein have a structure that, when required (run), allows to be directly stored in the computer memory, and its instructions to be executed by the Central Processing Unit (processor). Processors from different manufacturers and for different uses have different internal structures, and a clustered (compiled) program for use on one processor cannot be used on another processor with different characteristics. To make it possible, an element that can interpret the instructions to the characteristics of that specific processor is necessary. An interpreted language is a spoken language that enables an element, called "virtual machine", to translate written instructions in this language to a form that can be executed by a specific processor. Thus, a program written in an interpreted language can run on any processor that has an interpreter for this language.

Java: an object-oriented computer programming language developed in the 1990s by a team of programmers led by James Gosling at Sun Microsystems. Unlike conventional languages, which are compiled to native code, Java language is compiled to bytecode that is run on a virtual machine. The Java programming language is the language of the conventional Java Platform, but it not its only language.

JavaScript: a programming language used to create small programs to perform actions within the scope of a web page.

JSP: a Java-based technology that simplifies the process of developing dynamic websites.

Programming Language/development: a computer performs tasks following instructions pre-stored in its memory (algorithms). These instructions are prepared using a language defined by syntax, semantics, specific vocabulary, and subsequently grouped into a coherent set (or software program) that will be stored (installed) on your computer and will run when one or more of its features are required.

Layout of the map: the map display in the browser.

Linux operating system: system that uses the Linux kernel, developed by Finnish programmer Linus Torvalds, inspired by Minix system. Its source code is available under the GPL (version 2) so that anyone can freely use, study, modify, and distribute it in accordance with the license terms.

MapServer: free software that serves as the development environment for building geographic information systems for Internet, interacting with diverse spatial data repositories.

Model-View-Controller (MVC) Principle: a software development model, currently considered "software architecture pattern" used in Software Engineering. The model isolates the "logic" (the application logic) of the user interface (to enter and view data), separately developing, editing, and testing each part.

Open Geospatial Consortium (OGC): an international voluntary consensus standards organization. In the OGC, more than 280 commercial, governmental, nonprofit, and research worldwide organizations collaborate in consensus process encouraging development and implementation of open standards for geospatial content and services, GIS, data processing and sharing. It was previously known as Open GIS Consortium.

Open Source Geospatial Foundation (OSGeo): a foundation established to provide support and to develop high-quality open-source systems, for geospatial applications, with the mission to encourage the use and collaborative development of community projects for free software.

Oracle Application Express (Oracle APEX): previously named Oracle HTML DB, is a software development environment for rapid development of web applications based on the Oracle database.

Source: <http://www.guors.com.br/documentos_2008/Apresenta%E7E3o_Apex.pdf>.

Oracle Spatial Extension: storing spatial data in Oracle databases.

Proxy Server: a proxy server is an intermediate computer that acts as an intermediary between the user's computer and the Internet. It can be used to record the use of the Internet and to block access to a Website.

Python: a high-level, interpreted, imperative, object-oriented, dynamic programming language, dynamically and strongly typed. Guido van Rossum started its implementation in 1991.

QuickBird Images: a satellite controlled by the Digital Globe Inc.

Server Application Virtualization: the data processing can be done on machines other than the application server where the applications are installed.

Map server: for displaying an interactive map through a web browser, you need an application that works in conjunction with the web server, so that spatial data are converted to images (map) and displayed to the user in a browser. The map server performs this function.

Servlets: a component such as a server, which generates HTML and XML data to the presentation layer of a web application. It is basically a class in the Java programming language that dynamically processes requests and responses, thus providing new resources to servers. The most commonly used definition considers them server extensions. Servlet is a module that extends the functionality of a Web server through application modules implemented in Java.

Shapefile format: a popular geospatial vector data format used by Geographic Information Systems also known as GIS. It was developed and regulated by Esri, which develops ArcGis software, as an open specification for data interoperability between Esri and other software products.

The Open Planning Project (TOPP): foundation that organizes the development of free computer programs.

URL: stands for Uniform Resource Locator. The URLs are a resource's address, be it a file, a network, intranet, or Internet. A URL has the structure: protocol://machine/path/resource. The protocol can be HTTP or FTP.

Web mapping: the process of designing, implementing, generating, and delivering maps on the World Wide Web, which can be viewed and accessed through the browser.

Web server: software (computer application) installed on a server (computer) that allows publishing pages and systems using internet protocols, either on the World Wide Web or an intranet.

WMS, WFS and WCS Specifications: specifications for Web Map Service, Web Feature Service, and Web Coverage Service. The first relates to images of maps, as *jpg, for example; the second relates to vector data with attributes such as * shp; and the third refers to data using remote sensing technology, for example.

List of acronyms

ACP: Public Civil Action
DTI SBC: Department of Information Technology of São Bernardo do Campo
GGI: Integrated Management Office
GPS: Global Positioning System
HABISP: Information System for Social Housing in the City of São Paulo
IP: Police Investigation
OP: Participatory Budgeting
NIS: Social Insurance Number
PLHIS: Local Social Housing Plan
PMRR: Municipal Risk Reduction Plan
PMSBC: Municipality of São Bernardo do Campo
PMSP: Municipality of São Paulo
PROC. AMD: Administrative Procedure
PROT. MP: Public Prosecution Protocol
SECOM: Communication Secretariat of São Bernardo do Campo
SEDESC: Social Development and Citizenship Secretariat of São Bernardo do Campo
SEHAB-SBC: Housing Secretariat of São Bernardo do Campo
SEHAB-SP: Housing Secretariat of São Paulo
SGA: Environmental Management Secretariat
SIHISB: Housing Information System of São Bernardo do Campo
SOPP: Participatory Budget and Management Secretariat
SPU: Urban Planning Secretariat of São Bernardo do Campo
SU: Urban Service Secretariat of São Bernardo do Campo
TAC: Conduct Adjustment Agreement
TPU: Right to Use Agreement
UF: Federation Unit (State)
UFABC: Federal University of ABC

CPF: Brazilian Social Security Number
RG: ID
APP: Permanent Preservation Area

Nova Silvina
Housing Project.
Photo: Wilson Magão.
Collection: Secom/PMSBC, 2012.

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Luiz Marinho
MAYOR

Housing Secretariat

Tássia Regino SECRETARY
Paulo Roberto Massoca DEPUTY SECRETARY
José Luiz Ribeiro de Macedo DIRECTOR OF PUBLIC WORKS
Gisele Dias DIRECTOR OF LAND AFFAIRS
Karla Sanches PROJECT COORDINATOR
Márcia Gesina SOCIAL WORK COORDINATOR

Technical Staff
Information System for Social Housing in São Bernardo do Campo – SIHISB

Coordination
Karla Sanches ARCHITECT AND URBAN DESIGNER

Development

Municipality of São Bernardo do Campo
Letícia Palazzi GEOGRAPHER/GEOPROCESSING – HOUSING SECRETARIAT
Washington Moyses DBA/INFORMATION TECHNOLOGY DEPARTMENT ANALYST OF THE ADMINISTRATION SECRETARIAT

Hired Consultants
Clayton Leite DBA/DATABASE ADMINISTRATOR
Herman Charles Christ SYSTEM ANALYST
Jonatas Venâncio WEB DESIGNER
Rodrigo Nascimento JAVA DEVELOPER

Support
Ana Gabriela Akaishi UFABC
Aramis Horvath Gomes SEHAB
Cristiane Fernandez SEHAB
Fabiana Mendes de Souza SEHAB
Marina Fukumoto SEHAB
Letícia Palazzi Perez SEHAB
Rodrigo Juvenal da Silva SEHAB
Thais Fernanda Lopes SEHAB

Consulting on Experience Systematization
Karina Oliveira Leitão ARCHITECT AND URBAN DESIGNER
Herman Charles Christ SYSTEM ANALYST

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[2013]
Fernando Haddad MAYOR

Housing Secretariat
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Marco Antonio Biasi DEPUTY SECRETARY AND SOCIAL HOUSING SUPERINTENDENT
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Information System for Social Housing – HABISP
José Carlos Lima
Jorge Luiz Evangelista Ferreira

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Housing Secretariat
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Elisabete França DEPUTY SECRETARY AND SOCIAL HOUSING SUPERINTENDENT
José Frederico Meier Neto HEAD OF CABINET
Ana Lúcia Sartoretto DIRECTOR OF LAND REGULARIZATION DEPARTMENT

Information System for Social Housing – HABISP
Ademir Moreno Escribano
Eliene Corrêa Rodrigues Coelho

Aliança de Cidades
Cities Without Slums

William Cobbett MANAGER
Mariana Kara José REGIONAL COORDINATOR – BRAZIL

Banco Mundial

Deborah Wetzel WORLD BANK DIRECTOR FOR BRAZIL
Paul Kriss INFRASTRUCTURE SECTOR LEADER
Oscar E. Alvarado PROJECT MANAGER
Alexandra Panman URBAN ECONOMIST

Edition
Municipality of São Bernardo do Campo
Municipality of São Paulo
Cities Alliance
World Bank

Organization and Texts
Alexandra Panman
Eliene Corrêa Rodrigues Coelho
Herman Charles Christ
Karina Oliveira Leitão
Karla Sanches
Mariana Kara José
Tássia Regino

Collaboration
Ana Gabriela Akaishi
Aramis Horvath Gomes
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Fernando Rocha Nogueira
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Paul Kriss
Paula Pollini
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Washington Moyses

Social Development and Citizenship Secretariat of São Bernardodo Campo – SEDESC/PMSBC

Comunication Secretariat – SECOM/PMSBC

Department of Technology of the Administration Secretariat – DTI-SA/PMSBC

Federal University of ABC – UFABC

Housing and Urban Development Company of the State of São Paulo – CDHU

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Keila Prado Costa

Art Direction
Graphic Concept and Creation

English Version
Maria Cristina N. V. Vasconcelos

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Maria Luiza Xavier Souto

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