

Contaminated site management and brownfield redevelopment in Latin America

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ABSTRACT

Regulators and planners, national and local governments in urban industrialized regions of Latin America are becoming increasingly aware of the challenges and opportunities related to the redevelopment of abandoned inner urban degraded areas and the management of contaminated sites. Countries with rather advanced legal and institutional frameworks in regard to the contaminated land issue like Mexico and São Paulo State, Brazil, already execute brownfield redevelopment, while most countries and especially local governments do not yet fully realize the potentials or are not aware of hidden risks. Examples from selected regions and cities in Latin America are given to show, how brownfield redevelopment is being put into action and how German and European stakeholders in the present and in the future may participate to promote the issue.

Introduction

Inner urban brownfield redevelopment and management of contaminated sites are emerging issues in Latin America, especially in the metropolitan centers of mega cities like Mexico DF, São Paulo, Buenos Aires and Rio de Janeiro, where industrial production and strong demographic concentration have led to profound social and environmental impacts. The often unbalanced social and economic conditions challenge sustainability and also affect environmental assets like the soil, water and groundwater. Urban sprawl results in uncontrolled settlement on former industrial or commercial areas as well as waste dump sites, not seldom driven by poverty, whereas inner urban town areas suffers from social and environmental degradation. The chance of urban revitalization should be used to improve environmental conditions and promote a more sustainable urban development. European experiences can show the need to implement legal frameworks and to support institutional development, establish cooperative management models and networking, promote public-private partnerships and create financial incentives. The transfer and exchange of know-how and technology have proven to be effective, but require a high degree of adaptation. The initiatives here presented to establish policies to protect soil and groundwater and add value to inner urban development are not comprehensive, since they focus on selected countries; however they seem to be representative for the region. The experiences carried out within the scope of the European-Latin American cooperation highlight the need for these projects, on the other hand reveal the legal, institutional and infrastructural differences that require specific and adapted concepts.

1. Cooperation initiatives

Brownfield redevelopment and management of contaminated sites are intrinsically co-related. This becomes even more evident in a continent, where the protection of the soil and groundwater are just beginning, as far as regulatory, legal and institutional structures are concerned.

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German Technical Cooperation) since the beginning of the 90's has been supporting Latin American regulators, environmental ministries and agencies to build up capacities for environmental management. Among others, contaminated site management has become an important issue in the environmental debate, especially in the great urban-industrial centers of the region. Industrialization and exploitation of natural resources has left its marks on the urban land, and countries like Brazil, Mexico, Chile and Argentina have recognized the need to deal with the issue of industrial pollution and one of its severest but still underestimated effects: the contamination of soil and groundwater. The main efforts in regard to building up institutional capacities for contaminated site management were undertaken by GTZ in Brazil – mainly in the state of São Paulo, Mexico and Chile. The experiences in these countries have shown, that contaminated site management and law enforcement will have implications on land use related issues such as urban planning, real estate market and property. GTZ soon realized that the contaminated site management issue has to be dealt with in a multi-stakeholder approach, involving, in addition to the regulators and environmental authorities, also urban planners, financing institutions, consultants and the real estate market. Thus the importance of

the brownfield issue was recognized. Experiences made by GTZ in Brazil show how a technical and regulatory framework on contaminated site management established in the State of São Paulo influenced national awareness building and triggered regulations, thus disseminating the issue on the local level and in relevant sectors (construction, banks, real estate) and consequently leading to the establishment of regulation concerning land use in some municipalities and moving the private sector and investors to a behavior of environmental due diligence.

In Brazil, GTZ cooperates with representatives of almost all above mentioned stakeholder groups: the Federal Environmental Ministry (*Ministério do Meio Ambiente - MMA*) and the State environmental agency of São Paulo - (*Companhia de Tecnologia de Saneamento Ambiental - CETESB*), the Municipalities of São Paulo and Rio de Janeiro, the Federal Loan and Savings Bank - (*Caixa Econômica Federal - CAIXA*) as well as consultants and associations related to the issue. Apart from the bilateral cooperation with these stakeholders, GTZ supports the networking amongst them, which has led to some major success stories and initiatives in the field of remediation and brownfield redevelopment, training programs and realization of events, also in cooperation with the private sector. Figure 1 gives an overview of the activities of GTZ which have been commissioned by the German Government (BMZ). It also contains information on cities involved in the REDESC project, coordinated by the city of Stuttgart and funded by the EU program UrbAL (REDESC, 2005).

2. Contaminated Site Management in Latin America

Industrialization during and after World War II, intensive mining exploitation and beneficiation of raw products like ore, crude oil, timber as well as enhanced industrial growth, especially of metallurgy, metal transforming and chemical industry in the 60's and 70's left its traces on soil and groundwater. Legislation on solid waste management and licensing of pollutant industry is rather recent in LA countries. Rapidly increasing population concentration in urban centres and metropolis, e.g. Mexico, São Paulo, Rio de Janeiro and Buenos Aires turned the issue of solid waste disposal even more critical, since installations were often not controlled and inner urban space became scarce and expensive. The result was obvious: landfills contaminated the soil and groundwater and jeopardised human health. In the late 80's and early 90's, a new cycle of economic reorientation and the increasing infrastructural difficulties in the mega-cities led to the exodus of industries, as happened in Europe 15 years earlier. The resulting derelict land preserved stigmas of contamination and degradation, remained abandoned and started attracting dwellers and illegal or informal occupation. Urban planners and regulators were aware of the problems, but only in the last years, these issues are gaining more importance and consideration as far as legal frameworks and more sustainable urban development strategies are concerned.

2.1. National and state regulations

A common characteristic of all countries is the lack of a specific legislation on the contaminated land and soil protection issue. Mexico's National Ministry of Nature and Environment (*Secretaría de Medio Ambiente y Recursos Naturales - SEMARNAT*) regulated responsibility and liability issues in the frame of its solid waste act of 2003, reviewed in 2006. A recent ordinance defines procedures for investigation, risk assessment and remediation as well as legal responsibilities. (SEMARNAT, 2006). Also soil quality and remediation standards for soils contaminated by hydrocarbons, PCB and heavy metals are available.

Brazil and in particular São Paulo State have submitted draft bills on soil protection and contaminated site remediation, but are still treating the issue with existing laws on pollution control, like the São Paulo State Law 996 and its ordinance of 1976. São Paulo presently deals with the issue mainly by institutional guidelines and directives such as the guide values for soil and groundwater, directives for risk assessment and investigation procedures "*Manual de gerenciamento de áreas contaminadas*" (CETESB, 1999).

Generally spoken, the predecessors of legal and normative frameworks in all countries are programs, which are present or underway also in Argentina, Chile and Uruguay. The National Commission on the Environment (*Comisión Nacional del Medio Ambiente - CONAMA*) in Chile

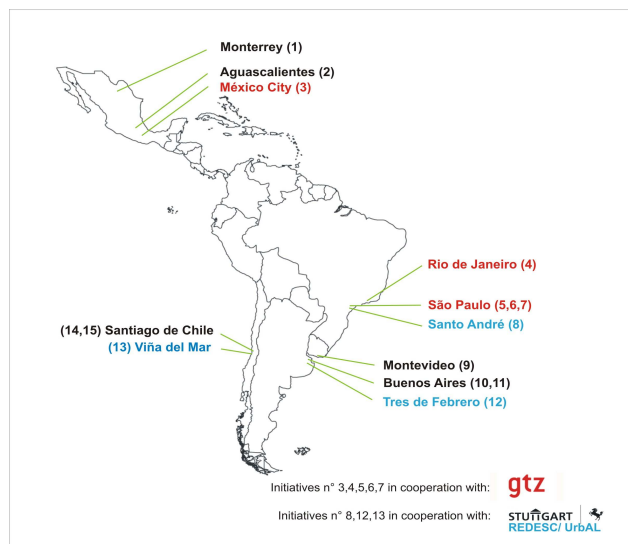


Figure 1: Selected initiatives in the field of contaminated site management and brownfield redevelopment in Latin America, 2007.

is presently preparing a national policy on the management of contaminated sites (Contreras, 2006). These programs aim at establishing procedures on site investigation and remediation, including site inventories and prioritization like the national program PROSCID – *Programa Nacional para la Gestión Ambiental de Sitios Contaminados* in Argentina (Secretaría de Ambiente y Desarrollo Sustentable, 2006) and the program on contaminated sites of Uruguay's National Environmental Agency "Dirección Nacional del Medio Ambiente – DINAMA" (Savorin, 2006). Inventories of contaminated sites are rather well developed in the state of São Paulo, where already almost 2000 sites have been registered, investigated and partly remediated. Mexico is presently building up its inventory SISCO – *Sistema Informático de Sitios Contaminados* and has already started a program for national priority sites. Both Mexico (SEMARNAT) and São Paulo State (CETESB) and to a lesser extent Chile (CONAMA) have received considerable technical support from GTZ to build up institutional capacities for contaminated land remediation programs and policies in the framework of bilateral cooperation projects (Figure 1).

2.2. Local governments, public funding and real estate transfer

Basic challenges regarding the brownfield issue like the regulation and permission/ licensing of site reutilization, the liability question, the competence distribution between the different administrative spheres and the public funding of orphan and abandoned sites are not yet solved in the Latin- American countries.

Evidently, the reutilization of contaminated land depends on the establishment of standards for soil use and the tight cooperation between environmental and local urban planning authorities. In São Paulo City, we see first attempts to streamline the licensing process for construction projects. The occupation of contaminated soils is orientated by soil use-related guidance values and the contamination situation is proposed to be fixed in the public registry of the property. Almost all new real estate and building projects have to undergo environmental site assessment terrains have potentials of being contaminated.

The CAIXA, Brazil's main financier of urban development, housing and basic sanitation, has recently implemented risk management procedures and tools in the credit sector, based on environmental due diligence. The "REVITA" project in cooperation with GTZ tests and applies the tools in the metropolitan regions of São Paulo and Rio de Janeiro, where several residential building projects sponsored by CAIXA have already caused financial and juridical losses because of soil contaminations detected too late and where on the other hand under leadership of the town planning departments, revitalization of derelict city areas with a great number of former industrial sites is being promoted.

In Mexico, the liability issue on real estate transfer is covered by the ordinance of the solid waste act of 2006 (SEMARNAT, 2006). A special guideline which aims at the permission for real estate transfer and regulates liability is under development. Authorization of reuse of contaminated sites is established in the frame of risk assessment and remediation. Besides these examples, no comparable instruments which prevent the occupation of contaminated sites are known from other countries. Public funding for remediation of contaminated sites which underlies the control and responsibility of the federal government (abandoned sites) are applied to the remediation of priority sites in Mexico. In the case of contaminated sites of the petro-industry, PEMEX (*Petróleos Mexicanos*) finances the remediation measures entirely.

2.3. The private consulting and remediation sector

Generally spoken, the private consulting sector providing services in remediation and investigation is not yet fully consolidated and structured. In Mexico, SEMARNAT published (May 2006) (SEMARNAT, 2006) a list of 169 authorized service providers for contaminated sites investigation and remediation. A project to prepare the certification process is proposed for 2008. Brazil, especially the region of São Paulo suffers from the great heterogeneity of professional qualification. About 12 companies are organized in AESAS, the Brazilian association of specialized consulting companies, however without any official certification. Relevant international companies from Germany, Europe and US are present or have joint ventures with local companies, and mostly offer services of high quality, while many small and less prepared consultants appeared in the last years on the presently booming consulting and investigation market. The upcoming market for brownfield redevelopment, the need of remediation of hundreds of gasoline spill and especially the generated impact of the renewable licensing procedure of industries (110,000 industries in SP State) require more qualified service providers, certification and quality management.

Cleanup and disposal infrastructure is to a certain degree existent in Brazil and Mexico, where hazardous waste disposals, co-processing and hazardous waste incineration are part of the solutions for contaminated soils. However, there is relatively little know-how and service provision for the management of construction debris, controlled demolition, physical soil cleaning (soil washing) and off-site bio-remediation

The academic sector is also an important service and know-how provider. In Mexico, for example, partnerships with several universities like the Universities of *Aguascalientes* and *San Luis Potosi* supported the elaboration of instruments and the implementation of remediation and redevelopment concepts. In Chile, the *Fundación Chile*, a privately organized research and development center, supports the CONAMA in its efforts to establish contaminated site management instruments.

3. Brownfield redevelopment in Latin America

3.1 Urban development aspects

Urban development is intrinsically related to cycles of economic development like the rural exodus caused by industrialization in the 60's and 70's of the last century. This resulted amongst others in important transformations of cities, commonly called urban sprawl. The population in the largest metropolitan areas in Brazil doubled between 1970 and 2000. At the same time the population of their suburban peripheral areas has more than tripled, threatening environmental systems such as, for example, the Atlantic forest system of Southeastern Brazil, that still form the greenbelts of cities like Rio de Janeiro or São Paulo. The demographic growth of the great metropolis is very unbalanced. While the center of the cities are losing population (for example, São Paulo about 3% per year), its suburbs are growing fast (in São Paulo, up to more than 5% per year) (Cidade de São Paulo, 2004). On the other hand, city centers started to change their functions in the late 80's and early 90's, and industries yielded space to service related sectors, logistics, administration and commerce. The exodus of (polluting) industries to peripheral areas of mega cities was, amongst others, caused by problems in transportation and infrastructure, by environmental restrictions and tax disadvantages. Like in Europe and the US, this process resulted in unemployment and social degradation, creating derelict land in inner urban city centers.

However, old production sites are beginning to be reused, but the conversion process generally happens without investigating their environmental history. Soil quality is not yet a relevant factor taken into account in urban planning and land use. This doubtlessly led and still leads to major conflicts and negative economical impacts, enhanced by the social situation. Inner urban shanty towns with extreme misery grow on to the degraded and contaminated sites like for example waste dumps, abandoned factories and degraded industrial zones, frequently jeopardizing human health. First economic and social impacts are experienced, like in the case of the "Barão de Mauá" housing complex in São Paulo Metropolitan Region. Built on an old hazardous waste dump, toxic gases put at risk human health and are presently leading to the proposal of the demolition of several housing blocs. In this case, financial losses for banks, owners and builders are estimated in the range of several million US-Dollars would be unavoidable.

3.2. Urban revitalization and management of contaminated land

From the preceding chapter it becomes evident, that urban regeneration is an important emerging issue in urban centres of Latin America. On the other hand, the issue of contaminated land management widely lacks legislation, appropriate institutional structures and financial resources to cope with the problem.

Since there is no or only a weak legal and institutional framework that regulates land use in dependence of soil quality it makes it difficult to consider "brownfields" as a really existent issue of public policy. Brownfields are defined as inner urban areas which represent obstacles to economic, ecological and social development because of a suspicion or real existence of contamination hindering their development. From this definition it is obvious that the promotion of the brownfield issue, in its proper sense, requires that soil contamination becomes an environmental issue to be legally enforced. As a general hypothesis, with some exceptions, this prerequisite is not yet met in Latin America.

Presently the following situations in respect to the reutilization of contaminated land are observed in Latin America:

1. The importance of contaminations of soil, groundwater and building material for the reutilization (and the related impacts on human health) is still not recognized or contaminations are in fact known, however do not represent a financial and legal restrictions for reutilization, because of lack of legislation, control and enforcement. Missing integration of planning and enforcement institutions enhances the problem. This results in a low liability and low financial risk for the investors. Summing up, the existence or suspect of contamination does not have any influence on the feasibility of real estate enterprises.

2. Soil and groundwater contaminations are properly identified and assessed and legal requirements are taken into account. The high real estate market value turns brownfield redevelopment by private investors feasible; environmental investigations and remediation/cleanup measures do not compromise the financial viability balance.

3. Soil and groundwater contaminations are identified, and properly managed. The legal and financial risks are evaluated. Brownfield redevelopment, however, needs external incentives to be implemented. These sites constitute the real challenge for the brownfield issue in Latin America.

3.3 Urban revitalization policies promoting brownfield redevelopment

In order to change the panorama mentioned above, it is very important to implement public policies that consider the sustainable use of the urban areas, trying to reduce the urban sprawl and the social and environmental degradation of inner urban town areas by promoting inner urban development.

In most of Latin-American metropolises, local or federal governments, as well as the private sector, have already recognized the economic potential of revitalization of inner urban areas. This can be triggered by the implantation of recreation and culture attractions, like in the case of the harbors of Belém in Brazil or in the case of Puerto

Madero in Buenos Aires, Argentina. It also may be motivated by policies to combat social degradation, as in the case of the urban rehabilitation program of the City Center of São Paulo "*Programa de Reabilitação Centro*" or stimulated by the interest to create new city districts focusing on commercial activities and housing pools, like "*Ciudad Parque Bicentenario*" in Santiago de Chile or the Technology Park "*Del Cerro*" in Montevideo, Uruguay.

Chile

The "*Ciudad Parque Bicentenario*", located in the Metropolitan Area of Santiago de Chile, is a good example for urban revitalization, transforming the former "*Los Cerrillos*" Airport of 250 acres in a new self-sufficient urban district with 15.000 housing units, commerce, small industry, new green parks and culture and recreation options for 50,000 new inhabitants. This huge urban re-qualification project, expected to be completed in 2010, is based on a local Master Plan (*El Plan Maestro*). The implantation of infrastructure and housing, realized with the participation of private investors, is managed by the Ministry of Housing and Urbanism (*Ministerio de Vivienda y Urbanismo*) (Ministerio de Vivienda y Urbanismo, 2006). Existent contamination of soil and groundwater by fuel hydrocarbons apparently was not a hindering factor for the implementation of the project.

In Viña del Mar, potential brownfields exist in the former industrial district "*El Salto*" and in the abandoned and contaminated seaside fuel deposit "*Las Salinas*", both with a great potential for urban revitalization. Although Chile does not yet have an appropriate legislation for managing contaminated sites on national level, the brownfield issue is slowly becoming a challenge and motivates the municipality of Viña del Mar to apply instruments of site assessment to orientate in the future the reutilization of contaminated sites, supported by the UrbAL project REDESC (Solari, 2006).

Argentina

Another example for urban revitalization of degraded and at the same time very attractive areas is the old harbor project "*Puerto Madero*" of Buenos Aires, Argentina, where mainly commercial and recreational activities have been created. (Puerto Madero, 2007). Former infrastructure of the port was recycled. However, no information about a pre-existing contamination situation is available.

For the "*Riachuelo-Matanza*" basin in the southern district of Buenos Aires, which hosts 60% of the major industries of Buenos Aires, brownfield redevelopment activities are intended. Potentially contaminated sites are presently being mapped. One of the main sites identified for redevelopment is the federal junk yard in "*Vila Lugana*", a 140.000 square meters property contaminated with lead, acids, hydrocarbons and solid waste. The creation of housing projects and commercial activities is under evaluation (Picolotti, 2006).

Mexico

The strategy to finance the remediation of some of Mexico's priority contaminated sites clearly gears to its re-usage. Brownfield redevelopment is seen as an opportunity to finance or co-finance the often costly cleanups of the sites, returning them to the economic cycle after remediation. This policy is applied to some state owned sites, for example the former PEMEX (*Petróles Mexicanos*) refinery in Mexico DF as well as orphan sites like "*San Felipe Nuevo Mercurio*" in Zacatecas State. Success stories and best practices of brownfield redevelopment from the cities of Agascalientes and Monterrey are described in chapter 3.4.

São Paulo Metropolitan Region, Brazil

In São Paulo City, one of the main instruments of sustainable urban development is the "Consortiated Urban Operation" (*Operação Urbana Consorciada*). The strategic Master Plan (*Plano Diretor Estratégico PDE*) defines nine areas of Consortiated Urban Operation, where the local government, through specific laws, intends to develop and revitalize degenerated urban and social districts. The financial resources come from the "*Outorga Onerosa*", an urban planning and compensation instrument which gives the private initiative the possibility to buy the right to construct above indices foreseen in the zoning legislation, participating indirectly in the investment in urban infrastructure.

A recently developed Urban Operation is the "*Operação Urbana Diagonal Sul*" (Southern Diagonal). It covers an area of 2000 hectares, extending throughout the valley of the river *Tamanduatehy* in the inner city of São Paulo, further on links to Santo André's Tamanduatehy urban development axis. The region of "*Diagonal Sul*" represents one of the main industrial districts of São Paulo, nowadays in clear decadence, with huge industrial ruins like Ford Automotive, Antarctica brewery, and several metallurgy, metal transforming and chemical industries and the old installations of the Federal Railway (*Rede Ferroviária Federal - RFFSA*). Altogether, of the 329 existing industrial areas in the region with potential of being contaminated, about 40 major abandoned sites have already been identified and pre-assessed for redevelopment.

Main goals of the local urban development program, that counts on financing of the Inter American Development Bank - IDB, are: implementation of urban infrastructure, modernization of the railroad, recovery and revalorization of the industrial patrimony, housing and social infrastructure, management of contaminated sites and creation of new parks and green areas (Sales, 2006). In this context, an appropriate suitable identification methodology as well as criteria for the redevelopment of former industrial sites with suspicion of contamination and high potential for revitalization has been developed with the support of GTZ. The urban development program "*Operação Diagonal Sul*" is a first step for the implementation of a brownfield redevelopment strategy, because, for the first time in Brazil, it

considers soil contamination as an important issue for future urban uses of derelict urban areas.

Santo André City, located in the Southern part of the metropolitan region of São Paulo, has already redeveloped several contaminated sites, mainly motivated by private interests, but well oriented by an appropriate local legal framework. The new federal University is presently being built on a brownfield, an old municipal vehicle workshop site. Both municipalities, São Paulo as well as Santo André, actually have legal and normative regulations which do not allow the reuse of contaminated sites without previous investigation, risk assessment and eventual remediation (Vaz, 2006).



Figure 2: Brownfield redevelopment project on an abandoned ceramic factory site, Rio de Janeiro.

Rio de Janeiro City

The municipality of Rio de Janeiro is presently implementing the Integrated Rehabilitation Plan (*Plano Integrado de Reabilitação - PRI*) of São Cristóvão. This district, which was the residential area of the nobility in the imperial period, has gone through profound transformations in the last decades, losing its industrial activities and consequently, between 1991 and 2001, 13% of its resident population. The "PRI" intends to change occupation characteristics into residential and commercial use, reutilizing abandoned or underused former industrial areas (Cidade do Rio de Janeiro, 2006). The municipality, in partnership with the CAIXA, elaborated an inventory identifying 167 properties, all of them with a high potential for housing projects. The study also identified about 20 abandoned former industrial sites. With the support of GTZ, vestiges of soil contamination were identified and evaluated, although a contaminated site management is not yet legally required in the construction licensing process. Currently, CAIXA is planning social housing projects (funded by public loans) on abandoned sites in São Cristóvão, creating up to 10,000 new residential units. More than 1,500 units are planned on former industrial sites, like the former ceramic industry where detailed investigations are under way (Figure 2).

As already mentioned above, CAIXA is presently, with the support of GTZ, developing instruments and procedures of environmental site

assessment which guide the loan business in housing construction on former commercial and industrial sites with suspicion or potential of soil or groundwater contamination. Furthermore, products and services for the promotion, support and funding of brownfield redevelopment initiatives on a local level are to be elaborated with the objective to qualify the bank to be a proactive broker of brownfield redevelopment.

3.4 Best practices and success stories of brownfield redevelopment

Best practices and success stories of brownfield redevelopment in Latin America are still scarce. They do exist, where policies on state or local level shifts their priorities from the traditional issues like transportation, infrastructure or public safety to sustainable urban development, where public or private funding exists and where environmental laws, control and enforcement are predictable to give security to private investments.

In this context, the project "**Railway Workshops**" in the Mexican city of Aguascalientes represents a very illustrative showcase. The property of the more than 100 year's old industrial installations, occupying an area of 89 acres, was transferred from the former National Railway Company to the state government. At present, new commercial, administrative and recreational activities are being implanted. Innovative remediation technologies, soil management and soil re-usage strategies, under the new and modern solid waste ordinance, are implemented (Miramontes, 2006).

The "**Parque Fundidora**" in Monterrey constitutes a good example of brownfield redevelopment, transforming a symbol of industrialization into a very attractive recreational and culture area. The former privately owned metallurgy plant "*Peñoles*" was transferred to the state of Nuevo Leon, which redeveloped the area in the context of the State Development Plan 2004-2009 in two separate phases, first the smelter plant and in a more recent phase the area of smelter sludge deposition. Remediation and the implementation of the park are orientated by onsite investigations and risk assessment studies of 2005 and 2006 (Estado de Nova Leon, 2006).

The recently initiated "**Sumidouro**" Project, located in the district of *Pinheiros*, São Paulo (Figure 3), represents an excellent example for public driven brownfield redevelopment, focusing public-private partnership as the main instrument of financing remediation. The project management is based on an intensive inter-institutional cooperation. The terrain of the old central waste incinerator "Sumidouro" is contaminated by heavy metals in soil and groundwater, while in the building material were found dioxins and furanes. The private investor is financing the confinement and remediation measures of the soil and in the building, as well as the creation of the new public park and the new educational and culture center. (Motta, 2006).



Figure 3: Brownfield redevelopment of the abandoned incinerator site “Sumidouro” in São Paulo.

As shown in Figure 4, the project’s public stakeholders are:

- the district administration of *Pinheiros*, in charge of the project management,
- the municipal environmental department, in charge of the elaboration and monitoring of the remediation and revitalization plans,
- the state environmental agency CETESB, in charge of licensing, establishment of remedial goals and supporting investigation logistics and technology.

In this case, GTZ acts as a facilitator as well as a technical consultant, both in the context of technical cooperation projects with CETESB and the São Paulo Municipality.

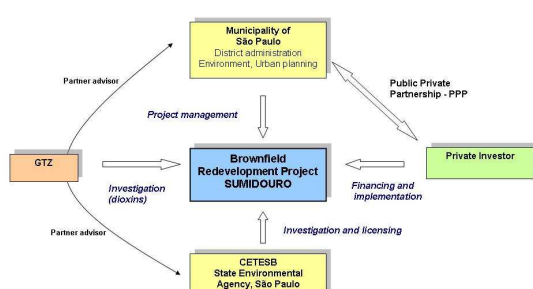


Figure 4: Stakeholder-map of the brownfield redevelopment project “Sumidouro”, São Paulo.

The “Sumidouro” Project may become a prototype for future brownfield redevelopment initiatives in São Paulo because it integrates public incentives, professional inter-institutional project management, modern soil remediation management and technology, as well as the involvement of private investors.

4. Challenges and demands

There is still a wide heterogeneity both in contaminated site management as well as in brownfield redevelopment in Latin America. Urban land still does not have its value influenced by soil quality and contamination, neither soil contamination always implies in soil use restrictions. As a general hypothesis, brownfield redevelopment is still not a real issue in urban planning and environmental management in Latin America. Nevertheless, GTZ experiences in Latin America show, that an appropriate legal and normative framework, like in Mexico and São Paulo State, are prerequisites for the promotion and implementation of brownfield redevelopment strategies and programs.

The experiences in the field of **contaminated land management**, centered especially in SEMARNAT/Mexico and CETESB/São Paulo, are worth to be multiplied in other countries of Latin America, like for example: legal framework, management tools and instruments, decentralization processes and inter-institutional cooperation, certifying instruments and quality control of the private sector, public-private participation models as well as the participation of the academic sector in the implementation of remediation projects.

The issue of **brownfield redevelopment** is a rather new challenge and for this reason, the demand is not very clear yet. It depends, as lined out above, on the consideration of soil and groundwater as an important asset. The cases described in this article show, that there already exist experiences with urban revitalization and rehabilitation, however, not always under the light of brownfield redevelopment. Sustainable urban development should take into account the need to revitalize inner city areas by using strategies to redevelop brownfields, trying to reduce urban sprawl and protect “greenfields”. One of the most important future challenges is to harmonize environmental management, urban planning and economic requirements. There is a great demand for clear legal and regulative orientations to support urban planning and guarantee reutilization of contaminated sites by use-oriented remediation goals, legal or guide-values, risk based assessment as well as clear liability orientations for investors and new owners.

Depending on the political and administrative structure of the countries, national, state or local governments constitute the central promoters of brownfield redevelopment, with emphasis on local governments in Brazil and state/national governments in other countries. In some cities there already exists know-how in urban and architectural development of underused urban areas, PPP driven financing models, appropriated reutilization concepts, as well as marketing strategies.

Brownfield redevelopment, as becoming evident by the European and US- American experiences, is generally in the competency of local governments, frequently supported or even driven by state and national financing. In this context it is necessary to develop and implement project steering mechanisms and management models of brownfield redevelopment at the local level, involving urban planning, economic and environmental competences. Local governments are recommended to develop and qualify institutional capacities on implementing instruments and strategies to incentive brownfield redevelopment, such as public start up funding, tax incentives, as well as special marketing activities and environmental communication instruments, which give information's to possible investors an may help to reduce the stigma of brownfields.

The demand for qualified professionals and capacity building in this working area is evident. Here European and US-American experiences can give important inputs. The availability of instruments to calculate and evaluate the cost/benefit of brownfield redevelopment and of innovative models for soil management which turn feasible cost reduction through recycling and adequate disposal of construction rubble are essential to be known in Latin America. These instruments assure positive ecological balances and help turn brownfield redevelopment sustainable.

5. Perspectives

In the region of Latin America exists a great demand for the exchange of experiences and know-how and inter-institutional cooperation and forums of discussion. This is justified by the existence of considerable competency in Brazil and Mexico and the fact that contaminated site management and brownfield redevelopment is emerging in most of the Latin American countries. Therefore it seems more than natural, that these existing competencies should be multiplied in the region (to avoid the re-invention of the wheel over and over again). Furthermore the interchange and cooperation between the region and Europe, especially as far as the brownfield issue and new and innovative topics and solutions are concerned, should be guaranteed in the future.

A first attempt was made by CETESB and GTZ in cooperation with other Latin American partners to build up a "Latin American network on control and prevention of soil and groundwater contamination" (CETESB, 2007). The multi-stakeholder network gears to the exchange of knowledge and experiences in the region, promoting discussion forums, seminars and workshops, and shall provide the exchange of with Europe through the recently firmed partnership between CETESB and the German Federal Environmental Agency UBA. The network is expected to formally take up its activities in 2008.

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References

- CETESB, São Paulo. 2007. Rede Latino-Americano de Controle e Prevenção de Contaminação do Solo e da Água Subterrânea. www.cetesb.sp.gov.br/rede/default.asp
- CETESB, São Paulo. 1999. Contaminated Site Management. www.cetesb.sp.gov.br/Solo/solo_geral.asp.
- Cidade do Rio de Janeiro. 2006. Plano de Reabilitação Integrada da região de São Cristóvão. www.armazemdedados.rio.rj.gov.br/arquivos/1654_pri-sãocristóvão250106final.PDF.
- Contreras, Jorge Trancoso. 2006. Gestión de Sitios Contaminados en Chile. CONAMA Chile. www.cetesb.sp.gov.br/rede/documentos/apresentacoes1/4_Jorge_Trancoso_encontro.pps.
- Estado de Nueva Leon. 2006. Parque Fundidora. www.parquefundidora.org.
- Cidade de São Paulo, 2004. Panorama do meio ambiente urbano SVMA/IPT, São Paulo. PNUMA, Brasília
- Ministerio de Vivienda y Urbanismo, Chile. 2006. Ciudad Parque Bicentenario. www.ciudadparquebicentenario.cl.
- Miramontes, Javier Llamas. 2006. Problemas y Soluciones en algunos Sitios Contaminados de México. Universidad Autonoma de Aguascalientes. www.cetesb.sp.gov.br/rede/documentos/apresentacoes2/8_Javier_seminario.ppt.
- Motta, Milton Tadeu, et.al. 2006. Estudo de caso – Revitalização de brownfield na área do antigo Incinerador Pinheiros. www.cetesb.sp.gov.br/rede/documentos/encontro_lat_americano/sumidouro.pdf.
- Picolotti, Romina. 2006. Plan Integral Cuenca Matanza – Riachuelo. [cmr.ambiente.gov.ar/archivos/web/CMR/File/PINCUMAR-10-\(Sep%2006\)-final-notas1.pdf](http://cmr.ambiente.gov.ar/archivos/web/CMR/File/PINCUMAR-10-(Sep%2006)-final-notas1.pdf).
- REDESC. 2005. Rehabilitación de áreas contaminadas para el desarrollo sostenible interno de la ciudad. LHS Stuttgart, European Commission Cooperation Program - UrbAL. www.redesc.de
- Sales, Pedro Manuel Rivaben de. 2006. Operação Urbana Diagonal Sul. www.cetesb.sp.gov.br/rede/documentos/encontro_lat_americano/diagonal_sul.pdf.
- Savorin, Pablo Gristo. 2006. Gestión de Sitios Contaminados en Uruguay. www.cetesb.sp.gov.br/rede/documentos/apresentacoes1/7_Pablo_encontro.pps.
- Secretaría de Ambiente y Desarrollo Sustentable. 2006. Programa Nacional para la Gestión Ambiental de Sitios Contaminados. www.ambiente.gov.ar/archivos/web/UniDA/File/ProgramaWEB2_1_2_06.pdf.
- SERMANAT, 2006. Secretaría de Médio Ambiente y Recursos Naturales, México. www.semarnat.gob.mx/gestionambiental/materialesyactividadesriesgosas/Pages/sitioscontaminados.aspx
- Puerto Madero, 2007. Corporación Antigo Puerto Madero, Buenos Aires, Argentina. www.corporacionpuertomadero.com
- Solari, Claudio Alvarado. 2006. Suelos contaminados: un desafío nuevo para el desarrollo urbano, desde la perspectiva de la ciudad de Viña del Mar. www.cetesb.sp.gov.br/rede/documentos/encontro_lat_americano/vina_del_mar.pdf.
- Vaz Júnior, Sebastião Ney. 2006. Áreas Contaminadas: O que fazer com este passivo ambiental – A experiência de Santo André com seu passivo ambiental. www.cetesb.sp.gov.br/rede/encontro_lat_americano/santo_andre.pdf.