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# BEM-VINDO Ao BRASIL

# MARKET OVERVIEW OF SOIL AND UNDERGROUND WATER REMEDIATION

**Geographical scope of the study**

This market overview is focused on the State of Sao Paulo, because it is the most advanced in the area of soil remediation in terms of legislation and private sector practices. It also has the greatest concentration of contaminated areas and the most detailed inventory thereof. As such, it represents the market with the biggest opportunities in the near future.

The Southeastern and the Southern regions are the most industrialized of the country and their industrialization began earlier than other regions, which indicates that the potential contamination is higher. In the North-East, industrialization has been a more recent development, at a time when the market was generally more environmentally conscious.

**Market size and trends**

The size of the Brazilian market for soil and groundwater pollution analysis and control was estimated by consultants to be US$100 million in 1997, and was expected to grow in 1998. However, it is difficult to make an accurate evaluation. There are no official statistics and a significant number of services are provided by independent consultants who do not officially have activities in the area of soil remediation. This is especially the case outside of the state of Sao Paulo.

The most common soil and ground water contaminants are oil-derived compounds, essentially hydrocarbons. The principal sources of pollution are: pipe and tank leakage, inadequate solid waste disposal, mining activities, problems with effluent treatment, accidents during chemicals transportation and the previously tolerated practice of dumping liquid effluents directly in the ground through infiltration lagoons.

In the metropolitan region of Sao Paulo (M RSP), it is estimated that 1,000,000 tons of solid waste are inadequately disposed of every year in 116 dumps, of which 950,000 tons are class I and class II. Still in the MRSP, it is estimated that 80% of the 2,000 existing gas stations, the majority of which are at least 20 years old, have tank leakage problems. Finally 2,300 potentially contaminated industrial areas have been identified in the MRSP, of which 800 are abandoned. The industries concerned include chemicals, solvents and metallurgical industry, zinc plating, electric and electronic equipment.

Preserving the quality of underground water is an important issue in Brazil because it represents 60% of drinking water consumption (13% in the city of Sao Paulo) and because the quality of surface water is steadily decreasing. It is also an economic issue as the treatment of underground water is minimal and far less costly than the surface water treatment.

The main clients for soil remediation are in the chemical and petrochemical industry and in mining. The market linked to the industrial sector is bigger, and its relative importance with respect to mining is increasing. In the future, the client base is likely to get more diversified with the growing number of environmental liability requests.

In the industrial sector, the strongest demand for soil and ground water remediation comes from the state of Sao Paulo. The main clients are in the petrochemical industry, and include oil refineries and gas stations. The second most important region in the industrial sector is Rio Grande do Sul State, which has a strategic location

in Mercosul due to its proximity to Argentina. Bahia, Rio de Janeiro, Parana and Santa Catarina states are other regions to consider. The trend is shifting towards using the services of local companies as opposed to direct consulting from abroad.

In the mining sector, the two main regions are Minas Gerais and Bahia states. Mining companies have traditionally hired foreign companies for soil remediation.

The number of specialists (mainly hydrogeologists) with expertise in the field of soil remediation is still very limited in Brazil. Finding qualified personnel is one of the main difficulties facing the local companies.

The use of bioremediation is still very limited in Brazil, but is regarded as the future. The use of bioaugmentation is very strictly controlled.

The current knowledge and technological gap between Brazil and North America or Europe (estimated between 5 and 10 years) has been decreasing at a rapid pace since the opening of the economy, mainly thanks to technology transfer agreements.

The demand for soil contamination analysis and remediation is growing. This is due to the combination of a gradual establishment of international standards since the opening of the market (such as ISO 14000 and environmental liability requests), growing public awareness of environmental problems and stricter legislation, mainly in the state of Sao Paulo.

Nevertheless there is still a significant education effort to do in the industrial milieu. Because of their very limited knowledge, many companies facing a problem of soil or groundwater contamination are not in a position to choose a consultant according to technical criteria. According to the main market players, this makes price the main decision factor. However, this situation is changing gradually thanks to the influence of multinationals and the greater knowledge of recently graduated professionals in the client industries.

The demand, which up to a few years ago was mainly for mere pollution diagnosis is now evolving towards more environmental risk assessment and remediation. The case of organochlorate contamination by Rhodia in the state of Sao Paulo, widely publicized in the early nineties, contributed to increasing the demand for soil remediation.

**Legislation**

It is crucial to follow closely the progress of the legislation on soil and underground water, as it is on the verge of important changes.

A new federal law on environmental crimes, that better defines infractions and rationalizes sanctions, was voted in February 1998. Its coverage includes the state's natural hydric resources such as underground water.

At the state level, Sao Paulo is the most advanced. CETESB (pollution control division of the state government) is currently revising the environmental legislation to include a decree on soil and groundwater protection that should be signed by the end of 1998. Until now, the controls could only be done through claims. This new decree, supported by new norms on soil quality developed by CETESB, will be a much more powerful tool to penalize polluters. CETESB is also working on a new law on soil protection that it hopes will be voted within the next four years.

Other states such as Rio Grande do Sul, Parana, Minas Gerais, Rio de Janeiro and Bahia are likely to follow the example of Sao Paulo in a near future.

The growing importance of international norms and programs such as ISO 14000 and Responsible Care are other push factors for the companies.

Recently, the number of lawyers specialized n environmental law has increased.

On the long-run, the recently created basin agencies are likely to get a higher legislative power and to establish very specific regional standards an soil and underground water quality.

Finally, it is important to take note that bioaugmentation (addition of microorganisms) is still very rare and that the federal law requires the evaluation of its use on a case-by-case basis.

**Actual and planned projects**

In the State of Sao Paulo, CETESB is conducting several studies to support current or future legislation changes:

- it has created a state vulnerability map of the underground water aimed at determining the tolerance level to various contaminants.
- it has recently released an inventory of domestic solid waste, with an evaluation of the risks of water table contamination associated to the different dumps and landfills.
- it is mapping the contamination related to gas station leaks and studying its impact on existing population centres.
- since 1983, it has been involved in remediation of soil and ground water contaminated by hydrocarbons.

There are several research groups working on this field. The most important is in the Institute of Geoscience at USP (Universidade de Sao Paulo). They conduct studies on denitrification, the impact of toxic substances and ground water management. Other important research groups include the hydrogeology groups at UNESP (Universidade Estadual de Sao Paulo) and at the Geology Institute of Secretary of Environment the state of Sao Paulo.

**Opportunities**

The market of soil and underground water remediation in Brazil, still at an embryonic stage, is likely to experience a strong growth in the next 5 years for the following reasons:

- the legislation is about to become much stricter, especially in the state of Sao Paulo
- the number of big corporations and multinationals adopting environmentally--friendly corporate policies such as ISO 14000 and Responsible Care is growing
- environmental liability requests during merger and acquisition processes are becoming the norm.

**Constraints**

The financial aspect is the most important constraint in the sector of soil remediation:

- local partners are looking for companies that have some expertise in financial engineering - there is no official resource fund such as the Superfund in the United States to treat contaminated sites where the polluter has not been identified.

**Market entry strategy**

A number of local consulting firms are willing to make formal partnership agreements with foreign companies, preferably with some knowledge in financial engineering.

These firms also seek informal cooperation agreements, which are already very common, for two main reasons:

- it allows for technology transfer
- subsidiaries of multinational firms ask for a specific method developed in the country or region (i.e. generally United States or Europe) where they are headquartered.

It is strongly recommended to have a local representative for obvious cost-related reasons, but also because:

- the legislation varies greatly as explained above, and even the interpretation of the same legislation may differ depending on the region
- Brazil has regional climatical particularities that affect biological activities
- the risk assessment method that is becoming the norm in Brazil is specific, with a higher focus on impacts on human settlement
- it is very important to establish a presence and a reputation before the legislation is reinforced and the market grows
- Brazilian business culture requires frequent visits, long-term investment and cultural sensitivity.

Finally, because of the variation of the legislation on soil protection and health, the best strategy is to start by focusing on one state, preferably the state of Sao Paulo.

**Sources of Information**

CETESB (pollution control division of the state government of Sao Paulo): http://www.cetesb.br
ABAS (Brazilian Association of Underground Water): http://www.abas.org
Institute of Geosciences, University of Sao Paulo: http://saturno.ige.unicamp.br/