A MODEL OF WORKFLOW FOR DESTINATION RESIDUES FROM MANAUS FREE TRADE ZONE

Nascimento, Wanessa da Costa

Pinto Azevedo, Marlise

Monteiro, Maria Carolina da Costa

Silva, Ocileide Custódio da

Nascimento, Waleska da Costa

Vieira, Raimundo Kennedy

Abstract: The Manaus Free Trade Zone is comprised of a manufacturing park, all located in Manaus (Amazonas State in northern Brazil). This economic model has not a plan for destination of industrial residues. The aim this work is proposing a model with an integrated solution related to industrial residue management.
Keywords: Amazon, sustainability, residue management.

1. Introduction

Suframa (Superintendence of the Manaus Free Zone) is the governmental agency created by decree-law no. 288 on 28th February 1967, which is responsible for investment promotion with the responsibility to identify economic alternatives attracting businesses to the region aimed at generating employment. However, after almost 45 years of existence of the Manaus Free Zone, the industrial hub which is concentrated a large industrial belt has no a strategic plan to measure the solid residues production from more 500 companies located at Manaus industrial belt. It's important to recognize that actions need to be developed in order to cover in a master plan for a strategic planning tool supporting a conscious disposal of solid residues of Manaus city. This industrial zone is much diversified: electronics parts, publishing and printing, soft drinks and concentrates, non-metallic minerals, chemical, pharmaceutical and others. Due those large options it's obvious that thequantity of solid residues is growing up each moment. The city of Manaus has a space limit for landfill (A Critica Newspaper). According to Semulsp (Municipal Government Autarchy for Public Utilities, 2010) the amount of solid residues increased 38% over the past six years meaning that until 2021 there will be a huge limitation of the residual deposits at the Manaus region. The annually data show that the total amount residues collected in Manaus was from 972.000 tons to up 1.98 million of tons. By day the city of Manaus produces three tons (Semulsp, 2010). It' possible to conclude that each person who lives at city produces 1.2 kg per day of residues(Semulsp,2010).

According to World Health Organization (UNDP, 1998) waste is "anything that the owner has no more interesting at a place or point and has no commercial value." However, it has a segregated solid residues with a proper on rational at origin (companies or homes) to be used in a future at recycling process certainly this residue will be transformed to raw material to use at industry or other manufacturing processes with commercial value established by market recyclable. This is the main idea that needs to be matured and developed for the Manaus region: the standardization of a procedure with a local legalization of methods with planning for industrial solid residues based at sustainability conception creating a potential third option sectorfor the local development of the Manaus Free Zone.

Based on this scenario, thisarticle aims to design a model of workflow for destination residues from Manaus Free Trade Zone with a systemic solution of industrial solid residues. Regarding with a literature review focused on this issue with a synergy and development of new alternative and sustainable methods. The classification methodology has two stages: the first one is applied for the nature of the research with taxonomies presented by Santos (2005) and Vergara (2003). For the second step involves the description of the steps of the methodology applied to research.

2. Strategic Planning

The guideline follows with the relationship between strategic planning as a result of a development based on sustainable competitiveness for ZFM. Then, it has a large emphasis on the master plan for solid residues for application in industrial necessity by specifying it in concept, description, importance of partnership and its implementation in the project's feasibility. In the third part is the explanation of the benefits and challenges faced by a green industry, highlighting the participation of state and society to this new horizon challenge. The conclusion exposes aplausible sustainability aimed at new perspectives.

2.1 The Solid Residues Management

According to Demajorovic (Brollo& Silva, 2001), the solid residues management is divided on three stages on developed countries. At the first phase, which includes the 70’s years, it had only solidified waste disposal. The greatest advances of this decade were the elimination of most of the opened deposits in Western Europe together with the destination of all residues to official landfills and incinerators. The second phase relatedthe 80’s, characterized by prioritizing the recovery and recycling of materials, through the establishment of new relationships between consumers, distributors and producers, guaranteeing, at least, part of one of the recycling process. After 80's, as the third phase, the attention is focused to reduce the volume of solid residues. The main propose is before thinking about the destination of the solid residues it’s important to

think to avoid generatingthe residues. Before thinking of recycling, is thought to re-use of materials requiring less energy.

Specifically in Brazil, there is alaw focused on the solid residues management: National Political Solid Residues Law (PNRs) under identification 12.305/2010approved by August, 2010. The text of this law shared someinnovations, such a creation of master plan for solid residue management.There isa requirement thatthe government could makeadiagnosis andmonitoring the flowof residues. This is an expectation that requirements an energy encouragingrecycling andrecovery of residues among other measures.
The idea of a strategic planning management of such residues takes into account various aspects and important points in managing this type of raw material still out of production, one example is the establishment of the Balance of Mass (versus raw material residue), the second classification of residue market value determines a framework for technical staff (professional subject matter experts), application of a residue inventory and the participation of lead in environmental agencies in discount shares in the environmental permit (Division for Sustainable Development United Nations, 2001). Figure1 shows a definition of the flow balance in order to improve the efficiency in the management of the materials on economic and environmental terms; it means the conception of eco-efficiency (Kraemer, 2005).

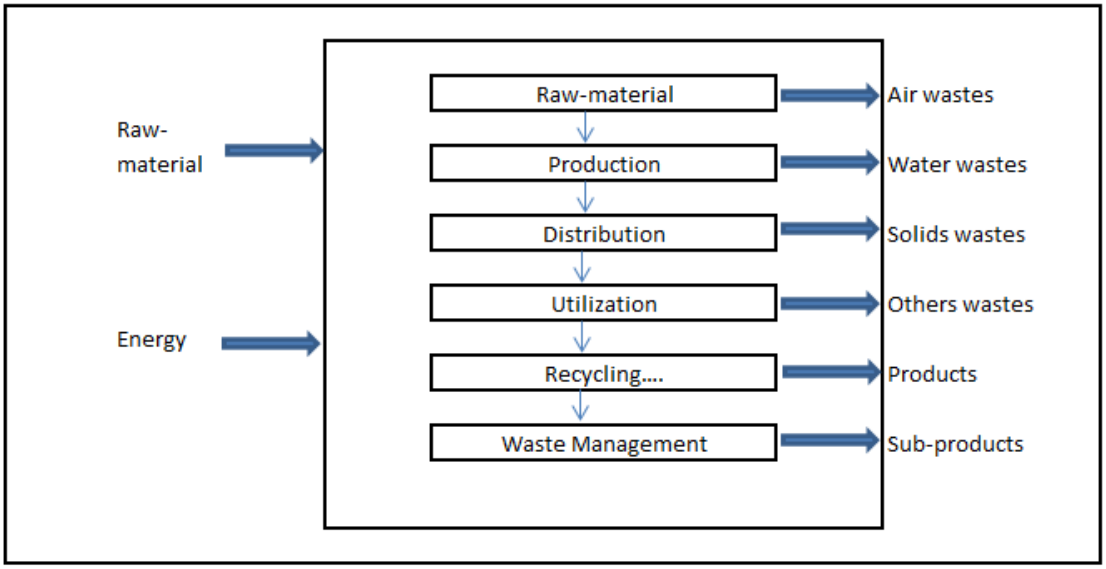

Figure 1.Definition of systems and subsystems for Balance of Mass. Source: Soares (2003).

2.2 Strategic Planning and Recycling

Recycling is a rational choice model to grow up the city of Manaus. Recycling is still defined as the process of reusing solid residue once upon a time that the components are separated, processed and retrieved, involving savings with raw materials and energy, combating waste and reduction of environmental pollution with change of ideas and concepts (UNDP, 1998). All these actions were initiated with procedures in selective collection industry, support and subsidies to scavengers of all sizes, promoting programs with suggestions of tax benefits that can be stimulus in the contribution of directors and initiatives in environmental education site. It seems to be difficult steps but it can make all the difference on the process to create of a center specializing in a model of 3R's - Reduce, Reuse and Recycle.

Gonçalves (2003) classifies the process into three stages of the production chain of recycling: the recovery, which includes the processes of separation of residue at origin with selective pick up, pressing and baling; the revaluation, which includes the processes of processing of materials such as milling and extrusion and, finally, the transformation that is recycling itself, transforming the materials recovered and revalued on a new product. The recycling cycle was optimized with the concentration of all these steps in the same region avoiding the transport of material over long distances to be industrially processed, which can be achieved with the installation of centers for recycling.

2.3 Strategic Planning: results of a development based on sustainable competitiveness

The companies also need to be flexible to adapt to changing environmental conditions. (Wang and Li, 2006). Thus, innovation leads to new guidelines and dictates of the consumer market. The ability to alternate in unpublished ideas or follow the latest trends at any given time defines the concept of globalization. Mission, values, objectives and goals are organizational attributes already known, but they are increasingly involved in social responsibility and energetic participation in the reduction of environmental impacts. The incorporation of unorthodox methods and more forward-looking, holistic, integrative, and systemic - all inherent in strategic planning - emphasizes the construction of a consistent and highly sustainable, differentiating at the time of competition (Dias Calaes, 2006). The concern to demonstrate to consumers that attention is also voted for the issues of revitalization and preservation alternative is a strategy that pays off, profits and consolidation of the organization. Importantly, the tool of strategic planning need is based on public policy and private. For Goncalves (2003), the state's role is exercised, against society, which is to discuss, propose demands to the government and take control of society. According to Dias Calaes (2006), decision-making must be supported in situational analysis and structural factors (technical, operational, managerial and economic) and systemic (legal, institutional, environmental, infrastructure, fiscal and financial). The actions and

reactions need to be supportive of a fierce competitiveness, creating a healthy and sustainable economic rational. The most important thing is to prospect and secure a viable model extending the benefits already guaranteed to the region and complementing them with others too. Environmental issues can and must be supported by theories administrative, managerial and strategic contribution to a better process. The Figure 2 illustrates a systematic flow of strategic planning for their development based on private and public policies statements.

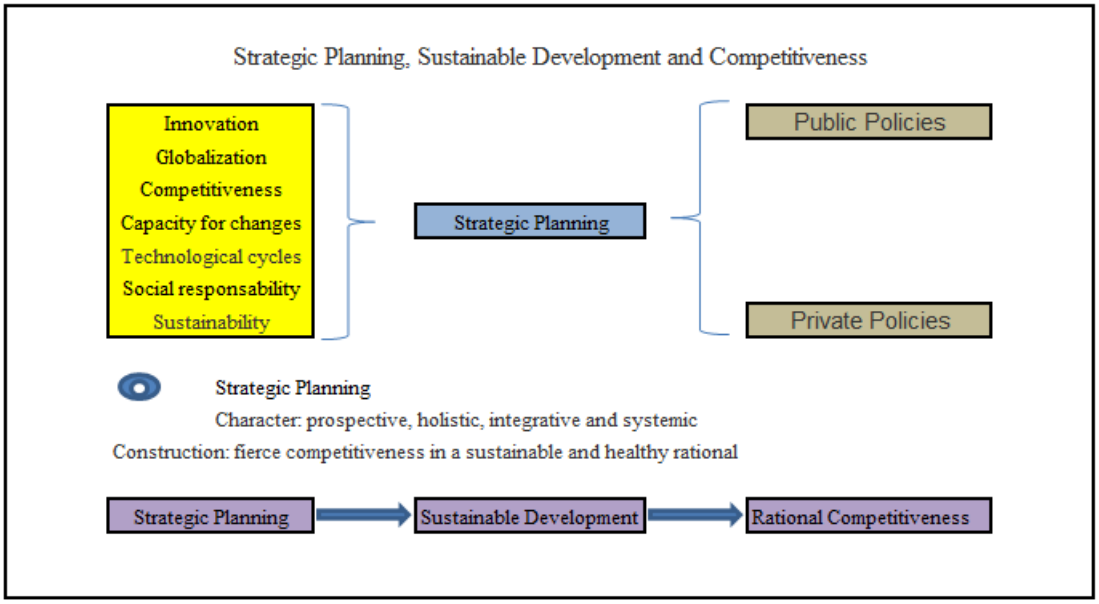

Figure 2. Strategic Planning, Sustainable Development and Competitiveness. Source: Adaptation Dias Calaes, 2006.

2.4 The Strategy for a competitive for a green industry

All planning and assertive management strategy should understand each other all plans, programs and projects through a process of analysis of different factors that affect the competitive position of the market in the most different perspectives and time profiles: small, medium and long time .In detail, there are aspects, such as (Dias Calaes, 2006):

- Intrinsic: factors regarding decision of the administrators: innovation, changes profile, development, production and human resources, among others.
- Extrinsic: macro factors involving economics, politics, institutions, regulation, infrastructure and society where there is a certain range of the process.

Based on this assumption, the planning process, which the management of residue from Manaus Free Zone is concentrated, bases on the analysis of external and internal environments prospecting the context of a scenario in order to complete gaps in the process are minimized. Intrinsically it have questions of how to support the need for increased treatment and disposal actions of domestic industrial waste, increasing a greater incentive to create an adequate system of internal management of industrial

waste to developing a better understanding of the reality of the disposal outside of industrial residues. It's important to encourage the use of pollution control plants. Extrinsically, there are challenges of how to develop an understanding of the real conditions of service companies assertively to ensure waste disposal and optimizing the business environment for the disposal of industrial residue.
It's important to note that such factors are also linked to aspects of strength and weaknesses, and thus correlated to opportunities and threats from unknown points in the development of a possible new industry based on sound and consistent economic sustainability. Alongside all these administrative questions of how to structure the organizational form, update management tools, strengthen and provide greater specification of standards and strengthen the ties between government, residue generators and service companies in the area.
The Figure 3 shows the analysis of internal and external environments front of the master plan for residue. Dias Calaes (2006) argues that strategic planning is also helping to expand the discipline of projection and long-term forecast, as well as to disseminate a learning process, interaction and negotiation at all levels.

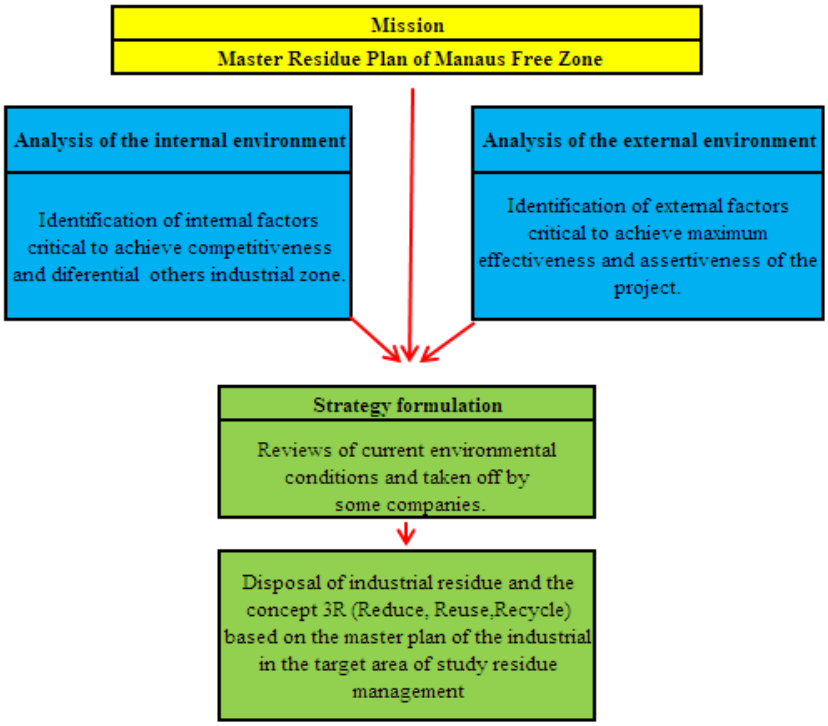

Figure 3. The Competitive Strategy and Sustainable. Source: Adapted of Dias Calaes (2006).

3. The Context of the PIM and the role of JICA

Manaus Free Zone is one of the most modern industrial parks in Latin America. It brings together approximately 550 plants generating 100.000 direct employees and over 500 000 indirect employments. It is certainly a complex national and international

economic hybrid. The economic wealth and development brought to the region are indisputable; however, there are points in the model that need to be adjusted with the most severe attention and management. On an imminent, there is the amount of residue produced by all the industrial production. This point led to the Brazilian Cooperation Agency (JICA) and Suframa firm a technical cooperation agreement in order to evaluate the current conditions of handling and residue management industrial at Manaus Free Zone. It is worth mentioning that this partnership involves the Federation of Industries of the State of Amazonas (FIEAM), Center for Industry of the State of Amazonas (Cieam) and JICA.
The main idea is to develop an expertise for the use of industrial residue which until now is not valued and is treated as scrap. Data published in the T & C Magazine Amazon (IX Year - Number 20 - 1st Semester of 2011) show that this study has been completed and is already being implemented. According to the coordinator of Engineering and Architecture Analysis Project at Suframa, Mr. Luiz Flavio Brandao Simoes, the study was finalized and is being implemented. "*The project in question (the study) can be considered complete, since the goal was the formulation of the Master Plan with proposed actions to improve the management of industrial redisue from Manaus Free Zone. Currently, there has been implementing the project and the Suframa with IPAAM (Public Government Agency), in partnership with residue generators and managers (private). Suframa has been carrying out the action that seeks to understand and consolidate the data treatment and disposal of residue generated in Manaus Free Zone, to ensure that all factories in operation and deliver their inventories of industrial solid residue in a standardized and timely that is, every year. To this end, Suframa has made the spread of software for database Residue Inventory, which should be official by the state environmental agency in 2012*,informed him.

The goals contained in the JICA established a pattern of an environmental management structure to a proper disposal officer in relation to the guidelines, and monitoring engine adjustments. As publication (News Letter Version 1.Suframa, 2010): "The study was implemented through the actions described above and aims to establish an adequate system of industrial residue management at Manaus Free Zone. For this purpose, the following goals have been met: 1. The establishment of management, treatment and proper disposal of industrial residue by generating sources (factories and companies, etc...), 2. The establishment of an adequate system of disposal of industrial residue released by generating sources, 3. The establishments of an administrative and organizational structure to promote, guide, monitor and regulate the points 01 and 02.

To achieve these goals, it was necessary to do the questions: 1. How to understand the actual conditions of industrial residue generation sources (factories, etc...)? 2. How to establish a system of disposal of industrial residue? 3. How to define management tools of industrial residue? The "Figure 4 shows a standard model of an establishment of an adequate system of industrial residue management.

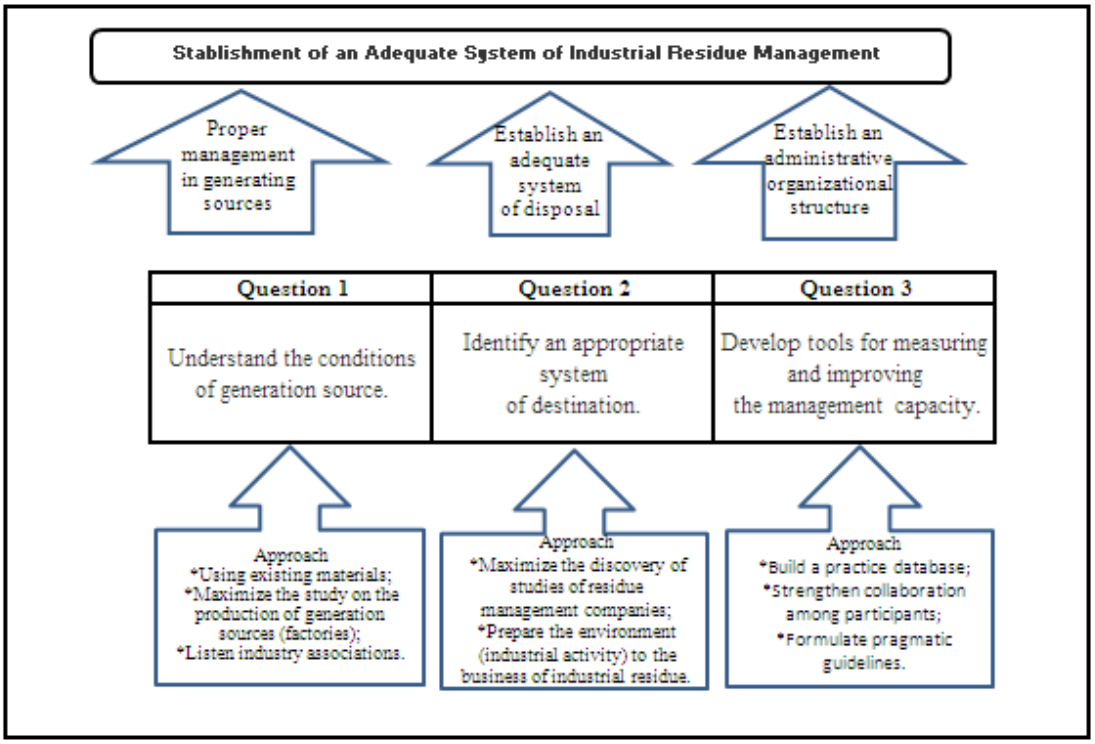

Figure 4. Appropriate System for Industrial Residue Management. Source: Suframa, 2010.

According to information published on the Integrated Study for the Development and Solution for industrial residue management of Manaus Free Zone (JICA) all the technical survey and mapping to a specific profile obeyed the Manaus industrial residue questionnaires, interviews and technical visits in 457 local factories. This study also was based on an understanding of practices have not yet consolidated investigating flows consistent with and inefficient residue plan as an option for a promising new entry into a sustainable journey.

The Master Plan for Industrial Residue Management is essentially a prospecting plan vigorous action in five years (deadline 2015) which defines the appropriate procedures of the collection industry and further establishes the proper procedures for collecting treatment and disposal of residue based on the overriding principle of the 3R's (Recycle, Reuse and Reduce) minimizing negative impacts to the environment. So actions should be taken to resolve issues still being discussed as the need to clarify the practices of this master plan, the absence of a properly licensed landfill for industrial focus, administrative inconsistencies and fill gaps in order to improve the business environment where services companies operate residue. Thus, this master plan creates an appropriate system of environmental management of industrial residues in Manaus indicating improvement solutions to solve the questions.

There is also concern in creating the parameters for the system and manifest the residue inventory ensuring the disposal of industrial residue and strengthening of the master plan through training, regulation and cooperation between those involved. It also influences the cooperation of a culture in a business environment and practices that

gradually eliminate the improper disposal by promoting best practices. Alongside this, the master plan encourages companies to do procedures incorporate highly sustainable techniques, educating them on environmental molds already correct. There is also a proposal for a master record, or an integrated system of shared information that can be monitored by the inspectors about the amount of residue being handled internally (in factories) and externally (by service companies contracted residue). This information available in time becomes a facilitator in the construction of public policy, urban mapping, continuous improvement and strengthening of sustainable projects.

The objectives proposed by the JICA begin from the review of current conditions of the industrial residue management in the Manaus Free Zone and its environs to the compilation of results in report form. There is also the bringing of formulating a master plan for industrial residue management in Manaus Free Zone (a plan for five years meaning from 2011 to 2015) and draft guidelines for improving the management of industrial residue. Regarding the final goals, the JICA provides the proper disposal of industrial residue and 3Rs (Reduce, Reuse, Recycle) based on the master plan for a management in the target area of the study with the establishment of proper disposal of industrial residue. It also proposes to reduce the improper disposal of industrial residue minimizing environmental impacts and achieving the above objectives, both domestic firms and foreign firms will be encouraged to come to the Manaus Free Zone and create new employees opportunities.

4. The propose of Strategic Plan of Residue (SPR)

Based on scenario with missions, objectives and targets are possible to formulate a strategy for industry residue management. Starting with the current reviews of specific environmental conditions and adopted by some companies and formulating a concrete plan, there is ease of implementation of this project which will acquire a sense of unity and direction of a green industrial purpose. It’s possible to check through the Table 1.

Table 1.Strategic Plan of Residue (SPR)

Civil Society Organisations	Public Institutions	Private Institutions

* Environmental Awareness; * Participatory Education; * Encouragement of joint socio-environmental programs; * Universal service delivery; * Reduction in residue generation; * Establishment of paradigms in the division of responsibility of the environment; * Implementation of voluntary processes in residue treatment.	* Involvement of political actors: executive legislative and civil society; * Identification of appropriate technologies and intelligent the reality of society; * Approval of laws, rules applied to the management of industrial residue; * Participatory planning for the control social and environmental continuity of action; * Supervision of management and implementation of plans established policies; * Disclosure of data and statistics about socio-environmental work; * Strengthening institutional and regulatory framework; * Promoting economic sustainability and fostering reuse, recovery and recycling.	* Contracts specialized companies in services of general interest; * Preponderance in generation schemes competition; * Development of procedures to provide employability in the economy and environmental solutions; * Possibility of partnership with other sectors, promoting environmental stewardship; * Cooperation with socio-environmental policies existing; * Focus on the outcome of activities - environmental protection; * Development of disseminating agents education on waste management.

Source: Authors

5. The benefits and challenges of green industry

There is importance of a strong and effective sustainability for the Manaus region, since the industrial zone based on legal rulings which have terms to be expired someday.The Table 2 shows a picture of the benefits for each of sustainable development according Fleig (2000), Veiga (2007) and Lowe (2001). The social side is represented by the communities and the government while the economics side relates to the companies and industries.

Table 2. Potential benefits to the community, environment and enterprise with the development of industrial park zone

Community	Environmental	Companies
Expansion of locally business opportunities	Continuous environmental improvement	Improved profitability
Increase the tax base (benefit for the government)	Consumption of natural resources	Improved corporate image in the market (green image)
Development of community pride	Reducing the amount of residue into the environment	Access to new layers of the market

Reduced costs by eliminating residues	Innovative environmental solutions	Improved environmental efficiency
Improvement of environmental health	Increased production of natural systems	Easy access to funding
When constructing sustainable industries, to create sustainable employees	Development of environmental technologies	Reduced vulnerability of the industry partners network
Improved health of employees and the community	Recovery of brown fields (sort of industrial landfills)	Competitive advantage: increased presence and market leadership
Environments and improved habitat	Reduction of air pollution, water and soil	Reduce operating costs (energy, materials and water)
Creating an economy that reuses residue from the		Reducing the cost of waste disposal
Economic and social gains resulting from the partnership community and industry		Improvement in the relationship between supplier and customer
Minimizing the impacts of infrastructure		Improved public image
Improving the quality of life in surrounding areas social programs		Increased productivity of employment
More efficient use of resources as a result of greater environmental awareness		Reduction of environmental liabilities
Increase the number of employees		Additional revenues from marketing residue
Diversification of business		

Resource: Fleig (2000), Veiga (2007) e Lowe (2001).

As shown, the benefits interest and motivation for the parties involved in the follow on with proper planning and management in the allocation of such residue. In contrast, there are still several obstacles to the development and ease of industrial ecology based on a viable and sustainable that can meet local economic needs. Below

are related to the main obstacles related to the integrated study of JICA regarding the subject (Castello Branco, 2009):

- Due to the financial returns from the commercialization of sales of residue, companies still do not feel motivated enough to invest a capital increase and in different negotiations. Thus, new technologies are developed and studied, limiting the action potential of a whole;
- The search for quick fixes is not the major focus, since the options currently still meet the volume of the operation who is shy and has little prospect of growth due to the limits;
- Industrial Interdependence: the more there is a dependency relationship between the companies, the greater the rigidity of internal system, it means, a poor performance or failure of one will result in an extension to the other. The fragility is a characteristic of this profile;
- High costs - return on long-term: increasing return on invested capital requires an energetic and ravenous time. Time which does not meet the alternative plans already in need of more distant and soft. In developing a residue management aimed at building a highly sustainable industry, are involved from an abstract design of the scenario, to prepare the chosen place, with professional training, alternating culture, capital raising, among other steps. No sleight of hand;
- Involvement of public policy and government incentives, the government manages the state and as is also crucial piece. They need to work out details regarding the preparation of the institutions responsible for promoting industries with regard to the approach and technical expertise and professional support through tax incentives or tax that national and international investments are attracted to the region;
- Establishment of environmental education standard: assuming that education is fundamental in the life of a person turning their participation in the reality of a society, the educational activities are essential to the achievement of change, seeking the association between operating activities and inspections, an ecologically conscious involvement with a dazzling sound and sustainable future.

6. Conclusion

The biggest challenge of developing a master plan application of solid residue is the active participation of business, government, investors and especially awareness of

society itself that this is part of this active process.
The awareness of the importance of an efficient plan to subsidize the steps of consolidation, implementation and search for results is an initial step for Manaus Free Zone. This plan runs properly provide the installation of an economically viable industry based on the unique management of residue resulting reduction in the use of natural resources in alternative income generation and a greater sense of well being in local society.
It is worth noting also the need to promote scientific research and know the flow, validates the amount of waste generated and dwells on a relationship between production, consumption and disposal. So the chain has enough capacity to subsidize and manage resources with available information, and sufficiently assertive society.

The citizen is the residue generator itself and how this reality must be knowledgeable about the target audience of the whole society in order that the incentive and the instrument are vigorous action to participate in the process of solid residue management.

6. Referências

ARAÚJO FILHO, Guajarino de. **A dinâmica sócio-técnica da Zona Franca de Manaus**. Dissertação de Mestrado em Engenharia de Produção, Universidade Federal de Santa Catarina, Florianópolis, 1991. Disponível em:< http://www.scielo.br/scielo.php?pid=S0103-40142005000200006&script=sci_arttext>. Acesso em: 06 ago.2011.

BOTELHO, Antônio J. **Redesenhando o Projeto Zona Franca de Manaus.** Manaus: Editora Valer, 2006.

CALAES, Gilberto Dias. **Competitividade e sustentabilidade na indústria mineral.** Texto para discussão. Disponível em< http://www.cetem.gov.br/publicacao/CTs/CT2006-046-00.pdf>

CALAES, Gilberto Dias. **Planejamento Estratégico, Competitividade e Sustentabilidade na Indústria Mineral: Dois Casos de Não Metálicos no Rio de Janeiro**. Dissertação de Doutorado. Departamento de Geologia do Instituto de Geociências da UFRJ, Rio de Janeiro, 2005.

CASTELO BRANCO, Roderick Cabral. **Polo Industrial Ecológico de Manaus: uma proposta para o alcance da sustentabilidade.** Dissertação (Mestrado em Administração) Universidade Católica de São Paulo, 2009. Disponível em:http://www.academicoo.com/polo-industrial-de-manaus. Acesso em: 24 set.2011.

CETRAM – Central de Energia e Tratamento de Resíduos da Amazônia. **Relatório de impacto ambiental: implantação de aterro industrial.** 2008. Disponível em:<http://www.ipaam.am.gov.br/adm/imgeditor/File/RIMA_CETRAM.zip>. Acesso em: 05 jun.2011.

JICA – Agência de Cooperação Internacional do Japão. **Estudo para o Desenvolvimento de uma solução integrada relativa à Gestão de resíduos industriais no pólo industrial de Manaus.** 2010. Disponível em:< http://www.suframa.gov.br/suframa_publicacoes_jica.cfm>. Acesso em:14 dez.2011.

KRAEMER, Maria Elisabeth Pereira. **Resíduos industriais e a questão ambiental associada à contabilidade aplicada ao ambiente natural.** Disponível em< http://www.atena.org.br/revista/ojs-2.2.3-06/index.php/pensarcontabil/article/viewFile/45/45>. Acesso em 15 set. 2011.

LOUREIRO, Violeta Refkalesky. **A Amazônia no século XXI: novas formas de desenvolvimento.** São Paulo: Empório do Livro, 2009.

ONU – Organização das Nações Unidas. **The Global Compact.** 2007. Disponível em:< http://www.unglobalcompact.org/>. Acesso em: 05 jun. 2011.

PORTER, M.E. **Estratégia Competitiva: Técnicas para análise de indústrias e da concorrência.** 9ª Ed. Rio e Janeiro: Campus, 1986.

SOUSA, Ana Carolina Cardoso**. Responsabilidade social e desenvolvimento sustentável: A incorporação dos conceitos a estratégia empresarial.** Dissertação de Mestrado em Ciências em Planejamento Estratégico - Universidade Federal do Rio de Janeiro, 2006. Disponível em< http://www.ppe.ufrj.br/ppe/production/tesis/sousacc.pdf>. Acesso em: 07 jan. 2012.

SUFRAMA – Superintendência da Zona Franca de Manaus. **Estudo para o desenvolvimento de uma solução integrada relativa à gestão dos resíduos industriais no polo industrial de Manaus**. 2010. Disponível em< http://www.suframa.gov.br/suframa_publicacoes_jica.cfm>. Acesso em: 03 jun. 2011.

VERGARA. Sylvia Constant. **Projetos e relatórios de pesquisa em Administração.** São Paulo: Editora Atlas, 2004.

WERNECK, Vianna. **Desenvolvimento econômico e reformas institucionais no Brasil: Considerações sobre a construção interrompida.** Tese de Doutorado em Economia - Universidade Federal do Rio de Janeiro, 2007. Disponível em< http://www.ie.ufrj.br/datacenterie/pdfs/pos/tesesdissertacoes/tese_salvador_werneck.pdf>. Acesso em: 07 jan. 2012.

Sites consultados

Divisão para o Desenvolvimento Sustentável das Nacões Unidas (2001) Disponível em< http://europa.eu/legislation_summaries/foreign_and_security_policy/cfsp_and_esdp_implementation/r00009_pt.htm> 2006>. Acesso em: 6 out.2011.

JICA (Agência de Cooperação Internacional do Japão). Disponível em:< http://www.jica.org.br/br/index.php>. Acesso em: 20 nov.2011.

IBGE (Instituto Brasileiro de Geografia e Estatística). Disponível em:< http://www.ibge.gov.br/home/>. Acesso em: 20 nov.2011.

Jornal A crítica. Disponível em:< www.acritica.com.br>. Acesso em: 20 nov.2011.

Presidência da República Federativa do Brasil. Disponível em:<http://www.presidencia.gov.br/>. Acesso em: 20 nov.2011.

SDS (Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável). Disponível em:< http://www.sds.am.gov.br/>. Acesso em: 20 nov.2011.

SEMUSP (Secretaria Municipal de Limpeza e Serviços Públicos). Disponível em:< http://semulsp.manaus.am.gov.br/>. Acesso em: 20 nov.2011.

Suframa (Superintendência da Zona Franca de Manaus). News Letter Vol. 1. 2010. Disponível em:<http://www.suframa.gov.br/download/publicacoes/jica/newsletter_nr001_pt.pdf>. Acesso em: 17 nov.2011.