

### **34. The rise and the demise of the Environmental Engineering and Sustainable Infrastructure (EESI) master program *KTH***

With the support from the ALV faculty four professors travelled 1991 to Botswana, Mozambique, Namibia and Zambia to assess the demand for such a program. Visits were also paid to universities in Norway, Finland, England and France to get some experiences from established master programs with similar subject profile. Further, after the Swedish government's submission to become an EU member in the autumn of 1990, the interest to establish English-taught courses at Swedish universities grew significantly. For this reason the Educational Committee of the KTH Central Board allocated special development funds to set up a program in Environmental Engineering, which could provide interesting courses in English to EU-students. Subsequently in 1991 two proposals for parallel graduate programs were developed: one in Environmental Engineering (EE) and the other in Sustainable Infrastructure (SI). The two programs were presented at a meeting of representatives from the Swedish International Development Agency (Sida), Tampere University and other faculties inside KTH. Following the emergence of the sustainable development issues at the Earth Summit in Rio de Janeiro 1992 Sida proposed to KTH that the two programs be merged into one. Prior to this Sida had a policy of only supporting higher education in target countries, but in the 1990s a change was under way. Sida granted ALV additional development funds for the program. In the spring semester 1993, some of the EESI-program courses were given on a trial basis. The Swedish Institute (SI) granted five East European students to participate in these courses.

#### The curriculum and student recruitment

The scope of the EESI program of its 19 years of existence has been international and multicultural. Given the growing complexity of environmental problems, which tend to touch on every sector of society, new challenges are posed to the role of environmental engineers, planners and managers. It therefore follows that holistic and multidisciplinary approaches to addressing them are necessary.

The curriculum or course structure, developed before the major Swedish university reform, has basically been intact, see figure 1 for the 2006/2007 course structure. Up to 2007/2008 the program length was 1,5 years (total 60 credits) with two semester courses work and one semester for writing the master thesis. Since the program initially was based on two separate proposals the students in the first year classes tended to select either typical engineering (EE) courses or planning courses (SI) in their study plan. Subsequent revisions of the program based on annual evaluations resulted in more integration of engineering and planning subjects. Thus the 1998/99 classes started period 1 with the two compulsory core courses Environmental Impact Assessment and Political Economy for Environmental Planners. A new course in addition to the original set up Theory of Science, Research Methodology and Excursion was launched. The content of this course was before a part of the master thesis work. For the periods 2-4 the students should select two of four elective courses. These changes provided the students with better and more

comprehensive tools for environmental analyses in an international perspective as well as the possibilities to interact and learn from each other.

### **EESI 2006-2007**

<b>Autumn Semester 2006</b>		<b>Spring Semester 2007</b>	
<b>Period 1</b>	<b>Period 2</b>	<b>Period 3</b>	<b>Period 4</b>
IB1634 Environmental Impact Assessment (5c)	IB1291 Environmental Dynamics (5c)	IE1610 Environmental Data (5c)	IB1640 Natural Resources Management (5c)
IH1142 Political Economy for Environmental Planners (5c)	IB1292 Environmental Dynamics (5c)	IB1233 Water and Waste handling (5c)	IB1635 Quantitative Hydrology (5c)
	IH1143 Sustainable Urban and Rural Development (5c)	IH1141 Urban Infrastructure (5c)	IB1333 Environmental Geology (5c)
	IH1501 Human Settlements and Housing (5c)	IF1462 Management of Land and Water (5c)	IH1146 Sustainable Project Management (5c)

IU1030 Theory of Science, Research Methodology and Excursion 5c

Figure 1. The EESI program curriculum structure 1998/99 – 2007/2008.

The second major revision followed the Swedish Parliament decision in 2006 to align with the Bologna process. This resulted in that KTH and the EESI program adopted the Bologna system of 30 credits per semester and that a new semester was added. The core of this third course semester became the EESI Project course (15c) in which the students should use their various achieved courses knowledge in a longer semester integrated project. The EESI Project course was complemented with the new courses Ecosystem Dependency and Environmental Justice (7,5c), Life Cycle Cost Assessment (7,5c), Waste Recycling and Management (7,5c), and the Quantitative Hydrogeology (7,5 course) course, which was removed from the second year spring semester and replaced by the new Environmental Measuring and Monitoring (7,5c) course. The enlarged EESI program started with the 2008/09 class.

During the 19 years of existence the EESI program registered 726 students from all over the world. According to the KTH statistics 502 students were awarded an EESI master certificate. This is a success rate of 70 percent, which is quite high. The rise of the EESI program was facilitated by a number students grants from various Swedish agencies. Sida supported scholarships for 8 students per year during 1993-2004. An other agency, the Swedish Foundation for International Cooperation in Research and Higher Education (STINT), provided 4-5 scholarships from 5-7 students from “emerging economies” between 1996-2003, and the Swedish Institute (SI) 2-6 scholarships from East European students from 1993- 2007 . Two

students per year were recruited from University of Ghana between 2002-2006 funded by the Linnaeus-Palme teacher and students exchange program. At the end of the 1990s some 200 international students competed for the Sida and STINT scholarships. At the peak of the program 257 students applied for the EESI program in 2005 and 307 in 2006 as their first choice.

Table 1. The number of registered EESI students, the number of students in the EIA course and the number of EESI exams between 1993-2011. Source: KTH Ladok statistics.

Year	Registered	EIA-course	Exams	Year	Registered	EIA-course	Exams
93	25	45	-	03	46	67	43
94	28	64	15	04	52	69	31
95	43	62	20	05	48	74	42
96	51	73	22	06	38	62	21
97	44	71	38	07	34	63	20
98	38	70	33	08	31	75	23
99	41	67	37	09	37	79	19
00	42	66	27	10	30	75	14
01	45	63	33	11	8	40	22
02	47	72	42	Total	728	1257	502

In addition to the EESI program students courses in the program were open to KTHs engineering students in civil engineering and surveying (4.5-5 years Swedish traditional master programs), EU exchange students and students from other Swedish universities at master levels. As an example the EIA core courses received between 60 – 80 students each year (table 1).

#### International relations generated

A central part in the EESI program with so many international students has been teaching in project form. In collaboration with University of Latvia the teacher group arranged 1997-2000 an excursion to Riga in project form to study engineering and planning problems at the former Rumbula military airport. In collaboration with Gdansk Technical University the teacher group arranged 2001-2004 an excursion to Gdansk to study engineering and planning problem at the Czarny Dwor recreational area close to the Gdansk Baltic beach. These excursions aimed to engage students and teachers to integrate knowledge, values and attitudes in addressing real-life environmental problems.

Between 2005-2007 teachers in the program participated together with the Delft university in a Tempus project to give curriculum and teacher support for the development of master programs in water and environment at the Birzeit University in the Occupied Palestine Territories. This project was followed by a new Tempus project 2010-2012 to develop a Strategy for the Higher Education in Water and Environment in Palestine including the Palestinian universities of

Birzeit, Al Quds U, Al-Najah and Loughborough University UK, Technical University of Athens Greece and KTH.

During the 19 years of existence no special funding was allocated to investigate the labor market need of the graduated students or what job positions the graduated students have got. But informal follow up by the EESI administrative office did show that most of the international students got very qualified positions in public administrations and the industry in their home countries. Just to give an example one of them became the Head of the Environmental Protection Agency of Zambia. Another student is at present working with the Lithuanian government in the EU Council with international environmental issues e.g. Rio+20. Many continued with doctoral studies at foreign universities for further qualifications. In the beginning a limited number continued for doctoral studies at KTH, but at the end of the first decade of this century there has been a tendency that more graduate students ask for doctoral studies at KTH due to more constrained job markets in their home countries.

In summary as regard to the content of the EESI program, the international contacts and job opportunities it has created the program must be said to be very successful. In 1997 Sida asked for an evaluation of the EESI program. The evaluator, Professor Walter Leal Filho from Hamburg Technical University, found the program to be “very good”. A master thesis 2004 by a student in the EESI program concluded the program was well performed.

The ten first years

The planning of the EESI program coincided with a favorable situation of a growing interest for sustainable development, a concept which has been a core trend in most courses. Thus the program had a good start just a couple of years after the Rio Conference 1992. The combination of engineering and planning attracted a lot of international students. A decisive factor why the program has survived for so many years was that the program was constructed based on the existing competences at the former ALV Faculty. Also most of the involved dedicated teachers were around 40-50 years old, which from the beginning guaranteed a long-term engagement and stability in the program.

The administrative support from Sida the first ten years was of great importance for the coordination of the program. The funding sustained a part-time program director, a part-time program assistance and program secretary, who formed the EESI office. It meant that the office in practice was independent from the participating departments' budgeting. Between 1996-1999 the office was staffed by 2.0 full-time equivalents. The office was responsible for all practical matters: advertising the program, recruitment process, arranging for housing, selecting of students, courses schedule, student follow up etc. The program secretary also had the important function as the student social councilor.

The program development was initially the joint responsibility of the teacher group co-chaired by the two Heads of Departments which provided most of the courses. In the 1990s the program

director(s) prepared two to three teacher groups meeting per semester. At these meetings evaluation of courses performance, teaching engagements, student performance, recruitment policies etc were discussed. After the Millennium shift the teacher group meetings were reduced due to increased teacher stress and ended in the summer period 2005-2007 up in the EESI Annual Conference as the sole teacher meeting. Initially there was also established a selection committee of teachers for scholarship students and other students. This committee chose the students in the program after a proposal of the program director(s). But after five-six years the selection committee was abolished and the selection was done by the program director(s).

Thus the first ten years of the program was characterized by quite high “freedom” at the teacher group and administrative office levels to run the program. This freedom managed to handle the internal changes of departmental structure into “big departments” followed by the university reform including the master program budgeting. The demise started with the end of the Sida support 2004, the set-up of the School system from January 2005 and influences from the EU level.

#### The demise of the EESI program

With the end of the Sida support the EESI office came in a more vulnerable position. The 2000-2003 years students in the EESI course structure (thesis work excluded) generated about 5.2 – 5.4 million SEK per year of “customers “ income to KTH. The year 2000 the income from thesis work was about 1.4 million SEK and the external support to the EESI office 1.5 million SEK. Thus in the beginning of the millennium shift the EESI turnover was in the range of 8 - 8.3 million SEK, which was an essential income for the involved departments. With the gradual application of the NPM-model various figures indicate that the government general cut of funding to higher education was some 35-40 per cent in a ten years period. The stress level of the teachers increase, which was a decisive factor why the successful excursions were given up. Under these circumstances the departments in the program were reluctant to take on the costs of the EESI office, which started the process of downgrading it. The last few years the administration of the EESI office at the department level was almost reduced to zero.

In 2005 the Swedish government presented a bill “New World – New University”. The government and later the parliament pointed out that the key word of the future higher education policy should be “competition power”. The aim of the policy was declared to “strengthen the higher education competition power. Sweden should be an attractive country for students with an education of high quality which is developed in line with the Bologna process”. The bill copied three of the EU Higher Education Area goals: to promote movement (of student and teachers), employability and Europe as a continent of competition power. The parliament decided to introduce a general two years master degree. At KTH this started the final process to give up the Humboldt master system in favor of the Anglo-Saxon Bologna system. The Swedish course credit system (1 week of studies = 1 credit) changed in line with the Bologna (1 week of studies=1.5 credits), and the Bologna course grading system A-F replaced the KTH system 3-5.

From 2008 the application process of master students was changed. Students should now apply to a national data base instead of applying directly to the university, which initially created a lot of confusion and transferred power to the bureaucrats both at national and university central level at the expense of teacher influence.

Parallel to these external changes the new School system 2005 vested all power to the Head of School. The Rector appointed the Head of Department for four years in a quasi-democratic process. In the first years the Head of School was even formally the “procurer” of courses in the education programs until a special person was given this position. The new Head of School also started to interfere in the EESI program structure, which could be interpreted as a redcentralisation of the NPM model. He argued that it should contain “two tracks”, an EE-track and a SI-track, and referred to some very unclear recommendation from the Central Faculty Board at that time. The teacher group never had any discussion of the two tracks, and was side stepped. Almost all students in the 2005 year class protested to the Head of School and the Rector and wrote: “Now you are thinking of dividing the EESI program into EE and SI. It seems to us that all the development KTH has made on this program and the international reputation that has been built over the years will be destroyed. Don’t you believe that a multidisciplinary work is necessary to reach sustainable development? Or all that we have learned is just theory? Instead of creating more divisions we believe that you should work more in to trying to develop the concept of interdisciplinary work and improve the communication between the departments and teachers”. In fact the intention of the Head of School was to split the EESI program in the new power system that was established. The track discussion led to less flexibility for the EESI students to select their courses, and to that the Head of School after trade union negotiations in 2008 annulled the EESI Program Coordinator from his work duties as coordinator.

The final blow to the EESI program was the implementation of tuition fees from 2011 class. Already the government bill New World – New University announced the government intention to set a up a tuition pay system for non-EU/EES students. Most universities saw this a threat as they especially from the Millennium shift had set up and developed a lot of new master programs open for international students. However the tuition fee system was approved by the four government parties and the social democrats in the Parliament in June 2010. In fact the tuition meant a confiscation of funding to the universities. The government bill estimated an allocation of 500 million SEK to universities before the parliament decision. But the same bill only allocated 90 million SEK for scholarships to pay tuitions. The government has never explained what has happened with the difference. In a press release the government wrote: “The Swedish Higher Education shall compete with high quality and a good study environment, not by free education”.

KTH got 85 per cent less non-EU/EES students in 2011. Only 70 students paid the tuition invoice of 145 000 SEK per year, and KTH had to lower its general education target ceiling by 100 million SEK. The two Rectors of KTH and Chalmers wrote in the morning paper Dagens

Nyheter in November 2011: “Now we have got it black on white...Tuition fees were a mistake”. They were worried that the tuition fee system should harm the Swedish competition power.

At the master program level the tuition fee system has led to a disorderly process of abandoning master programs at the various Schools. The EESI program lost almost all their African students, as they were not able to pay the tuition fee. From 2012 the EESI program has been merged in a “horse-trading” process within the School of Architecture and the Built Environment (ABE School) with the Water Systems Technology master program, which had existed since 2007, into the “New EESI Program”. Many of the original courses have survived in the new program, others have disappeared. But with the existing recruitment situation many courses have too few students to be economically viable. However, many of the teacher staff have started to challenge the non-inclusive and more and more bureaucratic School system that hinders the development of high quality master programs.

The general conclusion

Finally, the account of the history of the EESI program raises the general question if it is possible to run high quality master programs under a neo-liberal system of “competition power”. Today higher education is a short-term business system of delivering student examinations for a not well defined global market. The EESI program started with great enthusiasm by a group of dedicated teacher. But gradually funding squeeze, continuous internal reorganizations, external political decision-making have led to the dismantling of the faculty organization, which more or less have “killed” an organized teacher influence.