

# INTERNATIONAL NET MAPPING OF SUSTAINABLE UNIVERSITIES

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## Abstract

The objective of this work is to develop a search site to map all of High Education Institutions (HEI) and their environmental actions; to create a worldwide cooperation network between HEI with practical support in its campuses. The Site will have the following workflow: first, the HEI is invited to take part on the network, when one representative of the institution will subscribe, creating his/her own login. The next step is to point on the map the country/city where the HEI is located, which serves as the site's user interface. By doing this, a window will pop up, allowing the user to select the desired environmental indicators. Moreover, the HEI will have the option to inform new environmental practices and the research projects that are being carried through in the environment area. At the end of the process, the HEI can demonstrate its interest in developing research projects in partnership with other institutions. So, in the site, there will be a forum for easing the exchange of ideas and spreading of projects, congresses and publications about this subject. This project has as main benefits: to show the sustainable practices the institutions that take part on the network are doing, as well as arguing about the environmental performance of each one; stimulating the creation of technician-scientific cooperation networks between the HEI with sustainable practices; allowing discussion about sustainable development; promoting the integration between HEI, teachers, researchers and HEI managers.

## Keywords

*International net mapping, sustainable universities, environmental indicators.*

## 1. Introduction

High Education Institution (HEI), as educational and research institutions have an important contribution to sustainable development, besides its potential effect on modifying the minds of people through education.

In Careto's and Vendeirinho's (2003), viewpoint universities and other higher education institutions need to practice what they teach and thus combat the environmental impacts, and to serve as an example in complying with legislation, stepping the theory aside and going into practice. However, most of the HEI has no central authority to coordinate environmental practices. For this reason, many environmental practices of internal HEI differ from department to department.

Therefore, this article aims at analyzing qualitative and quantitative sustainability practices adopted by the HEI and the relevance of this research is to present a systematization of environmental improvements adopted. This was possible through an extensive literature review on sustainable practices at national and international HEI.

This paper aims to present the initial structuring of a search site with the mapping of all the HEI and their environmental actions that will create a cooperation network among the institutions in sustainable practices on their campuses.

The creation of the network and identification of environmental actions in universities have as main benefits: disseminate sustainable practices of the participating institutions, as well as discuss the environmental performance of each one, to stimulate the formation of technical and scientific cooperation network between HEI with sustainability practices; enable discussions on the role of HEI in relation to sustainable development, promoting integration among HEI, teachers, researchers and university administrators.

## **2 Practice sustainability of HEI**

### **2.1 Global examples**

The HEI started to introduce environmental issues into their management processes from the sixties on. The first experiments emerged in the United States simultaneously with the promotion of professionals in environmental sciences that stretched over the seventies. In the eighties, the focus was more specific policies in waste management and energetic efficiency. During the nineties global environmental policies were developed, which bring together all institutional areas, such as the Campus Ecology at the University of Wisconsin at Madison or Brown is Green, of Brown University in the United States (Delgado; Vélez, 2005).

According to Delgado and Velez (2005), there are about 140 higher education institutions, worldwide, that have incorporated environmental policies in the administration and academic management. Among the HEI that have adopted environmental policies and made commitments to sustainable development, ten are certified with ISO 14001, such as the University of the United Nations in Tokyo, Japan.

Ribeiro et al. (2005), mentions that the IES considered the pioneer in implementing an Environmental Management System – (EMS), is the Mälardalen University, Sweden. Currently the university is certified according to ISO 14000.

To reach this certification, the institution has established an environmental policy, designing programs that generate positive results and that are consolidated in constant improvement. It can be noted as a result of the program: environmental publications; energy consumption control, efficient transportation for users, and also a program to reuse and properly dispose of the waste (Oelreich, 2004).

Blewitt's work (2001) presents eleven HEI in the UK, some of that highlighted below, with their respective practices:

- The Bishop Burton College had as main target of the project: to identify good environmental practices within the college in order to establish a management and indicate areas where improvements were needed. Furthermore, it was developed a guide with good sustainable practices, focusing on students' understanding of sustainable development.

- At Blackburn College, the project involved two basic strategies: to work within the departments of the institution, identifying those who cause a direct or significant impact to the environment, pointing out solutions based on ISO 14001 environmental management standard, involving the training and sensitization of staff to control energy use. In the curriculum matter, the faculty of Blackburn observed ways to develop an awareness of environmental sustainability among students, including the community where the institution is installed.

- Cornwall College sought to review its programs to promote sustainability among its students and staff. It also introduced the statement of sustainability in its popular programs, development of projects, production of a questionnaire aimed at examining the level of sustainability addressed in the basic curriculum of their courses. In a practical level, forty assignments were written to all students and staff knows sustainable practices, containing elements such as energetic efficiency, water reuse, organic food, health systems and security began to be taught to all students.

- At Huddersfield New College, the project focused on environmental indicators and the base curriculum. The initiative was part of the project Ecocampus. In the environmental sphere, the work was focused on the following areas: research on patterns of staff and students movement in order to produce an action plan and monitor procedures to reduce commutes by car for a single occupant; to raise staff and students awareness to reduce and minimize the generation of effluents, control over water and energy consumption, stimulating learning and providing opportunities to students increase their interest about sustainability,

projects were developed out of college to protect and enrich the environment. These successful activities had highlighted the strong participation and community engagement. Regarding the courses curriculum, a large number of projects involving students were developed.

► The Southgate College, Enfield College and College Capel Manor Horticultural & Environmental Centre, all within the same county, created a partnership and developed several activities, such as: a tool for sustainability analysis, in order to examine the courses under their commitment to sustainable development, a monitoring tool, which indicates economic data, environmental and social information, a method to disseminate the projects developed within institutions.

► In South West Association for Education and Training (SWAFET), an association which has seven representatives from colleges, a project was made to focus attention for future development in the southwest region. The project goal is to produce a map showing the degree of commitment to the sustainability of the faculties from the southwest region. The research was done, sending questionnaires to all the 37 colleges in the region, and had a response rate of 59% was achieved. The results of the questionnaire highlight examples of good sustainability practices that were later presented at a regional conference in June 2001.

► The St Helens College hosted a recycling and transport control program. In addition, the council signed a partnership with the municipalities in the metropolitan area of St Helens and collaborated with the organization of events in the environmental area. The faculty also joined the Ecocampus that was considered the main way to implement policies of sustainable development at the college. The objective was to establish an environmental management system within the institution. The project had two main focuses: to find a responsible to coordinate the institutional review program and to develop interactive curriculum materials that refer to sustainable development.

► The Walford and North Shropshire College had as objectives to develop an agricultural version of technical courses and training of environmental managers, including a course manual containing an overview of legislation and public policies and a CD-ROM and a video to support and highlight the course through the distribution of leaflets. The assessment materials were developed and edited. These would be used in an experimental course, which works at the college and would be evaluated before promoting its use in other institutions. The intention was to show potential benefits at the college farm, but during the project implementation the farm was closed due to FMD.

► The Walsall College of Arts and Technology identified sustainable projects developed within the college, such as the restoration of the institution building following environmental standards and the promotion of ecosystem biodiversity on the campus. Each activity of the institution is measured by sustainability indicators. The college is a member of the Ecocampus program.

► The Wigan and Leigh College Wigan showed as a improvement of environmental performance the introduction of sustainable development in all areas of college. The good practices developed by these institutions are part of an initiative whose main objective is to implement an Environmental Management System to reduce energy and water consumption. Under this process, it was developed an action plan for continuous improvement and goals were set to achieve sustainability, eg environmental safety training for staff and integration of sustainability concepts in school curricula. These institutions are also part of the Ecocampus program.

In Portugal, there is not an agent nationwide with positions taken regarding strategies in higher education for sustainable development. It is a deficiency that penalizes the individual efforts of the Portuguese universities in defining and implementing their own strategies, depriving them of partners, incentives and guidelines for concentrated action (Fouto, 2002).

According to Fouto (2002), Portuguese universities are taking individual steps, such as:

► University of Algarve - encouraged its students to perform an environmental review in one of his faculties;

► University of Aveiro - a study on environmental policies in universities was already led and implemented;

► The Technical University of Lisbon - promoted through their students, an environmental audit on their premises of Institute Technical Superior;

► The New University of Lisbon - promoted the signing of the Charter of Principles of Environment of its campus in Caparica.

The experience of the Faculty of Science and Technology, New University of Lisbon (FCT-UNL), Caparica Campus, shows some interesting aspects. As an HEI that since its foundation offers a degree in Environmental Engineering, FCT-UNL is naturally more sensitive to environmental and sustainable development problems (Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT-UNL, 2005).

One example is the fact that the FCT-UNL has been the object of an environmental survey in 1998 conducted by a group of undergraduates in Environmental Engineering, under the discipline of auditing and environmental management.

Besides the institutions of the United Kingdom and Portugal there are in Europe the university Zittau / Görlitz, Germany, with the ISO 14001 registration and the Autonomous University of Barcelona, Spain, with links between environment and security and the establishment of an Environmental, Health and Safety office, according to standards requirement and the implementation of action plans over the transport area (Careto; Vendeirinho, 2003).

Another example is the Autonomous University of Madrid, which is also integrated in the European project Ecocampus and inspired by Agenda 21, developed courses of action towards the implementation of an EMS. The activities performed differ in some points of the previous ones, as the introduction of environmental criteria in urban construction and vegetation control to promote greater biodiversity. A key differentiator from other control programs was the introduction of environmental criteria in the relationship between the university and suppliers of consumables (Ribeiro et al. 2005).

Delgado and Velez (2005) report that, recently, some Spanish HEI are pursuing to certify their environmental management programs. This applies to the University of Granada, which is implementing an EMS in all its centers and facilities, applying the guidelines of ISO 14001 as well as a waste minimization plan, aiming to reduce the impacts to on the environment by laboratories, classrooms and administrative sectors.

Even in Europe, the contributions of Bonet et al. (2002) are highlighted, which reports in his article a survey conducted at a university located in the region of Bordeaux - France. Energy consumption and water services available at the institution were identified. Regarding per capita consumption of water it was found that it was the highest if compared with the average consumption of large cities. The fact is aggravated because part of the water consumed on the campus comes from aquifers. As for energy consumption, the parameters remained similar to the consumption of urban dwellers, which highlights the need for control also of that item.

These data prompted the University of Bordeaux to join the Ecocampus program therefore it started to consider the best management of physical and environmental issues as one of the elements needed for a prominent environmental policy at its university. From this moment on, a larger number of tests on physical flows have been done, as the waste flow of chemicals and wasted water flow. Nevertheless, the method that was presented in Bonnet's et al (2002) is actually a tool, and should be understood as a single element of an environmental management system.

In addition to the IES mentioned above, can be related, as summary, results of research conducted by EMS and HEI, Careto's and Vendeirinho's (2003), which highlighted the following notable cases of HEI located in Anglo-Saxon America:

- ▶ Vermont University (USA), which developed a system called "ecological footprint" and production of alternative fuel (biodiesel) for its transport fleet. A similar example occurs at the University of Burlington (USA), which uses this system as a pedagogical tool of communication and information on environmental performance;
- ▶ Michigan University (USA) with a program of sustainable construction, an acquisition policy incorporating environmental criteria, waste management, energy, water resources, green spaces, transport and report to stakeholders, approaching systems for environmental excellence;
- ▶ University of South Carolina (USA), concerning the management of waste generated by students at the end of each school year, started an environmental program to other parts, being the co-founder of a platform of fifty universities and other educational institutions based on a commitment to improve environmental performance and share knowledge and experiences in this area;
- ▶ University of Missouri-Rolla (USA), certified according to ISO 14 001;
- ▶ Emory University (USA), points an experience that has shown that building a green building is not more expensive than a conventional one. In fact, when the costs are considered by integrating the Life Cycle Analysis for the same period of operation, the green buildings are less expensive than conventional buildings. The documentation and illustration of the savings achieved through this life-cycle analysis were crucial to get the support of the direction to sustainable construction projects. In addition to energy savings, there is evidence that green building increases productivity reduces the incidence of diseases, increases the rate at which students learn and increase employee morale;
- ▶ Carnegie Mellon University (USA) also uses sustainable construction projects;
- ▶ Louisville University (USA) with a consistent effort in providing advice and training on environmental management through the Kentucky Pollution Prevention Center (KPPC), with the disposal of documents, tools, e-learning and distance learning courses over the Internet to HEI in all implementation stages of EMS;
- ▶ Middlebury College (USA) with a full program in all areas of environmental management, such as ("Task Force" to management support; guide for investors, the "Pathways to a Green Campus Report" program), the Transport Program of alternative vehicles - leasing and loan of electric vehicles, including buses, for demonstration purposes and for use in school life, production of biodiesel from vegetable oils, including cooking oil as alternative

fuel to transport the fleet of the; relocation of all parking areas to the periphery of the campus), the landscape and conservation (measures for mapping protected areas, development of educational opportunities and development of a plan and land management), energy and water (the energy level control, design of large-scale systems to improve sustainability), it was used a minimal amount of herbicides and pesticides in gardens, use of paper (recyclable paper, front and back copies), policies (increase the environmental component College guidelines), waste management (Waste Working Group, focusing attention on the reduction and reuse; maintenance rates of recycling and composting).

► The British University in Canada, which implemented a policy of sustainable development through the creation of an office of sustainability (in charge of a program for sustainable energy, green buildings - Green buildings) and the creation of an office of waste management.

The Harvard University in Massachusetts, and University of Michigan (USA) are other HEI that involved, respectively, the environmental policy of the institution and the development of environmental awareness campaigns directed at the whole academic community, as well as the creation of a campaign water consumption and recycling (Delgado; Vélez, 2005).

In Latin America one of the highlights of the University Program for the Environment (PUMA) is the National Autonomous University of Mexico, whose mission is to support, promote, coordinate and promote activities aimed at investigating and disseminating a culture around the environmental area (Delgado; Vélez, 2005).

In Colombia, the Pontifical Javeriana University established an environmental policy consistent with their mission. This policy aims to consolidate the environmental system of the institution and, consequently, the implementation of an EMS (Pontificia Universidad Javeriana, 2003).

In 2000, Universidad Externado Colombia created a recycling program for the responsible use of solid waste. Universidad Nacional de Colombia carried out a research project on socio-environmental issues and prepared maps of the campus in order to identify key environmental impacts. Universidad Del Valle has produced an environmental diagnosis of its campus and many initiatives have been developed, including the creation of subjects for the environmental training, but the majority of them are elective (Delgado; Vélez, 2005).

Halac and Marchisio (2006) present the case of the town university of the National University of Cordoba in Argentina where, from the development of concepts and tools of valuation analysis and resolution of environmental problems identified, was developed a line of work initiated by the Research team of the Institute of Human Environment, School of

Architecture, Urban Planning and Design. The main objectives of the study focused on strategies to improve quality of life from the viewpoint of sustainability.

It may be noted, though, the case of Universidad Politecnico Gran Colombiano, which since 2000 has been working in the dimension of the concept of sustainable development, based on the institution's mission, expressing concern about the issue by announcing a comprehensive education and integrator based in the generation of sustainable development. It was created a multidisciplinary team that performed an institutional development project and began work on the implementation of EMS and the pursuit of eco-efficiency. This process was founded by ISO 14,000, and consisted of an environmental assessment that has been identified all environmental aspects in the campus. As a conclusion, the authors emphasize the need for waste management and water and energy consumption (Delgado; Vélez, 2005).

## **2.2 Brazilian examples**

In Brazil, works involving the HEI in the implementation of EMS's are relatively recent and are, in most cases, isolated initiatives. The example of Brazil's most important university that has implemented an Environmental Management System is the University of Vale do Rio dos Sinos (UNISINOS) located in the county of São Leopoldo in Rio Grande do Sul. Through the Green Campus project, UNISINOS was the first university in Latin America to be certified according to ISO 14001. The project aims to preserve, improve and restore environmental quality, ensuring the conditions for socio-economic development, safety, life protection and environmental quality. One of the most important achievements was the creation of the Environmental Management course in 2005. Through this, UNISINOS enabled the creation of laboratories for environmental studies, basic and applied research and even tools of GIS and other technical and human resources needed for the formation of their students (Verde Campus, 1997).

The Federal University of Santa Catarina (UFSC) is an example of an attempt to implement an EMS. It has created an Environmental Management coordination, linked directly to the rector's office, and it has established yet a policy of responsible environmental management. Through this, the emphasis has been to use education as a tool to improve the relationship between humans and the environment, to bring the community together as a partner in this proposal and seeking a better quality of life through the knowledge generation (Ribeiro et al. 2005)

In practice, some proposed programs are already underway. The chemical waste collection system at UFSC, for example, a third party is responsible for the proper collection and

disposal of wastes. It has been developed through a partnership with state government agencies, NGO's and associations, the Green Room project. This activity consists in the creation of a space in the institution dedicated to the design and development of activities of an educational nature, having as a major tool the disclosure and dissemination of publications on the Environment (Ribeiro et al. 2005).

Still in Santa Catarina state, there are initiatives from the Regional University of Blumenau (FURB). According to its environmental policy, FURB is an institution committed to environmental protection and to natural resource savings, seeking a better present and future life quality. This institution affected its environmentally conscious stance by creating the Committee for Implementation of EMS - Environmental Management System - in March 1998, which consisted of representatives from the whole university community. The objective of this committee is to clearly identify environmental problems of the University, to establish a plan for continuous improvement in reducing or eliminating these problems. This Committee established FURB Environmental Policy according to ISO 14001 standards and initiated an Environmental Planning and which culminated with the creation of an Environmental Management System at the University in 1999. FURB Environmental Management System is an organizational structure aiming to implement environmental policy and the objectives proposed by FURB environmental management, and it is composed by the Environment coordinator, and Responsible Environmental Agents (Butzke; Pereira; Noebauer, 2002 ).

The University of São Paulo created the PURA-USP group (Program for Rational Use of Water, USP), which has been responsible for paradigm changes in managing supply and water demand. In addition to maintaining low levels of consumption and the establishment of a structured management system, were created activities of technological nature (elimination of leaks, replacement of sanitary equipment for conventional model-saving and waste minimization in process) and mobilization (advertising campaigns and training). The Ciudad Universitaria Armando of Salles Oliveira obtained a 43% of water consumption reduction - from 137 881 to 79 053 m<sup>3</sup> / month (1998/2007). PURA-USP has promoted the sustainable use of water at USP not only in the environmental aspect but also in economic, social and cultural aspects (Silva; Tamaki; Gonçalves, 2008).

Besides this action, USP has activities for managing its solid waste through the USP-RECYCLE program that, through shared management and the action of internal committees in its units and agencies, local figures have the responsibility, besides a widespread advertising campaign, to prepare the cleaning staff of each unit and train managers and

responsible people who monitor the process on its own place and work. USP also has the PURE-USP - Programme of Rational Use of Energy USP (Diaz-Rock; Massambani, 2008).

Oliveira (2008) points out that other HEI have adopted different practices in environmental management, even though in some cases, in a less integrated way. The author states examples from the University of São Paulo (USP), which implemented a Permanent Commission for the Environment at the Ribeirão Preto campus, and has designed an EMS project at the Pharmacy faculty. Universidade Estadual Paulista (UNESP) took actions for waste management on Sorocaba campus.

This same author also highlights the efforts of the Federal University of Juiz de Fora, which among other actions developed an environmental education program, seminar on environmental issues, human resources training, garbage collection, sewage treatment with macrophytes and environmental programs involving the community.

Another HEI developing an Environmental Management Program is the State University of Londrina (UEL), aiming at the development of actions for waste minimization, environmental conservation and training of people committed to environmental ideals. UEL has programs in the area of selective collection and solid waste recycling, management and efficient use of energy and reduction in water consumption for verification in the losses system (Universidade Estadual de Londrina, 2008).

According to Ribeiro et al. (2005), Federal University of Rio Grande do Sul (UFRGS) has also been striving to implement an EMS. Initially, a diagnosis was made on waste generation and its various destinations in the units of the university. Through this initiative, it was possible to obtain useful information about the waste generated by the university. Analyzing the diagnosis, made from data obtained at UFRGS, it was found the existence of some specific initiatives, aiming at improving the environmental aspects of the university. At the Engineering school, a group formed by students of Materials Engineering has devised a system of Solid Waste management. With the support of the unit, this group implemented the system in 2004. Although the project achieved its goals in the first months of implementation, the gradual removal of the students who initiated the project, associated to the lack of involvement of senior management, caused the disintegration of the project. The Management school is another unit from UFRGS which also has been developing activities related to Environmental Management. From the initiative of a group of students guided by a professor, it was also proposed the implementation of a Management System of Municipal Solid Waste in this unit. The group conducted a survey on waste generation and, currently, is looking for possible actions to reduce water and energy consumption.

Tauchen (2007) introduced the environmental management model implemented by Horizontina College (FAHOR), which is based on actions developed by other HEI and is taking actions on the economic and on the saving of natural resources , creating a master plan for the occupation of land and green spaces , recovery of watersheds through the involvement with Clean Water project, integration of disciplines in the environmental area in all graduation courses, re-use of rainwater, management of laboratories wastes, ecological campaigns, use of recycled paper and the management and control over energy consumption.

The universities mentioned above, as well as a growing number of companies that are developing an EMS in their organization must take a few steps in order to get the ISO 14001 certification. These steps can only be conceived as a program to guide the improvement of the organization's environmental performance previewing steps: environmental policy, planning, implementation and operation, checking and corrective action and ongoing revision.

HEI have reviewed numerous sustainable practices, as an initial step of the institutions, which serve as an example for society.

### **2.3 Methodology for mapping of sustainable universities**

In order to develop a search site to map all HEI and their environmental actions as well as to create a cooperation network on a global scale among HEI that keep sustainable practices on their campuses the following steps were taken:

- The management team of Under Development will use an agile methodology called SCRUM, which is defined by its stories and details, which is estimated to be developed by the teams involved. Regarding the development of the Site will be used the PHP language and MySQL database, both free software and also the Google Maps API, which allow the use of Java Script code to make notes on maps, and thus determine the exact location of the HEI project participants and the registration of their respective environmental indicators;
- The site will have the following dynamics: initially the HEI is invited to join the network, and by this time, the representing of this institution will make his/her registration by creating your login. Later s/he finds the city/country of his/her HEI scoring a point on the map that serves as the interface of the site, where a window with environmental indicators to be selected. Moreover, the HEI will have the option of informing new environmental initiatives and research projects being conducted in the environmental area. At the end, HEI can demonstrate their interest in developing research projects in partnership with other institutions. In this sense, within the site, there will be a forum for exchange of ideas and

dissemination of projects, conferences and publications involving the issue of sustainability. All this information can be linked to social networks like Orkut, Facebook and Twitter, depending on existing integration APIs. At a later stage, the site will serve to publicize their HEI sustainability reports.

## 2.4 Sustainability indicators

The indicators were acquired based on researches made by fifty higher education institutions, involving America, Europe, Asia and Oceania. These indicators have been structured into nine different groups of environmental aspects as described below.

Regarding organizational aspects of HEI (Table 1) eleven indicators were taken, especially solutions based on ISO 14000 environmental certification, environmental audit and other important elements of the institution management.

Table 1: Indicators of environmental aspect of the organization

Organization
The HEI has environment certification
Environmental management coordination
Environmental auditing to indicate where needs improvements
Diagnoses of direct or significant impacts for the environment
Fulfillment of environmental standards/license/legislation
Solutions based on ISO 14000 pattern
Training and awareness of employees, teachers and students
Budget forecast for investments in the environmental area
Emergency procedures for environmental accidents
Disclosure of environmental information on the internet
Sustainability reports

In the research, teaching and extension aspect (Table 2) were created six indicators of importance. Assuming that the HEI is responsible for the training of future managers, these indicators are very important to define the level of involvement of the environmental aspects of teaching HEI. It is essential to understand the inclusion of environmental subjects at the graduation and master's degree courses as well as programs of environmental awareness-oriented society.

Table 2: Environmental indicators for teaching, research and extension aspects

Teaching/Research/Extension
Inclusion of environmental thematic in the courses curriculum
Research projects with environmental thematic
Programs directed to society that creates environmental awareness conscience
Graduation and master degree courses in environmental area
Partnership with another universities on the environmental thematic
Organizing events in the environmental area

Another group of indicators is related to material consumption, purchases and acquisitions made by HEI and its goal is to identify whether the institution has a preference for environmentally friendly suppliers (Table 3).

Table 3: Environmental indicators for the aspect of material consumption

Material consumption
Preference for suppliers with a return system
Preference for suppliers with environment-friendly products
Preference for products with an environmental certificate
Policy to reduce the consumption of materials (raw material, inputs, auxiliary materials)

The solid waste control (Table 4) is another very important indicator. The waste management, policies to reduce paper use and recycling programs are some of the indicators highlighted.

Table 4: Environmental indicators for the aspect of solid waste

Solid Waste
Management plan for solid waste
Policy to reduce the use of paper
Use of recycled paper
Actions to reduction solid waste
Solid waste selective collection
Environmentally correct treatment
Appropriate destination
Reuse program
Recycling program
Composting system for organic waste

The group of indicators related to water, soil, air and noise (Table 5) constitute the group of indicators that are less quoted and charged by the HEI. Usually it appears as isolated actions and the highlight given was to effluent treatment, monitoring of water consumption and use of rainwater.

Table 5: Environmental indicators for the aspect of water, soil, air and noise

Water, soil, air and noise
Measures to prevent soil pollution
Effluente treatment plant
Monitoring of water consumption
Program to reduce water consumption
Rain water recovering
Control/monitoring emission of greenhouse gases
Control/monitoring emission that contribute to the depletion of the ozone layer
Policy for prevetion of smell/dust/noise/vibration
Measurements of noise in the campus

The indicators related to energy (Table 6) are those that most obviously appear in the polls. On this basis structured by six indicators, that seek to highlight the control over energy consumption, energy efficiency equipment and the use of alternative energy sources.

Table 6: Environmental indicators for the aspect of energy

Energy
Measurement of energy consumption
Programs for reduction of energy consumption - power efficiency
Consider energy consumption when buying equipment
Constructions with thermal and light confort (low energy consumption)
Use of renewable energy sources
Energy plan and anual report

The surveys conducted in the HEI showed few indicators related to master plan. Especially In Brazil, are rare the HEI that have a master plan and follow the principles of sustainability in the construction and renovation of buildings (Table 7).

Table 7: Environmental indicators for the aspect of buildings and soil occupation

Buildings and soil occupation
Existence of a master plan
Constructions and reforms (execution) following sustainable patterns
Use of environmentally friendly construction material
Prevention/minimization of damage to landscape
Management of construction waste

Table 8 presents the indicators related to natural resource conservation with emphasis on the preservation and expansion of green areas, promotion of biodiversity in the campus ecosystems and use of biological indicators.

Table 8: Environmental indicators for the aspect of conservation of natural resources

Conservation of natural resources
Preservation and expansion of green areas
Promote biodiversity in the campus ecosystem
Use of biological indicators of water, soil and air pollution

The last aspect is presented in Table 9 shipping. In developed countries the indicators related to this aspect are the ones that most stand out, especially in European countries.

Table 9: Environmental indicators for the aspect of transport

Transport
Incentive to public transportation use
Incentive to bicycle use

The HEI will choose, from the aspects and indicators presented in the tables above which environmental indicators will be adopted in the campus management, in aspects related to education, involvement of the society and the introduction of environmental subjects in the graduation and master's degree. Through this database it will be possible to disclose which indicators are most used by HEI allowing each institution to disclose its commitment to the environment.

## 2.5 Website of the international network sustainable universities

The website is structured in three languages, Portuguese, English and Spanish and, to join the Sustainable Universities International Net (SUIN), it is only needed to access the address [www.riusmap.net](http://www.riusmap.net) and fill in the form. After filling the form in, the user selects the login screen (Figure 1), where it is possible to access the system.

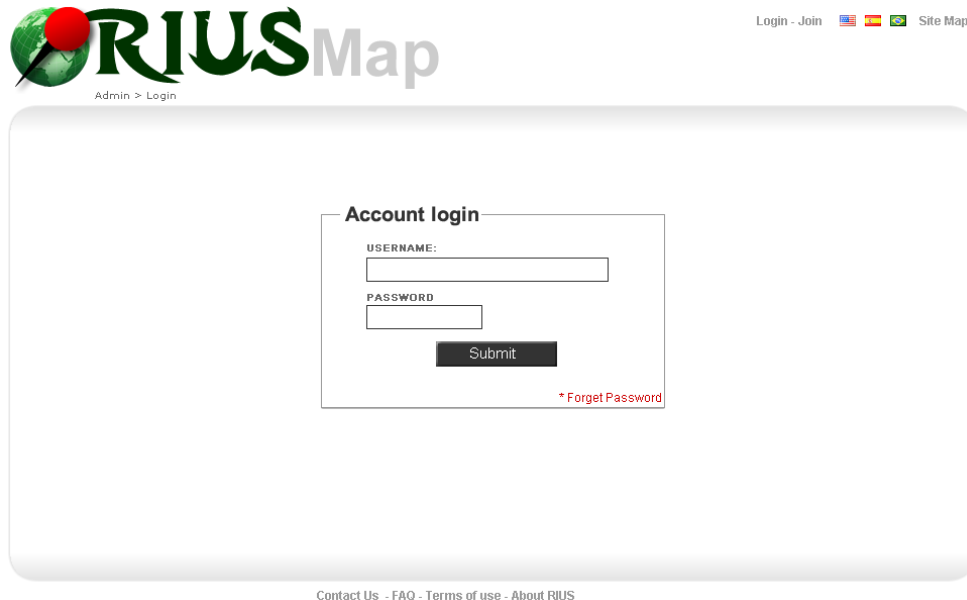


Figure 1: SUIN system login screen.

After logging in, the user can access the initial marking screen (Figure 2), in which is possible to select the environmental indicators proposed for each group. After selecting a place for the first time, the content appears without any marked indicator, which makes possible the inclusion of new indicators for each group.

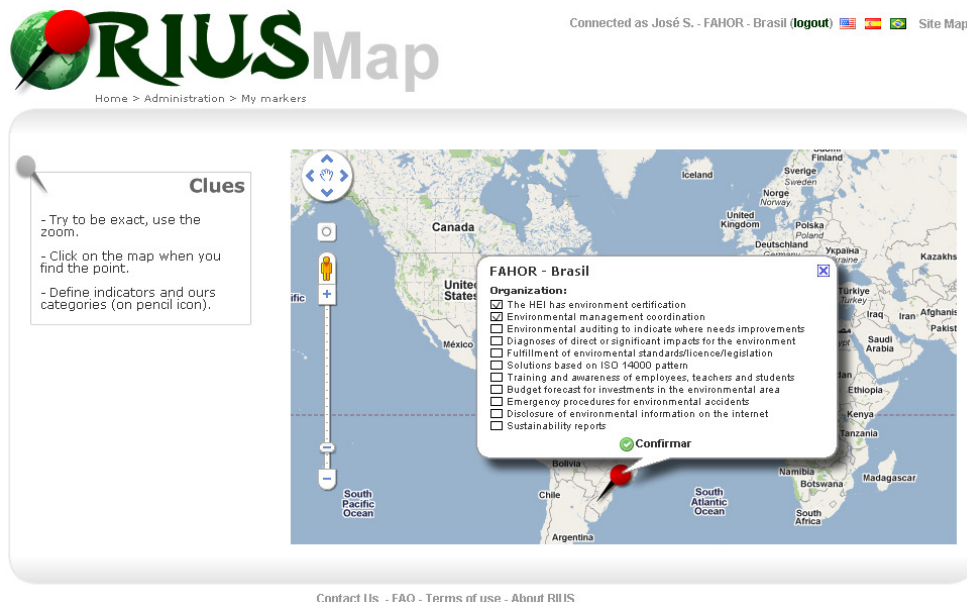


Figure 2: SUIN system indicator's screen.

When selecting a group of indicators it is possible to elect the ones practiced by the institution, and, after confirming, it is possible to move forward to another group and select new indicators, as a way to fulfill the system with other items in the current categories.

When the environmental indicators charged by the HEI are identified, any user is allowed to visualize them (Figure 3).

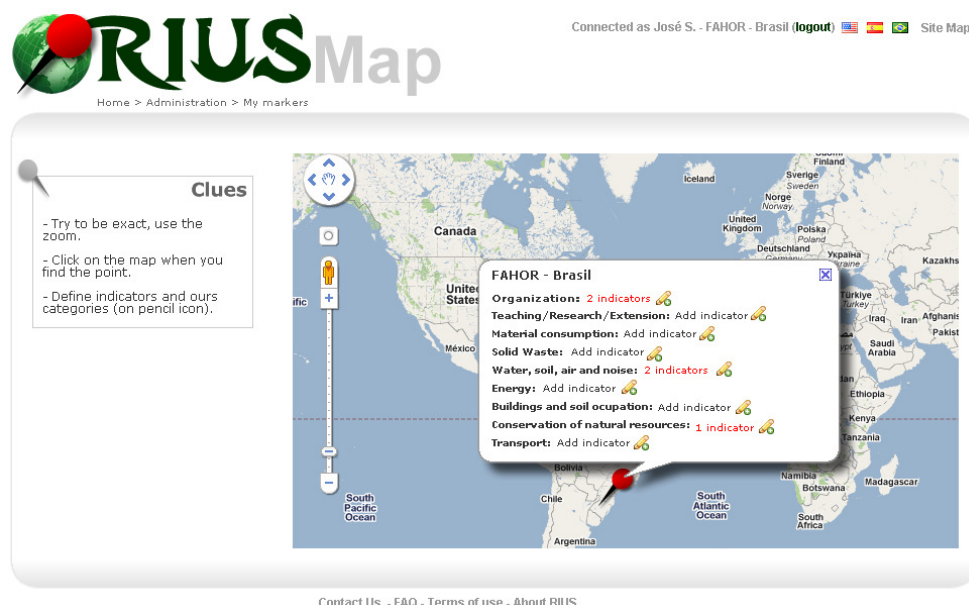


Figure 3: Group indicators screen

Figure 4 shows the images available to ordinary not logged in users, whose main purpose is allow people to make searches. In this part it is possible to filter information by country, institution and indicators group, just showing the results that attend the request information.

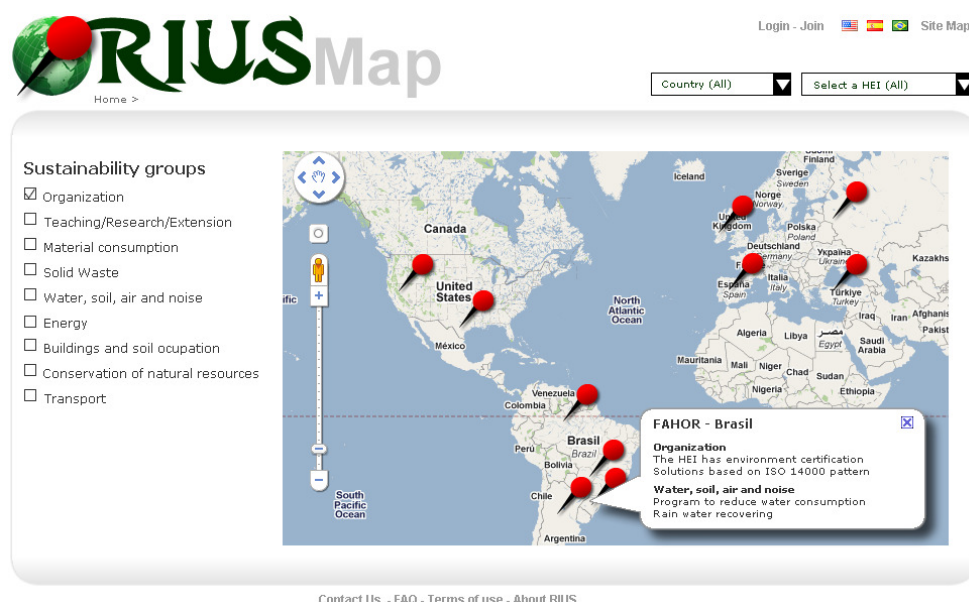


Figure 4: research screen

*The 14th European Roundtable on Sustainable Production and Consumption (ERSCP)*

*The 6th Environmental Management for Sustainable Universities (EMSU)*

Through this system it will be possible to advertise the environmental actions performed by the HEI, in a way to raise the participation level of the institutions in the environmental area.

## **Conclusions**

It can be concluded that the available literature related to environmental management in academic contexts is restrict and not enough explored. By analyzing studies performed in Europe, Anglo-Saxony and Latin America, especially in Brazil, it is concluded that, in most cases, the practices are isolated and in situations in which the institution is already working. This situation reveals rising adaptation worriness from the HEI in the pursuit of a sustainable development, not only in the teaching aspect, but also in environmentally correct practices. Some universities showed an approach which is more restrict to one or another group. On the other hand, another universities have a more expanded approach, trying to fit in all campus management aspects with environmental incidence.

This research evidences that in the mentioned HEI, the sustainable actions that are most highlighted are practices related to management of environmental system and the manageable areas in environmental scale, as the control consumption and water reuse and the management of wastes program. Another interesting aspect was the small insertion of subjects on the environmental area in several courses offered by the institutions, which proves the recent concern in teaching professionals able to work in favor of sustainable development.

Regarding the website and the creation of an international network of sustainable universities, it will be possible to broaden the discussions about HEI role toward sustainable development. In this system universities and colleges will be able to publish their environmental practices, to know what actions other institutions are performing as well as to interact as a cooperation network at academic level.

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