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Water conservation as a tool to support sustainable practices in a Brazilian public university

Maerbal Marinho [a,*], Maria do Socorro Gonçalves [b], Asher Kiperstok [c]

[a] Industrial Engineering Graduate Program/PEI, Federal University of Bahia – UFBA, Bahia, Brazil
[b] UFBA, Brazil
[c] Clean Technology Network of Bahia – TECLIM/ PEI – UFBA, Brazil

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ABSTRACT

Rational use of water can be a powerful tool to promote sustainability on university campuses. Other than resource and financial savings, it aims to support technological and behavior innovation towards a more balanced relationship between human activities and nature. This work reports on a water saving program case study, led by a research group at a university in the northeast of Brazil. It describes and discusses methods used and results obtained. From 1999 to 2008 the program reduced per capita water use by half at the university. It has brought significant resource savings to the institution. Internal results foster the implementation of cooperative projects between the university and public and private partners. All these projects involve engineers, social workers and undergraduate students from different courses. However, internal and external results have been insufficient to guarantee the internalization of the program in routine activities of the university. The permanence of the program still depends on the research group that created and manages it. The paper also presents the difficulties faced in sustaining a program like this at a Brazilian university and discusses future action to be taken to achieve the program's goals.

1. Introduction

Sustainability is a long term and complex goal. Universities have an important role in this process, both in terms of technological and behavioral innovation, and have been required to assume it. Technical literature reviews several experiences to seek sustainability in universities around the globe, describing a variety of administrative structures and practices (Disterheft et al., 2012; Corcoran and Koshi, 2010; Davidson et al., 2010; Ryan et al., 2010; Juárez-Nàjera, 2010; Stephens and Graham, 2010; Macnamara, 2010; Ferrer-Balas et al., 2008; Sammalisto and Lindhqvist, 2008; Beringer, 2007; Beringer et al., 2007; Blottnitz, 2006; Tauchen and Brandli, 2006; Verbitskaya et al., 2002). Launching sustainability initiatives requires the implementation of short term activities with rapid and noticeable results. This work reports the case of AGUAPURA, the water saving program of the Federal University of Bahia, Brazil (UFBA).

UFBA, located in Salvador, the capital city of the state of Bahia, in the northeast of the country is linked to Brazil's Ministry of Education. Although in a humid area, with almost 2000 mm/year of rainfall, the city is mainly supplied by water from the semiarid region of the state (which receives less than 800 mm/year of rainfall). Currently UFBA has an academic population of about 35.000 people. The campuses in Salvador included in the program consist of about 100 buildings, with almost all of them having an individual water meter.

AGUAPURA started as an initiative of a group of lecturers at the Polytechnic School of the university. Initially aimed to organize and orientate maintenance activities, it soon became clear that knowledge of each building's daily consumption and awareness of the academic community was central to a more rational use of water. The research group on clean technologies TECLIM, assumed the responsibility to develop a decentralized control system involving students and staff from all academic faculties to support these efforts.

Many university researchers work with environmental issues, but they are predominantly limited to research and lecture rooms. They do not integrate university priorities and operational practices. There was no institutional environment to start a broad environmental program at the university. Hence, a water saving

* Corresponding author. Escola Politécnica da UFBa, TECLIM (DEA, 4° andar), Rua Aristides Novis, 02 – Federação, CEP 40210-630 Salvador, Bahia, Brazil. Tel.: +55 71 3283 9892, +55 71 3283 9798.
E-mail addresses: maerbal@ufba.br (M. Marinho), mariagon@ufba.br (M.doS. Gonçalves), asher@ufba.br (A. Kiperstok).
URL: http://www.teclim.ufba.br

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program was launched and managed by a research group as a research program. More than just saving water, it aimed to contribute to students' education and to provoke the university to incorporate sustainability actions. Despite the significant results achieved, the program faces continuing difficulties maintaining and expanding its activities, mainly because it has not been fully incorporated into the administrative routines of the university and the institution has no managerial routines which focus on environmental goals.

Chapter 2 reviews some of these approaches and experiences found in literature, referring both to implementation of sustainability programs and water saving efforts at Higher Education Institutions (HEIs), to allow a better comprehension of how AGUAPURA relates to similar programs around the world. The program itself is depicted in chapter 3. As water saving actions and research is an ongoing effort of the TECLIM research group, initial hypothesis and strategies are continually reviewed as positive results and difficulties to overcome, are clarified. This chapter includes a presentation of the main factors identified to be decisive to attain a more rational use of water in universities and other public premises. Chapter 3 also includes a brief description of the set of actions developed to act on these factors. Until now, the program has not been able to effectively intervene on all these factors, nevertheless, significant results have been obtained.

The experience developed in the university attracted the interests of other public institutions, allowing the program to expand its frontiers out of the campuses. Chapter 4 brings a synthesis of these new partnerships. Chapter 5 presents a discussion of the experience developed and the conclusions of this work. The possibility of a specific water saving program to support broader environmental efforts is also discussed here, as well as the barriers that need to be overcome.

2. Environmental practices and water conservation in higher education institutions

Universities have been required to assume a leadership role towards sustainable development. Several international declarations, signed by Higher Education Institutions (HEIs), show the amplitude of the commitment. As well as providing good environmental education and research opportunities, universities should also be an example of what they teach. They should include good environmental practices in all courses, expand environmental issues in society as a whole and underpin a general move towards sustainability (Halifax Declaration, 1991; Talloires Declaration, 1990; Tbilisi Declaration, 1977).

HEIs around the world deliver millions of graduates to the work force each year. Among them there are both environmental specialists, as well as professionals with a strong possibility to generate environmental impacts. Campuses themselves may generate significant environmental impacts as a result of their activities and operations (Alshuwaikhat and Abubakar, 2008; Bonnet et al., 2002; Viebahn, 2002).

Lack of consideration or lack of awareness of environmental issues in HEIs is contradictory to education and recognition of the role of such institutions by society. Both theoretical learning and the incorporation of new patterns of behavior to reduce stress on the environment are more effective if developed in an environment where what is taught is what is practiced (Bonnet et al., 2002; Viebahn, 2002). Moreover, practices of sustainability on campus can boost cooperative research with industry and governmental partners. (Adomssent, 2011; Lehmann et al., 2009). Lack of sustainable practices transmits a message to society that universities do not value and are not able to implement sustainability (Bekessy et al., 2007).

Research on official university internet sites shows that some universities refer to sustainability as essential for social responsibility, academic excellence in learning and research, institutional valorizations and recognition and a trend in growth and qualification towards sustained academic leadership. There are explicit references to the commitment to "do what we say" (University of Cardiff, 2012; University of Lund, 2012; University of Gothenburg, 2012) and the university as a "living laboratory of environmental issues" (University of British Columbia, 2012; University of Harvard, 2012). The "Lünenburg Approach" (Adomssent et al., 2008) is especially highlighted by the emphasis on incorporating sustainability at all levels of training (Beringer, 2007; Barth, 2008).

Despite the fact that sustainability is relevant for society in many aspects, only a few universities worldwide are facing the challenge to strive for it (Adomssent et al., 2008) and to implementing a holistic institutional change (Thompson and Green, 2005; Barth, 2013). However, subscription to statements does not ensure compliance. Several universities did this but do not necessarily seek to fulfill their goals (Bekessy et al., 2007; Wright, 2002). Predominant focus in literature reviewed, is on campus operation: materials, water and energy saving and waste disposal (Alshuwaikhat and Abubakar, 2008).

There are several difficulties in introducing changes in complex institutions such as HEIs. Universities function in non-hierarchical ways giving a high degree of individual freedom to their researchers and lecturers. This makes it difficult to guide the implementation of new practices. Some barriers towards sustainability include: lack of knowledge and interest on the part of the academic community and usually their upper management; short time available for academics; staff resistance to new attitudes and procedures and; lack of pressure from society (Karatzoglou, 2011; Ferrer-Balas et al., 2008; Thompson and Green, 2005; Viebahn, 2002).

Considering this predicted resistance and difficulties, incremental changes may reduce conflicts related to wider changes due to a centralized decision. Each incremental step should be accompanied by communication and participation of the academic community some specific greening actions may deliver rapid and visible results that contribute to the success of other steps (Lozano, 2006). Daily operations change and new routines incorporate sustainable principles as "business-as-usual" (Barth, 2013).

Actions of individuals and small groups may help induce the process. This includes addition of new partners and widening the scope of action. This is accomplished by leading by example, provocations and results achieved (Davidson et al., 2010; Ferrer-Balas et al., 2008). When there is no strong administrative leadership on the subject, the process may involve a relatively small group that has to work with a variable support group, depending on the number of partners it can find for each action. In this case, it is important to identify means to involve the administration in a sustainability agenda, step by step, building political capital by creating programs and projects which include other members of the academic community (Thompson and Green, 2005). Implementation of sustainability into universities is a learning process. There are many ways to initiate it. Barth (2013) suggests the importance to strengthen partnerships and to gradually expand what has already been achieved.

Restricted sustainability actions also predominate at Brazilian HEIs. Publications mostly register isolated water or energy saving and waste management projects. Very few universities express an environmental policy or perform broad environmental management systems. Environmental issues are predominantly limited to research and specific courses or disciplines. Various authors (Karatzoglou, 2011; Ferrer-Balas et al., 2008; Thompson and Green,