

Environmental education in Switzerland

ESSENCE report

Working Paper

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■ ENVIRONMENTAL EDUCATION IN
SWITZERLAND
ESSENCE REPORT

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*MUB
Bildung*

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1. Environmental institutionalisation in Switzerland

1 Ministry and agency of environment

The main Swiss executive body for environmental affairs is the Federal Department of the Environment, Traffic, Energy and Communications DETEC (German: UVEK). Within this Department the Swiss Agency for the Environment, Forests and Landscape SAFEL (German: BUWAL) is most directly involved. Many other Departments and Offices are concerned with environmental themes, for example the Federal Offices for Water Management; Public Health, Energy, Spatial Planning (land use), etc.

<http://www.uvek.admin.ch>
<http://www.admin.ch/buwal/>

1.2 National environmental report

The report „The Environment in Switzerland 1997 – Facts, Figures, Perspectives“ (Swiss Federal Statistical Office SFSO (German: BFS) / Swiss Agency for the Environment, Forests and Landscape (SAEFL)), is published on a three year basis. Despite of major improvements in areas such as air pollution, the environmental situation is still considered unsatisfactory. One of the main recommendations from the last report is to integrate environmental aspects into other political fields and to collaborate more intensively with the concerned participants.

<http://www.admin.ch/bfs/news/pm/dpbuwal.htm>

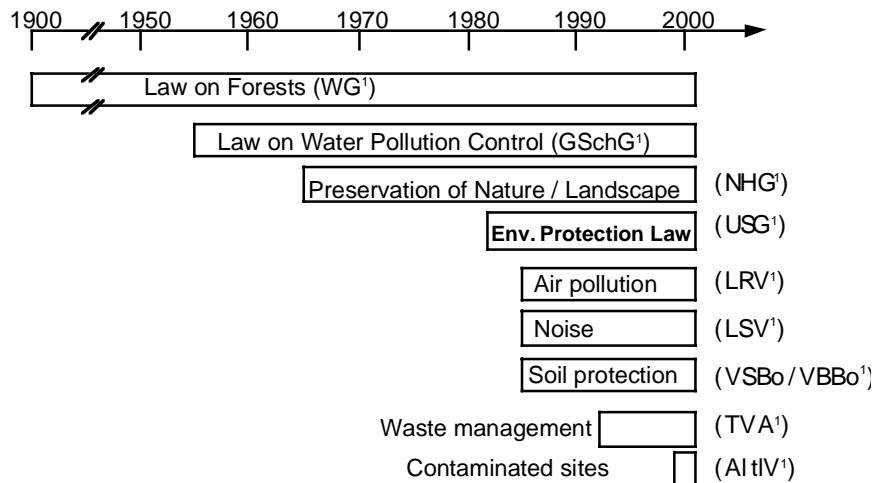
1.3 Environmental framework law

The most important environmental legislation is the Law relating to the Protection of the Environment “Umweltschutzgesetz” (USG, 7. October 1983). As one of the major control instruments, it introduced the Ordinance on Environmental Impact Assessment. It describes the procedure to assess in compliance with federal environmental legislation (including the Laws on the Preservation of Nature and the Landscape, on Water Pollution Control, on Forests and on Spatial Planning) of a project. The Figure 1 shows an historic overview of the development of the subject areas of environmental legislation at the federal level. The correct application of national environmental legislation is first and foremost the responsibility of the cantons. For this purpose the cantons and municipalities may pass their own environmental laws and regulations, provided that these do not contradict federal law.

Traditionally Swiss policy is largely based on command and control measures. Environmental legislation got more complex and requires a cost-intensive monitoring and control system. The most recent amendments of the law (1995) have included a new orientation supporting environmentally conscious behaviour and promoting individual. The cornerstones of the new environmental policy are: economic instruments, individual responsibility, the “polluter pays principle” and volunteer agreements. This new orientation fits well in the concept of sustainable development which, since Rio 1992, has been the guiding principle to a modern, future-oriented environmental policy.

<http://www.admin.ch/uvek/themen/d/umwelt/umweltpo.htm>

Introduction of selected Laws and Ordinances on regional environmental issues in Switzerland



(Source: according to Dissertation R. Schwarzenbach, 1999)

1) The Abbreviations are given in German.
G = Gesetz = Law; V = Verordnung = Ordinance

1.4 Council of environmental experts

Councillings by ad hoc expert groups

Council on Sustainable Development, *Advisory Body on Climate Research and Climate Change*
Commission on Environmental Research.

Important groundwork was also done by the *Rio Interdepartmental Committee (IDA-Rio)*, established in 1993 and consisting of representative of the federal ministries.

At the beginning of 1997 the head of the Federal Department of the Interior commissioned the Swiss Academy of Natural Sciences (SANW) to set up an *Advisory Body on Climate Research and Climate Change*. This body is entrusted with the task of constantly assessing scientific findings, keeping the administration and the public informed and making recommendations on research and policy.

The scientific community, too, is able to make a sound contribution to the decision-making process: Particularly relevant in this context is the Swiss Priority Programme Environment (SPPU). For many years important contributions have also been made by federal institutions such as the Swiss Federal Institute of Technology in Zurich (ETHZ) and Lausanne (EPFL), the Swiss Federal Institute for Environmental Science and Technology (EAWAG), the Swiss Federal Laboratory for Materials Testing and Research (EMPA) (both with their headquarters in Dübendorf), the Paul Scherrer Institute (PSI) in Würenlingen, the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) in Birmensdorf, the agricultural research laboratories and the cantonal universities.

1.5 National environmental plan

1.5.1 The strategy and action plan for Sustainable Development in Switzerland 1997

Sustainable development is a process – it cannot be decided upon and implemented with just a single action plan. The Federal Council aims to promote Agenda 21 by continually developing

its strategy and action plans in different aspects (e.g. environment and health). Regularly updated reports inform the public on future perspectives and the current state of sustainable development in Switzerland. On a municipal and regional level, there are additional efforts to implement Agenda 21.

<http://193.5.216.31/buwal/bulletin/1997/d2a02s04.htm>

http://www.admin.ch/swr/d_f_e/publikationen/studien/doc_d_fop/fop_52_98/index.html

1.5.2 Traditional national environmental organisations (NGOs, founded prior to 1980)

Some examples are:

Swiss Association for the Protection of Water and Air (VGL)

Solar Energy - Association of professionals (SOFAS)

Swiss Society for the Protection of the Environment (SGU)

1.5.3 Newer national environmental organisations (founded later than 1986)

Some examples:

Swiss Association for Environmentally Conscious Management (ÖBU)

Swiss Association for Environmental Technology (SVUT)

Swiss Association for Hazardous Wastes (GESO)

An incomplete overview of organisations can be found on the internet site:

<http://www.ambios.ch>

2. The system of higher education in Switzerland

Higher education in Switzerland is provided by the cantonal universities of Zurich, Bern, Fribourg, Basle, St. Gallen, Lausanne, Neuchâtel, and Geneva; the two younger universities 'Università della Svizzera italiana' and the 'Universitäre Hochschule Luzern', the two Swiss Federal Institutes of Technology (the ETH Zurich and the EPF Lausanne), and the newly restructured federal 'Fachhochschulen' (Colleges of Higher Education). Admission to the Universities and Federal Institutes of Technology requires a high-school degree on the baccalaureate level ("Maturitätszeugnis" - comparable to the German Abitur). The "Fachhochschulen" require the "Berufsmaturität" certificate (a vocational grade, which is acquired optionally in vocational education). The latter are more praxis-oriented than universities and generally offer shorter study courses. Apart from the full-time degree courses, post-graduate and continuing education courses offer the possibility to combine studying with professional work. Doctoral studies require a university degree.

For more information see:

<http://www.switch.ch/edu/edu-map.html>

www.unesco.org/iau/educch.html

2.1 Trends and changes in the national system

With the foundation of federal "Fachhochschulen" in the last years, leading existing institutes were reorganised and unified. The unification of their curriculae improved the acceptance of the respective degrees and mobility of students within Switzerland. The development of "Fachhochschulen" has also led to a shift of responsibility in educational matters from the cantons to the federal government.

There is also a political pressure on cantonal universities located in the same geographical/linguistic regions to co-ordinate their teaching by proposing complementary curriculae especially at the masters (diploma) level. Especially with the increasingly limited financial resources this development demands more entrepreneurial leadership qualities in the educational institutions.

For more information see:
<http://www.admin.ch/bbw/bbtd/bbtdindex.html>

3. Characterisation of the environmental debate 1990 - 2000 in Switzerland

3.1 Major environmental problems

Switzerland has an effective but expensive 'end-of-pipe' environmental protection system (waste water treatment plants, waste incineration, etc.). However, long-term, sustainable solutions require measures, which address the source of a problem, i.e. avoiding emissions, reducing resource-exploitation and damages in the first place. This has not yet been taken into consideration enough. The most important environmental problems concern diffuse chemical pollution, land use, energy-related problems (especially traffic) and the increasing incapacity to fulfil legal requirements.

3.2 Key political issues/controversies

One of the key environmental issues concerns the transit traffic of trucks crossing the Alps. Whereas some years ago, the Swiss population decided to transfer transit goods from trucks to trains, the European Union now wants Switzerland to open its transit routes allowing more trucks to pass through the Alps. Negotiations with the EU have been finalised and negotiations within our country on how to solve this problem are under way.

Other key issues concern the energy debate: it is planned to impose taxes on the use of non-renewable energy (or CO₂). The level of taxation and the use of the additional revenue are currently the subject of heated and emotional debates. Another controversial field concerns nuclear energy. The ten years moratorium on nuclear plants is now coming to an end. The decision to replace five nuclear power plants in Switzerland will be on the agenda again soon.

Yet another major debate concerns environmental (and health) effects of the introduction of genetically modified organisms (GMO). An initiative to ban the release of GMO was rejected by the people in 1998, but legislation is not yet complete and the debate continues.

3.3 Central actors

The central participants in the environmental debate are the national and cantonal parliaments and environmental agencies, lobbies, political parties, and environmental non-governmental organisations (NGOs). Traditionally scientists do not engage much in political issues – an exception was the debate on genetic engineering.

3.4 Key government programmes/initiatives

see Chap. 1.5 and 2.1.1

3.5 Social / business pressures

The most severe resistance to environmentally related restrictions comes from professional associations, the industry, and from the private sector in general. Key arguments cited concern the competitiveness with other countries and unemployment.

3.6 Education and research policy

During the nineties, special efforts were undertaken to support interdisciplinary research projects in the course of the Swiss Priority Programme on Environmental Technology and Research (SPPU) of the Swiss National Science Foundation (SNF). These projects are now being finalised and will be followed up by National Centres of Competence in Research, which are generally more disciplinary in character. As an example of a current project on “learning in society”, we would like to mention, the international conference “Transdisciplinarity: Joint Problem-Solving among Science, Technology and Society” to be held in Switzerland in February 2000.

http://www.snf.ch/SPP_Umwelt/Overview.html

<http://www.digitalwork.ch/transdisciplinarity/home.html>

4. What do we know about the environmental labour market in Switzerland?

4.1 Definition of environmental professionals

1) Is the definition of the “environmental professional” limited to, e.g. scientists with a specialisation within technical, social, natural, health sciences, and/or arts and humanities.

The term „environmental professional“ is not legally protected in Switzerland. The background of the members of the Swiss Association of Environmental Professionals (SVU) is very heterogeneous. Most members, however, have a background in natural sciences, environmental sciences or in engineering.

2) Are “environmental professionals” usually professionals with a full-time “environmental job” or are persons who have “environmental duties” beside their “normal work” also seen as environmental professionals.

There are presumably three different ways of integrating environmental aspects into professional life: One of them is clearly defined „environmental“ positions (e.g. environmental managers). A further possibility is to delegate certain responsibilities within a job position. A third method is to implement environmental aspects in the management of an organisation as a whole (e.g. as part of Total Quality Management). We do not know in what proportion these three forms are present in the job market.

4.2 Organisation of environmental professionals

The Swiss Association of Environmental Professionals (SVU) is the professional association in the field. The educational background of its members is very heterogeneous. This is explained with the fact that specific environmental higher education programmes were created only in the 80ties. The SVU has developed a professional ethical code, with which its members comply.

4.3 Statistics 1995 – 2000

What disciplines are the environmental professionals in your country specialised in? Are there certain trends discernable?

According to a survey conducted on environmental professionals by the SVU (Mieg, 1997) the largest proportion have completed their studies in biology (27%), followed by engineering and architecture (18%) and environmental sciences (16%).

A survey covering Swiss enterprises and organisations (Froidevaux, 1997) came to similar conclusions but from a different perspective: The enterprises are looking for professionals with a background in biology (31%), engineering (26%) or with a more global, interdisciplinary environmental education (20%).

What sectors do environmental professionals work in: industry, consultancy, public or R&D? Are there certain trends concerning this?

For the graduates with a degree in environmental sciences from the ETHZ most jobs are found in environmental, engineering or spatial planning companies (18%) and in higher education (17%) (Frischknecht und Woschnack, 1999). The sectors services, public administration and banking/insurance are evenly represented at nearly 10% each. In general, this data reflects the wide range of job possibilities available in the market for environmental scientists and underlines the difficulties in assigning the various jobs to specific branches (category “others”: 8%).

Are ‘environmental professionals’ usually professionals with a full-time ‘environmental job’? Do many people have ‘environmental duties’ next to their ‘normal’ work? Are there certain trends concerning this?

In Switzerland, employment in the environmental area is generally a full-time occupation, although the option of working part-time can also be found frequently (Froidevaux, 1997). The average percentage of employment among environmental professionals is 85% (Mieg, 1997). In a survey on graduates with a degree in environmental sciences from the ETHZ, the percentage was lower (77%) due to the high number of PhD students, who generally hold a 50% position. There is no data available on the amount of time environmental professionals actually spend working on environmental affairs.

4.4 Contextualisation / evaluation of statistics

The data in Chapter 4.3 is based on quantitative data from three surveys: a study on enterprises and public administration (Froidevaux, 1997), on environmental professionals (Mieg, 1997) and a study on young professionals who had recently completed their studies of the environmental sciences at the ETHZ (Frischknecht und Woschnack, 1999). The focus of these surveys was on the description of higher and continuing education and on career placement and career opportunities in the job market.

4.5 Where are the gaps in knowledge?

4.5.1 What do we need to know?

Environmental education graduate courses are also offered for social scientists (e.g. environmental economics at the University of St. Gallen or environmental psychology at the University of Zurich). The market for social scientists with a specialisation in environmental matters has not been analysed in surveys however. Whether such a market exists (outside of the university) and what its characteristics are not known.

4.5.2 What should we specifically investigate in more detail?

The Commission for Environmental Sciences of the Swiss University Conference made the suggestion to endogenise environmental graduate courses, that is to integrate environmental aspects into existing education programmes. Based on this development, some questions of specific interest are: Is this endogenisation sufficient to integrate environmentally relevant knowledge into daily professional work? Are, for example, the job opportunities better for an environmental scientist with business skills or a business professional with additional environmental knowledge? How are enterprises organised: Are specialized environmental professionals really needed when environmental aspects are already integrated in the existing management practices?

5. Description of environmental programmes - universities and higher vocational institutes

5.1 Definitions (and limitations)

(Instructions: the following definitions were used by Lars Emmelin in an OECD Report on Environmental Education at University Level published in 1973)

Discipline - a specific body of teachable knowledge with its own background of concepts, procedures and methods.

Multidisciplinary - juxtaposition of various disciplines, sometimes with no apparent connection between them.

Pluridisciplinary - juxtaposition of disciplines assumed to be more or less related.

Interdisciplinary - an adjective describing the interaction between two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration over a wide field.

Transdisciplinary - a state when a common set of axioms prevail, related to but lying beyond and outwit traditional disciplines.

Comment: In Switzerland the term „transdisciplinarity“ is often understood today as the close cooperation between actors from within and outside of academia for the purpose of defining research requirements and conducting research. The research questions are usually independent of disciplines and pertain to real world situations (Modus 2 Research: (Gibbons et al., 1994)).

5.2 Typical structure of programmes

The Swiss University Conference gives an overview of the environmental programmes offered in higher education in Switzerland (Table 5.2.1).

Table 5.2.1: Overview of environmental programmes offered in higher education in Switzerland.

University/ Institute	Environment is				
	... central element (diploma course) See 5.2.3	... optional course /specia- lisation (major course, „Wahlfach“) See 5.2.2	... additional aspect to the main course (Nebenfach) See 5.2.4	... central element (Post- graduate course) See 5.2.1	... a central element for continuing education programmes (See 5.4)
Basle		*	*		*
Bern		*	*	*	*
Fribourg	*		*	*	*
Geneva	*		*	*	
Lausanne		*	*	*	
Neuchatel		*		*	*
St. Gallen		*	*		*
Zurich		*		*	*
EPFL ¹	*			*	*
ETHZ ²	*			*	*
IDHEAP ³					*

Source: http://www.shk.ch/Pub/cse/IntroFR/default_D.html

A further, more detailed overview is provided in a report by the Swiss Centre for Environmental Education (SANU). In addition to these graduate and post-graduate education programmes there are numerous practice-oriented courses in continuing education. Under the name PEAK (German acronym for **P**raxisorientierte **E**AWAG-**K**urse), the Swiss Federal Institute for Environmental Science and Technology (EAWAG) for example offers continuing education courses for practicing environmental specialists.

further links:

http://www.eawag.ch/events_e/e_index.html

http://www.swissuni.ch//current/ch/Dme/THM_Dm17.html

<http://www.ambios.ch/sanu/>

The following brief programme descriptions are based on publications of the Swiss Conference on Higher Education (http://www.shk.ch/Pub/cse/IntroFR/default_D.html) and on the Guide in Environmental Education from SANU (Altwegg, 1997).

¹ Ecole Polytechnique Fédéral de Lausanne (Federal Institute of Technology, Lausanne).

² Eidgenössische Technische Hochschule Zurich (Federal Institute of Technology, Zurich)

³ Institute des hautes etudes en administration publique (Institute of Higher Education in Public Administration)

5.2.1 A degree followed by an environmental specialisation at a Bachelor of Science, Master of Science or Ph.D. level.

The Federal Institute of Technology Lausanne (EPFL) offers the most post-graduate environment courses. These courses usually run for one to two years. Specialisation in various branches is possible (engineering, energy, spatial planning). The post-graduate course in environmental sciences is given as an example. Admission requirements are a university diploma equivalent to a Master's degree.

Post-graduate degree „**Programme postgrade en sciences de l'environnement**“ at the EPFL.

Teaching (contact-hours):	650 course hours, 10 months research
Admission requirements:	Degree in higher education (equivalent to M.A. or M.Sc.)
Duration:	18 months
Course requirements:	Written exams
Certificate (vocational/academic):	Diplom „d'études postgrades en sciences de l'environnement“
Attendance:	Full-time
No. of graduates per year:	Approx. 410
Subjects:	economics , eco-toxicology, air, water and soil conservation.

Contact: Département de génie rural, environnement et mensuration, GR-Ecublens, 1015 Lausanne
Tél. 021/693 27 71, Fax 021/693 57 30
e-mail: secrétariat-dgr@epfl.ch
<http://dgrwww.epfl.ch>

5.2.2 A 'traditional' disciplinary basis (e.g. chemistry, biology, ...) followed by an environmental specialisation. Leading to a degree.

Several universities offer environmental programmes as an additional minor subject taken in the course of a disciplinary higher education ("minor degree", „Nebenfach“):

University of Basle: studies on Man-Society-Environment;

University of Bern: Various subjects in „General Ecology“;

University of Zurich: „Nebenfach“ environmental sciences;

University of Geneva in cooperation with the University of Lausanne: Diploma in environmental natural sciences (“Diplôme en sciences naturelles de l'environnement”).

These courses typically offer an environmental interdisciplinary perspective complementary to the subject chosen as the main degree. The following chart illustrates an example on Environment Sciences of the University of Zurich.

„Grosses Nebenfach Umweltwissenschaften“ (Universität Zurich)

Contact hours (lecturing):	336 hours
Admission requirements:	Successful second-year examinations („Vordiplom“) in the main degree course. The background in natural sciences is assessed in an interview.
Duration:	4 Semesters
Examinations and Theses:	Thesis, two months of practical work outside of the university (internship) with a report, oral and written examinations.
Certification (professional/academic):	Accredited as a minor course („Nebenfach“) at the University of Zurich
Fulltime / part-time:	Two afternoons of regular lectures in the course of one semester. Additional specialised block-courses on other days and during the semester break.
Subjects:	e.g. environmental law, environmental economics, public relations, environmental ethics....

Contact: Institut für Umweltwissenschaften, Nebenfach Umweltwissenschaften,

Winterthurerstrasse 190, 8057 Zurich

Tel. 01/635 47 41, Fax 01/635 57 11

e-mail: petral@uwinst.unizh.ch

<http://www.unizh.ch/uwinst/lehre>

5.2.3 Thematic programme based largely on environmental themes/problems (e.g. environmental compartments). Disciplinary knowledge presented in interdisciplinary units/modules/courses.

An example for a problem-oriented programme is the Programme “Umweltnaturwissenschaften” (Environmental sciences) at the ETH Zurich (Swiss Federal Institute of Technology Zurich). This programme is associated in the European Credit-system (ects).

“Umweltnaturwissenschaften” (ETH Zurich)

Contact hours (lecturing):	28-35 hours per week during 4 years
Admission requirements:	Certificate from high school (Matura, Abitur) or entrance examination
Duration:	10 semesters: 4 semesters basic studies with final examinations after the 1st and 2nd year „Vordiplom“ 6 Semesters specialisation (Fachstudium) in a chosen discipline and natural system
Course requirements:	Examinations in 1st, 2nd and final year, 1 Semester practical work experience (internship), 1 Semester Diploma Thesis
Certificate (vocational/academic):	ETHZ-Diploma „Umweltnaturwissenschaftler ETHZ“; The possibility of continuing with a Ph.D. study is offered in various Institutes.
Attendance:	Full-time degree course
Orientation:	Problem-oriented
Subjects:	<i>Natural sciences:</i> Basic disciplines: mathematics, computer sciences, physics, chemistry, microbiology, biology, environmental hygiene... <i>Social Sciences:</i> environmental economics, law, psychology and sociology <i>Environmental System:</i> anthroposphere, aquatic systems, atmosphere, geosphere, terrestrial system <i>Major Case Study</i>

Contact: Departement für Umweltnaturwissenschaften, ETHZ-Zentrum, HCS, 8092 Zurich
Tel. 01/632 25 23, Fax 01/632 13 09
e-mail: secretariat@umnw.ethz.ch
<http://www.umnw.ethz.ch>

5.2.4 Specialised programme within a 'traditional' disciplinary programme (e.g. biology) the student has freedom to choose a particular pathway in the later years of study. One of these may be an environmental specialisation.

Some universities offer environmental specialisation within some disciplines. The programme „nature, landscape and environmental conservation“ (Neben- oder Wahlfach NLU) at the University of Basle is portrayed as an example. It can be chosen by the students in the degree programmes of biology and of geography.

„Neben- oder Wahlfach Natur-, Landschafts- und Umweltschutz“ Universität Basel

Duration	Depending on main degree programme: 4 or 8 semesters („grosses oder kleines Nebenfach“)
Contact hours (lectures):	approx. 350 hours (12 to 32 hours per semester and week); 3-8 days of excursions
Attendance:	Fulltime And one additional week of both project work and practical training. For the major degree: 2-3 months practical work (internship).
Admission requirements:	Student of geography, biology, chemistry or subjects of the philosophical-historical faculty. Further backgrounds are possible on an individual basis.
Course requirements:	Oral final examination.
Certificate:	Certification for each of the modular courses No specific final certificate (integrated part of degree programme)
No. of graduates (until 1999):	50
Subjects:	Social and cultural sciences, basic and additional natural sciences, environmental social sciences, various fields of specialisation.

Contact: Stiftung Mensch - Gesellschaft - Umwelt, Koordinationsstelle MGU, Socinstrasse 59, 4002 Basle, Tel. 061/271 57 70, Fax 061/271 58 10

e-mail: mgulehre@ubaclu.unibas.ch

<http://www.unibas.ch/mgu>

5.2.5 Environmentally oriented disciplinary programme. The amount and manner in which environmental aspects are presented may vary between programmes.

In some of the degree courses (e.g. civil engineering and agricultural engineering at the ETH Zurich), environmentally oriented courses are offered as optional courses in the programme. Similarly, the Commission of Environmental Sciences has suggested including environmentally relevant aspects in the basic courses (of all disciplines) in higher education. It is not yet possible to assess the degree of endogenisation (actual integration into the programmes).

5.3 Disciplinary setting

The universities and colleges of higher education offer programmes with varying disciplinary focus depending on their specific orientation. The Federal Institutes of Technology for example offer more technical and scientific programmes, while the cantonal universities focus more on the humanities and social sciences.

5.4 Adult education and training

The Swiss Academy for Environmental Education (SANU) offers a broad spectrum of environmental courses in continuing education and training. Short courses are primarily offered by the specialised institutes for continuous adult education and NGOs (e.g. WWF). Public research organisations such as the EAWAG offer praxis-oriented environmental courses. The University of St. Gallen together with the EMPA (Swiss Federal Laboratories for Materials) offers a course in environmental auditing and management. These courses are generally part-time (running parallel with professional work) and have a strong orientation to practical application. For unemployed academics there are a number of programmes designed to develop professional skills and enhance career opportunities through practical experience (UP-Environmental programme for unemployed and FAU – “Fachverein Arbeit und Umwelt”). They are carried out in collaboration with various environmental authorities.

<http://www.unisg.ch:9000/cgi-bin/query?mss=de/simple.html>

http://www.eawag.ch/events_e/e_index.html

<http://www.upbern.ch/ingang.htm>

<http://fau.ch>

5.5 Analysis of strengths and weaknesses (or if you like suitability) in the types of programmes above with regards to the skills and (disciplinary) knowledge required by the profession.

stronger points

System View (in some)

Disciplinary knowledge behind the environmental education (in others)

weaker points

No crisp professional target profile

Partially arbitrary collection of lectures

5.6 Trends in educational opportunities

The changes in the legal status of the universities and the limited financial resources will increase the competition between higher educational institutions and private institutions offering professional and continuous education at a higher level (e.g. in the field of environmental management).

5.7 External Quality Assessment Reports on environmental education programmes

Quality assessment is carried out by the universities, for example, by surveys with graduates from their degree programmes. However, these do not exist for every of the programmes mentioned above.

6. Evaluation

On what basis are environmental programmes generally designed: on scientific research, on labour market demands, on environmental issues, or on students' issues?

It is not possible to make generalised statements on the origin and development of environmental education programmes. The programme of environmental sciences at the ETHZ, for example, has a disciplinary origin: Politically interested representatives from different disciplines developed the degree course. The programme Man-Society-Environment at the University of Basle has been developed as a reaction to a political and social demand. An example of a course which follows a market demand is the post-graduate course on spatial planning at the University of Basle: The choice of modules by the students determines in part the content of the programme. However the full-time graduate and postgraduate courses are primarily structured around scientific interests.

Is there an increasing or decreasing balance between the demand and supply of environmental professionals on the following aspects:

Extent to which professionals are specialised: they have enough disciplinary and enough environmental sciences skills;

Disciplinary knowledge: supply and demand concerning Environmental engineers, natural environmental scientists, social environmental scientists, environmental health scientists, environmental scientists in arts and humanities;

Supply and demand (through policies) in industry sector, consultancy firms, public sector and R&D sector)

These questions cannot be answered directly. A positive development is the fact that there are hardly any unemployed environmental scientists.

7. Methodology

7.1 Contributing persons and organisations to the report

Which persons from which institutes/organisations have contributed to the report, and to what extent?

The following people and institutions have contributed to this report:

(in alphabetical order):

Prof. Janusz Dominik, Institut F.-A. Forel CESNE, Université de Genève

Dr. Susann Eichenberger, Institut für Umweltwissenschaften, Universität Zürich

Dr. Ruth Förster, Mensch-Gesellschaft-Umwelt, Universität Basel

Dr. Herbert Guettinger, EAWAG, Dübendorf

Prof. Charles Hussy, CUEH, Université de Genève

Prof. Ruth Kaufmann-Hayoz, IKAOE, Universität Bern; Präsidentin der Kommission für Umweltwissenschaften KUW der Schweizerischen Hochschulkonferenz

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Dr. Bruno Oberle, BUWAL, Bern

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I would like to express my thanks to these people for their support and to Tania Schellenberg for the translation! I also thank Thomas Baumgartner and Susanne Ulbrich for reading and commenting the report.

Is the report reviewed by a representative group of institutes offering environmental education, concerning different types of programmes in form and contents (described under 'typical programmes' and 'disciplinary setting'?)

Representatives from nearly all of the portrayed programmes have commented the report.

Is the report reviewed by the national organisation of environmental professionals (if existing)?

yes, the report has been submitted for review.

Has the report been directly reviewed from the demand side (for example by representatives from industry, R&D, etc)?

No

7.2 Process of contribution

The contents of the report were collated from written sources and telephone conversations. A draft of the report was sent to the partners. The comments were discussed and integrated into a second draft, which was once again circulated amongst the participants.

7.3 Sources and data-collection

Which sources are used for data-collection (political debate, labour market, education, etc)?

The main sources used in this report include the publications of the UVEK and especially the BUWAL. The information on education, career opportunities and job market was taken from publications of the SVU, the SHK and from the survey on graduates of the Department of Environmental Sciences of the Institute of Technology in Zurich (ETHZ). The educational programme profiles were based on overviews provided by Swiss Conference on Higher Education (SHK) and the SANU.

In what way do you believe the sources or data derived from the sources could have a particular bias?

SVU: The questions refer to a survey conducted in the professionals' association, hence there may be a bias concerning professional interests of the association.

SHK: Enterprises and public administration: There was a particularly strong participation of firms addressed by organisations of environmental professionals.

ETHZ-survey: Graduates with a degree in environmental sciences from the ETHZ. It is not exactly known which graduates participated. At the worst case, assuming only unemployed graduates participated, the unemployment rate would be 25% rather than 5%.

Which uncertainties and possible flaws in the analysis should be mentioned (due to lack of data and specific methods of data collection)?

Statistical data on uncertainties is rare. A particular problem lies in the characterisation and the evaluation of the job market as the traditional official classifications are usually not applicable. Information on the percentage of environmental (including non-professional) activities is not available and probably very difficult to assess.

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Adresses of coordination centres of environmental sciences

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<http://www.unizh.ch/uwinst>

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