

## HAZARDOUS WASTES MANAGEMENT IN BRAZIL: THE NEED FOR A REGIONAL SYNOPTIC APPROACH

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### ABSTRACT

Hazardous wastes management in Brazil is a particularly difficult task to accomplish. The country's enormous area, the lack of tradition on dealing with this subject, few trained people, the high investment costs and the sophisticated technology involved make the regional management of hazardous wastes a mandatory approach to reduce costs and maximize benefits. In order to achieve this goal, a synoptic approach over an entire geographical region on all aspects of hazardous wastes management is proposed. On the other hand, several difficulties are foreseen, some of them in the socio-political arena, requiring a lot of an environmental diplomacy and competent social communication in order to succeed. Despite the difficulties, there seem to be no options to deal with this problem when simultaneously considering its environmental, technical, and economic aspects.

### KEYWORDS

Hazardous wastes; Brazil; regional management; interstate wastes transfer; environmental diplomacy; environmental politics.

### INTRODUCTION

Even in the industrialized countries the hazardous wastes problem is a recent issue. If the 60s and the 70s can be considered, respectively, the water and the air pollution decades, then the 80s should be known as the hazardous wastes one. In Brazil, only the second half of the 80s saw a more intense move to hazardous wastes control. From this period are the Regulations 06/88 and 13/87 from the National and the State of Bahia Environmental Councils (CONAMA, 1988; CEPRAM, 1987), respectively, besides the standards from the Brazilian standards association on hazardous wastes management. At the same time, the problem surfaced via the media, environmental pressure groups, and State environmental agencies, emphasizing the lack of proper strategies and facilities to deal with the situation.

Due to the concentrated nature of Brazilian industrialization, most of the hazardous wastes generated within the country are found at a small number of places. São Paulo, Rio de Janeiro, Salvador, Porto Alegre, Belo Horizonte, Curitiba, and Maceió metropolitan regions plus a few other

industrial estates concentrate most Brazilian hazardous wastes. There are only 5 or 6 hazardous wastes incinerators in operation in Brazil at present time, and quite a few hazardous wastes landfills. To make things worse, most of them are dedicated to deal with hazardous wastes from the companies who built them. Only one or two accept wastes from other industries, under lower priority schemes.

On the other hand, federal and some states' legislation is requiring proper hazardous wastes management schemes for new or renewed permit applications. As individual solutions are almost always economically prohibitive to small or medium-sized generators, an environmental impasse is created. This background generates the favorable conditions for the tentative adoption of the hazardous wastes regional synoptic approach.

## BRAZILIAN GENERATION OF HAZARDOUS WASTES: AN OVERVIEW

### Large Continuous Generators

Under this designation are the States of: São Paulo, generating 820,000 t/y of hazardous wastes from its chemical and petrochemical complexes, steel mills, foundries, metallurgies, leather tanning, pulp and paper, and 57,000 miscellaneous industries (Magalhães, 1990); Rio de Janeiro with a diversified industrial park (metallurgy, oil refining, chemical and petrochemical processing etc.) and home of the fourth Brazilian petrochemical complex, presently being designed; Bahia, producing around 80,000 t/y of hazardous wastes from a large petrochemical complex, oil refining and chemical processing facilities, and metallurgies; Minas Gerais, contributing with a large metallurgic complex, chemical processing, and manufacturing industries; Rio Grande do Sul with its petrochemical complex, oil refining, chemical and leather industries; Alagoas generates most of its hazardous wastes at the chlorochemical complex and associated industries; Paraná and Santa Catarina have a fairly more scattered pattern of industrialization, the same occurring with their hazardous wastes.

From the above picture it can be seen that about 70% of all Brazilian hazardous wastes are generated in the Southeast and South regions (States of Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Paraná and Rio Grande do Sul). The Northeastern States (among whom are Bahia and Alagoas) may contribute with some 20% of the total, leaving the remaining 10% to the rest of Brazil in a very scattered point sources pattern.

### Small and Medium-Sized Continuous Generators

This group of generators may produce up to 5 t/y of hazardous wastes and are spread all over Brazil, although maintaining a geographic and numerical pattern similar to that one of the large generators. Despite the lower quantities individually involved, this situation can pose significant occupational and environmental impacts due to the ignorance of their producers, improper location of the facilities, and their big number. Among typical generators of this group are those that have old PCB-filled transformers, laboratories, small solvent and paint users, metal plating facilities, electronic parts industries etc.

### Occasional and Accidental Generators

Under the first designation are those facilities that produce hazardous wastes in a discontinuous way, between large time periods - e.g. once or

twice a year -, and residues generated from old medicines disposal, and pesticides and drugs apprehension actions. The second group is exemplified by clean-up operations following accidents involving residues or hazardous chemicals. These are usual situations, although quite often not recognized as a hazardous wastes generating operation. It is foreseen that its percentage of the total will increase with the improvement of the environmental and sanitary enforcement actions. The geographic and quantitative distribution is similar to the one of the large generators, except for the pesticides that have a stronger importance in the states with large agricultural activities.

## STATUS OF HAZARDOUS WASTES MANAGEMENT IN BRAZIL

### Clean Technologies

Reflecting its short history there is no systematic approach to develop, search, stimulate, and disseminate "clean technologies" as the first step towards environmentally acceptable hazardous wastes management. This approach is informally practiced, however, in those States having well established permit application services and environmental impact assessment procedures. These situations cover only the big projects, leaving without assistance a large number of smaller productive processes.

### Recycling

This technique is a little bit more practiced in Brazil than the previous one. The high treatment or disposal costs and the eventual revenues gained from direct recycling or the selling of the hazardous wastes to other companies can explain this performance. In fact, there are three or four hazardous wastes interchange schemes, most of them managed by industrial associations.

### Hazardous Wastes Awareness

There is a reasonable theoretical knowledge of this subject among white collar employees from the bigger Brazilian and foreign companies. Most of the few specialised people were trained and worked initially for the Government, leaving later to private industry due to the high turn-over in the Public Service. The University is almost apart from this very important environmental challenge, not offering specialized training nor researching it. The big newspapers, magazines, and the more important TV networks cover the subject frequently, helping to shape a concerned public opinion.

### Legislation

Hazardous wastes are addressed via the recent and environmentally advanced national and states' constitutions and through federal - e.g. the National Environmental Policy Act from 1981, as amended in 1989 - and state acts. There are also specific regulations from the national and state environmental councils. From the former is the Regulation 06/88 (CONAMA, 1988). The state of Bahia's Environmental Protection Council - CEPRAM - issued the most detailed and strongest Brazilian piece of legislation on the subject (CEPRAM, 1987). It is also mandatory to mention the importance of local legislation, greatly emphasised by the Brazilian constitution, as an additional source of legal requirements to be dealt with.

### Enforcement

This is certainly the biggest problem in the management of hazardous wastes in Brazil. Apart from two or three states, all the rest of the Brazilian environmental agencies are under severe personnel and financial constraints, making the legislation enforcement a real challenge in such an enormous country. The combination of this problem and the lack of information from the generators make the right mix for improper management of hazardous wastes.

### Facilities for Hazardous Wastes Treatment and Disposal

One of the greatest difficulties of the the Brazilian hazardous wastes management system is the lack of a sufficient number of adequate facilities to treat and dispose these residues. In fact, a large portion of São Paulo's hazardous wastes are not properly disposed, a situation that is not so different from other Brazilian States.

Despite some operational difficulties, an interesting experience is that of Bahia's CETREL company, specialized in solid and liquid hazardous wastes management. It is in charge of the hazardous wastes final disposal from the Petrochemical Complex of Camaçari, Aratu Industrial Center, and other industries. Owned by the state of Bahia and by private industries, it has operated with hazardous wastes since 1985 and is scheduled to be privatized soon.

A new and promising approach is the recent awareness of the private sector to see hazardous wastes management as a business opportunity. Examples of this scheme are: a hazardous wastes landfill in São Paulo's metropolitan area jointly being planned by two traditional Brazilian sanitary and environmental engineering companies (Magalhães, 1990); a hazardous wastes landfill under operation in Rio de Janeiro; the trend/practice of chemical industries and cement factories to incinerate other companies' hazardous wastes under payment in their dedicated incinerators or rotary kilns - São Paulo's Hoechst is making US\$ 9,000 a day with this business (Militello, 1990); and the existence of some hazardous wastes recycling companies.

### Trends

There is a strong move towards better environmental management practices in Brazil. As a part of the problem and as one of its most public-sensitive issues, hazardous wastes management will be under close public opinion scrutiny in the years to come. The subject is to be treated in a much more professional way by all groups involved.

At the same time, the hazardous wastes debate is to become much more complicated than it is now, demanding a competent management of all associated problems.

### LEGAL-SOCIO-POLITICAL QUESTIONS CONCERNING HAZARDOUS WASTES MANAGEMENT IN BRAZIL

Permeating and enveloping the difficult technical questions about hazardous wastes management are the even more intricate legal-socio-political ones. In this arena sometimes decisions are made that pose risks to the environment and society as a whole. Even more serious is the fact that decision-makers are not aware of it.

### NIMBY in Brazil ?

The NIMBY (from Not In My Back Yard) syndrome seems to have arrived in Brazil already. It has two aspects: almost all informed people recognize the need for adequate hazardous wastes management, including their final disposal options (landfills, incinerators etc.); on the other hand, only a few citizens would accept these facilities close to their homes, offices or farms. An impasse is created. In fact, it is an archetypical attitude that emerges with the recognition of the risks associated with hazardous wastes management.

A Brazilian version of NIMBY could probably be called NIMSE: Not In My State. The Goiânia radioactive accident is a classic example of this attitude. Following the clean up, a big fuss agitated Brazil: where to dispose the radioactive wastes. Several options were studied with no conclusions. Nobody accepted his State as a place for the final disposal of the "hot stuff". The federal government tried to choose a place for a "national landfill". As a consequence of the strong socio-political opposition, the problem was widely discussed by the Press and in the Congress, the federal government decided for a more "democratic" option: a landfill in each State regardless of the environmental constraints. There was no agreement either. The radioactive waste still lies in a temporary disposal facility specially built close to the city of Goiânia. In this situation -as in many others- the socio-political components of the problem predominated over the technical ones.

Another famous situation involved the State of Bahia as the chosen place for the final disposal of the radioactive wastes from the Angra dos Reis nuclear power plant, situated in the Rio de Janeiro State. The chosen area seemed perfect from a strictly speaking technical point of view: it is almost uninhabited, has a very low rainfall and semi-arid weather, and is low-cost land. As soon as the press published the studies of the federal government recommending the Raso da Catarina area as the radioactive wastes site, the state environmental council -CEPRAM- passed a resolution banning the disposal of this kind of waste in the state territory. There were at least two strong reasons for this reaction: the Raso da Catarina is a conservation area with a very peculiar fauna and flora, housing the endangered blue macaw species; and a long standing regional resentment between the poor Northeast region and the rich Brazilian Southeast. The proposal was seen as leaving the benefits -nuclear-generated electricity- in the Southeast and exporting one of its biggest associated problems -the radioactive wastes- to the Northeast. The obvious conclusion: NIMSE - Not In My State. There is no solution to the problem so far.

In both situations the reactions to federal government's original proposals were not environmentally adequate. On the other hand, the original proposals were strongly unfair, poorly announced to society, and had no benefits that could counterbalance the environmental impacts -lower electric energy costs, for example. It was a typical "you get all the benefits and we the socio-environmental impacts" approach.

### Environmental Legislation

The Brazilian constitution of 1988 is considered to be one of the most environmentally advanced in the world. It devotes an entire chapter to the theme and grants constitutional status to the maintenance of a balanced environment and to pollution control activities. Another innovation is the establishment of the so-called "environmental crime", that opens the possibility to send a polluter to jail.

Following the promulgation of the federal constitution, each state passed its own constitution, pressing even further on environmental subjects. Almost all states dedicated a chapter of it to increase and specify their own requirements about environmental protection. One of the important features of several state constitutions was a noted awareness about radioactive and hazardous wastes interstate transportation. In many cases this practice is strictly forbidden. The prevailing attitude supports that each state has to solve its own wastes problems, an intrinsically fair approach at first, although not necessarily a socially and environmentally safe one. As an example, it can be said that there are some Brazilian states that may have no adequate areas to dispose radioactive wastes, based on demographic, environmental, and safety criteria.

The last stage of this process lies with the municipalities, that also promulgated their fundamental legislation, adapting it to the federal and state constitutions. One important aspect of this legislation is the full recovery of municipal autonomy, generating one more level of environmental control via permitting and enforcement actions. This can be clearly exemplified by the banning of ethanol as a car fuel in the city of Salvador by the city council, although approved to be used in the rest of the state.

Besides all this major legislation, there are also the routine laws passed by the National Congress, the state House of Representatives, and all marginalia, represented by the rules and regulations approved by national, state, and municipal environment councils.

As can be seen, legislation can impose severe difficulties to the management of hazardous wastes in Brazil or effectively protect the environment and society. It only depends on how the question is addressed.

#### AN ALTERNATIVE TO HAZARDOUS WASTES MANAGEMENT IN BRAZIL: THE REGIONAL SYNOPTIC APPROACH

##### Theoretical Considerations

It is not an easy task to deal with such a complex situation. There are so many variables of different nature that no single model can claim to solve it in a straight-forward way. Brazilian inflation is a clear example of how theoretically well conceived models are quickly dismantled under real-life situations. Despite the difficulties, it seems that there is no option than to face the challenge and try to solve this important environmental problem.

The proposed synoptic approach consists basically in managing the hazardous wastes problem over an entire region, regardless of political boundaries and taking full advantage of environmental capabilities. This is the ideal situation, however. It is almost impossible that the environmental decision-makers would have so great a freedom in practical situations. It will be necessary to negotiate, to practice environmental diplomacy, and guarantee whatever will be possible in each circumstance.

Supporting the regional synoptic approach is a fundamental idea: there is a threatened **ecosystem**, politically organized as a **federation** of states that constitute the Brazilian nation. The very peculiar interconnected and broad nature of the question requires a similar solution: a synoptic or holistic attitude, where the parts are less important than the global, although having their needs carefully considered.

To increase its probability of success the synoptic regional approach is proposed in a very flexible way, allowing for adjustments to diverse regional situations.

The main goal of the synoptic approach is the achievement of a regional environmental satisfaction, where all involved parts - or at least a major group of them - will recognize a fair solution to the hazardous wastes problem. It is obvious that a creative compensation scheme has to be created, in order to counterbalance the impacts generated to the more affected groups e.g. those people living close to a landfill or an incinerator.

#### A Tentative Regional Synoptic Approach to Brazil

To the North and Center-West regions of Brazil the first step towards the regional synoptic approach seems to be the establishment of one or more company(ies) specialized in hazardous wastes management for each region. Several financial arrangements can be tried to organize the company, ranging from a completely private enterprise to a state-owned one, plus all the intermediate alternatives as a state-contractors-generators scheme. Regional characteristics will finally dictate the better organizational model for each circumstance.

The company's main role will be to offer hazardous wastes management services to industry and government. These services will cover the identification of the wastes, its handling, recycling, packaging, eventual transportation, treatment, and final disposal. It should be a "problem-solving" company, looking for new customers, supporting the old ones, and working in close connection with the environmental agencies.

Things are easier in the Northeastern region due to the pioneer experiences of CETREL and CINAL in the states of Bahia and Alagoas, respectively. They are companies specialized in liquid and solid wastes management, and their experiences can be seen as prototypes of the regional synoptic approach in smaller areas. It is also reasonably easy to expand their services to other areas within the same state, as is currently under way at CETREL.

In the state of Bahia there are also some examples of the above mentioned flexibility of the model. Big generators have their own hazardous wastes landfills and incinerators. All the rest of the companies prefer to use CETREL's facilities.

An interesting feature for the proposed companies could be a network of collecting and temporary storage facilities spread over its operational area. It will reach the most generators and will reduce transportation costs.

The Southeastern and Southern regions, as the main generators of hazardous wastes, can have several alternatives in establishing their great number of needed facilities.

Five or six multipurpose/multiuser facilities strategically located seems to be sufficient to cover Brazilian need for hazardous wastes treatment and final disposal services. There will also exist the facilities of the big generators that may want to solve their own hazardous wastes problems.

A promising attitude to facilitate the always polemic interstate hazardous wastes export/import activities could be the interchange of residues. Under this scheme a state could send its wastes to a neighbour state that has an expensive and sophisticated facility e.g. an

incinerator, while receiving another kind of residue it can safely dispose, treat or recycle.

When the problem is the incineration of hazardous wastes and there are severe socio-political difficulties to practice interstate hazardous wastes export, a mobile incinerator can help to solve the problem within the state where it was generated.

#### CONCLUSION

The flexible and holistic nature of the regional synoptic approach to hazardous wastes management takes full advantage of the capabilities of the environment and encourages the practice of environmental diplomacy. At the same time, the high investment costs can be shared, making it possible for society to have facilities that otherwise would have been prohibitive to build. All these features makes it a strategy worthwhile experiencing, despite several foreseen difficulties.

#### REFERENCES

- Conselho Estadual de Proteção Ambiental (1987). Resolução no. 13 de 29 de julho de 1987. Diário Oficial do Estado da Bahia, 1 e 2 de agosto de 1987, 1-13.
- Conselho Nacional do Meio Ambiente (1988). Resolução no.03, de 16 de março de 1988. Diário Oficial da União, 16 de novembro de 1988, 22123-22124.
- Magalhães, N. (1990). Indústrias admitem gravidade da situação. Saneamento Ambiental, I, no.2, 20-23.
- Magalhães, N. (1990). São Paulo é recordista na geração de resíduos. Saneamento Ambiental, I, no.2, 18-19.
- Militello, K. (1990). Lixo gera receita de US\$ 9 mil ao dia para a Hoechst. Folha de São Paulo, 12.09.90, F-4.



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