

# **Workshop on European Waste Management Experiences**

## **WORKSHOP REPORT**

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junho de 2012



# Workshop on European Waste Management Experiences

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# **II Workshop on European Waste Management Experiences**

## **Report edition**

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## **SUMMARY**

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Video presentations are available at:

Part 1

[http://iptv.usp.br:80/portal/Id.do?instance=0&id=usp0Gn\\_OnORfUyNrf7ofze5SNMC4fz9bVmznfjdxrA5aEo.&type=video](http://iptv.usp.br:80/portal/Id.do?instance=0&id=usp0Gn_OnORfUyNrf7ofze5SNMC4fz9bVmznfjdxrA5aEo.&type=video)

Part 2

<http://iptv.usp.br:80/portal/Id.do?instance=0&id=uspDVht6j6nG4rwYpVvvCetYEMhsxL31uGaHhsVzmJSoj8.&type=video>

## **1. Presentation**

From the principle of duality between the Architecture and Design who developed a dichotomy condition to a complementarity condition to serve the people welfare. The field of architecture, urbanism and design, is among the 50 areas of CAPES (Brazilian Coordination for Enhancement of Higher Education Personnel), which proposition has changed the concept from 'doing what is possible' to the concept of 'making possible what you want to do'.

The CAPES performed in Rio +20, with specific presentation on Cities Design, which evaluates the role of postgraduate training and qualification in people with domain in the areas of processes, technology and energy.

There are 3,397 programs operating in the country with 5,080 courses in all. We highlight the proposed professional master whose only difference to regular master is the regular attendance of a public that seeks qualification for entering the market. There is a high concentration of courses in the Southeast and South regions of our country.

Brazil experiences a considerable amount of funding reaching R \$ 3.2 billion. Thus, from the undergraduate to postdoctoral training is encouraged overseas, as there was no precedent in Brazil. Significant investments are also being oriented to events organization and equipment obtaining such as recognition of the professionals' contribution. The 'Portal de Periódicos' of CAPES represents another achievement. Today CAPES has a significant collection of about 30,000 titles.

In this context, it becomes feasible and necessary to exchange experiences with other countries in order to exchange local practices or dissemination of results. We must design routes to proposals presentations and bring opportunities for all our expertise - it is actually placed at the service of the common welfare that is the only reason the national graduate agency CAPES.

This seminar contributes significantly in the construction and dissemination of relevant content to the concept of management, technology and sustainable design. The researchers' participatory action in the solid waste management framework highlights the importance of the CERSOL initiative, under a solid perspective of continuous knowledge improvement.

### **Ricardo Triska**

Coordinator of Architecture, Urbanism and Design Area - CAPES  
Production Engineering, PhD  
Professor at Graduate Design Course - UFSC

## **2. Introduction**

This report is released by the University of Sao Paulo (Brazil) and European institutions in Education, Research & Development initiatives that cooperate in order to study and provide the basis to sustainable waste management systems. Here are highlighted the main comments and recommendations arising from presentation and discussions. The workshop is a follow up of the Seminar on Solid Waste and Socio-environmental Impacts occurred on 2011 which resulted in a book available at <http://www.iee.usp.br/>.

The Multidisciplinary Centre of Solid Waste Management (CERSOL) congregates professors and researches from University of Sao Paulo, PUC and UNICAMP, Universities from Sao Paulo state, Brazil. The main issues are water, sustainability and environment with focus on solid waste, which achievements through innovation, training and research and development.

CERSOL was established in order to attend environmental demand on waste management and priorities. One of the main targets of the CERSOL is to learn from previously experiences from European countries that are leaders in waste management and innovation. This Centre encompasses different questions related with health, legal compliance, technical perspectives, economy and other areas of knowledge on waste management.

São Paulo, one of the greatest cities of the world, experiences typical examples of waste management problems that remain to be solved because of political or technical reasons. In this respect, the National Policy on Waste Management (Law 12,305/2010) is the main challenge that Brazil is facing. In order to provide solutions, the University is charged to return solutions to society through a multidisciplinary approach regarding training, innovation, technology and knowledge tools.

More than 50 researches, professors, students and collaborators cooperate at CERSOL, under the sustainable waste management concept, working in accordance with the requirements of the main society sectors. Previous academic collaboration was accomplished with the partnership between the University of Sao Paulo, COOPAMARE (a waste pickers cooperative) and the SENSEable City Lab from the Massachusetts Institute of Technology (MIT).

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Finally, we express our sincere gratitude to all who collaborated direct and indirectly with this project and specially to the European and CERSOL teams.

Maria Cecília Loschiavo dos Santos

Sylmara Lopes Francelino Gonçalves-Dias

Lúcia Helena Xavier

## **Panel 1**

### **Trajectory of waste management in Europe – consumer needs and market barriers**



Soure: L-AWP, 2010.

**Panel 1 - Trajectory of waste management in Europe – consumer needs and market barriers**

Coordinator: Robert Harland – Loughborough University – England

Commentator: Maria Cecília Loschiavo dos Santos - Brazil

**Sustainable Waste Management Policy in Sweden**

Jessica Magnusson - SP Technical Research Institute – Sweden

The SP Technical Research Institute is from Sweden, a small country compared to São Paulo, that is increasing its international collaboration and improving the integration between technical and business areas from research in order to lead through the combination of multidisciplinary areas and customers demand. The business areas of SP Technical Research Institute regards: energy, life sciences, build environment, transport, ICT and risk, safety and security. The Riksdag has adopted 16 objectives for environmental quality in Sweden, as follows:

Figure 1. Objectives for environmental quality in Sweden.

<b>Reduced Climate Impact</b>	<b>Good-Quality Groundwater</b>
<b>Clean Air</b>	<b>A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos</b>
<b>Natural Acidification Only</b>	<b>Thriving Wetlands</b>
<b>A Non-Toxic Environment</b>	<b>Sustainable Forests</b>
<b>A Protective Ozone Layer</b>	<b>A Varied Agricultural Landscape</b>
<b>A Safe Radiation Environment</b>	<b>A Magnificent Mountain Landscape</b>
<b>Zero Eutrophication</b>	<b>A Good Built Environment</b>
<b>Flourishing Lakes and Streams</b>	<b>A Rich Diversity of Plant and Animal Life</b>

Source: NATUR VARDS VERKET, 2012.

This research institute works with Universities and also with industries to bring up solutions that may be put into the market.

Since Stockholm in 1972, the first meeting to discuss the environmental aspects all over the world, Sweden has a pioneer history on environmental management. In this respect, SP Technical Research Institute also participated from Rio-92 and from Rio+20, both were held in Rio de Janeiro.

The Swedish municipality has been working in waste management initiatives that improved significantly in the last years. SP Technical Research Institute defined 16 targets for environmental management considering parliament, municipality and other decision levels in order to provide a road map for companies' actions on environmental issues by their own. Today, these targets may be considered more objective and also dynamics as environmental objectives. Considering that the food waste generation will decrease 20% until 2050, as the same time it is desirable to have 40% of food waste been biologically treated in national level and introduce recycling.

The triple-helix concept (commerce, political and industries) is applied to support the decision

making process by municipalities. In this context, integrating perspectives the investments became more interesting in waste management.

In European Union the countries have been working in order to minimize the waste generation, reducing consume, raising efforts in recycling and energy recovering and avoiding landfilling. The European Directives are the environmental norms that drive the action regarding waste management. Specific policies were conducted in Sweden in order to taxing landfilling (Table 1).

Table 1. Drivers for waste management in Sweden

1991	Municipal waste treatment plan
1994	Producer responsibility
1999	EG-directive for landfill is accepted
2000	Landfilling tax (around 27 EUR/tonne)
2002	Landfill ban on combustible waste
2003	Tax on landfilled waste is raised (around 37 EUR/tonne)
2005	Landfill ban extended to include all organic waste
2006	Landfill tax increased for the 3rd time (around 47 EUR/tonne)

This measure impacted the municipalities' decision. It is estimated that about 1% of household waste is disposed in landfills in Sweden, while more than 40% is incinerated with energy recovering. Some data suggest that recycling replace 12 million tonnes of virgin material and the energy recovering may replace 1,4 million tonnes of oil equivalent. In this regarding, Green House Gas (GHG) effects are projected to decrease by 75% from 1995 to 2015.

The tradeoff between increase GDP and reduce the amount of waste may be reached by move up the waste stairs by introducing alternatives for waste destination and mainly energy recovering by incineration. Biogas producing is another important technique to organic waste disposal.

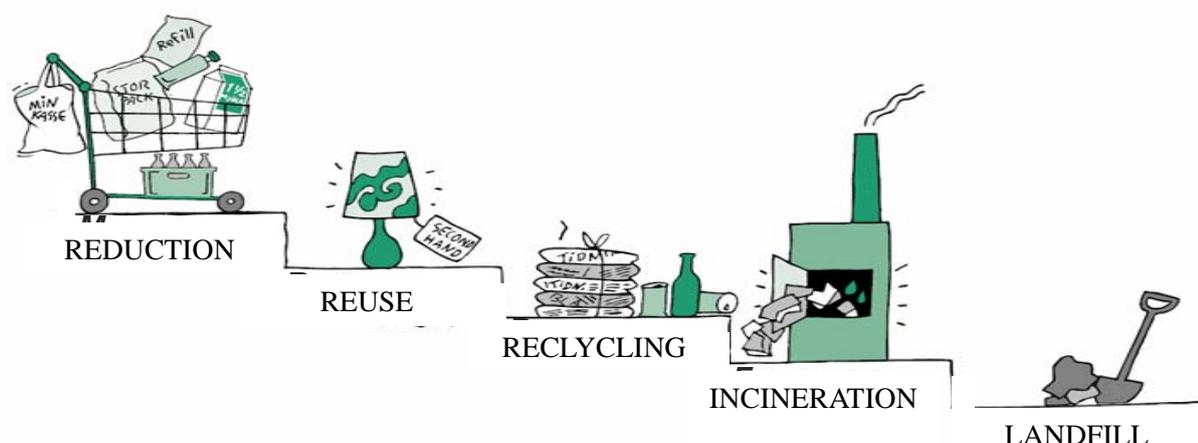
Another important issue is that the citizens need information to understand how they can collaborate along the process of waste disposal. The companies responsible for waste management have prepared the information that will be provided for citizens and other people that will adopt the system. To involve the inhabitants as customers of the process is a fundamental step of waste management. It may be observed that the political commitment has been observed in Sweden since 1960's, in another context the waste management would not be succeeded.

In Borås (a Sweden city) the biodegradable organic waste is turned into biogas that is used as combustible by around 50 buses and gas stations have been installed in the city for vehicles and collection trucks. The recycling model in the city of Borås has a household landfilling rate of about 0,8%.

In Sweden that is regulation about the producer responsibility that must take care of their products when they turn into waste. Nevertheless, it is the role of the municipalities to inform the people how they should do the disposal.

It have been seriously discussed in Sweden 'when does a product became a waste?'

Figure 2. Disposal steps.



Source: NATUR VARDS VERKET, 2012.

SP Technical Research Institute has been involved in Borås initiatives in waste energy recovering experiences. The goal was to reach efficient processes with low emissions. The proposals were developed through collaboration between SP and Borås University. The resulting knowledge is been shared with other countries under Triple-helix model. Academy, Research Institutes, Companies and the Municipality together in the same objective of developing a sustainable waste management system.

In this context, a successful experience in Indonesia is presented. The project was carried on in the city of Palu (the capital of the province of Central Sulawesi) in an open dump area. There may be observed people living together with the cows and waste, a very common situation around the world. It was observed that the average income of waste pickers is around US\$ 1,00 per day. One of the major proposal of this international cooperation was to improve the daily life of adults and children involved in waste handle process.

The organic material and its methane gas production is a huge contribution to the GHG effect and is a very big problem to the people living near by these dumps because of the explosions that may occur, among other problems.

The project integrated local municipality, the University, NGO's and the fruit market in the building a pilot biogas plant. From about 4 tonnes of fruit waste generated every day it was possible to produce 550 KWh of energy per day. The energy provision allowed activities for 24 hours at the fruit market. This project also resulted in a little reducing with the reducing in the GHG emission. It was also shaped a triple helix cooperation that resulted in the design and building of the biogas plant, life quality assurance, agreement of responsibility between interested parties, education and procedures for a sustainable operation to maintaining the initiatives, among other aspects.

From local government involvement through the national energy company from Indonesia it was possible, with collaboration of the University, to improve citizens' daily life by building biodigestors for provide energy for families.

In order to introduce significant improvements in waste management systems, some aspects are pointed out. Instead of just focus on technique and the cost of solutions it is important to understand how the society will be impacted and what requirements are needed before start the planning for future. Different perspectives must be analyzed, such as: technical, social, environmental, cultural, political, health and economical perspectives. Finally, decide what must be improved and how.

## The Cluster Eco World Styria

Christian Köberl – Eco World Styria – Austria

There is about 8 million people living in Austria and in the city of Styria are about 1 million people, small if compared with Sao Paulo. Styria is known as the Green TechValley because of 190 companies on service technology providers are working in a collaborative and sustainable way focusing in clean energy and waste management. Many Austrian Universities are working in ecoinnovation, clean technologies and related issues as basis of knowledge in environmental management.

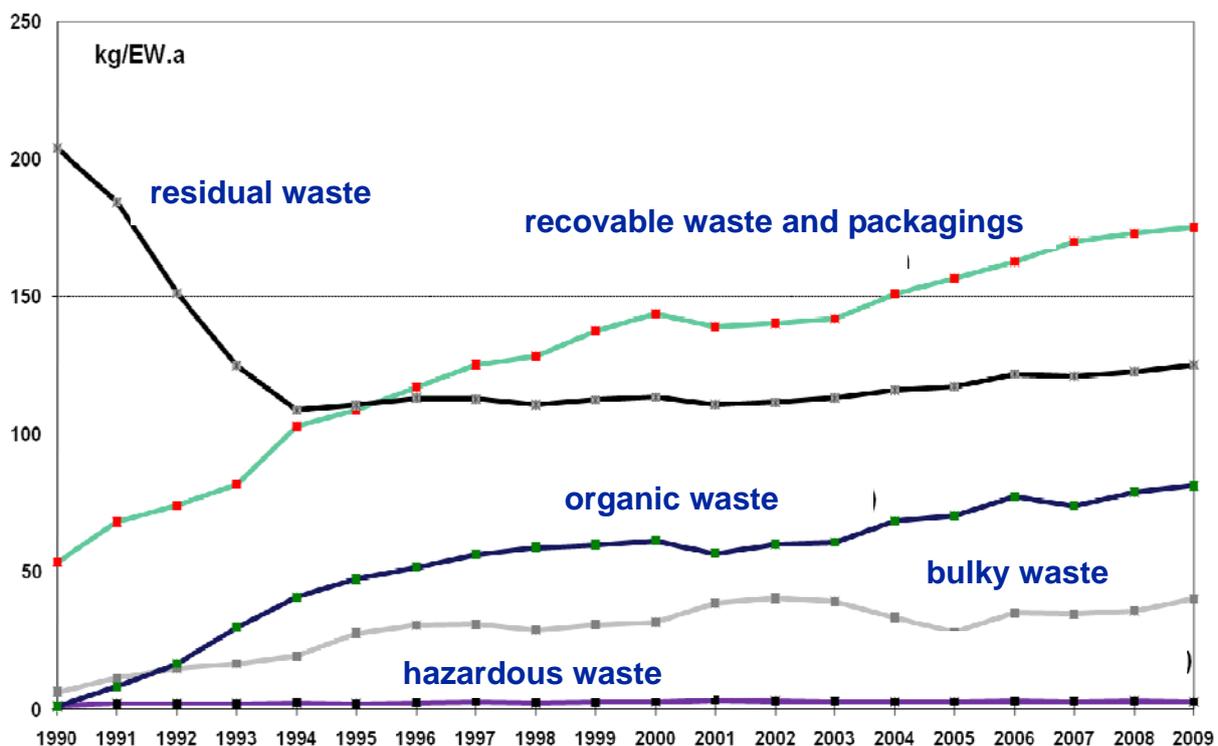
Eco World Styria supports the companies and the Styria municipality, under triple helix proposal, with basic services and projects related to innovation, know-how, and new markets in the areas of energy (solar, biogas, biodiesel) and environmental engineering. The cluster organization initiated in 1998. Nowadays the turnover of 7 billion Euros and about 32 thousand employees. This organization grow about 20% per year between 2005 and 2011.

In 1985 there were some problems in lack of capacity for landfills. In this context, municipalities started to propose solutions for these problems and started by separating the household waste in seven fractions (plastic, paper, metal, glass, e-waste, etc) and motivating the reuse and repair alternatives. Were implemented waste collection centres that use to be operated by handicapped people that are trained in refurbishing technique.

The waste collection cover 100% of Austria area and separated waste collection by citizens was implemented in 1991. It is strongly incentivated the reuse and recycling quota increasing.

About 20% of total waste generated in Austria goes to landfill, while 65% is recycled. In average 15% is responsible for energy recovering through incineration. It is estimated that are generated about 350Kg of waste per inhabitant per year in Styria.

Figure 1. Municipal waste future trends.



Source: ABFALLWIRTSCHAFT, 2010.

The type of disposal is chosen according to the calorific power of the materials recovered from

waste. Before landfilling the waste goes to a pre-treatment phase concerning mechanical and biological procedures in order to reduce methane production. Instead of methane it is produced carbon dioxide that is less harmful for the environment.

It is estimated that about one third of inputted material is organic waste. There are two paths for organic waste treatment in Austria. The first one is the composting, by which are processed 120.000 tonnes per year. The second one is the biogas production through energy plants to provide basically electricity and heating. About 70MW per year are produced by biogas.

Were presented pictures from the landfill about 30 years ago and the new concept of landfilling were can be observed a type of brown soil resulting from the mechanical and biological pre-treatment of organic waste.

About five years ago started a two days program in which the citizens are invited to collect waste as a social-environmental initiative that had the collaboration of 200.000 people in 2011.

In Austria it does not use to refer to waste management any more, instead it have been considered the material flow management where are proposed the material increase or decrease strategies from waste amount in order to protect the environment.

### **Metro Taifun**

Diedrich Tolanda – Metro Taifun (<http://www.metrotaifun.fi/en/metrotaifun.html>)

Finland is not a very big country. It has about 5,500 million inhabitants. Is was presented the Metro Taifun an automatic waste collection system that helps the problems related to transport and health. The waste is transported by a vacuum transport system from consumers to a central station. Through cyclone blowers and a vacuum system it is possible to lead the waste to the area of compacting and then send it to a recycling station.

It is a solution that has been adopted by some Asiatic and European countries, but it is not implemented in Latin America yet. One of the problems is related to the sizing of the pipe that will conduce the waste. Reducing the pipe it result in the energy reducing and, consequently, the energy efficiency. By this way, the system became competitive.

Some specific patents were producing according to specific phases of this automated waste management system. If the wastes are recovered from collect points, it is possible to separate the type of material in to specific container to be sent to recycling or incineration centres.

The pipes are composed of the same material that uses to transport water to the households. Thus, the infrastructure is affordable. The process is completely monitored by software with remote access to control it.

The largest structure implemented is located in Saudit Arabia at Meca and was dimensioned to recover 600 tonnes of waste per day, along 44km. The objective is removing the waste from the temples area and lead to the waste treatment stations.

## Panel 2

### Opportunities and barriers for waste as resource



## **Panel 2 - Opportunities and barriers for waste as resource**

Coordinator: Nelson Gouveia, Faculdade de Medicina/USP – Brazil

Commentator: André Felipe Simões – EACH/USP Leste – Brazil

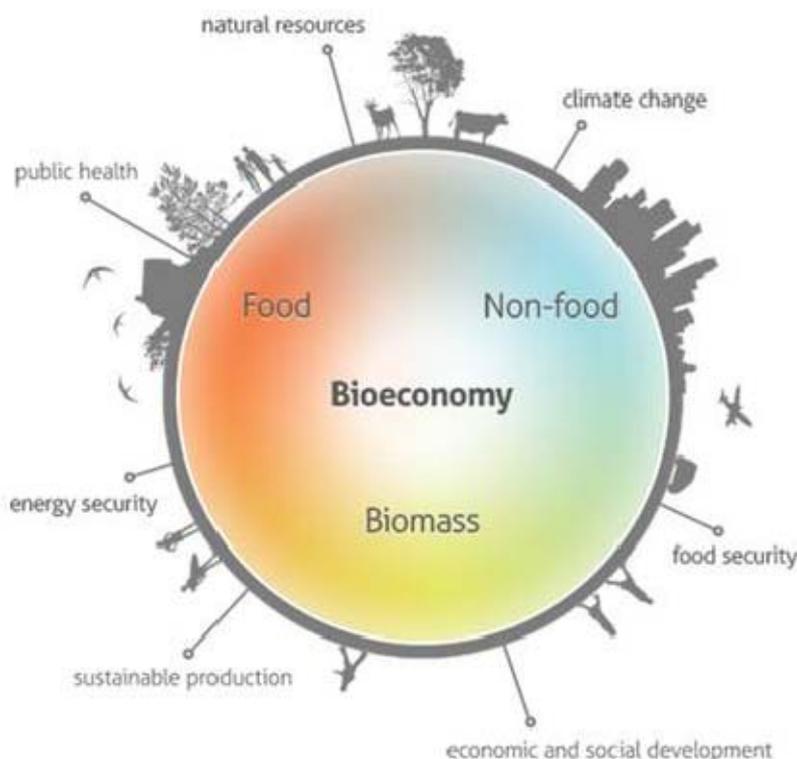
### **Possibilities and Barriers for Waste - Combustion**

Claes Tullin - SP Technical Research Institute – Sweden

According to historical data on global background, it is possible to verify that the energy consumption increased by the same way the growth in economy occurs. From 1950's until 2000's the energy usage increased five times mainly by the use of fossil fuels, coal, oil and gas. It is estimated that by 2050 there will be about 9 billion people in the world and, consequently, the energy demand will increase. A sustainable growth is expected in order to equalize the economical growth and environmental sustainability.

Bioeconomy approach proposes the use of sustainable biomass in productive sectors in order to optimize the energy consumption. Biomass may be used as energy source but other uses are observed like food, textiles, construction materials and others. Biofuels represent another important source of sustainable choices and is being largely used in Brazil.

Figure 1. Bioeconomy concept



Source: Schurr, 2011.

Considering a cascade usage of products and materials, regarding recycling and reuse steps, the result is compostable waste that may be used as energy source. A quite strong correlation between GDP raising and waste generation raising. In this respect, different technologies have been developed in order to accomplish a sustainable waste management system. Sweden has invested

along many years in the composting of organic waste and import waste from neighbor countries in order to produce energy from biogas. But the transport used to take the waste negotiated is object of discussion because of the emissions that results from waste transportation.

It is presented a Life Cycle Analysis (LCA) of emissions in different stages of waste management system in Sweden. Emissions from combustion part of incineration are about 400 Kg of CO<sub>2</sub>. On the other hand, the incineration process analysis show that there is a significant amount of emissions avoided, resulting in a negative emission. Heating and electricity production from biogas contribute even more for the negative emission pattern, resulting, in the data presented, 800 Kg of CO<sub>2</sub> avoided – two times more efficient than combustion in this analysis.

In Sweden about one third of the total energy is originated from bioenergy which a remarkable amount is produced from waste. Nevertheless, not even all the countries of Europe have the same pattern of landfilling or energy producing. Some countries like Lithuania, Romania and Bulgaria still uses to landfill about 80 to 100% of the generated waste.

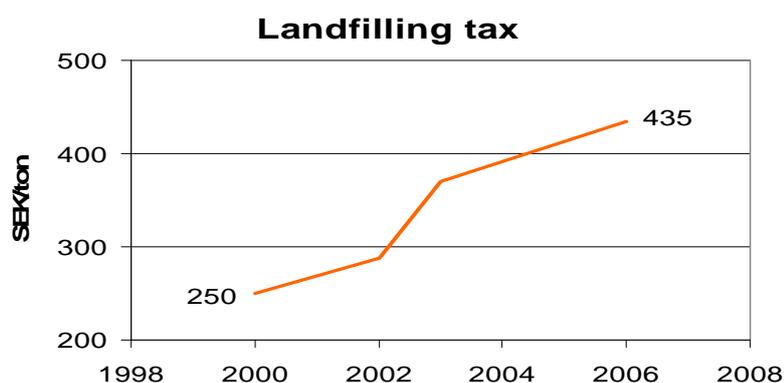
In 1992 it was introduced in Sweden the CO<sub>2</sub> tax from fossil fuels what motivated the use of biomass energy as alternative.

Beyond the economic aspects, the political issues have to be considered in a more complete analyzes. Thus, are presented the main regulations on waste management in Sweden (Table 2)

Table 2. Political drivers on waste management in Sweden.

1991	Municipal waste treatment plan
1994	Producer responsibility
2000	Landfilling tax
2002	Landfill ban on combustible waste
2005	Landfill ban on all organic waste
2006	Incineration tax
2008	All active landfills comply with ordinances and regulations for landfilling of waste
2010	National goals
	35% of food waste to biological treatment
	50% MSW to material recycling incl. biological treatment

Figure 2. Landfilling tax evolution.



A large amount of the produced energy in Sweden is used in household and industrial heating, it is estimated in almost 50%. While in tropical countries, like Brazil, this proportion would be dedicated to cooling systems. For this reason, it is important to combine heat production and cooling systems.

Some of the challenges in thermal conversion of waste as combustion or gasification processes. At first it is fundamental to define what is waste and how it must be separated according to shapes, materials and combustion properties. The next step is to characterize the material physically and chemically to have the exact parameters for efficient energy recovering according to rules established. In this context, it was elaborated a Fuel Handbook Report in 2012 (download available at [www.varmeforsk.se](http://www.varmeforsk.se)).

Another important aspect regarding thermal conversion of waste is the sampling for analysis.

Other important aspects pointed out are the risks and hazardous properties from waste incineration process. The decision about the process of combustion and energy recovering is closely related to the waste properties and the health and security parameters to be accomplished. In Sweden, the emissions from incineration use to be lower than some natural process emissions. It is exemplified the case of forest fires cases.

The process uses to be profitable once the raw material is very cheap. Although it is necessary to provide technological input to analysis of the material processed as well as to provide the ashes disposal according to environmental rules. Toxic ashes and fly ashes have to be disposed in safety way. Even in the ashes are valuable materials like some metals, for example. For this reason, ashes may be considered, in some case, as valuable materials.

One important limitation of the process is related to the ash deposit in the equipment. This deposition may cause corrosion and damage the equipment according to its usage. Alkalis in gas phase are also producing according to the process.

It is highlighted some technical aspects of the process and also some considerations about the quality of the waste material. As an example given, waste wood uses to be contaminated with zinc, chloride or lead, originally from painting. This contamination produces toxic deposits in the end of the process.

The waste refinery concept is introduced as a set of solutions provided for waste management through thermal treatment of waste. Some motivations for waste refinery:

- Efficient, safe and environmental friendly waste management
- Reduce the usage of fossil fuels
- Recycling of nutrients
- An area with huge growth potential and need for R&D

Finally, the partnership with the industries is considered as an important strategic aspect.

## **How to use biogas as success factor, what are the important aspects for success?**

Anna Sager - SP Technical Research Institute - Sweden

Waste may be considered residual or earlier material. We should think about collecting material instead of waste. In this concern, we will talk about biogas, presenting considerations about biogas as success factor and what are the important aspects for success to produce or in usage. Biogas is a big field for research and development.

At SP Research Institute, in the Department of Energy and Technology we study also the biofuels and biomass area, many services and projects have been developed considering different substrates on site. Some services focus on the product quality that is evaluated through specific analysis in specific laboratories and also test plants. There is also competence in refinery issues that we carry on under the triple-helix concept (regarding industry, research and public sector). We also work on the certification of biogas plants and biodigestion residue from biogas plants.

What is biogas? It is produced by different substrates that can be waste, sludge, manure or food waste. But it also can be crops, specially planted for biogas production. It is produced in the biodigester under anaerobic circumstances (without oxygen). It is obtained not only the biogas, but also some residues that may be used as natural fertilizer instead of artificial fertilizers. The process that occurs inside the digestors also occurs in the nature.

The biogas has a bad reputation often related to the odor or smell. Some new technologies have been developed to deal with this problem. It is observed that the smell occurs mainly during the transportation because the biodigestors are closed structures, so there is no smell coming from that, unless it is opened. Compost filters are example of new technologies to reduce the odor.

Biogas may be found in liquid or gaseous state and named also as liquid biogas, digestions gas, landfill gas and natural gas. It may be observed that 1m<sup>3</sup> of biogas corresponds to 9.67 KWh and it is not so different from conventional energy sources.

Biogas can be used for different purposes as electricity production and as clean vehicles fuel. It may be produced since small pilot plant until large industries.

Biogas has several advantages and benefits for the society. It may be considered a sustainable energy source compared to fossil fuels. Contribute to create jobs and thus improve the regional development and local economy. Contribute also with the usage of resources by the use of waste to produce energy. There are benefits to the environment because it is a renewable energy source, cuts the dependence from fossil fuels, reduces the greenhouse gas emissions and the residue may be used as natural fertilizers.

Some points are required as important aspects for success:

- Favorable political and legal framework
- Funding and support schemes
- Secure raw material supply
- Infrastructure to produce
- Customers to use the biogas
- Perception and social acceptance
- Economic viability
- Secure disposition of digestion residues/sludge or bio-manure
- Up to date technology

**André Simões – Commentator**

USP Leste – University of Sao Paulo, Brazil

In a newspaper of the city of Sao Paulo was published recently that small cities in Brazil, despite not having cell phone coverage, people acquire the equipment to use resources other than its primary purpose which is communication. The consumption emerges as a source of impact through the generation of waste coming from post-consumer products.

On the other hand, if we consider the waste as a source of resources. For example, incineration as a source of energy recovery can be interesting if a channel is stimulated by public policies. In Brazil the question is much more related to consumer behavior. The reduction in the generation, future perspectives, emerges as a possible solution through the taxes that help to regulation. The role of the industrial sector also emerges as dominant in this scenario.

## **Panel 3**

### **Innovation systems and new technologies: future challenges**



### **Panel 3 - Innovation systems and new technologies: future challenges**

Coordinator: Denise Espinosa – Poli/USP - Brazil

Commentator: Jorge Alberto Tenório – Poli/USP - Brazil

#### **Reuse, collaborative consumption and life style changes – Can Europe reduce the amount of waste?**

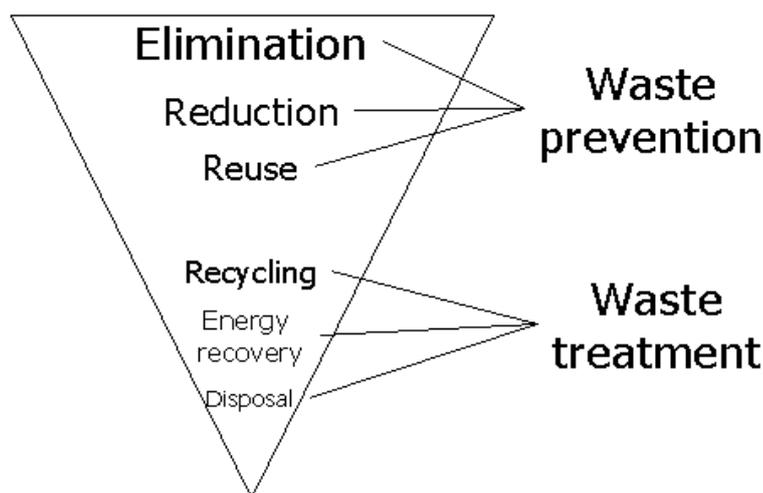
Jessica Algehed - SP Technical Research Institute - Sweden

The main topic is about how to reduce the amount of waste and not only in end-of-pipe procedures. The question is: Can Europe reduce the amount of waste?

The European policy on waste management desires to be as higher as possible in the hierarchy of waste. So, we hard work on waste prevention and waste treatment. Recently, the European laws have been focused in how to reduce or recycle and improve the energy recovering, by the same time avoiding landfilling.

There is no policy on how to reduce or about the waste prevention, but European Commission is putting pressure on the member states to actually have plans on how to reduce or prevent waste generation. Thus, the European countries are just working in waste prevention strategies to be presented in 2030.

Figure 1. Disposal hierarchy



Waste prevention is on the top of European waste management agenda. In some aspects it is related to the way of life, the way of consumption. It is somehow difficult to deal in an economy based in buy stuff. Nevertheless, some alternatives like reducing material or reuse of products have been motivated. Some alternatives of collaborative consumption and service have been proposed.

It is important to point out that sustainable consumption is not only related to waste strategies and policy. Sustainable consumption is not only related to waste management regulations, but also to other policies about how happy we are as consumers and people. There is a lot of research showing that there is no link between material consumption and happiness.

There was a research carried on in the United States asking people since 1945 “how happy they are with their lives” and the finds suggests that there was no changing in happiness over the time, despite the material consumption increases even more.

Another case related concern about an Sweden company named Spotify on music streaming service that provides music downloads instead of plastic CDs. This company was founded by a young

student at the University that earned a lot of money selling music in this way. That is a good example of a sustainable consumption that resulted in economical prosperity.

The European Commission provided guidelines how to accomplish waste management programs. It is proposed the collaborative approach along the supply chain. It is proposed to focus in specific sectors instead of consider the same solution at once. It is important to elaborate agreements and provide a life cycle approach in order to accomplish the goals. The European Commission suggest a number of policy strategies, information strategies, economical incentives for sustainable consumption and programs for promote reuse and repair, for example.

The strongest strategies are the regulatory ones like taxes, extended producer responsibilities, green public procurement, eco-design, etc. To 2030 will be combined a set of those strategies.

Food is an example of sector that may be worked in different European countries. In the European Union about 25% of the food is throughout. Packages and paper usage are another examples. Electronic equipments are pointed out by the European Commission because of the hazardous materials and also because of the exportation of this type of waste. Textiles are a scare example. Are produced over 10Kg per person a year and it will increase to 20Kg per person a year in the next 10 years, and there are no recycling systems for that. They end up incinerated. The baby nipples are estimated in 1 tonne per person in the entire lifetime and much of them ends up landfilled.

These are some considerations about 'why waste management is so difficult'.

Figure 2. Consumption and recycling.



It is important to analyze and have knowledge the way we use to consumption. To study the consumption behavior. There is a lot of things written about related issues and the most obvious is that consumption fulfill existential needs. We through up the products because they are useless for us, even though it still can be used. The companies created unsustainable needs and products. It is really a complex issue.

In Europe buying services becomes relatively more and more expensive than buy products. To repair products is more expensive than buy new ones.

To summarize, it is possible to reduce the amount of waste in Europe but it is one of the biggest challenges because is related with the products consumption and production ways.

## **E-waste management at USP**

Tereza Cristina Carvalho – Poli/USP - Brazil

Since 2009 is developed at the University of São Paulo the reuse and recycling of e-waste centre (CEDIR). The original idea for the project arose with the proposed collection of electronic waste in the area of Information and Communication Technology (ICT) at USP. On July 5, 2008 was collected 5 tons of electronic waste. It was thought at the time, that was enough to call a recycling company to remove the e-waste. However, no company wanted to withdraw. Then it was created the CEDIR in order to receive any post-consumption equipment in the area of technology and information. The first stage of e-waste management at CEDIR is to analyze if it is possible to refurbishing it. If it is possible, the equipment is remanufactured and borrowed for organizations with social purposes for use in digital inclusion projects.

If the equipments cannot be refurbished, it is dismantled and uncharacterized. The materials are sorted according to the categories (metal, plastic and glass) and forwarded to recycling companies.

In Brazil are produced about 12 million computers per year. The lifetime of a computer in a company is about 3 to 4 years. At USP equipment is reused in different departments, reaching 10 years of use. In Brazil there are about 200 million mobile subscriptions, with an annual growth of 18%. In Brazil, the life span of a cell was at around 1 to 1.5 years of use, but is decreasing for 7-8 months, in social classes A and B.

The CEDIR was created to receive post-consumer materials USP and society as a whole. Today has partnered with various social initiatives. It works in partnership with the Institute GEA in a program for waste pickers training in the management of electronic waste, with support from Petrobras.

It was designed to get 5 tons per month and now gets between 10 and 12 tons per month. Approximately 20% of the materials are received from the company and 80% of the university itself. The computers are donated to CEDIR by individuals are the most leveraged for social projects since they arrive in good condition.

How CEDIR design challenges are:

- cost of equipment maintenance;
- the cost allocation procedure;
- management of orphan equipments (whose producer is unknown);
- recognition and sorting of different types of plastic;
- storage of materials for the composition of minimum volumes for withdrawal by companies;
- pos-consumed K-7 and VHS tapes management, and
- pos-consumed printed circuit boards management.

The management of WEEE by waste pickers still need training to warn about toxic substances in WEEE and even information about basic notions business plan to marketing waste. Collectors who obtained R\$ 0.30/Kg. Today they can receive about R\$ 5.00/Kg from the inclusion of stages of disassembly and sorting of materials.

It is also important to educate society and producers for the purchase of green equipment, ie, that do not have toxic compounds in its composition and make possible sustainable management of this supply chain.

## **Panel 4**

### **Brazil-Europe dialogue in the context of the legal framework**



**Panel 4 - Brazil-Europe dialogue in the context of the legal framework**

Coordinator: Sylmara Lopes Francelino Gonçalves Dias – EACH/USP - Brazil

Commentator: Ed Brown – Sustainability Research School, Loughborough University - England

**National Policy on Waste Management (Law n 12305/2010)**

Patrícia Iglecias – Faculdade de Direito/USP – Brazil

Currently there is antagonism between environmental issues and economic issue in the light of the interpretation given to the concept of quality of life in relation to patterns of production and consumption. As a result, there is an economy predatory, not viable or sustainable. Thus, you need to change the cultural reality, especially in the context of Brazilian reality. This issue is dealt with, initially, from precepts contained in environmental legislation, places where the right to a balanced environment and even aspects of consumer protection.

In this context, from the preoccupation with the human being, the individual will be worked on public policy in general and, more specifically, public policy environmentally adequate disposal.

There are a number of problems due to both production and consumption. In this context, Brazilian law considers a shared responsibility between different actors and not exclusively related to production.

Environmental law is originally seen as a question of public law, while consumer law is related to private law. Today, however, the two disciplines are related. In our code of consumer protection is the concept of meeting the needs of consumers involving the improvement of living conditions and recognizes that consumption is related to cultural patterns. There is ample incentive for consumption.

Such concepts for consumption refer to aspects of physiological entropy, that is, consumption patterns related to basic needs and further the understanding of the entropy pathological beyond needs healthy and sustainable. To this introduction arises that the relationship between the environment and the consumer is very strong.

The National Policy on Solid Waste (PNRS) that defines solid waste substances, products, materials or discarded goods whose final destination is the proceeds, intends or is required to proceed.

From an economic perspective, the issue of waste today allows us to work with the idea of market correction, internalization of environmental costs and compensation externalities.

There is a distinction between waste and secondary raw material? From the interpretation of the law means that there is an objective view of the residue. That is, although there are other applications in the production process, it will always be termed residue. Otherwise, it would be other situations in which it could be classified in addition to waste.

From a legal standpoint, the residues were taken as something abandoned without ownership. Today, however, there is another legal nature, which was liable today is considered one environmental good. What becomes nonsense, since the sense of 'good' would be provided with one value and, in some cases, the residues are not valuable. As a consequence, this well belongs not only to its owner but direct, according to the Brazilian context, this residue is to involve the question of interests.

From a social standpoint, the law considers the prioritization of collectors insertion. Point that this should be reconsidered, improving conditions and empowering stakeholders.

The law proposes waste management through waste reduction, recycling, recovery and disposal. Must implement actions to consider affordability criteria, uncertainty and damage mitigation.

In a European Directive of 1975 already mentioned a code of best conducts, preserving the environmental and human health.

The law still talks about the ban on the importation of hazardous products and wastes that could cause damage. It is noteworthy understanding of shared responsibility for the life cycle of the product in the Brazilian legislation compared with the concept of extended producer responsibility,

proposed by the European Directives.

In this regard, one must consider the difference between damage and potential damage. In this context, the legislation puts the fulfillment of targets for minimizing impact, regardless of the occurrence of damage. One works with the concepts of tolerance and abuse of rights.

Under the responsibility concept, those involved have pre-established roles. Manufacturers and importers may establish purchasing procedures, gas delivery, partnership with cooperatives and collectors. Traders and distributors are required to return products and post-consumer waste for manufacturers. Consumers, through the implementation of sectorial agreements will be required to return products and post-consumer waste, as well as collaborate with separation for selective collection, when implemented. The holder of public cleaning services and waste management activities can take the responsibility of other actors in the chain, being paid in this condition, as sectorial agreement or term sheet set.

In the case of the supply chain, to encourage recycling, reuse, reduction or other disposition environmentally appropriate, and especially access to information so that there is effective collaboration.

As criteria of reverse logistics, established by law, it is important to mention economic viability. The products for which one must consider initially implementing reverse logistics systems are:

- Pesticides (waste and packaging)
- Batteries
- Tires
- Lamps
- Electronic waste
- Oil (waste and packaging)
- Batteries

These products were already regulated by CONAMA (National Environment Council), so a way to enable the implementation of reverse logistics systems. Of these, lamps and waste electrical and electronic equipment were not yet regulated.

It is mentioned in the law yet the extent of deployment of reverse logistics for packaging and other products. Since the packaging sector is already mobilized for implementation.

Despite already being in force, the law requires implementation through targets that will through:

- Sectorial agreement
- Regulations
- Terms of commitment

The sectorial agreement has contractual feature and should have representation from the sectors involved. The goals set forth by law, in turn, are related to the proportionality of products on the market.

Although fairly recent, the law makes a number of possibilities and creates space for new economic activities. The bottom line is questioning the basic ethics, a contextualization of a crisis of values in which rethinks a series of values. Happiness associated with the acquisition of goods being reconsidered under an ethical basis.

## **European regulation on Waste Management**

Jessica Magnusson - SP Technical Research Institute – Sweden

In Sweden, in 1999 was enacted the main regulation in waste management aligned with the European context. Concerning the environmental management Europe have different kind of laws. About waste management the responsibility is shared but it is not included in the law as it is in Brazil. Europe has the producer responsibility. Despite having organizations collecting and treating the waste, the company is responsible to finance those associations. This system occurs very well and is integrated with the municipalities that are responsible to inform the citizens about the way to help with the waste separations and collect.

There are some requirements to be followed by the organizations when they send their solid waste abroad. They need to track who is receiving and how the hazardous waste will be destined. Before the specific legislation this type of waste uses to go to countries Africa.

The companies need to guarantee that the waste management is done by the right way.

It was a brief consideration but it have been working in continuous improvement in European Union.

## **Some Lessons from Research on Solid Waste Management in Low and Middle-Income Countries**

Ian Smouth – Loughborough University - England

Despite working in a European University, the research focuses on solid waste management in low and middle income countries. The research interests are around interdisciplinary work focusing in problems from waste chain. From collection to disposal interesting alternatives have been discussed in this workshop and it is possible to observe that if each step work well, all the chain will be effective. Some other points of interest are the impact of waste management in the public health, the informal sector employment, the cost of solid waste management operations, the role of social enterprises, community organization and the role of collectors.

The first analysis starts from the identifications of what operations produce waste, how it is collected and taking through a disposal system. Considering in the disposal phase the recycling, incineration and other alternatives.

On the other hand, there are low income communities in which this processes will be not possible because, for example, there is no access for trucks. Particularly, for low income countries there are intermediate stages where may be considered primary collection with manual sorting of the materials or than the use of small trucks to reach the specific areas of waste collect. In some cases, the household waste must be delivered in a waste centre or to a transfer points. Some important impacts may raise from if these phases are not accomplished and those impacts may compromise other parts of society.

One characteristic why collection is important is because of the risks associated with the waste management. Injures and infections may result from the contact with solid waste. Spreading diseases by flies and rats in areas where the waste is not correctly disposed or treated. Some difficult from moving the solid waste are related to the urban traffic. Another important aspect is that surface and groundwater may be polluted by leachate running off from disposal sites. Aspects related with potential emissions, combustion and explosions from waste material decomposition in landfills and dumps must be strongly regarded.

Some perspectives on solid waste management services must be faced from different points of view and not uniquely through the lens of a particular discipline. While engineers may be interested in

equipments or processes for breaking down the waste or incineration, manitures may interested in maintaining the services and the operations, the social scientists may be interested in how people are involved and politicians are looking for popularity and waiting for election.

All the points of view are valid and important and, somehow, must be brought together. In this regarding, it is very impressive the way the CERSOL was concepted, integrating these exemplified knowledge.

In the political context it is important that the citizen return the question trying to answer what must be demanded from politicians. The political role may be illustrated with the case of London history with the Thames river that was very bad polluted. This river just runs outside the British Parliamentary building and was called the 'Great Stinky' because it used to be smelly. Maybe in this situation the government start to think about alternatives to recover this river, as it was done.

About economic issues, the financial support is very unpredictable and developing countries suffer with these conditions and are conduced to loans for waste management systems implementations.

Developing tropical countries have more rapid decomposition of organic material from waste due to the warm temperatures.

In Europe major part of informal labors are in the recycling area and not at collection, as observed in Brazil. In developing countries, this side of informal sector activity involved in solid waste management is often really quite expensive and complex. There are different organizations and groups involved.

In the professional level, solid waste management is not well developed. There is limited knowledge about solid waste management in many developing countries and the institutions are not focused in professional terms. On the other hand, the cities in the low income countries are growing much faster than cities in Europe. It may be observed a rapid growth of waste from increasing population and from increasing economic development.

In developing countries, the main constraint is the infrastructure. The whole operational support and the problems of congestion which reduces the efficiency of collection. By the same way, the social conscious, awareness about environmental issues.

To conclude, the citizens in medium and low income countries face different problems and conditions then in Europe. Because of that the solutions may require different approaches. It is important to consider in the research the multidisplinary and the multi stakeholder's analysis to understand issues of these particular places. Through understanding it is possible to design appropriate solutions.

## **Final Remarks**

### ***Prof. Ed Brown - Loughborough University - England***

According to some reflections present in this panel, it is possible to present some remarks. São Paulo is the most connected city in Latin America. To understand the waste management it is important the production process. Not consider the system as a black box, but try to understand the connections as a global economy, legal obligations and responsibility.

The application of the new law on solid waste management seems to be very innovative and the context and proposal should be discussed with many other countries.

It would be interesting to analyze how different regions and populations would be affected by the law. How the academy intend to work with those municipalities and help them to prepare for implementation of the law. Another important aspect is how different social groups are involved in the process of implementation of the law, and also how organizations and other actors in this chain are involved in this process for specific materials and waste. Municipality has an important role in communication and provides access to information with academic collaboration.

An important remark is about the main alternatives discussed in the workshop regarding the reducing of consumption. It may be required to determine the ways and levels of consumption may be achieved by each group.

Some specific questions may be presented as follows:

- What are the impacts of the proposed law?
- Who will gain with the new opportunities?
- Who loses?
- How does the communities pay for obtain energy and how they will have access to it?
- What is the level of transparency in the negotiation level?

A debate that occurred in Europe was about who will pay for sustainable patterns. The definition of the taxes and related issues. Maybe a proportional analysis according to the incomes could be evaluated.

Finally, it is important to reiterate that it is a two way process. There is too much to learn from Brazil and Brazil form Europe.

### ***Prof. Jorge Alberto Tenório - EPUSP***

The presentations highlighted points regarding knowledge and capacity in sanitation where waste management is included. The event was a very rich opportunity for the presentation of experiences from different European countries and the Brazilian proposal. Today was launched the Centre and the contacts are available for those who want to know the work and participate in projects. There is much work to be done and we are open to contributions.

***Prof. Maria Cecília Loschiavo dos Santos – FEA/USP***

We would like to thank the Institute of Electrical and Energy (IEE / USP), Faculty of Architecture and Urbanism (FAU / USP), University of Boras, SP Technical Research Institute, Loughborough University, CAPES, Polytechnic School (EPUSP), UNICAMP and PUC / SP.

In Brazil, the theme of the waste became known by the hands of the poor people of our society who have seen in the waste a chance of survival. To them we owe a hinge in building strong National Policy on Solid Waste. In all moments of this workshop were treated the paradigm shifts, this time of transition we are living in which is being established a new consumption behavior. Today, especially in Brazilian Valentines Day, we reflect on the care we should have with our planet.

***Prof. Ildo Luis Sauer – IEE/USP***

It is important to note the recognition of those who worked to achieve this second event and this environment of reciprocity, of exchange. The transformation of the planet after the Industrial Revolution, when were about 700 million people on the planet, is marked by an extraordinary increase in the production of social work, but above all because of the possibilities that the ownership of intensified energy and environmental permitting an intensified appropriation of metabolism. But now, with 7 billion people, the induced consumption - that is not necessarily to satisfy needs but to reproduce and enhance the consumer - allow contradictions discussed in this event.

On one side waste materials and other social outcasts who try to support their own needs precariously. So, a dual challenge that faces such an event. On one hand, coordinate, shed light on how and why we produce and consume. On the other hand, look at the huge asymmetry within and between societies as a challenge. The second no less important than the first.

On the eve of the Rio+20, proves extremely important the initiative of this organization, we recognize the merits and the huge expectation that arises around this field of work, uniting professionals from Brazil and abroad and also bringing the actors who participate socially and concrete this process.

***Prof. José Roberto Cardoso – Dean of EPUSP – University of São Paulo***

I congratulate the organizers, it is very important to be certain that the great challenges of modern society: energy, sustainability, water, waste and health, the discussion of these five themes should be in all professionals' capabilities, regardless of their formation. We should talk to our children and youth, with property, about the importance of these themes.

This importance is still a major process of internationalization. Our professional is no longer restricted to a country, to an office. He is in a multinational team. Will be daily discussed problems that occur with environmental restrictions around the world, so that it is no longer possible to dispense one of such kind of knowledge. For this to be consolidated, nothing better than that is inserted into a curriculum of all courses.

The University should seek a professional capable of acting globally. For this work to be successful, it needs to move through the areas mentioned. Surely this event contributed to this kind of thinking becomes a reality.

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## **ANNEX**

### **WORKSHOP PROGRAMME**

**June, 12th 2012**

**8:30 – Registration**

**9:00 – 9:30 – Opening Session**

**9:30 – Panel 1 - Trajectory of waste management in Europe – consumer needs and market barriers**

**Discussion**

**11:30 – Panel 2 - Opportunities and barriers for waste as resource**

**Discussion**

**12 – 13:00 – Lunch**

**14:00 – Panel 3 - Innovation systems and new technologies: future challenges**

**Discussion**

**16:00 – Panel 4 - Brazil-Europe dialogue in the context of the legal framework**

**Discussion**

**17:30 – Final Remarks**