



Experiences of environmental professionals in practice

Environmental
professionals

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Abstract

Purpose – The purpose of this paper is to explore the labor market position of environmental science graduates and the core competencies of these environmental professionals related to their working practice.

Design/methodology/approach – The authors carried out two surveys amongst alumni of the integrated environmental science program of Utrecht University and their employers. The surveys addressed alumni's working experiences and employers' assessment of the core competencies of environmental science graduates.

Findings – The surveys indicated that environmental science graduates have a fairly strong position on the labor market. They are employed in a diverse range of functions and working sectors, including consultancy agencies, research institutions, governmental organizations and NGOs. Graduates as well as employers consider a number of generic academic skills (e.g. intellectual qualities, communication skills) as well as discipline specific professional knowledge and practical skills as important competencies for the working practice of environmental scientists.

Practical implications – These insights can be used for the improvement of environmental science curricula in order to increase the employability of their graduates.

Originality/value – This paper presents data on the labor market position of graduates of "integrated" environmental science programs and provides insights into the core competencies of these graduates.

Keywords The Netherlands, Graduates, Competences, Labour market, Sciences

Paper type Case study

1. Introduction

Environmental problems and issues of sustainable development have increasingly gained attention from policy makers, scientists, market parties and actors from civil society in the last decades. Nowadays, environmental professionals are dealing with environmental and sustainability issues in a large variety of organizations, roles and disciplines at various levels. These developments have been strongly promoted and enabled by the academic world, on one hand as the home base of environmental sciences (since the late 1970s) and more recently "sustainability science" and on the other hand, as the provider of professionals fuelled with the knowledge and capabilities to take up the challenge of enabling the systematic societal changes required to reduce society's impacts on the environment.

Environmental science has developed strongly in the last decades. In many cases, dedicated scientists developed holistic and applied programs aiming at analyzing the impacts of human behavior and designing and assessing problem-solving strategies and policies directed to governments, businesses and individual behavior. These frontrunners integrated the various relevant natural and social sciences into multidisciplinary (and later: transdisciplinary) approaches. In early stages, this work



was often ignored and not rewarded by the main streams of the involved disciplines. More recently, most of these disciplines have developed environment-related subdisciplines. Nowadays, environmental science is increasingly oriented towards sustainable development (Rest, 2002; Vincent and Focht, 2009).

Mirroring these developments, teaching programs have been developed in higher education both at the “integrated” level and at the subdiscipline level (e.g. García *et al.*, 2006; Vincent and Focht, 2009; Kitamura and Hoshii, 2010). One can assume that students graduating from both types of academic teaching programs find their own specific niche in the labor market, but this remains an understudied area. The practice of developing and implementing innovative strategies for sustainable development will require both specialists for detailed development and assessments “on the spot” and professionals with a holistic, integrative view for overall assessments and (long term) strategy development, who are able to integrate diverging views from various scientific disciplines and from various societal settings.

Environmental science teaching programs should prepare their graduates for this role. To find – and keep – the proper balance in the curriculum between academic education and the market demand for environmental professionals, it is necessary to have an insight into the roles environmental scientists are expected to fulfill and the competencies they should have in order to be successful in these roles (Quality Assurance Agency for Higher Education, 2000; Runhaar *et al.*, 2005, 2006; Wong *et al.*, 2007; Vincent and Focht, 2009). As part of the EU Bologna process of tuning higher education in Europe, the so-called Dublin descriptors have been developed which can be used as end goals for program development at different levels (Meijers *et al.*, 2005).

Monitoring the career development and success of the graduates as well as developments in the labor market for environmental academic professionals, provides insights into the actual working practices of academically trained environmental scientists and should therefore be part of the quality assurance system of environmental sciences programs. However, only a few studies are available on this subject. In the late 1990s, a general comparative study on the relationship between higher education and employment of young graduates from 12 different countries with different disciplinary backgrounds was carried out, called the Careers after Higher Education – A European Research Survey (CHEERS) study (Schomburg and Teichler, 2005, 2006; Teichler, 2007). A further study by Giacomelli *et al.* (2003) examined the developing demand of young graduates in the environmental labor market in Italy.

In this paper, the authors present the results of two studies on alumni’s experiences and two studies on employers’ assessments of the requirements for and capabilities of environmental professionals. It is based on the alumni who finished their studies in the environmental sciences program at Utrecht University in the period 1989-2008. The authors address the following two questions:

- (1) What is the labor market position of environmental sciences graduates from Utrecht University? What is the nature of their work?
- (2) To what extent does the academic training fit the jobs our environmental sciences graduates hold?

2. Environmental sciences at Utrecht University

Utrecht University is one of the oldest and the largest universities in The Netherlands. It was founded in 1656, and consists of seven faculties with *c.* 7,500 staff members.

Approximately, 30,000 students participate in one of 45 undergraduate and 167 graduate programs. Utrecht University has offered courses in environmental sciences since 1978 and degrees in Environmental Studies/Sciences since 1989. The 30-year history of Environmental Science education at Utrecht University is summarized in Table I. The Doctorandus degree program that started in 1989 was an integrated two-year program in which students could participate upon completion of the first two years of a disciplinary program (such as biology, chemistry, physical geography, human geography, and law or social sciences). In 1998, the program was reviewed and two trajectories were introduced: one for students with a background in social sciences, and one for students with a background in natural sciences. One year later, the program was enlarged to two three-year programs: environmental studies and environmental sciences. As a consequence of the Bologna Agreement, in 2002 the university switched from the Dutch Doctorandus degree programs to the current Bachelor's programs in environmental studies and environmental sciences, and the Master's degree program sustainable development. This MSc program consists of an integrated part and four specialization tracks, of which two tracks have a natural science focus and two tracks have a social science focus. The focus of the program has broadened from environmental science to sustainability science (Clark and Dickson, 2003). The graduation level of the Doctorandus graduates is comparable to those with a Master's degree (graduate level). At present (August 2008), there are 594 graduates with a Doctorandus degree, 72 with a Bachelor's degree and 55 with a Master's degree, of which 56 percent completed the natural sciences program and 44 percent completed the social sciences program.

3. Methods

To analyze the labor market position of our graduates, the authors carried out two surveys amongst our alumni: one in 2005 and one in 2008 (Adolfson, 2005; Goetheer, 2008). In the 2005 survey, we approached 450 alumni of the Doctorandus programs who graduated between 1990 and 2005, of which 162 (36 percent) completed the questionnaire. This questionnaire was distributed again in 2008 in a slightly adapted form, to include the first graduates of the Bachelor's and Master's programs. The 2008

1978	First elective course environmental studies
1989	Two-year multidisciplinary Doctorandus program environmental studies (inflow in third year after two years in basic discipline)
1998	Renewed two-year Doctorandus program environmental studies with social-science and natural-science stream (inflow remains in third year)
1999	Three-year Doctorandus programs environmental studies and environmental sciences (inflow in second year after one year in basic discipline)
2001	Four-year Doctorandus program environmental sciences (extra year at end) (inflow remains in second year after one year in basic discipline)
2002	Three-year Bachelor's programs environmental studies and environmental sciences
2003	Two-year Master's program in environmental sciences called sustainable development
2005	Master's program sustainable development recognized as prestige master by the university (funds to strengthen international character)
2008	Start international joint degree MSc program sustainable development in cooperation with Graz University, Ca'Foscari University Venice, Leipzig University, Basel University, Hiroshima University, and (since 2010) Stellenbosch University, Teri University New Delhi and Jawaharal Nehru University New Delhi

Table I.
Overview of 30 years of
environmental sciences
education at Utrecht
University

questionnaire was sent to 176 alumni who graduated between 2001 and 2007, of which 87 (49 percent) responded. The questionnaire investigated:

- (1) The time lag between graduation and first job.
- (2) Channels used in job seeking.
- (3) Fields and characteristics of the:
 - first job; and
 - later jobs/career development.

Because of the composition of the respondents' population, the 2005 survey provides insight into career development at the start of the professional career of our graduates as well as in later stages, while the 2008 survey mainly provides information on early career perspectives.

The extent to which the academic training fits the environmental sciences graduates' jobs was studied in three ways. First, questions on this subject were included in the graduates' questionnaires. Second, data from two labor market workshops organized in 2006 by the inter-university committee environmental sciences were used. These workshops were organized to attain insight into the vision of employers of environmental scientists on the strengths and weaknesses of our alumni and the essential knowledge and skills needed for the work that environmental scientists do in practice ($n = 23$) (Visseren-Hamakers and Vermeulen, 2006). Thirdly, the 2008 survey was complemented with a questionnaire for the employers or superiors of our alumni ($N = 6$, Goetheer, 2008).

4. Present occupations of environmental sciences graduates

Graduates from the Bachelor's degree program

Only 19 percent of the Bachelor graduates enter the labor market directly after their graduation (Figure 1). The majority of the bachelor graduates continue to study in a Master's degree program. The 17 graduates included in this study have enrolled into 11 different Master's degree programs at six different universities within and outside the Netherlands. Because of the low number of graduates with the new "bachelor" title who are in a job it is not yet possible to get a clear picture of the labor market position of this group. Therefore, they will not be included in the further analysis.

Graduates from the Doctorandus and Master's degree programs

Both surveys indicate that the majority of the graduates (2005: 70 percent; 2008: 64 percent) from the Doctorandus and Master's degree programs entered the labor market after graduation. The relative number of respondents who continued at the university to do a PhD is higher in 2008 (18 percent) than in 2005 (8 percent). It is striking that 22 percent (in 2005) and 20 percent (in 2008) of the Doctorandus respondents enrolled in further education against only 8 percent of the master respondents. In most cases, the Doctorandus alumni indicated that this further education involved completing the study in which they originally started in their first bachelor year[1]. In the 2005 survey, in total 73 alumni (45 percent) indicated that they finished a second Doctorandus program before, during or after their enrolment in the environmental sciences program.

In both surveys, 91 percent of the respondents were in paid employment and only 3 percent of the respondents indicated that they were currently looking for (paid) employment. Most alumni have had more than one job since their graduation (Figure 2).

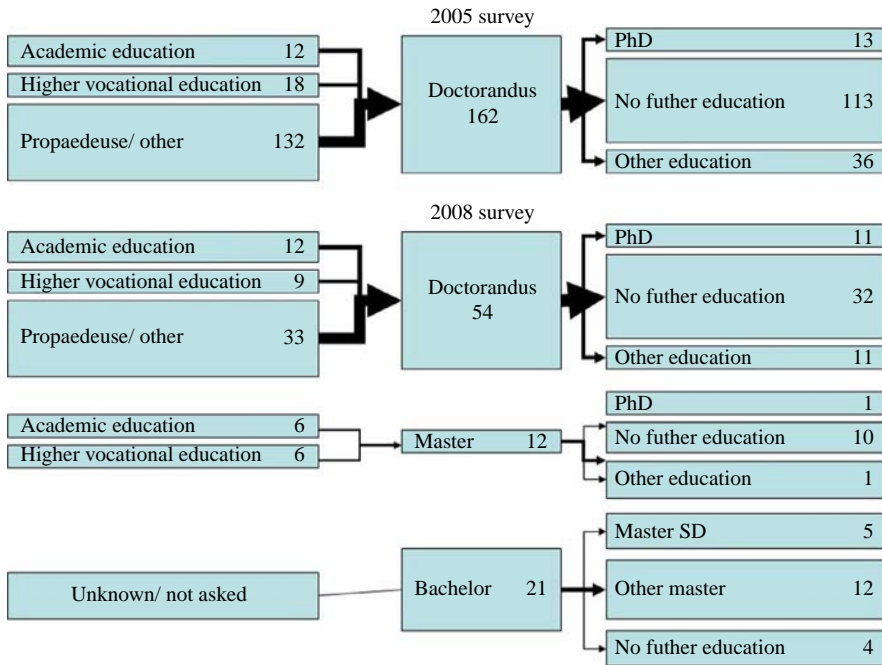


Figure 1. Educational history of environmental sciences graduates before entering and after graduation from the Doctorandus (2005, 2008), Bachelor's and Master's program ($n = 162, 54, 12, 21$ resp.)

Many alumni find their first job relatively quickly: in 2005, 53 percent of the respondents found their first job within four months after graduation (Figure 3). In the 2008 survey, this has improved even more since 62 percent indicated having found their first job either before or within two months of graduation (27 percent). The option “before graduation” was not included in the 2005 survey. If applicable, the respondents would have indicated “within one month” or “not actively looking”.

The results from our surveys indicate that the main channels for gaining employment are personal contact/internship during the last phase of the program and voluntary applications to vacancies in newspapers, specialized journals and (more recently) the

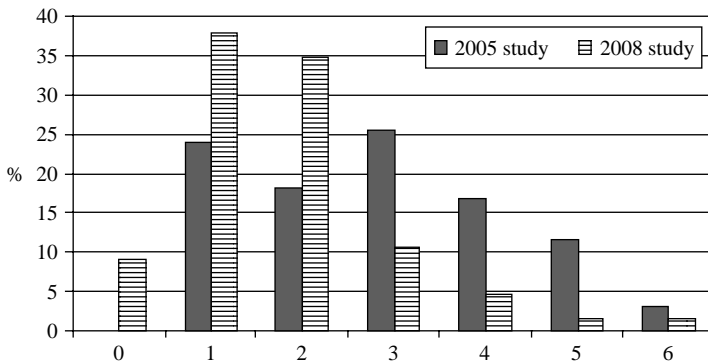


Figure 2. Numbers of jobs of environmental sciences graduates, survey 2005 ($n = 139$), survey 2008 ($n = 60$)

internet. Other ways of finding a first job are mainly through a temping agency (general or specialized environmental temping agency) or through the university (Figure 4).

In 2005, 68 percent of the respondents indicated that they were working in the environmental field and 73 percent were working in a job at academic level. In 2008, these percentages have increased to 78 and 85 percent, respectively. Most graduates find their first as well as their current job in consultancy agencies, governmental organizations (local, regional, and national or international) or at a university (Figure 5). In the 2005 survey, business/industry was a relatively important sector for the environmental science graduates as well. A relatively small number of graduates are working in education (secondary schools, higher vocational education), business and industry, NGOs, knowledge institutes and other sectors, like banking, employers' organizations and entertainment.

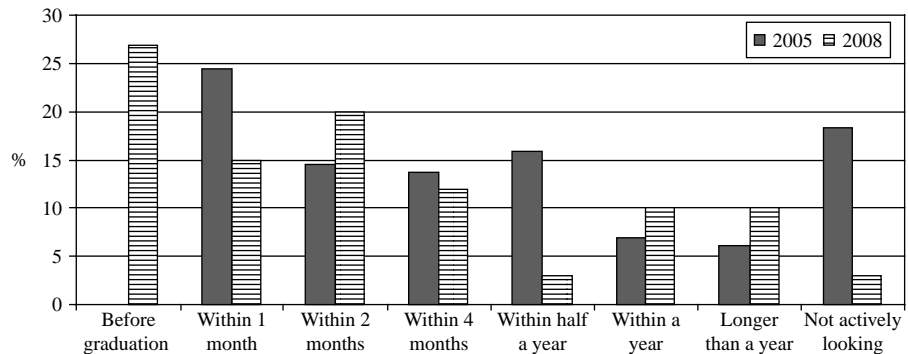


Figure 3. Timeframe for finding the first job after graduation, survey 2005 ($n = 138$) and survey of 2008 ($n = 60$)

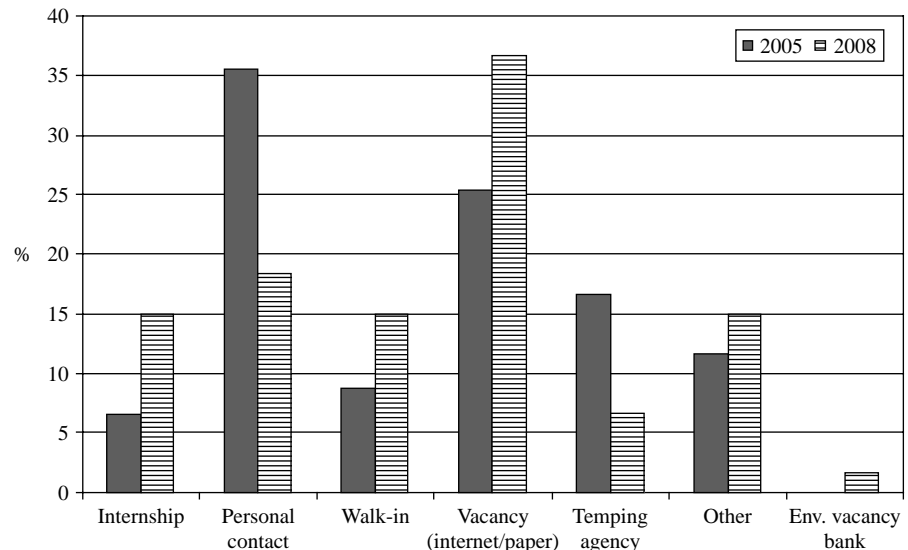


Figure 4. Ways of finding the first job after graduation, survey 2005 ($n = 138$) and survey 2008 ($n = 60$)

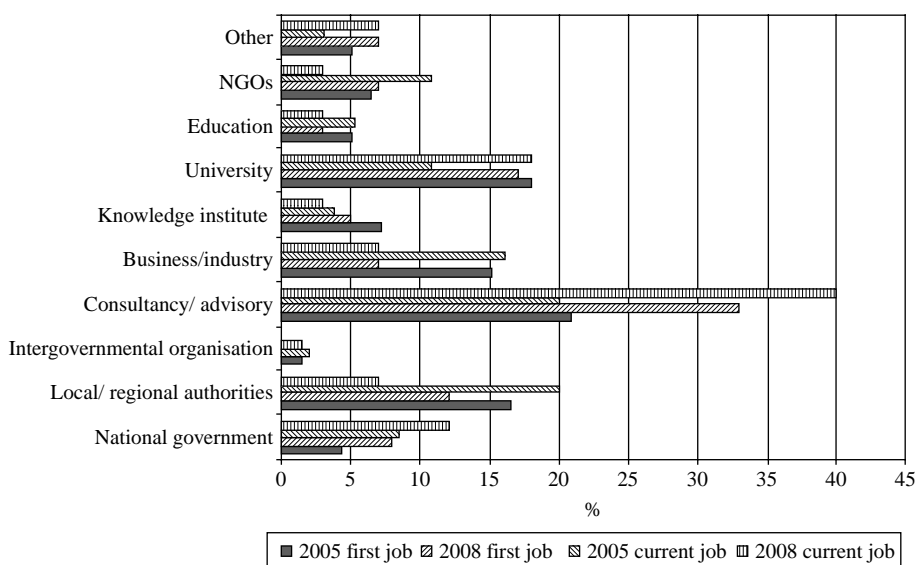


Figure 5. Sector of first job after graduation and current job, survey 2005 ($n = 139$) and survey 2008 ($n = 60$)

In line with the sectors in which environmental scientists work, in their first job they mainly work as a researcher (often as a PhD student), advisor, policy maker, or in other types of functions (mainly not in the environmental field) (Figure 6). The data on the current jobs indicate that later in their career fewer graduates work as a researcher whereas more work as an advisor or project leader.

Figure 7 shows the average percentage of time the respondents spent on specific types of work. The types of work reflect the outcomes of a discussion during the 2006 labor market workshops and therefore are categories of types of work environmental scientists do in practice according to their employers (Visseren-Hamakers and Vermeulen, 2006). Figure 7 shows that environmental sciences graduates carry out a variety of types of work. Besides the predefined types of work, graduates undertake a number of other tasks. Moreover, Figure 7 shows that in general, there are some typical types of work for natural and social environmental scientists. Obviously, cause-effect research in the realm of natural sciences is undertaken exclusively by natural sciences respondents. In addition, the natural sciences respondents typically assess technological solutions and actual performances. It is interesting to see that the assessment of policy scenarios is more often carried out by natural sciences respondents. Social sciences respondents more often undertake cause-effect research in the realm of social sciences than natural sciences respondents. Furthermore, they develop policy plans and analyze social relations. The most important categories besides “other” types of work for both natural and social sciences are “knowledge transfer” and “advising third parties/ helping implementation”.

The results show that environmental professionals have clearly stepped out of the circle of the academic world, where analyzing, assessing and modeling is a core activity and have taken positions at various institutions in government and the market that engage in implementation of environmental strategies. Here, advising, convincing and knowledge transfer are core activities. We may expect that these various positions partly require different intellectual and social capabilities and skills.

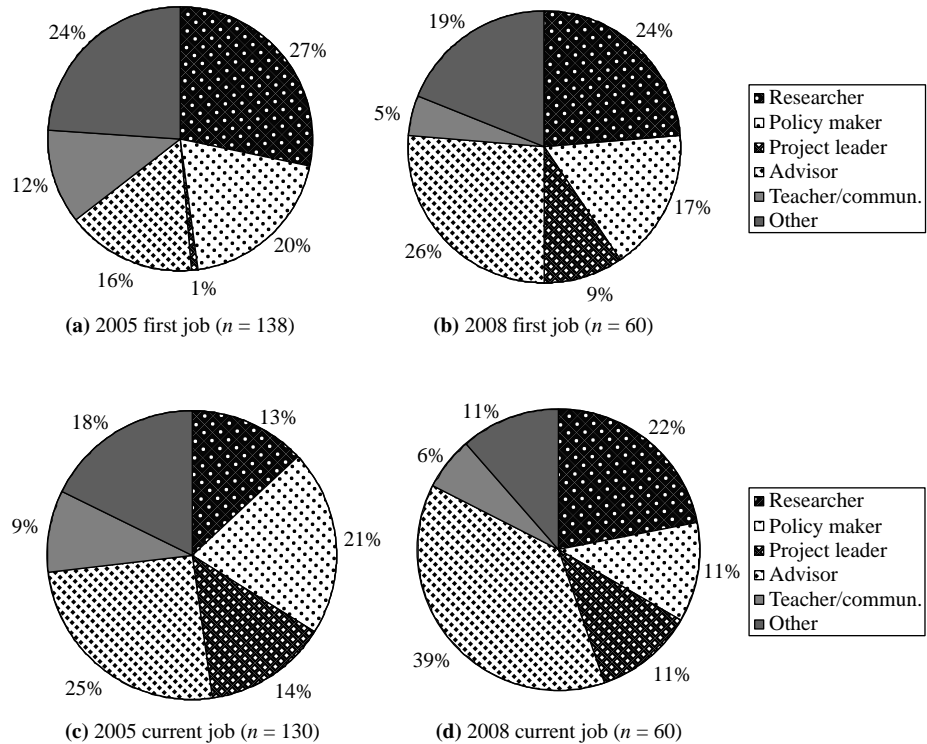


Figure 6.
Type of function

5. Competencies of environmental sciences graduates: fit between education and professional practice

Core competencies of environmental professionals

We defined eight core competencies of environmental professionals, including generic skills (Washer, 2007) as well as discipline-specific competencies. These competencies are:

- (1) *intellectual qualities*, e.g. analytical and integrating capacity, insight into context, concise;
- (2) *professional knowledge*, e.g. knowledge of natural and social science disciplines, relevant policy and legislation;
- (3) *research skills*, e.g. knowledge of research methods and working with system models;
- (4) *numeric and ICT skills*, e.g. statistical knowledge, GIS skills and other applied software;
- (5) *practical skills*, e.g. translating theory into practice, thinking in practical terms, project management;
- (6) *communicative skills*, e.g. language proficiency, concise and convincing presentation skills, customer directed, and debating skills;
- (7) *social skills*:
 - networking and convincing, e.g. being able to convince third parties, inducing external parties to act proactively; and

- social teamwork, e.g. multidisciplinary cooperation, building bridges, giving and receiving feedback, motivating team members.
- (8) *self-management*, e.g. discipline, sense of responsibility, insight into personal qualities and limitations, setting priorities.

Graduates' perspective

Figure 8 shows which competencies the environmental sciences graduates from the Doctorandus and Master's programs perceive as important for their first job after graduation or their further education. Intellectual qualities, self-management, communicative skills and practical skills are considered most important; these competencies are considered (very) important by, respectively, 83, 77, 70 and 70 percent of the respondents. About half of the respondents value the following competencies as (very) important: social teamwork (53 percent), networking/persuading (52 percent) and professional knowledge (48 percent). For numeric/ICT skills and research skills the picture is mixed; these skills are considered (very) important by only 20 and 32 percent of the respondents, whereas 32 percent of the respondents value these skills as hardly important for their professional practice.

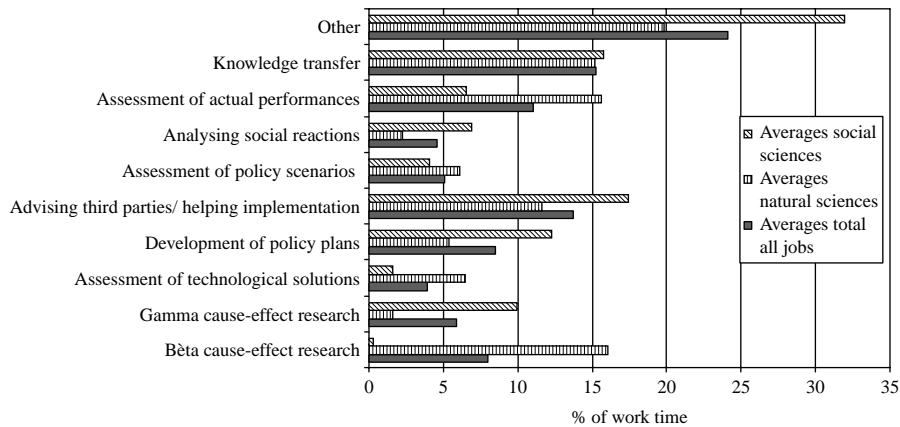


Figure 7. Average percentage of time spent on different types of work (for all jobs to date): natural sciences ($n = 59$), social sciences ($n = 56$), and total ($n = 115$) (Survey 2008)

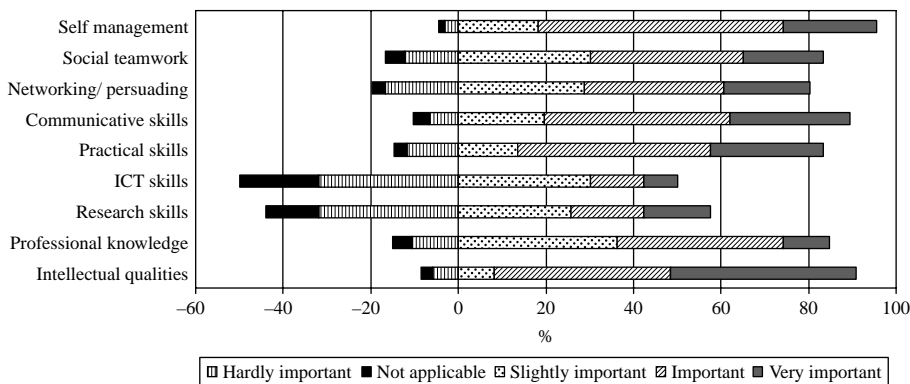


Figure 8. Valuation of importance of core competencies for job or further education according to environmental science graduates from the Doctorandus and Master's degree programs (survey 2008, $n = 66$)

Employers' perspective

In the two workshops in 2006, 23 employers of environmental scientists were asked to rate the relative importance of the eight core competencies for environmental scientists working in academic or implementing positions. All competencies were valued as important to some extent. Intellectual qualities, professional knowledge and communicative skills were considered the three most important competencies in both types of positions. In academic positions, especially intellectual qualities and professional knowledge were considered most important, whereas in implementing positions, communicative skills were valued most. In the 2008 survey ($n = 6$), employers also valued practical skills as important.

In conclusion, employers and graduates agree on the importance of intellectual qualities, communicative skills, and practical skills for the professional performance of environmental scientists. Professional knowledge however, is valued more by employers than by graduates, whereas graduates consider self-management skills of greater importance for their professional life than employers do (Table II).

6. Strengths and weaknesses of environmental scientists

Graduates' perspective

In both alumni surveys, graduates were asked to indicate their level of agreement with statements about the fit between the study program and their working experience. Moreover, they were asked to mention the main strengths and weaknesses of the program. The outcomes indicate that the graduates are generally (very) satisfied with the knowledge and skills they obtained during their environmental sciences program (Figures 9 and 10).

In 2005, the majority of the respondents (strongly) agreed that the knowledge (57 percent) and skills (64 percent) they obtained during their training were useful for their professional performance. The interdisciplinary and holistic character of the environmental sciences program is considered the main strength of the program. The majority of the 2008 respondents (strongly) agreed that the holistic character of environmental sciences ensures quicker understanding of various issues (78 percent), and that the interdisciplinary skills they acquired during their training enable them to

Competencies	Average scores		
	Academic positions (2006 study)	Implementing positions (2006 study)	All positions (2008 study)
Self-management	14	11	10
Social skills	11	16	
Social teamwork			10
Networking/persuading			9
Communicative skills	19	28	15
Practical skills	12	15	19
Numeric and ICT skills	10	10	6
Research skills	15	10	3
Professional knowledge	25	17	13
Intellectual qualities	26	20	13

Table II.
Relative importance of competencies considered essential for environmental scientists in academic and implementing positions, according to employers

Notes: $n = 23$, Visseren-Hamakers and Vermeulen (2006); $n = 6$, Goetheer (2008); employers were asked to divide 100 points over the different categories of competencies; the higher the score, the more important a competency is

build bridges between disciplines (54 percent). Moreover, the respondents (strongly) agreed that they have sufficient profound knowledge of social sciences (68 percent), natural sciences (62 percent), and research methodology (56 percent). However, the level of knowledge required for specific fields is more often mentioned as a weakness than as a strength. Further, strengths mentioned are the (communicative) skills acquired and the project group work, whereas (the lack of) practical experience, lobbying and persuasion skills are mentioned as weaknesses in the program.

About 40 percent of the respondents from 2005 (strongly) agreed that additional knowledge and skills would have enabled them to perform better in their first job, whereas 34 percent (strongly) disagrees with this statement. In 2005, 39 percent of the respondents (strongly) felt that a degree other than environmental sciences would have been just as appropriate for their first job, whereas 33 percent (strongly) disagrees to this statement. This perception had changed slightly by 2008. In 2008, 34 percent (strongly) agrees to this statement, whereas 43 percent (strongly) disagrees.

Employers' perspective

In the two workshops in 2006, 23 employers of environmental scientists were asked to spontaneously name specific strengths and weaknesses they have seen in environmental scientists in their organization. In total, they named 45 different types of strengths and 58 types of weaknesses. 23 entries for strengths could be categorized as "multidisciplinary and generalists" (Table III).

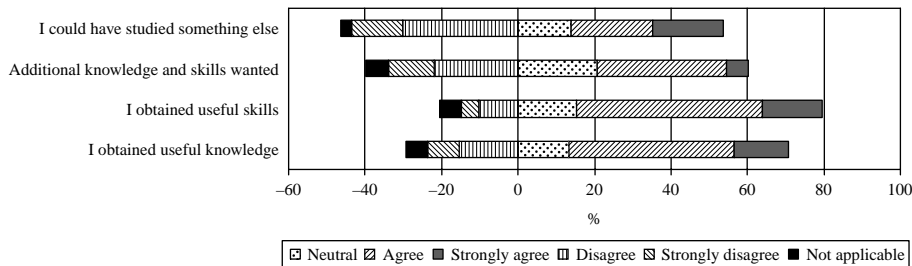


Figure 9. Extent of agreement to statements regarding the fit between study and work, Doctorandus degree respondents (Survey 2005, n = 136)

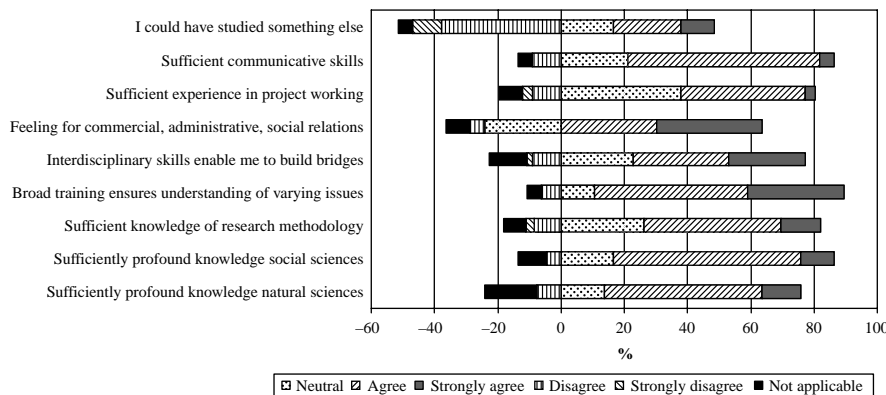


Figure 10. Extent of agreement to statements regarding the fit between study and work, Doctorandus and master's degree respondents (Survey 2008, n = 66)

The employers value the multidisciplinary and generalist character and external orientation of environmental scientists. Examples used are the ability to build bridges between disciplines, broad knowledge, and communication and cooperation skills.

The weaknesses can mainly be found in practical skills, e.g. communication skills, and process and project management skills, as well as in lack of up to date knowledge, e.g. of environmental policy and law. In the discussions, the shortcoming in communication skills was mostly linked to a lack of practical experience, e.g. negotiation situations for policy making.

7. Conclusions

Results of the surveys on the employment status of environmental science graduates from Utrecht University sketch quite an encouraging scenario. There is a clear niche for this type of broad and multidisciplinary professional in the labor market. In this respect, the situation in The Netherlands seems to be comparable to the north of Italy, where Giacomelli *et al.* (2003) concluded that the environmental labor market is in search of young professionals with a broad educational basis who embrace natural scientific and technical disciplines as well as socio-economic disciplines. This is in addition to highly specialized persons whose skills can be found in other, more traditional scientific faculties (such as chemistry and biology). The average length of time taken to find the first job after graduation (4.7 months), employment rate (93 percent) and the percentage of graduates seeking employment (3 percent) are close to the figures for higher education graduates in The Netherlands from the CHEERS study (Schomburg and Teichler, 2005; Teichler, 2007).

Most Bachelor graduates continue to study at Master's level before entering the labor market. As the Bachelor's degree is relatively new in The Netherlands, employers have little experience with this type of graduate. In both the 2006 and 2008 surveys, employers indicated that they prefer to choose a master's graduate if they were to hire a new environmental scientist.

From the perspective of quality assurance, both the views of the graduates themselves and their employers on the strengths and weaknesses of the graduates provide valuable information for improvements to the curriculum. Environmental science graduates are employed in a wide range of functions and work in different sectors, ranging from research institutions like universities, to consultancy agencies, governmental organizations, industries and NGOs. Their multidisciplinary

Table III.
Strengths and weaknesses of environmental scientists in professional organizations, according to employers

Strengths		Weaknesses	
Multidisciplinary and generalists	23	Weak communication skills	17
Collecting, assessing and applying knowledge	7	Weak specialization and lack of up-to-date knowledge	13
External orientation	6	Little practical orientation	8
Communication and cooperation	3	Lack of market oriented thinking	6
Project management	2	Lack of strategic insight	4
Other strengths	4	Weak research capabilities	4
		Other weaknesses	6
Total	45	Total	58

Note: $n = 23$

and generalist character, and their ability to build bridges between disciplines, are competencies valued by themselves as well as by their employers. This is reflected in the observation that graduates as well as employers consider a number of generic academic skills (e.g. intellectual qualities, communication skills) as well as discipline specific competencies (e.g. professional and practical knowledge) as important competencies for the work of environmental scientists. Therefore, environmental sciences curricula should include a mix of both types of competencies in their programs, in order to train professionals that can make a valuable contribution to sustainable development.

Note

1. In this period, the Environmental Sciences program still started in the second year, with students from different relevant disciplines entering the program (Table I).

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