

Technology and Sustainable Development in Europe

Summer European University Châlons-en-Champagne -France

This year's Summer European University, which took place in Châlons-en-Champagne was to be an opportunity for students, experts and researchers of Europe to discuss the topic of sustainable development (SD) and its relevance to the training of engineers. In spite of its intended focus, however, many of the topics addressed were of tremendous value even to the non-engineers present, such as myself, and sparked enthusiastic conversations among the participants.

Between the 7th and the 17th of July, six days were scheduled as 'working days', each with its own topic and speakers. A number of these days also included a workshop, while the rest were dedicated to extracurricular activities. The themes addressed were the following: (1) SD as a concept; (2) technological research in the training of engineers; (3) technological research and sustainable development; (4) technology and agrarian systems; (5) women, culture and equity; and finally (6) industrial, social and political stakes in sustainable development.

Conference summary

Tuesday July 8th was devoted to the introduction of the topic of SD and thus revolved around term definitions and historical reviews. Throughout the conference, we had the opportunity to hear repetitive references to the Brundtland Report's (1987) definition of SD: 'to meet the needs and aspirations of the present without compromising the ability to meet those of the future.' The persistent allusion to this unclear definition of SD emerged as a recurrent theme throughout the conference, although few attempted to offer a better version. Ernest Lowe was expounded specific examples of what sustainability involves. His discussion included examples such as consumer trends, the impact of war, green design, efficiency and carrying capacity. Anne-Marie Genin, who teaches at the École Nationale Supérieure d'Arts et Métiers (ENSAM), addressed the philosophical debates surrounding SD, dealing primarily with the perceived (and actual) lack of specificity entailed with SD. This emerged as a recurrent theme throughout the conference.

The day dedicated to the research in the training of engineers took place at the Université Technologique de Troyes (UTT). There, Mr. André Beraud gave a synopsis of the historical evolution of the profession of engineers. Mr. Menouar Boulahfa for his part introduced the unique concept of a national engineer association, as is the case in Canada, and how this has helped integrate practical SD concepts. Finally, Mr. Nicolas Buclet and Mrs. Martina Keitsch both spoke of their institutions' incorporation of the three aspects of SD – economy, environment, and society – in their engineering program. Mrs. Keitsch, as an industrial ecology specialist, also brought up more specific details of some basic concepts of SD and the tools used such as 'cascading', biomimicry, material flow analysis, life-cycle analysis and by-product exchange.

On the third day of the conference, we had the opportunity to hear speakers with concrete experience and hands-on knowledge about SD implementation. Mr. Andrea Cuomo, from the

Italian company ST Microelectronics, expressed his economic and moral motivations to implement efficiency measures and environmental standards. Interestingly enough, during question period, we found out that although they were ahead in putting these values into practice, their company lacked a procedure to find out if, and how much, their measures impacted the environment. It was clear that a means of assessing and ranking environmental impacts would need to be developed. Following this, we heard Mr. Daniel Froelich, from ENSAM, tell us about eco-design as a tool to satisfy consumer needs while decreasing environmental impacts of products throughout their life. Many private firms were quoted as having changed their products to integrate the idea of being more environmentally friendly. Among the list were such notables as Thompson, Schneider, Flymo, Philips, and Xerox. To end the day, Mr. Niki Bey, from the Danmarks Tekniske Universitet, discussed the different applications and methodology of life-cycle analysis.

The succeeding theme focused on technology and agrarian ecosystems, where again three experts were invited to share their thoughts and experiences. Mr. Hervé Bichat suggested that focusing on local sustainability solutions is more important than concentrating on the global level, as the former emphasizes the autonomy of the people. Mr. Luis Garcia-Torres explained the principle of conservation agriculture. He dealt with its long-term economic benefits and compared them to the negative impacts of our present agricultural system, especially as a consequence of tillage. The third speaker, Mr. Charles de Courson, deputy of the Marne, advocated the use of green oil by reporting on its potential benefits: a decrease in greenhouse gas emissions; increased independence; an encouragement of local economies; and improving the acceptability of automobiles. I should note that the speaker failed to answer whether the crops were produced in a sustainable manner. He was unable to respond to the findings of a study from the University of California at Berkeley, which suggested that the life-cycle of biofuels production has a greater impact on the environment than the production of traditional fuels.

After a day to celebrate Bastille Day, we returned on Tuesday the 15th to the conference to discuss gender, culture and equity with Mr. Issyad Kato, from Niger, and Dr. Cléonice Le Bourlegat, from Brazil. Mr. Kato talked of the fascinating Tuareg people, primarily regarding their matriarchal society and the cultural changes they have undergone with the desertification in their area. This topic caused many in the audience to question the purpose of development, and the true motivations behind external involvement in such isolated and economically deprived cultures. The main questions that emerged were: Is it possible to get involved in the Tuareg's way of life while safeguarding their culture? And, if not, is it worthwhile, i.e. 'good', for external agencies to want to 'develop' them? Building on this same topic, Dr. Le Bourlegat defended the case of local development in Brazil with reference to the value of agricultural reforms. These, she argued, are necessary to channel and unite the demands of the population in order to resolve the issue of landless peasants.

During the final day of the conference, the speakers addressed the present-day issues surrounding SD. The first speaker, Mr. Dominique Bourg, once again pointed out the definitional difficulties of the term SD, as well as the impacts of using occidental indicators to measure development. Mr. Lowe then proposed a continued and expanded discussion of industrial ecology and its potential, while also emphasizing that the field will need to integrate elements of political economy. He also noted the positive and negative impacts of the local political economy on SD, which, via 'development', we are now exporting to the poor world. The closing speaker, however, remained

very optimistic. Indeed, Dr. Leo Dayan explained that we know more and more where we want to go as an aim for SD, even though we are still debating how to get there, thus bringing in the role that engineers will have to play in this area.

An important element of the conference was that the organizers had invited speakers with many different experiences from diverse backgrounds. Speakers included European and international experts from private, academic, and governmental backgrounds; and, many of these had been trained in a field other than engineering or environmental studies. The speakers were able to communicate well their knowledge about the topic they presented, and supplemented their talks with information on websites where further research and deeper analysis could be found. Furthermore, because of the way the conferences, workshops and extracurricular activities were organized, it was possible to interact continually with the experts to entertain questions and more informal discussions.

As I have mentioned, the lectures were complemented by workshops. These were conceived of to serve two purposes: first, to provide a venue for us to comment on the speakers of the day; second, they were to be used by the participants to put together a set of suggestions of best practices and critique in order to include SD in engineers' education and in general social consciousness. Unfortunately, only three of the five workshops took place due to an apparent overbooked agenda. This oversight inevitably lowered the opportunity for debate, discussion and new ideas. Nevertheless, the workshops that did take place exposed us to the difficulties of agreeing on SD issues and gave us an idea of the many steps necessary to make SD part of everyone's daily life.

Practical sustainable development

Even though SD is still unclear at the conceptual level, and many of the debates were rather abstract, a number of concrete SD examples were presented. Some of these measures could be extremely useful if applied at a broader level. To illustrate the potential of topics discussed at the conference in the practice of sustainable development, let me take two examples: conservation agriculture; and life-cycle analysis.

Agriculture is an intrinsic, although for most of us hidden, aspect of our lives. With today's problems in developing countries to produce the required amount of food to feed their populations, and also the developed countries' dependence on modified crops and heavy technology, conservation agriculture is a concrete solution to bring about SD. Conventional agriculture is usually understood as burning its crop residues, using heavy machinery, and tilling the soil to control weeds and plant seeds. The greatest drawback of such practices is that they are unsustainable. The negative impacts of conventional agriculture include: soil erosion, soil compaction, and poor nutrient content. These, in turn, trigger water and nutrient loss, thus creating poor soil quality, loss of fertility and a decrease in biodiversity. As if this were not enough, contemporary practices cause groundwater and air contamination from the infiltration of chemicals and pesticides and the burning of fossil fuels.

To avoid such dire consequences, conservation agriculture proposes to go back to methods that are in harmony with the rhythm and capacity of nature. It refers to “practices that permit the management of the soil for agrarian uses, altering its composition, structure and natural biodiversity as little as possible and defending it from degradation processes”¹. For example, techniques such as direct sowing (or no-tillage), reduced tillage, incorporation of crop residues and cover crops in perennial woody crops (spontaneous growth or sowing of appropriate species) directly impact the reduction of soil removal, protecting it from erosion and enriching its content of nutrient matter. As a consequence, soil fertility is enhanced and surface water contamination is reduced. While advocating less industry-intensive techniques, proponents of conservation agriculture still support a commitment to technical research.

Apart from the scientific evidence of agricultural improvements, a major economic benefit of this technique is a reduction in the cost of farming the land. In fact, such changes in farming measures have been implemented, for financial reasons, in the U.S., Australia, Canada, Argentina among others. Europe, however, has been slow in moving towards conservation agriculture. This is due to the fact that government funding is almost inevitable in the first stage of the transition, for example to reduce the costs of changing machinery and to absorb the shock of the decrease of output in the first years. In the developing countries’ context, it is believed that it would be cheaper to go directly to conservation agriculture rather than follow the route of the North, but one question remains: Is the funding available? In both developing and developed countries, the implications of switching to conservation agriculture include: (1) a reduction in the short-term ability to compete at the international level; (2) a concentration of the government’s income in agriculture rather than other needed areas such as industry and education; and (3) it would also involve adapting the method to each environment on a trial and error basis, thus surely creating substantial economic losses. On the other hand, now would be the best time for the developing countries to switch to conservation agriculture while they are not yet competitive, so that they will become so in the future.

Another realizable topic that was addressed was life-cycle analysis (LCA). Niki Bey, from the Danmark Teknische Universitet, was invited to educate us on the standards, applications and methods of LCA. LCA is a means for quantifying the environmental impacts of both the products and the system in which they evolve, including raw material production, transportation, assembly, usage, energy use and decomposition. After starting with the idea of cradle-to-grave in the 1980s, and then going to the ISO 14040 standard, we are now at the beginning of a decade that looks at integrated production policies, which were outlined by the United Nation Environment Program under the name of LCA.

As we discovered during Andrea Cuomo’s presentation, despite pressure on industry to decrease environmental impacts, we are still wanting for empirical information on what, where, and how production should be modified to effect real change. Although Mr. Cuomo’s company, which produces semi-conductors, has applied some of the strictest environmental policies in the world, he was unable to determine the tangible environmental benefits of such policies.

¹ European Conservation Agriculture Federation. [<http://www.ecaf.org/English/englis.htm>]. Accessed August 26, 2003.

By undergoing a screening LCA, which is a general quantified LCA, companies could better assign environmentally-friendly investment, and have evidence of their environmental improvements; from a financial perspective, given changing social attitudes towards the environment, firms could also use the data to compare themselves to other companies for Green

Marketing and Green Labeling. The drawbacks to LCA are few: small companies may note the costs of the undergoing the study; and, sustainable development advocates may point to the fact that the LCA only judges environmental impacts without consideration of social ramifications.

LCAs need to become part of all industries' action plans in order to the implementation of effective environmentally-friendly policies and procedures. This, in turn, would allow intra-industry and inter-industry comparisons to discover, and promote, the best practices. Indeed, as this conference has confirmed for me, the public must be the moving force behind environmental issues. Only through the exercise of consumer choice will companies be compelled to improve their environmental practices. By choosing companies that demonstrate their environmental commitment through Green Labels –drawing on the information of environmental LCAs – the public will have greater power to effect change for the better. As Mr. Cuomo himself noted, environmental responsibility may soon become the expected behavior for all firms working at the international level, just as it is now the case for quality control standards. LCAs may just expedite the process.

Finally, other than these two examples of how theoretical concepts could be applied in a practical context, it seems relevant to note that the conference had consequences on two concrete projects. Indeed, the idea of a 1st World University focusing on research and action in the area of Sustainable Development was set forth, as well as the project of a Sustainable Tourism Tour of Niger in December of 2003, both of which rose from conversations between speakers, organizers and participants.

Conclusions

As much as I have enjoyed this conference for the possibility for students to continually discuss environmental matters with students, organizers and speakers, I consider that the knowledge that I brought back with me could have been greater. As I have presented in the summary of the conference, topics were presented separately from each other with relatively no ties between all the issues. It is my opinion that more workshops and a day devoted to summing up the relationships and the dependence of all these topics with one another would have been beneficial to understand the systemic difficulties to SD and could have enhanced the learning possibilities.

One major goals of the conference was to discuss the relevance of SD in the training of engineers. However, this was dealt with only during the day at the UTT and informally with the proposal of measures and best practices put together during the workshops. This later one did propose steps, although very broad ones, to integrate SD in the domain of education, industry and public policy (see attached pages). Some of the measures discussed include: to integrate SD issues in all related classes and throughout the education system, to create pluridisciplinary

research centers, to emphasize the economic benefits that come with efficiency, to increase cooperation and exchanges across continents, etc. The focus remained nevertheless education in general rather than the engineers specifically.

As I have learned in this conference, many ideas like these are now pushing SD concerns forward. In the field of agriculture as in that of industry, progress in technologies and tools is constant. The increasing availability and use of such technology in Europe is indicative of its potential the world-over. This is not to say that the spread is inevitable. There are numerous short-term obstacles to the implementation of completely environmentally sustainable policies. Despite the costs, however, sustainable development policies have much long-term promise. We just need to tap into that promise to effect real, environmentally conscious change.

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