BALANCING TRADITIONAL AND NEW EDUCATION APPROACHES WITHIN A POSTGRADUATE PROGRAMME IN ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

The Faculty of Civil Engineering of the Aristotle University of Thessaloniki launched in 1998 a one-year postgraduate programme in 'Environmental Protection and Sustainable Development'. Among other objectives, the programme complements the Faculty's traditional undergraduate curriculum by introducing these modern disciplines and, at the same time, the new concepts and ethics that relate to environmental engineering. In the paper the presentation of the programme's elements and functions and the discussion about the factors and conditions that had specific influences on them concludes a critical overview of the old and new ethics in engineering culture as well as a review of current trends in educational approaches related to environmental protection and sustainability issues. Given the solid nature of the civil engineering education obtained by the Faculty's traditional five-year undergraduate programme, the challenge to shift immediately to the new paradigm of contemporary environmental education programmes, in structuring the short-duration postgraduate programme, was given a careful consideration. The final decision was a rather moderate one, as the Faculty opted for a flexible course balancing traditional and new educational approaches.

1. INTRODUCTION

The importance of environmental protection and sustainable development has been clearly recognised by the majority of the countries in the world. Still, in order to save the planet from an ecological disaster and also to provide future generations with a more fair distribution of the natural wealth, an active participation of all political and economic systems is required. In most places the battle to balance increasing economic growth with environmental conservation constitutes an ongoing dynamic process, so that it is difficult to foresee potential winners and losers. Sustainable development, the principal goal of this international movement, has been the focus of high attention within the European Communities for many years, but officially since 1992, when the Commission published the programme of policy and action in relation to the environment and sustainable development. The progress of this programme is continuously under review, a fact that shows the high interest placed upon it by the member-states (European Commission, 1997, 1998). Similar efforts, i.e. to help countries achieve the transition to sustainable development, are being observed also at a larger scale. OECD and its affiliates constitute a typical example of such a collective action towards the general aim of harmonisation and integration of relevant policies within an overall economic framework (Eppel, 1999).

Current action of big organisations on sustainable development encompasses the full range of their activities, including education. In fact the promotion of environmental education, public awareness and training during the last decade has been greatly influenced by the outcomes of the United Nations Conference on Environment and Development, which took place in Rio in 1992, and especially by Agenda 21. Public awareness of environmental conservation and sustainable development depends on both formal and non-formal types of environmental education provided to all people; still in our case the interest is placed upon the environmental education that is provided to those who are, or soon will be, active professionals in related fields.

Briefly commenting on the environmental education at the general level (i.e. the non-formal type), one should note that its wide acknowledgment as an important tool in the environmental conservation process is not enough; it should be followed within each country by a full promotion at the national level, despite difficulties or even barriers of various forms (Filho, 1996). As an example, non-formal environmental education for adults, involving both cognitive development and personal empowerment, can be a valuable tool for resource and environmental managers to use in managing public investment processes (Diduck, 1999). On the other hand, when speaking of specific roles of individuals, the problem confines to the higher education institutions themselves, whose response to this big issue for the years to come should be given the highest priority in their strategic plans. Educating for the environment is indeed a challenge for the 21st century, but the response to it is still slow and, therefore, it should be soon accelerated, mainly through immediate rethinking current educational statuses (Orr, 1995).

Within the framework of the above, this paper attempts to contribute to the discussion about the means and instruments that should be used for the enhancement of environmental education at the university level. To this end, in what follows, the differences in ethics between a traditionally educated civil engineer and an environmental engineer are first presented, followed by a review on current educational concepts and approaches related to environmental management and sustainability issues. The emphasis is placed upon the transition stage, i.e. on how to shift from traditional to new approaches, given the fact that society is urgently looking for new type of engineers to serve its current and particularly its future needs.

The case study that concludes the paper refers to a postgraduate programme of study in 'Environmental Protection and Sustainable Development' that was recently launched by the Faculty of Civil Engineering of the Aristotle University of Thessaloniki. Within its specific scope, the present paper is a follow-up of a previous publication (Latinopoulos, 2000), both papers being authored by the Director of Studies of the above programme. In this sense, the discussion that follows revolves around factors and conditions that have influenced the structure and contents of the novel and ambitious postgraduate programme which, among its other objectives, aims at complementing a conservative, traditional, and of long duration undergraduate curriculum of civil engineering.

2. OLD AND NEW ETHICS IN ENGINEERING CULTURE

2.1 The traditional engineering culture

In order to answer the fundamental question, whether there is such a thing as an engineering ethic, one has to trace back to history of the profession of engineering. Even by this way, engineering culture has to be examined from several perspectives, before reaching a final answer (Marsh, 1997). However, what is certain is that, historically, engineers had always a key role in economic development and for many periods of time engineering has been a principal agent of development in its general sense. Still, the engineering profession differs markedly from other human service

professions in that it deals with objects that do not influence people directly, a fact that is mainly due to the considerable negative social and environmental impacts of technology. Moreover, for ages, numerous engineers were, and still are, too focused on the technical part of their work so that, although they know that they have a significant role to play, eventually they fail to fully understand their place in society.

The factors that limit the ideological development of engineering have deep roots, as they relate to intrinsic features, like a strong faith in pure technology, a collective professional consciousness without the ability of introspection, the inability to critically assess the role of engineers in society, and an overall belief and pride that current engineering principles can always provide the basic tools to reach the best solution of any problem. In general, engineers do not clearly understand that their attitudes and values greatly influence their approach to problems. This is one more factor that adds to the general picture of a conservative profession and subculture with its own social processes for maintaining traditional values and ideologies (Marsh, 1997).

There are various theories, most of them originating from sociologists, that can be utilised to formulate models which are capable to describe the ideological development of professions. So, the functional model of professions suggests that norms and values of the engineering profession are developed during long periods of training. Such training is mainly obtained during university studies, but it can be further emphasised by the inclusion of professional training and contact with professional peers. Still, specific research into the engineering profession demonstrates that, besides from the school model and the work environment model, which together form the traditional functional model, there is a third model that adds significantly to this development (Makkai, 1991). This third model, namely the social origins model, argues that the individual's origins and predisposition prior to university training constitute a significant force in determining later values.

In the face of the current rigidity of attitudes and values, recognised in the engineering profession, and given the complexity of the origin of such a culture, the emergence of environmental engineering poses a series of questions basically on how engineers can deal with the concepts of environmental protection and ecologically sustainable development. There are many ways to look for realistic answers to these questions. But, above all, it is certain that a new culture, that is a change in the engineering ethic, is required for those who will be professionally involved in environmental issues, particularly as environmental experts (i.e. biologists, ecologists, chemists and engineers). The most efficient approach seems to be that one which promotes education as the best model for such a change in the profession of engineering. Thus, before proceeding to the review of several aspects of such a process, we have to refer briefly to the main issues of these two major concepts.

2.2 The concepts of environmental protection and sustainable development

One of the most challenging priorities governments face today is to apply much of the pressure that will move modern society onto a sustainable path. Still, the magnitude and complexity involved in the major structural changes on economies, that governments should force in order to achieve this task, makes their planning a very difficult process. A feasible approach, though, may come from the world markets, that is these who helped make the Industrial and Information Revolutions possible, but also these whose failure to properly allocate natural resources and efficiently use energy sources resulted in numerous environmental problems. Indeed these markets can guide the next revolution toward sustainability by enforcing economic instruments, like the "polluter pays principle", while at the same time supporting and promoting the development of new clean technologies (Roodman, 1999).

Of particular interest, as far as the concept of environmental protection and, more specifically, of pollution prevention is concerned, is the current trend in most developed countries to promote the preventive approaches instead of the traditional reactive ones. The well-known command and control approach, in which the reactive control model is dominating, used to give priority to technological fixes despite their cost. Initiated in the USA at the beginning of 90's, national policies in developed countries changed to pollution prevention or reduction at the source whenever feasible.

The concept of sustainable development, since the so-called Brundtland Report, became the central notion for politicians, ecologists and economists. In the Report a sustainable development was defined as the development that provides for the needs of the present generation without endangering the possibilities for future generations to provide for their needs. This broad but clear definition leads to the need for a more detailed analysis of the concept of sustainability, which can be accomplished by appropriately considering the four principal dimensions: the ecological, the economic, the social political, and the cultural dimension.

From the point of view of engineering, particularly civil and environmental, it is obvious that, from the above four dimensions the economic dimension is the most interesting one, closely followed by the ecological dimension. Thus, speaking of sustainable development, one must choose between two concepts: (a) weak sustainability, which is satisfied if losses of natural capital are compensated for by increases in man-made capital of equal value, and (b) strong sustainability, which requires that aggregate natural capital does not decrease. Before deciding, a very careful analysis is needed, because the notion of sustainable development is subject to environmental standards imposed on decision-making. Thus, it should be always kept in mind that these standards (e.g. to safeguarding the atmosphere, protecting biodiversity and so on) cannot be traded off against each other and cannot be expressed in terms of money valuations (Bowers, 1997).

3. CONCEPTS AND TRENDS IN ENVIRONMENTAL EDUCATION

3.1 Issues in environmental education

At the dawn of the 21st century the issues of environmental protection and sustainable development can be classified among the most challenging subjects for educators of all stages. A major target is to materialise through education the ecological or environmental literacy, an overall ability to connect, to synthesise knowledge from the gamut of disciplines, in order to see the big picture (Roodman, 1999). This implies that students should be able not only to understand the physical processes but also to think how these processes shape global phenomena of non-physical nature, like economy and geopolitics. Thus, properly trained environmental engineers can be also characterised as environmentally literate only if they have the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems.

With a few exceptions, institutions of higher education in engineering disconnect disciplines and insist on teaching technology as if it were the only way to the solution of environmental problems. The reasons for such an attitude can be summarised in the following (Orr, 1995):

- The organisation of both curricula and research in a fragmented way, i.e., based on disciplines, sub-disciplines and departments, each dealing only with small pieces of the total picture.
- The rise of discipline-based professionalisations, a fact that, for the sake of gains in standards and quantity in knowledge, narrows the focus of scientists on subjects within particular fields.

- The slow, if any, response of higher education institutions to the environmental crisis and their fixation to ideas that serve task-oriented propagation of knowledge, which very vaguely fits with our responsibility for the earth.

What actually should be done is rethinking the fundamental principles of higher education and more specifically rethinking the conventional curriculum. The last relates to rethinking how institutions operate, buy, invest and build. The design of an environmental education programme must be synonymous to ecological design, in the sense of connecting disciplines and of incorporating intelligence about how nature works into the way we build, produce and, above all, live (Orr, 1995).

In its general meaning sustainability seeks to continue to meet current demands, without infringing on, or compromising the needs of future generations, by promoting optimal use of resources and energy. Thus, among various issues brought in by sustainability, one can distinguish those of resources and energy conservation and pollution prevention as the ones that are firmly connected to engineering. As a consequence, an environmental educational programme run by an engineering faculty should incorporate the issue of sustainability in its course structure through a properly balanced curriculum that includes both technological advances and sustainability issues as the ones mentioned above (Dahab and Gutierrez-Martin, 1998).

As mentioned in the previous section, current action in environmental protection policies has been shifted from reactive approaches to preventive ones, the major task of this trend being to put into practice the concept of pollution prevention. Still, the relevant pace is yet slow and this is reflected also upon education. The principles of assimilative capacity and control theory are the critical issues around which environmental education curricula have largely been implicitly designed. What is now required, in order to teach preventive strategies, is a more systematic, strategic, interdisciplinary framework, in which students should be also provided with opportunities to feel responsible and comprehend value changes, as described in the next section. Recent experience shows that, at both the undergraduate and postgraduate levels, preventive environmental education curricula are not only feasible but also very promising (Simpson and Budd, 1996).

3.2 Educational approaches and methods

Within a general context and in order to achieve the target of creating environmentally literate graduates, environmental education has to be seen as if consisting of some or all of the following stages: (a) raising awareness, (b) knowledge and understanding, (c) skills, (d) attitudes and values, and (e) action. In practice, none of them should be separated from the rest because of their inter-relationship; nor should they be seen as a series of stages to be reached in succession (e.g., from awareness to action, as above). By tradition and basically following standards that are common in other related curricula, like the engineering ones, typical classroom environmental education concentrates mainly on knowledge and skills and partly on awareness and action. This inclination towards the use of cognitive domain education methods predominates for years in many undergraduate and postgraduate programmes, while only little emphasis has been put on the affective domain education methods (i.e., the methods which can be used to examine attitudes and values related to environmental issues).

Recent experience shows that environmental education could be today characterised by an emerging preference for the affective domain, as many environmental educators are ready to adopt a values-education approach to teaching. Still, there are many questions regarding the best way to incorporating such an approach into environmental curricula, in order to achieve the goal of developing environmentally literate citizens. Development of environmental conceptions that embed environmental knowledge, attitudes and values, and behavioral orientations are still in their

early youth (van der Vorst, 1997) or even in the form of theoretical models (Ballantyne and Parker, 1996), and a lot of research is required to enable environmental educators in designing more effective relevant teaching and learning methodologies. Particularly in the case of environmental engineering education, the change from the traditional engineering programmes is actually a change of culture, a cultivation of new engineering ethic (Marsh, 1997).

Of special interest, when designing an environmental programme's course structure, is to consider the value of using each of the education methods in teaching at the same time about, through and for the environment, that is implementing both the cognitive and affective domain approaches. Experience from various classrooms shows that, among cognitive domain methods, problem solving/critical thinking is nowadays a much preferred education method, whereas cooperative learning and observation, experiments etc. are also valuable methods, as contrasted to the classical forms of self-directed learning, case studies and formal classroom lectures. Among affective domain education methods, action learning, awareness activities and moral development activities are much favored by students in environmental programmes. This reality should be given careful consideration by individual teachers as well as by faculties during the process of designing new or reviewing existing environmental curricula.

Finally, speaking of the educational process, one should realise that it needs specific management. Managing the educational process combines the development of a well-defined plan with the proper use and training of all available resources and particularly of the human resource. At the faculty level, the design of an effective education programme calls upon faculty members who are properly trained, or at least well experienced, in designing such programmes, strategic planning and faculty development (Russel et al., 1997). At the end, a successful education programme is the result, among others, of a properly designed and effective educational process that is continuously managed by experienced faculty members.

4. THE POSTGRADUATE PROGRAMME

4.1 Background and objectives

The Faculty of Civil Engineering of the Aristotle University of Thessaloniki was established in 1955 and is the oldest of the seven faculties within the School of Technology. After a major reform in the higher education legislation in Greece that took place in 1982, the Faculty was practically reconstructed and formed an autonomous unit that awards the Diploma of Civil Engineering after completion of a five-year undergraduate programme. Aligned with typical international trends at that time, the Faculty was partitioned into four divisions: (a) Structural Engineering, (b) Hydraulics and Environmental Engineering, (c) Geotechnical Engineering and (d) Transport and Organisation.

Both the above described administrative structure of the Faculty and the structure and content of its undergraduate curriculum mark a traditionally oriented Civil Engineering education approach. Following the classification adopted in a recent survey, carried out within the activities of a Socrates-Erasmus thematic network project called 'European Civil Engineering Education and Training' (EUCEET), the undergraduate programme of the Faculty belongs to the so-called continental system – as opposed to the anglo-saxon one – and particularly to the category of programmes of long duration, i.e. from 4.5 to 6 years (Manoliu and Bugnariu, 2001). The distribution of various categories of subjects (namely Basic Sciences, Engineering Sciences, Core Engineering Subjects, Engineering Specialisations and Non-Engineering Subjects), taught along its five-year curriculum, was found to be very close to the average distribution in its own category of programmes, as calculated in the analysis that concluded the above questionnaire survey. The typical as well as traditional structure of the undergraduate programme was confirmed even by its

average value of contact hours per week (26.1) that is almost identical to the mean value of the corresponding statistic of the relevant faculties' sample (26.8).

Until recently the Faculty was offering only one postgraduate programme leading to a PhD degree. To catch up with rapid developments in civil engineering education, but also to serve current and future societal needs, the Faculty launched in 1998 two one-year postgraduate programmes in the areas of Environment and Earthquake Engineering, respectively. Common objectives of the programmes are: (a) to offer scientific training and specialisation to engineers and scientists within a rather short period of time, (b) to provide them with the necessary background and technical knowledge related to complex, still practical, problems, creating thus individuals capable for a successful career in both the public and private sectors, and (c) to prepare highly-qualified students for entry into the doctorate (PhD) programme of the Faculty of Civil Engineering.

Particular objectives of the postgraduate study course in 'Environmental Protection and Sustainable Development' are to provide students with the scientific and professional knowledge that is necessary for their field of interest and to develop their abilities to formulate solutions to various problems in the context of current environmental and related socio-economics considerations. These objectives are accomplished by offering a flexible course structure that mixes both traditional and modern educational approaches dealing with the protection of the environment and the integrated sustainable management of civil engineering projects. The programme has been designed so that, after completion, the graduate will:

- acquire a high-quality knowledge of all issues related to environmental protection and sustainable development;
- get familiar with existing institutional and legal framework in Greece and in the European Union;
- be able to analyse, investigate and manage any project related to the theme issues;
- be able to develop environment-friendly policies and become a policy-maker with a full responsibility for his/her role toward the society.

An added value of the present programme is that it is the only one-year postgraduate course, offered by a greek faculty, that integrates civil engineering technology, environmental protection and sustainable development. Although the issues of environmental protection and sustainable development are of great importance in the country, environmental education at the university level is seldom offered in Greece, at least in the form of autonomous programmes. At the undergraduate level there are only 3 faculties in the country that are fully devoted to environmental education: two of them - at the Democritus University of Thrace and the Technical University of Crete - offer five-year environmental engineering degree programmes while the third, at the University of Aegean, offers a four-year environmental science degree programme. On the other hand, among approximately 200 postgraduate programmes in all fields, offered by various faculties of the 17 Greek Universities, 20 are dealing in various ways with environmental issues and only 3 of them are offered by engineering faculties (at the Aristotle University of Thessaloniki, the National Technical University of Athens and the Technical University of Crete).

4.2 Structure and contents

The Postgraduate Diploma of the programme is granted after completion of one full year of study, which breaks up into two semesters totaling a 9-month teaching period, during which the course units listed in Table 1 are being taught, and a 3-month summer term devoted to thesis preparation. Successful completion of at least 9 course units is a prerequisite (i.e. the four compulsory course units of the 1st semester and any five from the elective course units of the 2nd semester).

TABLE 1. The content of the programme

Core course units (1st semester)	Elective course units (2nd semester)	
• Environmental Assessment and Management	• Sustainable Management of Water Resources	• Urban – Land Planning and Sustainable Development
• Natural Resource and Environmental Economics	• Protection and Restoration of Groundwater	• Protection and Sustainable Development of Coastal Zones
• Decision and Risk Analysis	• Management of Liquid and Solid Wastes	• Protection of the Marine Environment
• Acquisition, Processing and Management of Environmental Data	• Transportation – Transport Policy and the Environment	• Environmental and Energy Approach to Buildings
	• Environmental Management of Transportation Projects	• Environmental Geotechnology
		• Management of Natural Hazards

Following most of the concepts and trends mentioned previously, the programme structure is designed so that: (a) Core course units cover the general theories, approaches and techniques, whereas elective course units constitute a group of specialisation topics. (b) The issues of sustainability and environmental protection are embedded into several course units, while corrective actions, both at the policy and technology levels, are emphasised in the more traditional engineering topics. (c) The educational process is a mixture of various methods, many of which originataing from within the cognitive domain, in an attempt to conform, at least for the first years of the programme's operation, with long-existing habits but, on the other hand, to challenge both teachers and students toward the new teaching paradigms.

4.3 Educational process and resources

Although the Division of Hydraulics and Environmental Engineering holds the major part in teaching and research activities of the programme, practically all divisions of the Faculty participate in it. Well-equipped laboratories of the divisions support the training of students in various fields. Computer facilities of the Faculty include a local network of numerous workstations and PCs, which are connected to the Aristotle University campus computer network. The new library of the Faculty is another useful resource on its own and also as the gate to the university's main library. Furthermore, recent developments in educational methods, and particularly the introduction of educational software and multimedia in the teaching and learning processes (OECD, 1998), kept the Faculty busy for the last two years in an attempt to adopt to the impact of information technology. One of the most valuable products from this activity is the Faculty's Electronic Educational Library, a multi-purpose electronic system aiming to improve teaching methods through multimedia applications (Avdelas and Latinopoulos, 1999).

Teaching material, especially of the type of commercial educational software, has been also purchased and installed in the local computer networks of the Faculty in order to serve the specific needs of the postgraduate programme. In addition, following current trends in classroom teaching with notebook computers (Neu, 1998) and in order to enhance presentations and learning efficiency, original educational material was produced by some of the instructors. As already has been noted in various higher education courses related to Environmental Science (e.g. Lowry, 1999), lecturing with the aid of suitable software, like PowerPoint, could significantly benefit students' performance. In addition to this option, other types of instructional material used in the programme include videos and slides collections on environmental educational topics. These topics were carefully selected, so that their contents are aligned with national standards and problems of interest, with course units of the programme and also with needs and interests of the students.

The high-level status of the material resources described above is being harmonically coupled with the human resources of the Faculty to form its overall teaching and learning potential. Moreover, a long experience of the Faculty staff, and particularly of the 20 professors affiliated with this programme, adds to an equally significant research potential. Most members of the Faculty staff are specialists in their respective fields and participate in numerous research programmes of the Faculty as well as in funded research undertaken in cooperation with industry and public authorities and agencies, both at the national and the international level. Given the particular characteristics required in enhancing advanced environmental education, especially when, as described in previous sections, such a training is to be provided to traditionally trained civil engineers, the research potential of the teaching staff is an added benefit to the postgraduate programme at hand. This is best seen in the production of various research reports, which constitutes an integral part of the whole educational process. Such an activity, when is supervised by qualified researchers, can help in developing individuals (i.e. the students) with sound-problem solving and decision-making skills.

Summarising the above, it can be argued that the described educational approach is similar to typical new models of environmental education which require a mixture of three sectors, namely Technology Knowledge, Transferable Skills, and Attitude, in order to obtain the desired learning outcome (van der Vorst, 1997). This is because the teaching methods and media, which should be used to create such an outcome (i.e. lectures, tutorials, seminars, laboratories, projects, information technology, books, independent study, group work, discussion groups, and field trips and visits), were all implemented in the postgraduate programme. What makes the difference from the most innovative programmes is the priority given in the present course to more traditional methods (i.e. cognitive methods for technology and skills) against the affective methods, which promote related attitudes.

4.4 Implementation and assessment

The Faculty of Civil Engineering has continuously operated the postgraduate programme in 'Environmental Protection and Sustainable Development' since September 1998. During these three academic years demand for the 30 places offered has been high, as the number of applicants ranged from 100 to 140. Nevertheless, evaluating the success of an environmental engineering program is a complex and, thus, difficult task that cannot be based on demand figures alone (Marsh, 1997). This is because these figures are biased by various factors such as fashion, inadequate supply of similar programmes, potentially strong job prospects etc. Therefore, a preliminary evaluation of the programme was carried out in order to reconfirm the rather apparent intrinsic values offered by it and, most of all, to assess the soundness of its original design and implementation concepts and practicalities.

The programme's evaluation process consisted of three parts: (a) a students evaluation survey, (b) a teachers self-assessment procedure, and (c) an overall assessment of the programme by two external evaluators, invited from foreign universities. Results from the first year's (i.e., academic year 1998-99) assessment can be summarised in the following:

- A prime feature was the enthousiasm of the programme designers but also of the teachers and students. This was mainly due to the fact that, for Greek conditions, it is a new and innovative study course that deals with a very important subject.
- The programme proved to be well structured and effective in its whole, regarding the students' attraction to the contents of the course topics as well as the implied teaching and learning methodologies. A direct proof for this is the fact that all elective course units were selected and successfully completed by more than seven students.

- Responses from students, collected during and after completion of the programme, confirmed the usefulness of a well-balanced curriculum (i.e. traditional versus new educational subjects) while, at the same time, underlined their inclination towards the non-classical forms of teaching and learning.
- The external evaluators agreed that the overall design of the programme meets very successfully the international standards of higher education studies in relevant disciplines and that it has great prospects toward its future development.

5. CONCLUSIONS

The new postgraduate programme in 'Environmental Protection and Sustainable Development', offered by the Faculty of Civil Engineering in Thessaloniki (Greece) proved to be an interesting and also a valuable experience for all Faculty members who were involved in its design and operation. Based on current concepts and trends in environmental engineering education and structured upon the Faculty's teaching and research potential, the programme looks very promising when considering the following factors: (a) the rather essential gap in this specific area of higher education within a country which strives to meet the forthcoming challenges of the 21st century, (b) the proper design of the programme, including the optimal utilisation of all the Faculty's resources, and (c) the enthusiasm with which educators and students were filled during the first time of the programme's operation.

What is to be seen in the near future is whether the specific model that was initially selected by the Faculty, and particularly the balancing of traditional and new educational approaches, can foster the new ethic required in the profession of environmental engineering, and (why not?) of civil engineering. The preceding review and discussion of the various issues and concepts that relate to the constraints, which should be met in order to accomplish the task for a new culture and the consequent full shift to the new paradigm, shows that further changes may be needed not only within the postgraduate programme at hand but also in the Faculty's undergraduate curriculum.

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