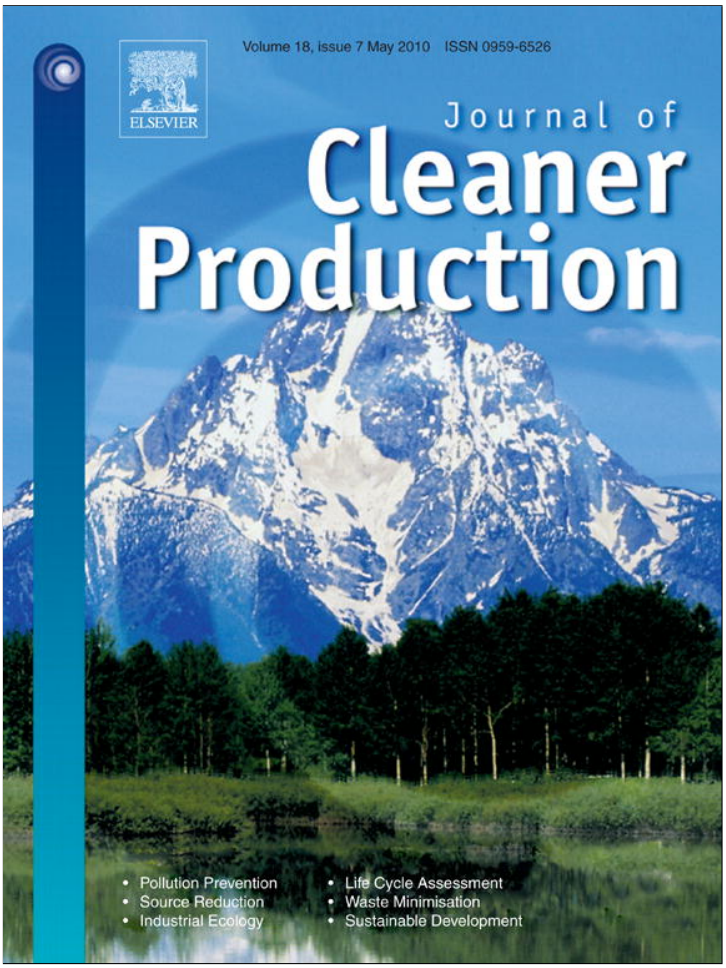

Journal of Cleaner Production 18 (2010) 607–610

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Going beyond the rhetoric: system-wide changes in universities for sustainable societies

Didac Ferrer-Balas [a,*], Rodrigo Lozano [b], Donald Huisingh [c], Heloise Buckland [d], Pere Ysern [e], Gyula Zilahy [f]

[a] Institute of Sustainability (IS.UPC), Universitat Politècnica de Catalunya, 08034 Barcelona, Spain
[b] BRASS Centre, Cardiff University, Cardiff, UK
[c] Institute for a Secure and Sustainable Environment, University of Tennessee, Knoxville, TN, USA
[d] Barcelonya Creatividad y Comunicación, Barcelona, Spain
[e] Environment Office, Universitat Autònoma de Barcelona, Spain
[f] Department of Environmental Economics and Technology, Corvinus University of Budapest, 8 Fővám tér, Budapest 1093, Hungary

ARTICLE INFO

Article history:
Received 15 December 2009
Accepted 15 December 2009
Available online 4 January 2010

Keywords:
Shared sustainability norms
Leverage points in academic changes
Sustainability science
Learning to learn
EMSU
MDGs
DESD

ABSTRACT

In October 2008, the 5th Environmental Management for Sustainable Universities (EMSU) international conference was held in Barcelona, Spain. It dealt with the need to rethink how our higher educational institutions are facing sustainability. This special issue has been primarily derived from contributions to that conference. This issue builds upon related academic international publications, which have analysed how to use the critical position of universities to accelerate their pace of working to help to make the transition to truly SUSTAINABLE SOCIETIES!

This issue focus is on the 'softer' issues, such as changes in values, attitudes, motivations, as well as in curricula, societal interactions and assessments of the impacts of research. Insights derived from the interplay of the 'softer' issues with the 'harder' issues are empowering academic leaders to effectively use leverage points to make changes in operations, courses, curricula, and research. Those changes are being designed to help their students and faculty build resilient and sustainable societies within the context of climate change, the Decade of Education for Sustainable Development (DESD), and the UN Millennium Development Goals (MDGs).

The overall systems approach presented by Stephens and Graham provides a structured framework to systematize change for sustainability in higher education, by stressing on the one hand the need for "learning to learn" and on the other hand by integrating leadership and cultural aspects. The "niche" level they propose for innovative interactions between practitioners such as EMSU is exemplary developed by all of the other documents in this special issue. To highlight some of the key elements of the articles in this issue, there are proposals for new educational methods based in sustainability science, a set of inspirational criteria for SD research activities, new course ranking and assessment methods and results of psychological studies that provide evidence that participatory approaches are the most effective way to change values within university members in order to facilitate the development and sharing of new sustainability norms.

1. Introduction

Facing a civilization crisis that confronts us with an unsustainable present and a threatened future, one important issue on the global agenda is to look for available leverage points to catalyse transitions towards more sustainable societies [1–3]. Much literature has been published on the roles of universities as key organizations that could, and in some cases are trying to, be the catalysts or trigger points (e.g. [4,5]). The main argument posited is that, commonly, they have a unique role in deepening and expanding human knowledge (through learning and research), while it is precisely a lack of knowledge integration and pertinent use of that knowledge, which is at the root of the current crises. The usual lack of such catalysts to effect change is being addressed by the emergence of new, general, approaches such as *Sustainability Science* (e.g. [6,7]) and by more specific approaches such as Participatory Action Research initiatives, which facilitate bottom-up, micro-regional level sustainability planning and development processes (e.g. [8]).

In that view, organizations such as universities, should tackle this challenge proactively. Regarding the present situation, some

* Corresponding author. Tel.: +34 934054374.
E-mail address: didac.ferrer@upc.edu (D. Ferrer-Balas).

0959-6526/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jclepro.2009.12.009

authors have argued that higher education has largely 'failed' in terms of sustainability [10,11], in what Sterling calls a 'systems failure', because of the "*continuing unability to sufficiently adapt our social and economic systems to their ecological context* (…)" [12]).

Although universities may not be the cause of many of our current problems, they may contribute to them, especially through the production of knowledge and education of students [13]. At the same time, is important to remember that universities are the places where the future leaders, entrepreneurs, decision-makers, and scholars are being prepared [14]. That idea can be summarized by Einstein's famous quote: "*We can't solve problems by using the same kind of thinking we used when we created them*."

Today, a major recognized institutional framework for change in all educational levels is the UNESCO led Decade of Education for Sustainable Development (DESD) [15]. This Decade, which began in 2005, has almost reached its mid-term point, and though thousands of DESD-related actions have occurred throughout the world, it has not yet influenced, in a significant manner, educational programs worldwide. The higher education sector is not an exception, which is not surprising given its high resistance to change [16].

In spite of a lack of visible changes in the mainstream, many initiatives are blossoming and building momentum [17,18], such as the EMSU conferences of 1999, 2002, 2004, 2006, 2008, and the ones already planned for 2010, 2012 and 2014; the Engineering Education in Sustainable Development conferences (E.E.S.D. 2004; 2006); the publication of specific journals or special issues in the Journal of Cleaner Production (JCLP), and in the International Journal of Sustainability in Higher Education (IJSHE); and numerous declarations and charters for sustainable development in higher education [4,19,20].

There are programs that are making major achievements in addressing the SD challenge in a holistic way, illustrative of this is The Observatory from the Alliance for Global Sustainability [21]. These 'opinion leaders' are creating a critical mass for SD changes in universities.

In this context, in October 2008, the 5th EMSU held in Barcelona, Spain, was hosted by the Technical University of Catalonia and the Autonomous University of Barcelona. It provided a valuable opportunity to work to achieve the urgently needed critical mass of academics focused upon sustainability. Under the title of "*a new knowledge culture*", the whole conference dealt with the need for rethinking how our higher education institutions (and at least some parts of them) are facing the challenges of sustainability. The organizers integrated sustainability principles in the conference, in its design, e.g. applying criteria of sufficiency (limiting to 150 participants on-site) and of efficiency, by creating a virtual community of participants that reached more than one thousand participants, worldwide through decentralized regional activities, and by establishing a social network on the Internet. It was an expression of changes being made towards sustainability in higher educational systems.

This special issue is primarily derived from inputs to that conference; additionally, it provides continuity to a series of international scholarly efforts designed to analyse how to use the critical position of universities to broaden and accelerate their efforts to help societies to become more sustainable. See, for example, the recent special issues of the JCLP on "Sustainability In Higher Education: What is Happening?" [22] and "The Roles of Academia in Regional Sustainability Initiatives" [23]. The presence of these "self-reflections" in a scientific journal such as the Journal of Cleaner Production, traditionally more oriented to exploring industrial and production issues, is important evidence of the increasing interest on the part of academics to tackle complex, multi-disciplinary, sustainability challenges.

2. Focusing on change management issues within university systems

Incorporating sustainability into a university system presents challenges regarding its education, research, operations and outreach dimensions [24,25]. It also creates opportunities for higher education institutions to implement effective assessment and reporting systems to track their progress in incorporating sustainability concepts and approaches throughout their systems [14]. Although universities should be organizations which foster change, they tend to be very conservative and resist change [26]; in fact they depend heavily on paradigms based upon disciplinary specialization and on testing based upon repetition of what is already commonly known (e.g. see Lozano's article in this issue). Fortunately, some universities are engaging in efforts to contribute to sustainable development [27]. In many cases they are doing this by recognizing that they not only educate future societal leaders, decision-makers, and intellectuals, but that they themselves should be learning organizations [28,29] and should practice sustainability in their activities such as education, research, outreach and campus facilities management.

As presented in previous issues of the JCLP, there is a need for a '*systems approach*' to involve university faculty, students, staff, alumni and '*society-at-large*' in making the transition to sustainable societies. Those authors stressed the need for changes in the technological dimensions of universities' operations (e.g. [30]), changes in curricula [31] or more generally changes to institutional strategies [32]. Fundamentally, transitions and changes must be linked to learning. In that sense, Albrecht et al. [33] concluded that sustainability initiatives "*have the potential to mobilize actors from all groups of university actors and these topics allow for both incremental and fundamental learning*." They stress the fundamental importance of "*transparency, broad participation and accountability to the public*." Lozano [14] claims that "*SD incorporation and institutionalization, even though a radical innovation, should be done incrementally and with the participation and empowerment of all the stakeholders to reduce the resistance to change and the appearance of unnecessary conflicts*." In the recent JCLP special issue on "Regional Sustainability Initiatives", the Hungarian [8] and Danish [9] documents reported on good examples of the potential for mutual learning for sustainability when universities and regions cooperate; this illustrates that they benefit both Higher Education Institutions (HEIs) and their partners in the short, medium and long-term. For this to be achieved, however, university leaders must overcome many organizational barriers, such as non-adequate financial resources, the lack of time and experience in such work as well as the low appreciation of the value of outreach activities within academia [23].

These authors underscore the importance of the participation of stakeholders in HEIs' activities. Generally, this has been accepted for outreach activities, which is usually provided low priority in HEIs. We posit that it is urgent that we work together to overcome this tension by understanding that interactions between higher education and a broad array of external practitioners and stakeholders can help universities to go beyond classical "outreach" activities. By applying the idea of trans-disciplinarity (e.g. [34]) throughout HEIs, these interactions can be included through all activities of the university (education, research, operational management, etc.) when sustainability is pursued and organizational learning for sustainability is required.

Therefore, our hypothesis is that through multiple interactions with society, HEIs will learn and move towards sustainability. But are universities currently and properly structured and prepared to learn as organizations in order to become and to better contribute to sustainability? The following articles in this special issue question the underlying assumptions, norms, and the role of '*system framing*,' that Argyris calls double-loop learning [28]. Moreover, this

issue proposes new methodologies for arriving at such re-framing, Argyris' triple-loop learning [35], to drive profound change that would imply "*not only the cognitive domain, but touches a more fundamental level – an existential level that includes the person and his/her attitudes, values, habits, etc.*" [36].

Thus, the focus of the articles in this special issue is on what could be referred to as 'softer' issues, such as changes in attitudes, curricula, societal interactions or the impact of research. These 'softer' issues can provide insights into different efforts at creating and utilizing leverage points [5,29,37] to help make sustainability a more integral part of universities' cultures and systems; however to do so, they must be understood within a systemic framework.

3. The state-of-the-art of university changes: an overview of the content of the articles in this special issue

As outlined above, the articles in this special issue address the needs for university changes for sustainability at different levels. The first two articles focus on the university system, in general, the subsequent articles focus on subsystems, such as "Research", "Curriculum", and "Staff awareness." The last article goes beyond the institution 'walls' to explore the role of universities in helping primary school level educators to engage in sustainability efforts.

In the first article, Stephens and Graham provide an overview of change towards sustainability by proposing a Transition Management Framework (TMF) for orienting research in HE sustainability. The authors suggest that there is many opportunities in the critical strategic level dynamics and in reflective activities that could help HE to facilitate and accelerate change. Their perspective is complemented by the second article, authored by Lukman, Krajnc, and Glavic, which after presenting evidences that "current" rankings do not integrate any sustainability criteria, proposes a new ranking model, based on synthetic performance parameters. This will make it possible to make comparisons of universities according to their integrative, multi-disciplinary research, education, and related environmental management.

The next article authored by Waas, Verbruggen and Wright, shows that, in general, research for sustainable development in universities tends to be underdeveloped. Thus, the authors propose a set of twenty-two preliminary, content, and process related characteristics to help systematize sustainability-oriented research.

The following four articles propose different approaches for the incorporation of sustainability into the core competency of universities: the curricula. Lozano's article explores the dynamics of the adoption and diffusion of SD in curricula by analyzing the results from the curricula audit of over 5800 course descriptions at Cardiff University in Wales. The author concludes that to better incorporate SD into the curriculum, a transformation towards more balanced, synergistic, trans-disciplinary, and holistic perspective is required.

Ceulemans and De Prins complement Lozano's paper by offering a teacher's manual and method for the integration of SD into curricula, based on experiences in Hogeschool-Universiteit Brussels. The authors emphasise that management support is a valuable asset. Because of its generality and flexibility, the method presents considerable potential as a framework for SD integration into courses and curricula.

The article by Desha and Hargroves, presents a survey on the state of energy efficiency (EE) in higher education in the context of Australian engineering curricula. The authors propose different options to support educators as they seek to embed sustainability within their engineering programs; illustrative of ways to achieve this is via auditing the programs or funding the development of specific teaching materials. They conclude that EE education is, at the moment, highly variable and ad. hoc, but that it can and must be changed.

Burandt and Barth assess two complimentary approaches, by analyzing the learning setting that could be suitable to address Climate change education. They assess the syndrome approach and scenario analysis. Both approaches were found, in their empirical context, to be useful in creating learning settings.

The next article is based on research using conceptual mapping to analyse sustainability education. This work by Correia, Do Valle, Dazzani, and Infante-Malachias shows, through an epistemological framework, the significant role of scientific literacy in fostering education for sustainability. Their analysis of a new course at the University of São Paulo, introduces a holistic perspective, into the existent specialized undergraduate curriculum. It is important to emphasise that, recently, Segalàs et al. [38] studied the results in sustainability courses at five technological European universities through conceptual mapping. Their results support the conviction of the urgent need for more emphasis on integrating the social dimension. They also concluded that students achieve better cognitive learning outcomes when multi-methodological experiential active learning education is used, which increases cognitive learning of sustainability.

The next article, by Juárez-Nájera, Rivera-Martínez and Hafkamp, focuses on the values, beliefs, and attitudes of university decision-makers in two different contexts: Mexico and Germany. The authors propose a socio-psychological model to explore the factors and psychological variables (such as universal values, awareness of consequences, ascription of responsibility, and personal intelligences) that should be fostered to encourage a change in the decision-makers' beliefs.

The last article, by Wiedemann, Hens, Raath, Richter, Stone, Renders and Caenhals, explores the outreach of the university by focusing on university teacher educational institutional promotion of Environmental Management Systems (EMS) programs in 39 primary schools in South Africa. The authors detect a similar evolution pattern independent from the socio-economic background of the schools. They also indicate that a well-elaborated managerial apparatus appears to be a pre-condition for improving environmental performance of school.

4. Conclusions

If the higher education sector is to make the urgently needed changes, there is a need for a global perspective of the transition pathway for the sector. In this respect, the systems approach presented by Stephens and Graham proposes a structured framework to systematize change for sustainability in higher education, by adopting the "transition management" approach. From that approach, they identify the "landscape", "regime" and "niche" levels of activity. According to that division, EMSU practitioners are actively engaged in '*grass–roots*' innovations, which are beginning to happen worldwide. To underline some of those innovations presented in these articles, they range from new educational methods based in sustainability science, to a set of inspirational criteria for SD research activities, to new academic ranking and assessment methods, to psychological studies, which claim that participatory approaches are the most effective to change values within university members, to approaches that help university members develop and adopt new, sustainability focused social norms that can be transformed into shared rules for sustainable life-styles.

In that sense, these authors report the potential of including interactions between higher education and a broad array of practitioners and stakeholders (related to the idea of trans-disciplinarity) throughout all activities of the university (education, research, operational management, etc.) when sustainability is pursued and organizational learning for sustainability is required.

The set of articles in this issue provides a collection of perspectives from which educators will be better able to identify and work with leverage points throughout the system to better incorporate sustainability into the everyday activities, policies and culture of all universities. The work of the authors, editors, and presenters at the EMSU 2008 conference builds upon previous efforts, and serves as stepping-stones for other scholars to push the levels of sustainability knowledge in higher education. We hope these contributions will be valuable to help HEIs learn from those experiences, to stimulate co-ordinated strategies, collaborative projects and programmes, and to build new visions regarding their critical position to accelerate the transition to truly sustainable societies.

Finally, we invite all readers to join us to ERSCP-EMSU 2010 conference that will be held in Delft, The Netherlands, from 25th to 29th October 2010.

Acknowledgements

Special thanks to all authors who have submitted original work for this special issue, including research papers, book reviews or educational initiatives, and also for the team of reviewers that have helped to enhance the quality of the work. Also, we would like to thank all the people who helped in organizing EMSU 2008 conference in Barcelona.

References

[1] Meadows D. Leverage points: places to intervene in a system. Hartland, VT, USA: Sustainability Institute; 1999.
[2] Carley M, Christie I. In: Managing sustainable development. 2nd ed. London: Earthscan Publications Ltd; 2000. p. 322.
[3] Reid D. Sustainable development. An introductory guide. Ist ed. London: Earthscan Publications Ltd; 1995. p. 254.
[4] Wright TSA. Definitions and frameworks for environmental sustainability in higher education. International Journal of Sustainability in Higher Education 2004;3(3):203–20.
[5] Stephens JC, Hernandez ME, Roman M, Graham AC, Scholz RW. Higher education as a change agent for sustainability in different cultures and contexts. International Journal of Sustainability in Higher Education 2008;9(3):317–38.
[6] Clark WC, Dickson NM. Sustainability science: the emerging research program. Proceedings of the National Academy of Sciences, USA 2003;100:8059–61.
[7] Komiyama H, Takeuchi K. Sustainability science: building a new discipline. Sustainability Science 2006;1(1):1–6.
[8] Bodorkós B, Pataki G. Linking academic and local knowledge: community-based research and service learning for sustainable rural development in Hungary. Journal of Cleaner Production 2009;17(12):1123–31.
[9] Lehman M, Christensen P, Thrane M, Jorgensen TH. University engagement and regional sustainability initiatives: some Danish experiences. Journal of Cleaner Production 2009;17(12):1067–74.
[10] Orr D. Earth in Mind. On Education, Environment, and the Human Prospect. Washington, DC: Island Press; 1994.
[11] Jucker R. Our Common Illiteracy: Education as if the Earth and People Mattered. Frankfurt: Peter Lang; 2002.
[12] Sterling S. Higher education, sustainability, and the role of systemic learning. In: Corcoran PB, Wals AEJ, editors. Higher education and the challenge of sustainability: problematics, promise and practice. Dordrecht: Kluwer Academic Press; 2005.
[13] Coincençao P, Ehrenfeld J, Manuel H, Vieira PS. Sustainable universities: fostering learning beyond environmental management systems. International Journal of Technology, Policy and Management 2006;6(4):413–40.
[14] Lozano R. Incorporation and institutionalization of SD into universities: breaking through barriers to change. Journal of Cleaner Production 2006;14(9–11):787–96.
[15] UNESCO. Education for sustainable development. United Nations Decade (2005–2014) Available from: http://portal.unesco.org/education/en/ev.php-URL_ID=23295&URL_DO=DO_TOPIC&URL_SECTION=201.html; 2005. Retrieved 24th September, 2007.
[16] Wals A. Review of contexts and structures for education for sustainable development learning for a sustainable World. Paris: UNESCO; 2009.
[17] Boks C, Diehl JC. Integration of sustainability in regular courses: experiences in industrial design engineering. Journal of Cleaner Production 2006;14(9–11):932–9.
[18] Wemmenhove R, de Groot WT. Principles for university curriculum greening. An empirical case study from Tanzania. International Journal of Sustainability in Higher Education 2001;2(3):267–83.
[19] Calder W, Clugston R. International efforts to promote higher education for sustainable development. Planning for Higher Education 2003;31(3):30–44.
[20] Lozano-Ros R. Sustainable Development in Higher Education. Incorporation, Assessment and Reporting of Sustainable Development in Higher Education Institutions. Lund: Lund University, IIIEE; 2003.
[21] The Alliance for Global Sustainability. The observatory: status of engineering education for sustainable development in European higher education. Spain: EESD-Observatory, Technical University of Catalonia; 2008.
[22] Lozano FJ, Kevany K, Huisingh D. Sustainability in higher education: what is happening? Journal of Cleaner Production 2006;14(9–11):757–60.
[23] Zilahy G, Huisingh D. The roles of academia in regional sustainability initiatives. Journal of Cleaner Production 2009;17(12):1057–66.
[24] Cortese AD. The critical role of higher education in creating a sustainable future. Planning for Higher Education 2003;31(3):15–22.
[25] Velazquez L, Mungula N, Plat A, Taddel J. Sustainability university: what can be the matter? Journal of Cleaner Production 2006;14(9–11):810–9.
[26] Elton L. Dissemination of innovations in higher education: a change theory approach. Tertiary Education and Management 2003;(9):199–214.
[27] Hansen JA, Lehman M. Agents of change: universities as development hubs. Journal of Cleaner Production 2006;14(9–11):820–9.
[28] Argyris C. Double loop learning in organizations. Harvard Business Review; 1977:115–25. September–October.
[29] Senge PM. The fifth discipline. The Art & Practice of the learning organization. London: Random House Business Books; 1999.
[30] Koester RJ, Eflin J, Vann J. Greening of the campus: a whole systems approach. Journal of Cleaner Production 2006;14(9–11):769–79.
[31] Lidgren A, Rodhe H, Huisingh D. A systemic approach to incorporate sustainability into university courses and curricula. Journal of Cleaner Production 2006;14(9–11):797–809.
[32] Ferrer-Balas D, Buckland H, de Mingo M. Explorations on the University's role in society for sustainable development through a systems transition approach. Case-study of the Technical University of Catalonia (UPC) 2009;17:1075–85.
[33] Albrecht P, Burandt S, Schaltegger S. Do sustainability projects stimulate organizational learning in universities? International Journal of Sustainability in Higher Education 2007;8(4):403–15.
[34] Scholz RW, Lang DJ, Wiek A, Walter AI, Stauffacher M. Transdisciplinary case studies as a means of sustainability learning Historical framework and theory. International Journal of Sustainability in Higher Education 2006;7(3):226–51.
[35] Argyris C, Schön DA. Organizational learning II. Theory, method, and practice. Redwood City CA: Addison–Wesley; 1996.
[36] Peschl MF. Triple-loop learning as foundation for profound change, individual cultivation, and radical innovation. Construction Processes Beyond Scientific and Rational Knowledge, Constructivist Foundations 2007;2(2–3):136–45.
[37] Maurer R. Beyond the Wall of Resistance. Unconventional Strategies that Build Support for Change. Austin, Texas: Bard Book, Inc; 1996.
[38] Segalàs J, Ferrer-Balas D, Mulder K. What do engineering students learn in sustainability courses? The effect of the pedagogical approach. Journal of Cleaner Production 2009;18(3):275–84.