

SOCIAL SUSTAINABILITY

Micro study summary

SOCIAL SUSTAINABILITY

Within the subtheme social sustainability research is conducted to determine the role of civil engineering in sustainable social development in Brazil. This chapter will start with a very brief recap on the social backgrounds in Brazil; the macro part of this preliminary report gives more details on the Brazilian society. Then our research approach is shortly explained. After, an elaboration of the findings of the two cases studied is given. Final, we present conclusions on the role of civil engineering on social development in the two projects studied and on sustainability of these developments.

SOCIAL BACKGROUND: BRAZIL

This chapter will present a first view on the Brazilian society and problems in the Brazilian society.

Brazilian society

The modern Brazilian society consists of four social classes; the high class, the formally middle class, the informally middle class and the lower class.

- The high class people have more property and prestige and therefore have access to government services, such as health, education and sanitation.
- The middle class can be split into formally employed workers and informally employed workers.
 - The formally employed workers consist of a technical work force like clerks, professionals, teachers and highly skilled workers.
 - Informally employed workers consist of self-employed businessmen.
- The lower class lives in favelas or distant housing projects. The population which lives below income national poverty line is 21.5%, about one-fifth of the country's total population (United Nations Development Programme, 2008).

Problems in the Brazilian society

Wealth and power are very unequally divided in Brazil: more than half of the national income goes to the richest 10% of the population. Many problems in the Brazilian society can be related to crime. Crime hotspots are the border zones and the favelas in metropolitan areas. In the major cities carjacking, murder and express kidnappings are common. The quality of sanitation is poorly in Brazil and mostly not good accessible for the lower classes. Brazil faces also a lot of problem with the human rights violations during capture and custody of suspects.

RESEARCH

Within this preliminary report it has already been explained that Brazilian social life differs on many aspects from the Dutch. This means that our 'western and Dutch way of thinking' might also differ from the way Brazilians think and act. This means that in Brazil, the aspects of social development, sustainability and the role of civil engineering will probably be different. These differences are mostly visible in urban areas. These differences will play the central role in our research.

The micro study goal is defined as:

“To find out what the role is of civil engineering in sustainable social development in cities of Brazil”.

Linked to this is our main research question:

“What is the role of civil engineering in sustainable social development in cities of Brazil?”

This main question can be answered through answering these to sub questions:

- a) *How is sustainable social development addressed in Brazil?*
- b) *How is civil engineering used to reach this sustainable social development?*

To gain in-depth project knowledge, we will look at two case projects and focus on three areas: project environment, project organisation, and implementation of project plans. These three areas are interrelated. These three areas are explained by Tjihuis (Tjihuis, 1996) in his 3C-model. This model is used to answer the main research question and to reach the goal of this micro study.

Project cases

The projects assessed are IBISS and PROSAMIM. Some indicative information about these two projects is provided in Table 1. PROSAMIM is a project that aims at social, urban and environmental restoration which aims at relocating people that live in the river banks in the city of Manaus. IBISS wants to contribute to the development of a society where social inequality is combated and human rights are respected. We think these projects can give a good guideline to answer the main research question

	PROSAMIM	IBISS
Starting date	2003: “official kick-off” of PROSAMIM I.	1989: IBISS was founded.
City	Manaus	Rio de Janeiro
Principal (type)	State of Amazonas (governmental)	IBISS (NGO)
Investors	For phase I: Loan of the Inter-American Development Bank (140 million USD) and investment of the state of Amazonas (60 million). Phase II will require a IADB loan of 154 million USD and a state contribution of 66 million USD.	Mainly donations of private persons and organizations.
Number of people directly affected	PROSAMIM I: ~21.300 families. PROSAMIM II: ~15.500 families.	Hundreds of people attending IBISS programs
Type of organization	Project, by executing a one-time program.	Process, with different ongoing programs.

Table 1: comparative table with indicative information of the two project cases.

The next chapters will provide findings on the two case studies.

CASE STUDY I: IBISS

IBISS will be the focus of our research to social sustainability in the favelas of Rio de Janeiro. First, the project environment is explained to shortly indicate the diversity of problems encountered. Second, the project organization is explained and the goals of IBISS are stated explicitly, after which we will discuss several projects and their long-term effects to be able to formulate some conclusions.

Project environment: Rio de Janeiro & the favelas

About one fifth of the more than twelve million inhabitants of Rio de Janeiro, survive in very poor circumstances. They live in one of the 700 favelas (slums), where organized crime rules. Most favelas are built against the hillsides of Rio. These areas, that would be top building locations in developed countries, are characterized by difficult building conditions and bad transport facilities.

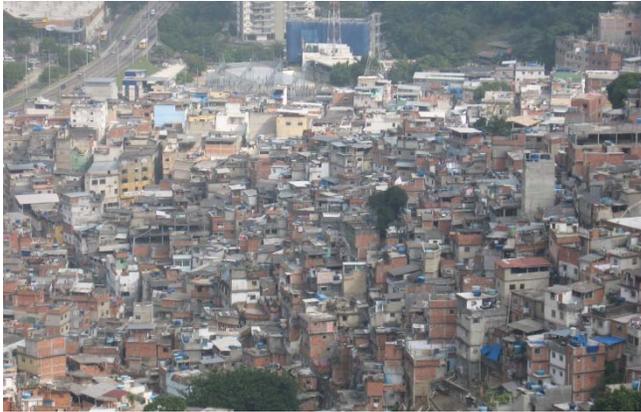


Figure 1: Favela Rochina, the largest favela in Latin America



Figure 2: Police violence is common in favelas

Violence

There are daily victims as a result of police using force or deadly confrontations between different drug gangs. The favelas are run by drugs lords who make it almost impossible for outsiders to invest in the area and the inhabitants of a favela. For most people, it is not safe and most of the time not even possible to enter a favela without being stopped or killed. Favelas form communities that have their own set of rules.

Access to basic facilities

Governmental organizations are not accepted in the area and are often repressed with force. While the government tries to fight these power circles actively (but not with much result), they hardly make any progress in the positive development of the area. While most favelas do have access to running water and electricity, they lack the basic healthcare and education facilities.

Children in the favelas

Children living in favelas easily end up involved in this criminal world and frequently die at a very young age as a result of this. The armed conflicts are the most important cause of death for children between fourteen and nineteen years of age. Between 1987 and 2001 almost 4000 underage children died due to fire arms. (Trouw, 2007). These children have hardly any chance to participate in society and do not receive much education. For some, the only opportunity to survive is to join one of the drug gangs in the ongoing war. This is a vicious circle that cannot be broken easily without support.

Conclusion

The problems in the favelas of Rio de Janeiro maintain a strong vicious circle of violence, lack of basic facilities and lack of proper education. To ensure a sustainable solution for these areas, the problems should be tackled based on trust and participation and based on a peaceful development, starting with providing children and youngsters with fair chances.

Project organisation

Organizational history

The abbreviation IBISS stands for "Instituto Brasileiro de Inovações em Saúde Social" or "Brazilian Institute for Innovations in Social Healthcare".

The IBISS organization was founded in 1989 by Nanko van Buuren. His primary goal was to give the inhabitants of the favelas in Rio de Janeiro a chance to break out of their situation. Over twenty years later, IBISS has grown into a large non-governmental organization with good contacts with the Brazilian government. Its figures are approved annually by the Ministry of Justice. Other ministries and governmental organization also provide financial and practical aid. A lot of small (pilot) projects are undertaken in the favelas, helping thousands of people to improve their day to day life. Projects that are successful in a particular situation are lobbied to be absorbed in regular local policy.

IBISS is financially supported by a lot of funds and private donors. These funds are primarily attracted by the IBISS Foundation in the Netherlands, which promotes the work of the organization and searches for funds and donors. (IBISS, 2010)

Organizational goals

The mission statement of IBISS as an organization is the following:

“In a sustainable way, IBISS wants to contribute to the development of a society in which social sicknesses such as leprosy and tuberculosis are eliminated, social inequality is combated and human rights are respected. IBISS aims to stimulate its target groups, in a way that motivates them to improve their current situation on their own.”

The main target groups of IBISS are:

- People who have to survive on the street in violent favelas;
- Victims of exploitation (child labor, drugs trafficking or prostitution);
- Victims of violence (police violence, sexual violence or violence within the family);
- Carriers of social sicknesses (AIDS, tuberculosis and leprosy);
- Mentally and physically disabled people.

With more than sixty projects in Rio de Janeiro, IBISS tries to reach a broad part of these target groups. In order to improve the situation of its target groups, IBISS tries to find new methods to help these people. They do this through a number of different pilot projects. To train their own employees for newly developed methods and to stimulate the application of these methods, IBISS set up the internal training centre Ipê Geral. This centre also tries to train informal leaders from the different projects and favelas to ensure a sustainable growth.

Since IBISS works with target groups that are excluded by society, a "normal" approach is often not sufficient. By constantly investing in the development of new ideas and working methods IBISS tries to reduce social exclusion. It uses a holistic approach in which care, assistance, education and advocacy go together. This means that people are seen in their totality and in relation to their surroundings.

IBISS distinguishes itself from other organizations by daring socially excluded groups to take the task of improving their situation into their own hands. IBISS acknowledges the desire to change and growth and thereby trusts in the strength of the target group. Using small targeted projects, people gradually get motivated to take initiatives themselves.

Advocacy is a very important part of IBISS' working method. For this reason IBISS also collaborates closely with projects of legal assistance for victims of violence and exploitation. It's a challenge to stimulate the target groups in a way that they work on their own future and eventually take part in society as full citizens. By bringing up the new approaches that IBISS developed within forums and councils, a contribution is provided to the formulation and determination of new public policies.

In the field of defending the human rights IBISS cooperates closely with legal advice projects for victims of discrimination, violence and exploitation. For real position improvement to occur, it is absolutely necessary that human rights are respected. (IBISS, 2010)

Projects

IBISS participates in and initiates various kinds of projects and programs. In line with its mission statement, IBISS usually does not make use of civil engineering to reach its goals. All of its projects aim at bringing social services into before unreachable places. This is done most of the time by training employees to implement a specific method. Civil engineering is therefore not really part of the IBISS organization. Therefore, this section will focus on the social sustainability aspect.

Health care

The main focus of IBISS's projects is to build bridges between people who are socially excluded and existing government services e.g. medical pre-posts in favelas where diseases are recognized at an early stage. From these pre-posts, patients are referred to official healthcare, which they otherwise would not reach. Pre-posts

are manned by workers who have followed the The Curso Agentes de Saúde (The Health Care Worker's Course). They make home visits, observe living conditions and make sure that patients receiving treatment complete it. If necessary, healthcare workers will refer patients to specialized services outside the community. This way, the gap between residents and public health care is bridged.

Participation

IBISS believes that disabled people should be fully included in society instead of being cast aside or treated as "problem cases". "Participar" is a program that assists mentally disabled people in participating in IBISS projects or other public facilities located in their neighbourhood, through specific attention and special accompaniment.

IBISS encourages mentally disabled people from the community to participate in activities at the Espaço IBISS. This centre hosts many socio-educational programs as well as an extensive sport facility, all suited to facilitate disabled people.

Soldados & Minas

There are perhaps up to five and a-half thousand young people working as child soldiers in Rio de Janeiro's raging favela drug wars. They are recruited by drug mafias, work as heavily armed soldiers, protecting the "boca de fumo" (drug sale points) against invasions by police or rival drug gangs.

IBISS plans to eradicate this extremely dangerous form of child labor. It developed, in collaboration with youth group leaders from violent favelas like Vila Aliança, Cidade de Deus and Vigário Geral, the program Soldados Nunca Mais (Child Soldier Never Again). This project strives to prevent children from this hard to reach group, from entering into the drugs trade and encourages those already involved to get out. Activities such as soccer, percussion, graffiti and/or hip hop are used as alternatives taking attention off drug trafficking and getting the youth involved in society again.

Minas (the Portuguese word for girlfriend/wife within the favela) is another program to help young people caught in the drug world. IBISS research in more than 350 favelas has shown that "beautiful virgins" are seen as "belonging" to drug bosses. Although there are cases where the drug boss "takes" a virgin, usually the young girls offer themselves to the drug boss in order to gain status within the favela.

Quite often, the drug bosses make their "beautiful virgin" pregnant against their will. This results in young teenage mothers, with unwanted babies. This in turn means the Child Care Council is faced with more and more cases of abandoned children.

Unfortunately, the creation of one large Children's Medical Facility is impossible. The reason is that the mothers all come from different favelas, ruled by different factions, spread out all over the city. Instead, the community health stations should be upgraded.

Garbage collecting

Another example of a bridge between socially excluded people and government services is the establishment of trade unions for prostitutes and garbage collectors. Without IBISS initiating this trade union, they would not be able to fight for their rights in society.

Garbage collectors unite in Movimento Nacional dos Catadores de Materiais Recicláveis (MNCR), which speaks for more than 300,000 "catadores" (recyclers) from all over Brazil. Primary goals of MNCR are to fight discrimination against catadores and to receive official recognition for their work, which is of great importance for their working environment. The MNCR also fights for better working conditions and facilities such as daycares and schools, so the children of garbage collectors do not have to accompany their parents to work in the landfills.

Cycling in favelas

All described projects above are not civil engineering oriented. Just a very small part of the IBISS organization focuses on projects that make use of civil engineering knowledge. An example of such a project is promoting cycling in favelas. Huisman states: 'IBISS is interested in cycling because a lot of the faveladors, inhabitants of the

favelas, work in the city center and have to commute for an hour or more every day. Most of the time they use multiple busses or bus and train to get to their destination. Because one has to pay again for every bus, this gets expensive very quickly' (Huisman, 2009)

Faveladors face many problems: bad road safety and surface, bicycle theft and a lack of place to park their bicycles at station. This last issue will be addressed by IBISS, by using knowledge of civil engineering. However, civil engineering solutions are hardly used to solve problems, there seems to be a real focus on successful implementation of the projects through community participation.

Implementation and problems during the projects

While implementing their methods and projects, IBISS always faces different kind of resistances. It could be faveladors, the government or even a geographic position that does not cooperate.

Community participation

The first example is of 'Soldados & Minas' where IBISS proved that the sexual abuse of young girls exists within the drug mafia. However, IBISS hasn't published this data yet because this information is considered to be classified by the drug mafia. In their education programme, IBISS serves bread and milk to children which show up at school in the morning. These children lack sleep, because it is always noisy during the evening in the favelas. Because they are so tired, they just cannot pay as much attention as they should.

Technical / geographical

Another example of resistance is about geographic positions, for example in the 'Soldados & Minas' project. If at all possible, IBISS wants a well prepared general children's hospital in Rio de Janeiro. Due to spreading of the favelas, this is not possible. Placing one hospital per favela would not be feasible at all.

Political / Government

The government sometimes also represents itself as a barrier. In the 'Participar' project, IBISS has to convince the Council for the Care of the Disabled that other policies and a different financial framework are needed, by providing positive experiences with the project. Furthermore, the government lacks influence in the favelas when it comes to healthcare. IBISS had to design methods to reach those people before the government gave their support.

Luckily, a lot of IBISS projects do have success and achieve their goals. Some nice examples are given in the next section. The 'Participar' project made 30 mentally disabled young people participate in simple activities in the swimming pool. These activities stimulated the development of the children and give their families a needed break. Because of this success, IBISS plans to extend the program to include another 120 children.

Another success was the election of the coordinator from IBISS for the garbage project Catadores da Vida, as national coordinator of the MNCR. He organized a national meeting, attended by over 30.000 garbage collectors.

The large amount of example projects duplicated by other organizations and the clear improvements in living conditions for faveladors show that the approach IBISS takes really does work.

Conclusions from the IBISS case study

IBISS works on a project basis. It makes use of capable volunteers and employees to try out new methods, which bridge the gap between social excluded people and government services. Most of the projects IBISS initiates or participates in make use of placing people right in the middle of the community. This applies to projects that focus on education, child labor, child soldiers, disabled people and many more.

Civil engineering is of very little importance in the work of IBISS. Physical buildings or infrastructure are not often used to attain set goals. Civil engineering could be of importance in the future, when living conditions of

faveladors increase. Increasing living conditions bring new needs, which could be fulfilled by making use of civil engineering.

Sustainability

We will address sustainability by looking at three aspects: People (social), Planet (environmental) and Profit/Prosperity (economic/financial aspects). We will pay special attention to the aspect of People, since this is the major focus in the projects studied in this micro-study.

People

IBISS' focus is primarily on people. People in favelas who lack education, healthcare, safety and other necessities of life are its main target. IBISS makes governmental services accessible to people on a project basis. From a sustainable point of view, this is the right way of working. By supplying long term opportunities, IBISS tries to change habits and mindsets of faveladors. It helps people to stand on their own feet and take care of themselves. Most projects initiated by IBISS are focussed on children. It tries to supply them with opportunities to make themselves a better future. This is a very sustainable way of fighting poverty in the favelas.

Planet

The IBISS organization does not show to pay much attention to the environment. Their projects mainly focus at human beings and place their interests at front. This could lead to a conflict in sustainability on the long term, when human interests or the projects themselves grow to the disadvantage of the environment.

Profit/Prosperity

Most money received by IBISS originates from sponsors, both governmental and private. A large part of this income is generated by private sponsors from abroad, which have a strong connection to the Dutch organization. IBISS does not have a sustainable money source of its own and cannot continue without money flowing in. It also does not have a sustainable money outflow in terms of profit, because the money that is invested in projects has no monetary results. There are however indirect results of growing prosperity, where children receive education and learn to support their own families on the long term.

Total sustainability

It can be argued if the IBISS project on total is contributing to a sustainable future, but it could at least be said that the project works hard to reach a more equal social situation in the favelas of Rio de Janeiro. It helps people to develop themselves and their way of living in a sustainable way, by providing them with any means possible but encouraging them at the same time to fight for their own future and develop their own prosperity.

Role of civil engineering

The role of civil engineering is very little in the IBISS organization. While there has been a project investigating possibilities of cycling in the favelas, this has not yet resulted in any measures in this area. Most projects focus on the people of the favelas and make use of existing constructions and infrastructure. It could be argued in civil engineering should be getting an increasingly important role in projects related to IBISS. In theory, as a result of the IBISS projects, people will get more mobile and more developed, increasing the need for civil engineering. On the other hand should this maybe be a concern for the governmental organizations and not directly for IBISS themselves, as their main focus is one the social aspects. It could be further investigated whether civil engineering could support existing IBISS projects.

CASE STUDY II: PROSAMIM

In this section, we will first discuss the problems facing Manaus and the Igarapés that have been explained in the Background chapter. We will continue with an explanation of the history of PROSAMIM, followed by an explanation of the project organization. After this, implementation and problems during the implementation

are discussed. Finally, some conclusions concerning the project and the aspects of sustainability and the role of civil engineering will be formulated.

Project environment: Manaus & the river bank settlements

The city of Manaus in the State of Amazonas faces a few different problems:

- Growth-related problems
- Geographical problems
- Environmental and hygienic problems

The Igarapés (streams) spread through the city are inhabited by people from the lowest social classes. The State of Amazonas tries to provide the low-income population currently living in the river bank settlements access to a sanitary sewer system to improve the quality of life and health of this population and reducing the pollutant load dumped into the Igarapés.

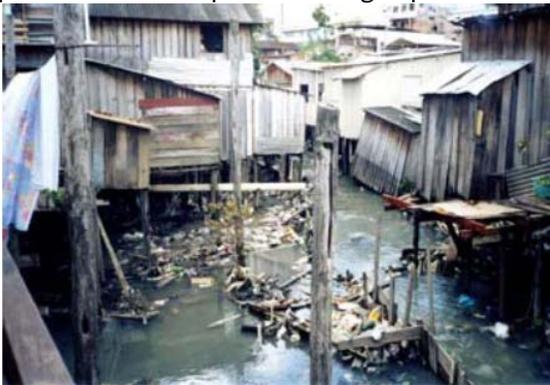


Figure 4: Living conditions in the Mestre Chico Igarapé



Figure 3: Waste and pollution is common.

Growth-related problems

The primary cause for the current problems in Manaus is growth related. However, the fact that there were no real policies dealing with the accompanying issues that arose was maybe even more influential (PROSAMIM, 2008). The Institute for City Planning in Manaus (IMPLURB) had no program to regulate existing settlements. Combined with the lack of alternative affordable urban housing for groups with low incomes, this caused the uprising of informal settlements with substandard housing. The Inter American Development Bank indicates: *“Manaus grew very rapidly without adequate infrastructure. The city’s population jumped between 1970 and 2003 from 300,000 to over 1.5 million due to the expansion of production-oriented commercial activities associated with the creation of a customs-free zone and development of public services and government operations”* (IADB, 2006).

Geographical problems

Substandard housing in itself reduces the quality of life of the population of Manaus, but the geographical situation aggravates the problem. The informal settlements mentioned above particularly arose in the banks of the streams near the city centre. The Igarapés were close to the sources of employment of the inhabitants of Manaus with lower income and also close to public transportation, public services (education and health), as well as other social infrastructure available in the area. But, like the PROSAMIM (2008) organization explains in their program, living in the streams of the Rio Negro has major downfalls. The regime of the Rio Negro has two periods: the rainy season from January to June, and the dry season from June to December. In times of flooding, the Rio Negro invades the homes located in located at the edges and in the beds of streams. During these floods the informal settlements are unsafe and can easily collapse.

Environmental and hygienic problems

The causes of these problems are associated with a lack of environmental education and infrastructure collection. Residents dump all solid and liquid wastes directly into streams, providing poor sanitary conditions and impairing the flow of water, especially during the rains. The constructions built in the streams (housing, and

narrow bridges and walkways) hinder garbage collection. The problem is the whole absence of public policies in these places inhabited by a population that has practically nothing and is excluded from society. The people living in the river banks have a low self-esteem. This is generated by the lack of a correct address and the lack of a house that provides safety against the risk of collapsing after heavy rains and Amazon deposits. Almost all households in the areas at risk have bad electricity services and the household's mostly use surface water for their needs.

In the PROSAMIM (2008) program document is explained that currently various diseases arise from water contamination and garbage that sprouts from the sewerage of the city's factories and homes. The occurrence of acute diarrheal diseases had an increase of 73% from 1998 to 2002. In the same period, cases of hepatitis A increased about 44%. In 2002, 53% of malaria cases in Manaus were identified in areas with housing conditions found on the banks of streams.

The project environment of PROSAMIM in Manaus is one with an entanglement of issues: growth, geographical, environmental and health problems are entwined with one another and also closely linked to social issues. This problem therefore not only needs a civil engineering solution to cope with the first couple of problems, but will also need a solution that carefully takes the local population into consideration.

Project organization

In this section we will first discuss the organizational history followed by the project goals and how the project organisation is organized.

Organizational history

As discussed in project environment, the problems surrounding the Igarapés are quite different in nature. The occupied areas have a high environmental sensitivity and are not suitable for city development. The Igarapés in Manaus represent an environmental problem, a social problem and an urban-development problem for the city of Manaus.

The very first start of the project was the result of statement of the government of Amazonas: *"the removal of families from risk areas, offering better housing conditions, the search of land for resettlement of families near the area where they live, assisting in drainage solutions and, proposals for urban development and recovery of areas of historical interest were defined as area of operation of the program, the quota of 30 m flooding of the Rio Negro"*. This statement guided a multidisciplinary team of specialists in hydrology, hydraulics, sanitation, environmental, social and economic issues in developing a "Termos de Referência" (Terms of reference, or TOR). This TOR would then guide future studies and help others in proposing plans or solutions for the problem in the Igarapés. Important to mention is that, from these point forward, frequent consultations would take place with a variety of parties. The TOR would even demand that firms would hold meetings with communities (PROSAMIM, 2008). Involved in the (preparation) of the program were:

- Government of Amazonas state
- Manaus city council
- Non Governmental Organizations
- Civil Society Organizations of Public Interest

Several different plans were prepared and investigated by consulting firms, taking into consideration a future perspective of 30 years. An alternative was chosen on the basis on being the most attractive in economic aspects including technical, social and environmental aspects. This (first stage) program would then be developed in more detail in order to get approval from the Inter-American Development Bank (IADB).

These studies have lead to a plan for approval from the IADB in 2003 which would be the official 'kick-off' of the PROSAMIM program. However, it took until 30 November 2005 before the IADB approved the credit operation.

Organizational Goals

The main goal of the PROSAMIM program can be formulated in the following way: to improve the environmental, urban, health, and housing conditions of the population in the Igarapés' watersheds in Manaus.

Project

The actual PROSAMIM program consists of two different phases. These two phases mainly concern the area of influence or the area that is being improved, see Figure 8. We will first discuss phase I. Currently, this phase is in execution. We will later shortly comment on phase II.



Figure 5: Indication of the location of the Educandos (PROSAMIM I) and Sao Raimundo (PROSAMIM II) areas within Manaus. The red lines within the oval represent a sample of the program that involved five igarapés (Manaus, Bittercourt, Mestre Chico, Cachoerinha and Quarenta) and a total of 4,326 families (PROSAMIM, 2008).

Phase I

The phase I program deals with the problems described in the cultural background above. Phase I has been approved in November 2005. Execution of the program started in 2006. Execution will be discussed below by major theme. These themes are essential and interconnect with each other. Sources used for this research use different ways to classify and explain the problems in theme, steps or pillars, we chose to use the three themes below. These themes cover the scope of the program and enable us to effectively discuss sustainability later on.

1. Sanitary Infrastructure
2. Social an Institutional Sustainability
3. Environmental Restoration.

The investment program constituted out of three components (PROSAMIM, 2008) , these components are discussed in the next section.

1. Sanitary infrastructure

The sanitary infrastructure is essential in the improvement of health conditions although the environmental improvement will also play an important role. The latter is more for preventing flooding and free flow of water without pollution. The sanitary infrastructure then insures that demands of people (sanitation and drinking water) are finally met, which was previously impossible.

2. Social and institutional sustainability

This part aims to improve operations and management of the program and making the program more effective. It strives to achieve community participation together with all governmental bodies involved. This way, they try

to make sure that current investments will have more long lasting benefits. In order to do this, the program used media, engagement activities and education.

Another way that seems to be applied is that there is a number of pilot projects (samples) undertaken. In fact, the program is undertaken, but on a small scale to demonstrate what is involved. This also forms a excellent opportunity to show its purpose and to encourage other people to participate.

3. Improvement of environment & urban development/housing.

This part forms the largest cost source and consists out of the construction of macro and micro drainage of rainwater and protection against flooding. Next to drainage systems, channels were constructed or adjusted, and protection was provided against headwaters. In general, the area became more protected against flooding from the Rio Negro and could cope better with heavy rainfall.

Also the (re)settlement of the urban population was important. The people that were at a direct risk of the problems of flooding and rainfall, as well as the people that were directly influenced by the construction of the program would need housing. Villa's were built according to stated rules about size and the number of occupants. These buildings are fairly distinctive, but do really form a great improvement when regarding the previous dwellings. Because this new housing situation would be really different (new situation and sometimes location), families were given assistance in adaption to their new environment.

There were several options for resettlement of families:

- **Indemnity:** An owner, who resides in a property with a value greater than R 21.000, received a cash compensation equivalent to the market value of improvement.
- **Bonus:** The tenant/landlord received a housing bonus worth up to R 21.000, for the purchase of residential property in Amazonas State.
- **Housing Units:** Houses are built in Central Manaus near the area undergoing improvements. Tenants or families leasing such a house, will receive a Housing Unit given that procedural rules are followed.
- **Housing Estates:** Public housing is located in the north of the city with a value of R 21.000. Tenants or families that had to give up there housed are ceded here under concession.

However, the case also showed that several families still want to stay near the area where they lived. For these cases, the program provided so-called "auxílio moradia" (housing allowance). This would be a monthly allowance to pay the rent of a house until construction of new housing would finish.

Next to this, parks and boulevards were constructed in the area of recovered land (which used to be under water due to lack of drainage and channels). These constructions where made to prevent the same problems emerging, like occupation of the banks directly next to streams. Further, it enables future generations to build extra infrastructure (roads etc.) and make space for maintenance (e.g. for channels, reservoirs, drainage systems), if needed.

All this helped in rehabilitating buildings in and around the streams in Manaus for residential and commercial use, improving the overall quality and wealth of the area. Next to ensuring improvement of health and safety, these developments will also contribute to the quality of the rest of (inner) Manaus and therefore also aspects like economic growth.



Figure 6: Results of PROSAMIM: new housing, channels and infrastructure

Stakeholders and shareholders

The PROSAMIM project concerns many different stakeholders especially many different governmental stakeholders. Due to the large number of parties involved, making agreements between these parties was logically difficult. Some of the more important parties are the state of Amazonas (principle), the Inter-American Development Bank (IADB) (funding). Responsible for coordination are the Ministry of Infraestructura (SEINF) and the Project Management Unit of the Streams (UGPI). Besides these parties, also the local community was carefully taken into account.

Financing of PROSAMIM

The financing of the program required 200 million USD. The state of Amazonas invests 60 million and the remaining 140 million is invested by the Inter-American Development Bank (IADB). This loan has an amortization period of 25 years with a grace period of 6 years. The disbursement period is six years and the interest rate is according to LIBOR (London Interbank Offered Rate) (IADB, 2005). According to the loan proposal found on the IADB-website, the state of Amazonas is capable of delivering their financial contribution, as well as servicing the debt (IADB, 2005). The IADB has taken into consideration that it is a necessity for a stable government to successfully implement plans. They recognized that with administrative changes, priorities could shift. Furthermore, a risk was identified in people losing belief in the government and with that, belief in the PROSAMIM program (IADB, 2005).

A cost benefit analysis was performed and this showed that the program was financially feasible. Among the benefits were considered (IADB, 2005):

- Drainage and road improvements that lead to less travel time, prevention of damage, and therefore cost savings.
- The difference in rental value before and after resettlement.
- Benefits of sewer services, water services and public spaces. The value of these services and public goods are estimated on a willingness-to-pay basis.
- Benefits of healthcare.

When all these aspect were taken into account, the different projects (on a subwatershed level) would be financially feasible.

Phase II

The second phase of PROSAMIM has also officially started. Although it does concern another geographical area (see Figure 5), the same project and design principles will be applied. Before implementation, it was necessary that the IADB would again be involved for financing. The loan was approved in August 2008. Financially speaking, this second phase is even bigger than PROSAMIM I. This time, the loan is approximately 154 million USD and another 66 million USD is contributed by the state of Amazonas (IADB, 2006).

The project organization is closely linked with the project environment (see project environment section). Civil engineering solutions are found for several of the problems but more importantly: there seems to be a real focus on successful implementation of the program through community participation.

Implementation and problems during the project

In the previous sections, it has become clear that the project organisation was, in many ways, closely linked to the diversity of aspects and problems. For instance, not only technical aspects like construction channels and piping were considered, but social aspects were thought of too. However, an earlier case study of the program (PROSAMIM, 2008) does mention several difficulties in implementing the program. Below, a description is given.

Political/Governmental

The preparation of the program required extensive work. The management unit responsible for coordination of the program (UGPI) had to involve 17 (governmental) entities that were directly involved and 11 entities that were indirectly involved. Especially the agreement with the water company required much attention (PROSAMIM, 2008). In the initial setting, the water company would be responsible for construction of water services but this formed a problem. In a new bidding, the state would take control and transfer the system after completion back to the water company.

Furthermore, the IADB demanded that all preparation were finished in the sense that construction could start (e.g. ownership of land, right of way) along with the bank's approval (IADB, 2005).

Community participation

From a social point, this issue was very important to achieve success. As mentioned before, the community was involved from the early start of the program. The program organization also organized meetings, activities etc. to insure involvement. Another aspect which may have contributed in this respect was the choice to improve specific areas first, in a stepwise process. These areas would then become example and showcases of what could be expected.

Technical

Although much information was available, there were still difficulties and problems with a lack of knowledge on soil/ground conditions. This has led to an expansion of the area that had to be improved. This was a significant increase in work according to the project organization (PROSAMIM, 2008), but the extent of this project is not known.

Next to this, there was also the difficulty in the supply of materials, especially soil for land filling. Several technical solutions had to be thought up to cope with these issues.

A case study recommended the use of good contractor, with multidisciplinary technical skills. This seems to be a good conclusion taken into account the many (technical) aspects that constantly have to be considered (PROSAMIM, 2008).

Urban/resettlement

The resettlement of families has proven to be difficult. It was difficult to meet the goals of those families, especially if they preferred to stay nearby the streams.

Although there were several challenges in implementing the PROSAMIM program, no really strange problems occurred. Most of the technical challenges are related to a lack of knowledge or (ground condition related) information. This challenge could be expected; given the situation it will have been difficult to get accurate information. The difficulties in organizing the program are also explainable given the project environment. Many (governmental) parties are involved which makes coordination difficult. The participation of the local population was important and necessary, but of course also provided some challenges. In that sense, the problems in implementing the program can be explained by looking at the project environment and project organization.

Conclusions from the PROSAMIM case study

When we consider the entire program life-cycle (of PROSAMIM I), we can see a close link between the project organisation and the environment in which this program exists. The challenges of improving quality of life in the Igarapés in Manaus are a multidisciplinary problem. Such a problem requires a multidisciplinary solution which seems to be the case with PROSAMIM. Especially social aspects were very important and community participation will have been a key-factor in successfully implementing the program. Implementing the program seemed to have its challenges, mainly the need for good coordination of activities and parties was challenging.

Sustainability

We will address sustainability by looking at three aspects: People (social), Planet (environmental) and Profit/Prosperity (economic/financial aspects). In all aspects, we take into consideration how the future is taken into account (not only looking towards the next couple of years, but also beyond). We will pay special attention to the aspect of People, since this is the major focus in the projects studied in this micro-study.

People

The most important contribution of the PROSAMIM program is the improvement of living conditions, safety and public health. Furthermore, the project also contributes to economic wellbeing for the population of Manaus in general. In this respect, we can state that investment in this program is investing in a social sustainable future.

However, on a smaller project scale; we also see that sustainability was taken into consideration. Studies e.g. assessed the ability of people, which will be using the new-build infrastructure, to be able to pay for the sanitary services provided. This, of course, is limited with the assumption that people will be willing to live in a way that is new for them. However, the participation of the local communities was given attention from the early start. The program doesn't just relocate people; it also takes some of the current functional aspects of the informal dwellings into account. The IADB, for example, mentions the necessity to facilitate the re-establishment of affected businesses from the informal dwellings. Apparently many unregistered businesses were run from the - to be removed -dwellings. In this research we could not easily value the compensational measures towards former inhabitants in this research. We expect that public health will really be improved by the sanitary measures taken in the PROSAMIM program; this will contribute to the people.

Planet

The program also influences the aspect of planet. This mostly has to do with the improvement of water related systems like drainage systems and channels. This prevents pollution which was one of the major problems in the area. Sewage systems are emplaced to prevent (more) pollution of the Rio Negro. The aspect of planet, however, was not the main focus of the PROSAMIM program.

Profit

As far as the aspect of profit or prosperity, it seems that most attention is paid to the financing of the project itself. The IADB has conducted a cost/benefits-analysis which is also focused on whether the program is important and financially feasible. It is mentioned however, that the program will have a positive influence on, for instance, the city centre and free-trade-zone. However, in the loan documents we studied no real prediction

on the long-term benefits were given. The division of benefits from this project is formally considered in the MCA, as mentioned in the loan proposal of the IADB (2005).

A case study also mentions that that population could participate in construction and maintenance activities to raise employment (PROSAMIM, 2008).

From a sustainability perspective, we also see that the program has taken the future years into account. Various measures are taken to insure success and to benefit from the PROSAMIM project in the years to come (for instance by preventing settlement to be built near the streams). However, next to the clear improvements in safety, health and living conditions, it is not clear how the local population will benefit from PROSAMIM in an economic sense. This is also very important from a sustainability and social development perspective, so this should be investigated more. The government of Brazil will probably benefit from the formalisation of the, currently informal, economy in the Igaurapés. Taking the people of the Igaurapés up into the formal economy and making them pay for the services they use will, possibly, enable Manaus and the state of Amazonas to provide the same services for future generations.

Role of civil engineering

What has become clear is that the role of civil engineering in the PROSAMIM program is extensive. Civil engineering is essential in improving living conditions, which in turn can contribute to social sustainable development. Although we think civil engineering (technical) solutions seem to have formed a foundation for social development, many other factors will certainly determine whether or not quality of life will actually be improved. Both hypotheses below will be discussed, in this regard, during the company visit of PROSAMIM.

CONCLUSIONS

In this final chapter we will present the conclusions drawn from the two cases, IBISS and PROSAMIM. First we will discuss both cases using the 3C-model and will therefore discuss the project environment, project organization and implementation of the two projects. After this, we will continue with discussing the aspect of sustainability in both projects (within the projects) and how they contribute to (sustainable) social development. Finally, we will conclude with a discussion about the role of civil engineering within these cases. We will then have gained in-depth knowledge about the two cases and will have answered our main research question.

IBISS & PROSAMIM

As the conclusions after the case study chapters also mentioned, the project environment, project organization and implementation are clearly related to one another. The project is organized in such a way that it deals with the specific aspects of the project environment. Likewise, the problems and successes that projects face are also explainable when we take the organization and the environment into account.

However, since the project environment (the problems, conditions and, most important, the actors in the specific cases) are different, we also see different organizational forms and different plans being drafted and implemented. In the case of IBISS, we see that several specific projects are undertaken. Each project deals with a certain problem. In the case of PROSAMIM, we see a more integrated program being undertaken with a holistic approach. This also has to do with the fact that the different problems are more entwined with each other (dealing with them involves a big intervention). IBISS tries to reach their goals by developing and initiating multiple, custom made, innovative, projects; in an effort to tackle a multitude of - sometimes very different - problems.

Sustainability

When looking from a sustainability perspective. We see that both projects do take into account the long-term effects of the project. The IBISS project invests in several - mostly social - projects to enable people to develop

themselves and make a living. In that sense, IBISS focuses on the core of the problem and not on compensating the results of this problem. This can be regarded as investing in sustainable social development.

The PROSAMIM project also takes sustainability into account in providing people with basic needs and solving environmental issues. But there also seems to be focus on guaranteeing the success of the program. Special attention is paid on making sure all the work done will keep being of benefit in the future and that the old problems do not reemerge. The work of PROSAMIM is fundamental in development in the area but it is not yet entirely clear how the local population will benefit from PROSAMIM in the future.

Role of civil engineering

Maybe even more interesting is what role civil engineering has in these two cases, and how this role may change in the coming years.

The role of civil engineering within IBISS is minimal since most projects purely deal with social issues. In this sense, civil engineering does not contribute much to sustainable social development in the favelas in Rio de Janeiro. We think that the lack of transport possibilities might currently form an invisible barrier to improve living standards of many people living in the favelas. However, when the population in the favelas will develop, civil engineering may become more important. For instance, with development it is also common that the need for transport and infrastructure will increase. This will raise needs where civil engineering might be vital. Civil engineering could already play a role in boosting existing IBISS projects, but this has to be researched more in-depth.

Within PROSAMIM, civil engineering is a fundamental aspect to provide people with basic needs and to improve living standards. But (sustainable) social development in the coming years will probably mainly depend on aspects besides civil engineering, like the economy and employment possibilities for the local population.

Overall, we can state that we expect that the role of civil engineering in sustainable social development in Brazilian cities is mostly an enabling role. Civil engineering builds a starting point for social development (PROSAMIM) or may solve problems that occur with development (possibly IBISS).

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