

Final Report to the ETH Board

Climate & Environmental Change



Sustainable Land Use



Food, Environment & Health



Natural Resources



Natural Hazards & Risks



Nikolaus Gotsch, CCES Manager; René Schwarzenbach, Delegate of the Steering Board
March 3, 2017

Table of Contents

Final Report to the ETH Board

	Abstract	3
1	Short Review of the History and Evolution of CCES (2006 to 2016)	3
2	Outcomes and Impact of the Competence Center's Operations	6
2.1	Research: Individual and Institutional Aspects	7
2.2	Education	8
2.2.1	Education of Graduate Students and Post Doctorands	8
2.2.2	Education of High School Students («Mittelschüler»)	9
2.3	Outreach Including Knowledge and Technology Transfer	10
3	The Legacy of CCES	11

Appendix

A1.	Publications, dialog, and interaction	A1
A2.	Use of Financial Means	A2
A3.	Program of the CCES Conference 2016	A3

Photographs

CCES project participants, if not indicated differently

Design and layout

Daniel Lienhard, Illustrator, Rorschach and Bregenz

Abstract

Over the period 2006 to 2016, CCES was instrumental in establishing a strong network of environmental researchers within the ETH Domain. CCES emphasized large, inter- and transdisciplinary (ITD) projects, mainly with a focus on long-term and/or infrastructure-intensive field studies. Addressed topics included the role of non-CO₂ greenhouse gases and of aerosols in climate and health, the role of the subsurface in the future energy system (joint projects with CCEM), challenges in integrated water resource management, natural hazards and risks in Alpine environments, sustainable land use including biodiversity issues, and the building and maintaining of large environmental data repositories. With this emphasis, CCES was able to: (1) create a unique positioning for the ETH Domain in environmental research, (2) serve as the basis for large, follow-up projects, many with EU funding (section 3), (3) provide experience in ITD research for graduate students and postdocs (section 2.2.1), and (4) generate legacy products. Specific legacy products include: (I) educational materials taken up by the MINT-Learning Center of ETH Zurich (section 2.2.2), (II) the Winter School «Science Meets Practice» continued by the td-lab (section 2.2.1), (III) instrumented field sites, (IV) data compilations and platforms, and (V) an initiative in science-policy dialog, which is being continued by the SCNAT (section 3).

The experience gained through CCES also provides some cautionary lessons for future large funding programs within the ETH Domain. An initially sub-optimal management structure, conflicts of interest and difficulties in managing the proposal review process posed significant challenges for CCES. Some of these issues were mitigated by the establishment of an international advisory board and other improvements in the management structure during the first funding period.

1 Short Review of the History and Evolution of CCES (2006 to 2016)

The origins of the Competence Centers of the ETH Domain date back to their approval by the Swiss National Assembly in 2001. The subsequent strategic discussions led to the establishment of four Competence Centers aimed for a period of ten years by the Board of the ETH Domain in December 2004. One of these approved centers was CCES under the lead of ETH Zurich together with EPF Lausanne, Eawag and WSL as the main partner institutions that were also represented in the CCES Steering Board (SB) consisting of the President of ETH Zurich, the President of the EPF Lausanne (permanent guest) and another representative of the EPF Lausanne, the Directors of Eawag and WSL, and a delegate from ETH Zurich). The strategic goals given for CCES by the Board of the ETH Domain were:

«To foster major advancements in research in the area of environment and sustainability; to establish the CCES partners as national and international focal points for environment and sustainability; to achieve a long-term structuring effect lasting beyond the completion of CCES; to establish a strong wide-ranging education and outreach program; and to achieve a visible societal impact with a focus on socio-economic implementation».



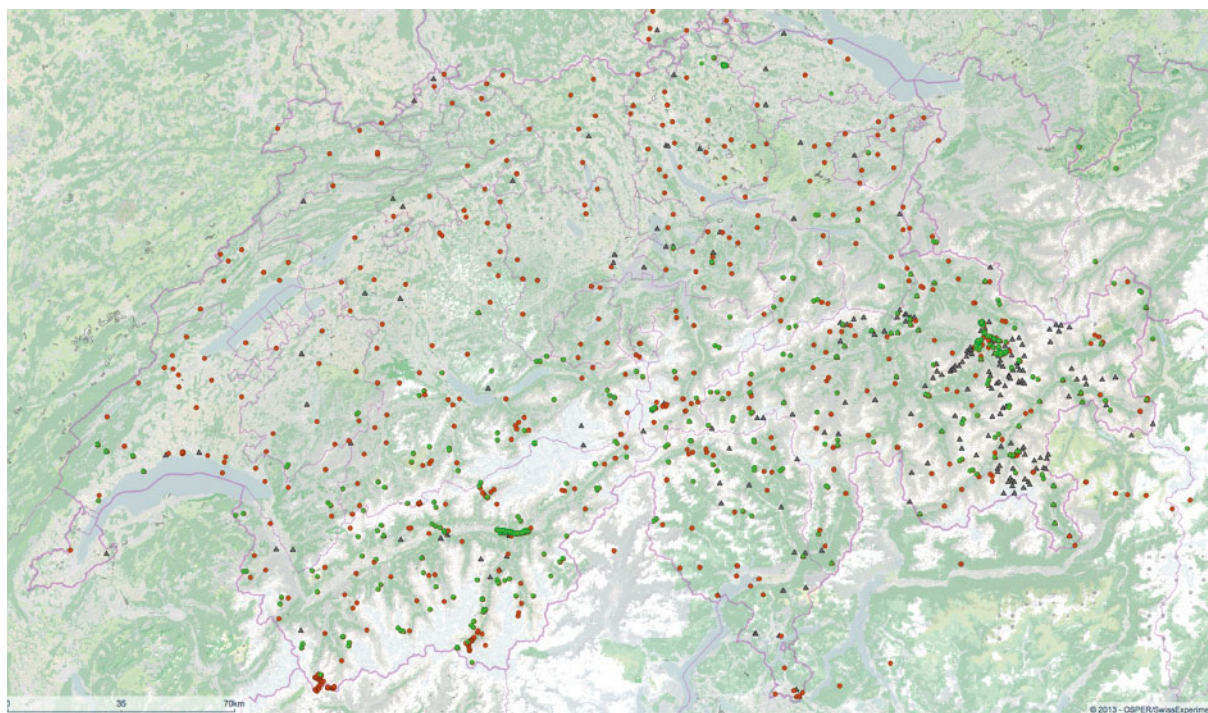
MOUNTLAND: Sustainable land-use practices in mountain regions: Integrative analysis of ecosystem dynamics under climate change, socio-economic impacts and policy implications.

For the implementation of CCES a Management Board consisting of leading scientists from the four institutions as well as a Management Office with an Executive Manager were established who prepared a business plan, in which the following five overarching research areas were proposed: *Climate and Environmental Change; Sustainable Land Use; Food, Environment and Health; Natural Resources; and Natural Hazards and Risks*. In December 2005, the business plan was approved by the Board of the ETH Domain for a first period (2006 to 2010). The call launched in early 2006 attracted 23 research proposals and one proposal for a technical platform (focusing on environmental data acquisition and data management) of which, after a scientific evaluation by the Research Council of ETH Zurich, 17 projects and the technical platform were approved by the Steering Board.

Although, in retrospective, CCES has managed to build an impressive scientific community working across disciplines and institutions to tackle important environmental problems (see section 2), it should be pointed out that the initial build-up of CCES was not a smooth process for several reasons. Critical aspects included (I) the lack of time and motivation of already overcommitted scientists in the ETH Domain to get involved in large inter- and transdisciplinary projects (in this context, a main hindrance was and still is the way the academic system rewards scientists, in that individual success is much easier in disciplinary as compared to inter- and transdisciplinary fields, (II) the comparably rather small amount of ETH Domain money considering the large size and the complexity of the projects, and the requirement to provide in-kind funding as well as to raise external funds both matching the funds obtained from the ETH Domain; and (III) the rather short period of time for submission of a very detailed research proposal. Furthermore, the initial community-building process of CCES was additionally aggravated by some governance aspects, e.g., conflicts of interests due to dual roles of some individuals as principal investigators (PI) of projects and members of the Management or Steering Board, respectively. A final critical issue in the initial phase raised by several applicants was the somewhat insufficiently transparent project selection procedures and the lack of independent external reviewers that were capable and willing to assess such large projects. Based on all these experiences, one can conclude that it would have been advantageous to outsource the entire evaluation and funding process to the Swiss National Science Foundation, rather than running a «mini-funding agency» within the ETH Domain.

A major improvement in the governance of CCES was accomplished by abandoning the Management Board, by replacing the Management Director by the Delegate of the Steering Board, and, most importantly, by establishing an international Advisory Board (AB) of highly regarded scientists and some representatives of industry in September 2006. This ensured an independent continuous evaluation of the various projects as well as of CCES as a whole. The AB was not only invaluable for providing critical feedback to the individual projects but played also a pivotal role in the selection process for the second period 2012 to 2016.

Since many of the scientists participating in CCES projects had never collaborated before or did not even know each other before working together in CCES, it was not surprising that it took most of the projects two or even three years to form a coherent research community, while a few projects never really reached that goal. The success or failure of forming such a community strongly – and obviously – depended on the leadership of the persons responsible for the venture (principal investigators) and its individual sub-units (project partners) and on the management organization of the project, e.g. the appointment of skilled executive project managers. Nevertheless, towards the end of the first period, more than two-thirds of the projects had managed to successfully build scientific communities capable of conducting inter- and transdisciplinary research of high societal relevance. A particular asset of these research activities was the construction of numerous field sites all over Switzerland that could never have been established without CCES. These field sites were not only pivotal for comprehensive experimental studies, but they also played an important role with respect to the interaction of the scientists with local authorities and the local population. Unfortunately, due to the significantly lower funds provided by the Board of the ETH Domain for the second phase 2012 to 2016 (CHF 15 million instead of CHF 30 million of the first phase, see Appendix A2), only about half of these projects could be continued. Nonetheless, eight projects selected by the AB as being the «CCES jewels» as well as the technology platform were supported during the whole second phase. Furthermore, a follow-up of the technical platform, the database EnviDat (Management of Environmental Research Data for CCES and the ETH Domain), aimed at developing an efficient, unified and managed access portal for environmental monitoring and research data, received more than CHF 400,000 in the years 2015 and 2016 to prepare the implementation of the database. Another CHF 680,000 were granted to seven CCES projects to ensure, as part of the EnviDat initiative, conservation, curation, management and access to observational data collected through their projects. Finally, five projects received a total of CHF 920,000 for conducting a final synthesis of their work.



Swiss Experiment/Osper: Experimental sites

Legend:

- Grey triangles: locations where at least a field site and information on the types of measurement are registered and further contextual information is also available for most of these locations
- Red circles: locations where at least a measurement location has been registered
- Green circles: locations where both data and metadata are fully integrated into the Swiss Experiment system

The dialog with stakeholders outside of the academic community has been conducted by the individual projects from the very beginning, see Appendix A1. This also holds for educational activities within the projects including courses for doctoral and master students. The establishment of the educational activities of CCES as a whole were started after the build-up of the research clusters in 2010, but took place primarily in the second period 2012 to 2016. These activities comprised (I) the CCES Winter School «Science Meets Practice» taking place annually since 2011; (II) the development of teaching materials in collaboration with the MINT-Learning Center at ETH Zurich within the scope of the CCES@School initiative resulting in the development and dissemination of teaching materials for three large CCES topics and the initiation of further materials after the termination of CCES; (III) the collaboration with the project platform «ETH Seed Sustainability» aiming to promote master theses at the interface between science and practice, and (IV) the collaboration with the Zurich University of the Arts (ZHdK) on joint bachelor theses.

Finally, the main outreach activities of CCES as a whole included the following activities: (I) the creation and the maintenance of an attractive website throughout the whole project; (II) the publication of 35 issues of CCES News since 2006 of which 18 issues in the ProClim Newsletter of the Swiss Academy of Science (ScNat) and ProClim – Forum for Climate and Global Change as from 2010; (III) the co-organization of large «focus of the year» public events at ETH Zurich in the years 2009, 2011 and 2012 on sustainability and resource issues; (IV) the initiation of a high-level science-policy dialog with two workshops in 2014 and 2015 as well as a podium discussion as part of the CCES Conference 2016 «Grand Challenges in Environmental and Sustainability Science and Technology» that took place in February 2016, and finally, the organization of two Latsis Symposia in 2007 and 2010 as well as a CCES Conference in 2014.



Public event «Designing the Future of Sustainable Energy – Chances and Challenges for Switzerland» co-organized by CCES together with and at ETH Zurich in September 2011. Source: Tom Kawara/ETH Zurich

2 Outcomes and Impact of the Competence Center's Operations¹

«CCES represents a clear, visible and measurable added value to the whole ETH Domain with regard to science and capacity building, particularly to strengthening the interdisciplinary approaches leading to transdisciplinary solutions with impact for science and application at the local, national and global level.»

This statement on the added value of CCES for the ETH Domain has been repeatedly made by the Advisory Board in its evaluations during the first and second period indicating that overall, despite the initial difficulties, CCES has been a great success and has well fulfilled the goals set by the Board of the ETH Domain. This has also become evident during the final CCES Conference «Grand Challenges in Environmental and Sustainability Science and Technology», which was attended by more than 300 participants and during which the CCES community demonstrated the high societal relevance and practical value of the research conducted within the competence center. An overview of the specific topics addressed can be obtained from the conference program provided in Appendix A3. In the following, the most important achievements and impacts of CCES in research, education and outreach are briefly summarized. Besides some general comments on numbers and facts, a few representative statements by principal investigators and project partners of CCES projects are quoted in order to also provide some individual opinions of involved scientists on the impact of CCES. It should be pointed out that these statements stem from participants of successful projects; some negative opinions not included in this report, particularly with respect to the cost/benefit ratio of participating in inter- and transdisciplinary research, were expressed by people involved in the few less successful projects of the first phase.

¹ The quotes of section 2 have been obtained within the scope of interviews with CCES principal investigators and project partners by the former CCES staff member Omar Kassab in late 2013. These interviews aimed at identifying the effects that CCES had on the interviewees' research, education and outreach activities. The interviews also led to an ongoing PhD project by the interviewer at the Professorship for Social Psychology and Research on Higher Education at ETH Zurich entitled «Assessing the Impact of Program Funding Instruments: the Case of University-based Research Centers» using CCES as a case study.

2.1 Research: Individual and Institutional Aspects

«I think that we could develop many things much faster thanks to the CCES framework.»

«It was really just the right thing at the right time. I think we made an impact.»

«CCES has helped us people at research institutes to better establish the contacts with ETH and, in turn, gave our research an important stimulus.»

«I didn't know any of the people I worked with from before.»

«I also established many contacts (...) That was really positive and I did things I would not have been able to do otherwise.»

CCES triggered and supported research that could not be carried out by a single institution alone and that would have been difficult to support through traditional funding channels. CCES has managed to bring together scientists from different disciplines working in different ETH Domain institutions who had never collaborated or who did not even know each other before. A major achievement has been the mobilization of a large number of top scientists to devote a considerable amount of their time to inter- and transdisciplinary research projects of high societal relevance. This is particularly remarkable in a time in which success in academic careers continues to be assessed primarily based on personal research achievements in scientific disciplines. Furthermore, the engagement in CCES has had a significant impact on the research agendas of participating individuals and groups and even on the institutional level, in that, for example, intensive field-oriented research was made possible. A few illustrative examples are described in the captions of some of the pictures shown throughout the report. Finally, through CCES, quite a large number of young academics got a chance to act as leaders of projects and thus were able to increase their national and international visibility.

With respect to the scientific output, in general, CCES partners have been very productive (see Appendix A1). In summary, 1,276 CCES-related articles were published in top peer-reviewed scientific journals and 2,599 abstracts, proceedings, presentations, and posters at scientific events such as conferences, congresses, and workshops have been contributed. Preliminary empirical results of the ongoing dissertation project of O. Kassab (see footnote 1) show on average an overall positive effect of CCES on (I) the publication intensity of the participating scientists (number of publications), (II) the quality of the publications (impact factor of journals, number of received citations) and (III) the collaboration behavior of participating researchers (number of co-authorships in joint publications). In fact, participation in CCES also seemed to have a positive effect on the general scientific publication activity of many of the participating scientists. These empirical findings are somewhat contradictory to the general belief that participating in larger inter- and transdisciplinary research projects leads to less scientific output in form of publications as compared to the output when conducting primarily disciplinary (basic) research.



TRAMM/TRAMM2: Triggering of Rapid Mass Movements in Steep Terrain. The TRAMM project was aimed to make an important contribution towards the development of an early warning system.

2.2 Education

2.2.1 Education of Graduate Students and Post Doctorands

«Those people got their early training in a very stimulating environment, and I think that is the highest leverage activity we can do (...). The CCES project context provided the actual students with an environment that is different from that of their professors, where they can work across the disciplines, tackling more complex problems.»

«What is important in the long run is to send well-equipped young people out with different tools than their elders. They will slowly change their field as they use the tools throughout their careers.»

«One of the really important things in this project is that it gives young people some coordination responsibility. As the traditional ecological PhD student you are very often by yourself, or you got one colleague sitting next to you. And one of the good things about these larger, interdisciplinary projects is that even if you are in a relatively junior position, you have to take some responsibility.»

The most important impact of CCES in the educational sector was the exposure of an impressive number of doctoral and master/diploma students (185 doctoral and 417 master and diploma theses have been accomplished). Within the CCES projects, graduate students and postdocs from different disciplines worked closely together and thus experienced collaboration across various fields of natural sciences, social sciences, and engineering. According to many of these young researchers, this exposure to other disciplines has influenced and will strongly influence their further careers and many of them are confident that the contacts established within the CCES projects will sustain after the end of their doctoral or postdoc work, and, apparently, have already proven beneficial for them in the short-term.

In addition to exposing young (as well as senior) people to inter- and transdisciplinary research, numerous other educational activities have taken place within the CCES projects and within CCES as a whole. 450 scientific events have been organized by CCES partners, among which the large number of 92 doctoral courses/summer schools should be particularly mentioned. What is more, with the CCES Winter School «Science Meets Practice» more than 150 doctoral students and postdocs were trained in conducting a dialogue with practitioners and the wider public. As is evident by some selected comments of participants of the Winter School, these types of event formats are of upmost importance for the development of soft skills required for the next generation of leaders and decision makers.



CCES Winter School: improving the capabilities to understand and critically analyze the foundations of scientific thinking and enhancing competences to critically reflect and evaluate scientific projects with respect to their societal embedding. Source: Carolina Adler/CCES

«For the first time, I experienced a very dynamic learning process interacting with other participants, lecturers and stakeholders from diverse fields.» (Participant 2011)

«This program gave me a lot to think about in terms of how I want to go forward both in my current research and my future career. Not only will I think of how my research can impact my field, but the broader 'real world' situation as well.» (Participant 2014)

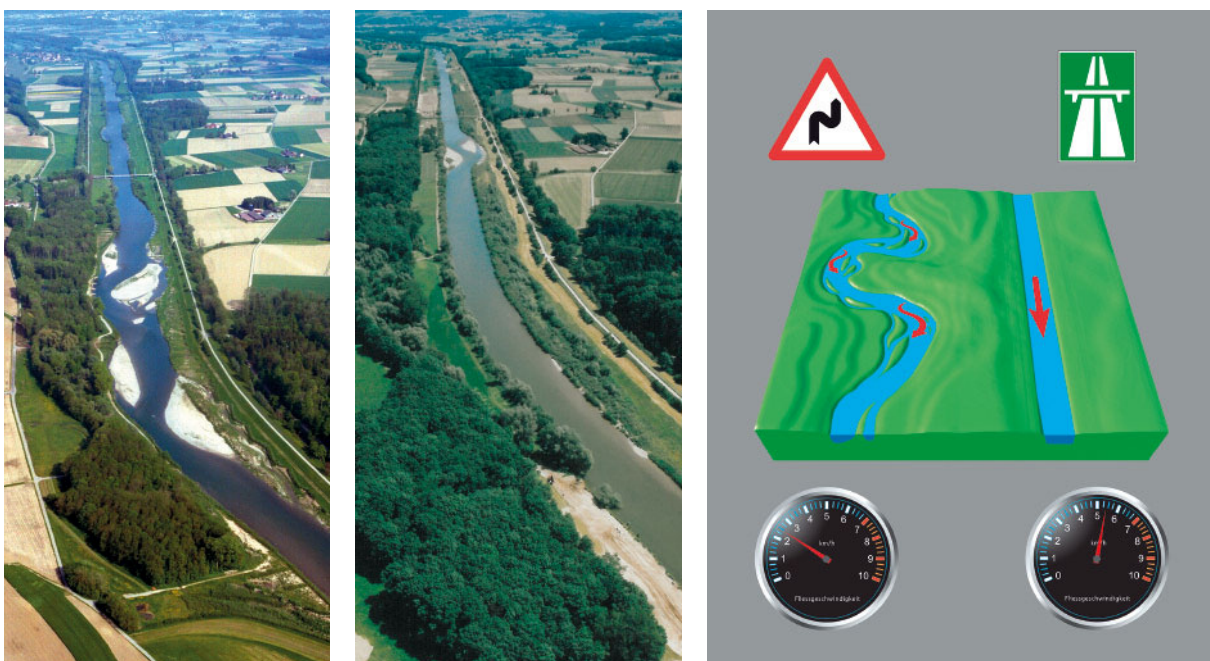
«Before coming to the Winter School, I had gained experience at the practitioner's level and at the scientific level separately; during the Winter School I could experience how these two could fit together forming a dialog.» (Participant 2016)

Finally, during the second phase, in cooperation with ETH Seed Sustainability, CCES has started to build a network with cantonal authorities in order to coordinate master theses at the interface between science and practice. Projects on the impact of in-stream habitat structures used in river restoration on fish populations in the canton of Nidwalden and standardized methods in order to provide nationwide comparable evaluations of flowing waters in the canton of Thurgau have been accomplished in collaboration with the respective cantonal authorities.

2.2.2 Education of High School Students («Mittelschüler»)

A unique asset of the CCES educational program has been the translation of scientific results of several CCES topics into teaching materials that can be used by high school teachers in traditional courses in chemistry, physics, mathematics, biology, geography, and as topics of special courses («Vertiefungsblöcke») focusing on broader issues also including societal aspects. These teaching materials have been developed in close collaboration with the MINT-Learning Center at ETH Zurich. Already accomplished or close to finished materials cover «River Restoration», «Landscape Genetics», «Geothermal Energy and Thermodynamics», and «The Chemistry of Climate Change». In addition, another three projects dealing with (I) natural hazards and risks, (II) with the ozone problem both in the troposphere and the stratosphere, and (III) with carbon sequestration just started and will end in 2018.

As has already been shown in various courses taught by the MINT-Learning Center, these teaching materials are highly appreciated, particularly by future high school teachers, in that they enrich the basic courses in natural sciences and mathematics by environmentally relevant aspects and in that they expose the high school students to important overarching themes of societal relevance.



CCES teaching materials: Imparting knowledge on complex environmental systems to high school students aligned with the respective curricula and based on latest findings in learning and teaching research.

2.3 Outreach Including Knowledge and Technology Transfer

Due to the focus of CCES, its societal impact was primarily on policy-makers, public administration, media, and the general public, and less on interactions with the industry (see Appendix A1 for quantitative information). With respect to knowledge transfer, the CCES participants have been very active. It should be pointed out that for quite a few of the participants it was the first time they actually actively participated in outreach activities. Despite the fact that some participants had been rather skeptical at first it turned out that the engagement with external stakeholders was mutually beneficial and fruitful in terms of the direct applicability of the research findings, or the feasibility of suggested solutions. CCES participants as well as CCES as a whole have managed to become a highly regarded partner for knowledge transfer between science and society. With more than 1000 practice and general public-oriented publications and events (see Appendix A1), CCES has significantly increased the visibility of the ETH Domain in the area of environment and sustainability in both society as well as in the international research community.

Finally, in 2014/2015, together with the Science Policy Platform (SAP) of the Swiss Academy of Natural Sciences (ScNat), the CCES Management organized two workshops on the improvement of the policy-science dialog with high-level participants from politics, administration, the private sector, and science. A summary of the most important results can be obtained from the CCES Office.



Collaboration with the Swiss Academy of Natural Sciences (ScNat): Identifying strategies and institutional prerequisites for improving the dialog between science and politics: workshop on energy transition at ETH Zurich in November 2015. Source: Omar Kassab/CCES

3 The Legacy of CCES

«I think it was CCES that kind of turned us into environmental scientists. (...) Before that, we have been ecologists, and biogeochemists, and so on, but you could really say, for the very first time, we stopped being a collection of disciplines, and that had a big effect.»

«Through the CCES project, I could make some international contacts in the first place, with EU projects, US research communities, where collaborations have emerged that would not have been possible.»

When founding the competence centers in 2005, in its strategic goals, the Board of the ETH Domain also required that the centers should *«achieve a long-term structuring effect lasting beyond their completion»*. Although it is inherently difficult to give a quantitative assessment on how CCES has changed the scientific community in the ETH Domain, numerous *follow-ups* of CCES research projects from all ETH Domain institutions are documented. For instance, as a consequence of their CCES project, partners of the EXTREMES project (PI A. Davison, EPF Lausanne) are collaborating with the University of Lancaster, with the Colorado State University and a Finnish group, with the University of Adelaide and with the University of Lausanne. CCES also triggered many collaborations for the SwissEx/Osper consortia (PI M. Lehning, WSL/EPF Lausanne), e.g. interdisciplinary and international co-operations within the framework of the Global Cryosphere Watch program of the World Meteorological Organization (WMO). St. Bernasconi, ETH Zurich, PI of the BigLink project, is collaborating with partners from the FP7 SoilTrec project (Soil Transformation in European Catchments) and with E. Frossard's group at ETH Zurich on phosphorus cycling. The RECORD/RECORD Catchment project (PI M. Schirmer, Eawag) triggered the participation in the multidisciplinary European Innovative Training Network INSPIRATION (*«Managing soil and groundwater impacts from agriculture for sustainable intensification»*) as well as the SNF project *«Water distribution»* investigating how retention areas, river restoration efforts, and groundwater systems can be used to help mitigate the effects of floods and droughts. ETH Zurich and WSL partners from the TRAMM consortium (PI M. Stähli, WSL) started an SNSF project entitled *«Forecast and Warning Concept for Landslides in Switzerland Based on Rainfall Triggering Thresholds and Multiscale Hydrological Modelling»*. Also from the TRAMM consortium emerged a proposal for a new COST action *«Landslide Early Warning Systems as Tools for Community Resilience»* submitted in October 2016 and currently under evaluation. A follow-up project DAFNE of the ADAPT project (PI B. Wehrli, Eawag/ETH Zurich) with South African partners (Mozambique, Zambia) on the Water-Food-Energy nexus in the Zambezi and Omo river basins is funded by Horizon 2020. Furthermore, a collaboration between the group of A. Schleiss (EPF Lausanne) and the Eawag department of B. Wehrli and A. Wüest is continuing with hydropower and sediment management projects in Switzerland funded by the Federal Office for the Environment (FOEN) and the SCCR *«Supply of Electricity»*.

WSL will further develop the *EnviDat database* designed as a portal to publish, connect and search across existing data, rather than as a large data center, and it closely ties in with the new ETH Domain's strategic focus area *«Big data and digital science»* and the newly established Swiss Data Science Center, a joint effort between ETH Zurich and EPF Lausanne. The possibility of offering the portal to other institutions within the ETH Domain is a mid- to long-term goal of EnviDat, hence an ongoing project which will be led and supported by WSL as a CCES legacy.

Finally, in particular for the numerous young scientists (PhD students and postdocs), CCES has provided a platform to build individual academic networks across disciplines and institutions already early in their career. For some of them, these networks have already paid off, and it can be expected that many of the contacts and friendships built during the projects will sustain in the future.

In the *educational sector*, the three main CCES activities will all be taken over by ETH Zurich and will serve the entire ETH Domain community. The CCES Winter School team has been successful in obtaining a grant from the Rectorate of ETH Zurich which secures that the school can be run for the next four years. The production of teaching materials containing important environmental topics of societal relevance will be further pursued by the MINT-Learning Center. A project of ETH Seed Sustainability has been initiated with the Transdisciplinarity Lab (TdLab) of D-USYS with the goal to establish a network between scientists within the ETH Domain and with practice as well as to build an internet platform for fostering master theses between science and practice in the area of environment and sustainability.

In the *outreach sector*, the science-policy dialog initiated by CCES has already been taken over by the Science and Policy Platform (SAP) of the Swiss Academy of Natural Sciences with the goal to establish a completely new form of interactions between scientists and politicians. The future energy concept of Switzerland has been chosen as topic to gain first experiences in this dialog.

«With CCES, the ETH Domain has created something of which it can be proud of – not only from the point of view of measurable scientific output but also with respect to integration and the building of very substantial multidisciplinary programs across institutions as well as triggering inter- and transdisciplinary approaches.»

CCES Advisory Board, November 2011



ADAPT: The African Dams Project: Adapt planning and operation of large dams to social needs and environmental constraints – an integrated water resource management study in the Zambezi basin. Filtering water samples for nutrient analysis at headwaters of Kafue River, Zambia.

Appendix

A1. Publications, Dialog, and Interaction

1.	Scientific publications (only published, not submitted/forthcoming)	2006 to 2015	2016	Total
1.1	No. of peer-reviewed ISI journal publications	1,034	51	1,085
1.2	No. of peer-reviewed non-ISI journal publications	186	5	191
1.3	No. of PhD theses	177	8	185
1.4	No. of master/diploma theses	403	14	417
1.5	No. of abstracts/proceedings/presentations/posters at scientific conferences/congresses/workshops	2,523	76	2,599

2.	Scientific events organized by the project/by project partners	2006 to 2015	2016	Total
2.1	No. of conferences/workshops etc. (open to an audience beyond project partners/participants)	241	13	254
2.2	No. of PhD courses/summer schools, etc.	88	4	92
2.3	No. of other events	101	3	104

3.	Outreach	2006 to 2015	2016	Total
3.1	No. of publications for stakeholders outside the scientific community (e.g. public administration)	220	7	227
3.2	No. of press articles (newspapers, radio/TV broadcasts, etc.)	500	4	504
3.3	No. of courses/seminars/workshops for stakeholders outside the scientific community	223	12	235
3.4	No. of public information events for local/regional authorities/residents	139	5	144
3.5	No. of events/activities at schools (courses)	167	1	168
3.6	No. of other events	126	16	142
3.7	No. of patents	8	0	8

A2. Use of Financial Means

Allocation of ETH Board funds to participating institutions (kCHF)

Period	Source of funds			Allocation of funds to								
	ETH Board	Others	Total	ETHZ	EPFL	WSL	Eawag	PSI	EMPA	Education & Outreach	Management	Total
2016	0 #	62	62	132	152	71	202	138	20	215	277	1,207
2006 to 2016	44,875	410	45,285	19,360	6,029	7,973	4,362	1,560	935	1,370	3,502	45,091

#) Total amount of ETH Board funds for the years 2013 to 2016 already transferred in 2013

Allocation of total funds to types of activities (kCHF)

Period	Source of funds			Allocation of funds to				Total
	ETH Board	Others	Total	ERUs	Research platforms	Education & Outreach	Management	
2016	0 #	62	62	590	125	215	277	1,207
2006 to 2016	44,875	410	45,285	34,739	5,480	1,370	3,502	45,091

#) Total amount of ETH Board funds for the years 2013 to 2016 already transferred in 2013

By the end of the year 2016, CHF 45,091 million of the CHF 45,285 million available in total in the period 2006 to 2016 have been allocated. The CHF 194,000 remaining after the termination of CCES will be used for educational and outreach projects related to environmental systems sustainability projects in the years 2017 to 2019. Co-funding of the following activities has been approved by the CCES Steering Board: development of another three sets of teaching materials by the MINT-Learning Center of ETH Zurich; seed funding to the Winter Schools organized by the Transdisciplinarity Lab of ETH Zurich; funding of a 20-percent-position of a scientific staff collaborator developing a platform at D-USYS of ETH Zurich conveying bachelor and master theses to institutional partners in the public administration, industry and civil society; implementation of a network tool for municipal infrastructure management at Eawag.

A3. Program of the CCES Conference 2016




The aim of the conference is to give an account of the state-of-the-art knowledge in the five research areas covered by CCES and how this knowledge can contribute to solving various pressing societal problems. During the two-day event, there will be six research sessions. Each will consist of three talks of 25 to 30 minutes followed by a half-hour discussion. A challenger will promote and stimulate discussion in each session. The sessions' topics will be addressed and presented by leading CCES scientists as well as by well-known international personalities. The conference will be concluded by a panel discussion in the afternoon of the second day, addressing the challenges and difficulties encountered in the dialog between politics and science. Further information on speakers and contents of the sessions can be found on our program page www.cces.ethz.ch/conference2016/program.

The target audience of the event are members of the environmental scientific community (master and PhD students, postdocs, and senior scientists including professors), as well as stakeholders outside academia who are interested in the topics addressed. The conference provides a unique opportunity to learn about the newest scientific developments in areas of great societal relevance, and it offers an interesting platform for networking.

The **participation fee** is 100 CHF (students 50 CHF). It includes conference participation and documentation as well as meals and coffee breaks listed in the program. Travel and accommodation arrangements are to be organized by the participants.

The **registration deadline** is January 17, 2016. Organizational details and electronic registration at www.cces.ethz.ch/conference2016/registration.

Further information is available on the conference website www.cces.ethz.ch/conference2016 or from the conference secretariat: Patrick Jiranek, info@cces.ethz.ch, phone: +41 44 632 85 37.

Organized by the
Competence Center Environment and Sustainability (CCES)
Wednesday, February 10 to Thursday, February 11, 2016
Auditorium Maximum, ETH Zurich, Switzerland

Climate & Environmental Change

Sustainable Land Use

Food, Environment & Health

Natural Resources

Natural Hazards & Risks















CCES Conference 2016 Grand Challenges in Environmental and Sustainability Science and Technology	
Wednesday, February 10, 2016	Thursday, February 11, 2016
<p>09.00-09.45 Arrival of participants, registration, and coffee</p> <p>09.45-10.00 Welcome and opening Lino Guzzella, ETH Zurich, and Fritz Schiesser, ETH Board</p> <p>10.00-10.15 Introductory remarks René Schwarzenbach, CCES</p> <p>10.15-12.15 Non-CO₂ greenhouse gases and aerosols: uncertain players in climate and health Chair: Isabelle Bey, ETH Zurich Challenger: Gian-Kasper Plattner, University of Berne/WSL Grand Challenges for Climate Science and Climate Services Guy P. Brasseur, Max Planck Institute for Meteorology, Hamburg, and National Center for Atmospheric Research, Boulder Non-CO₂ gases Thomas Peter, ETH Zurich Aerosols Urs Baltensperger, PSI, and Ulrike Lohmann, ETH Zurich</p> <p>12.15-13.15 Buffet lunch</p> <p>13.15-15.15 The role of the subsurface in the future energy system Chair: Stefan Hirschberg, PSI Challenger: Martin Saar, ETH Zurich What is the future for geothermal energy? Roland N. Horne, Stanford University Ten years after the Basel EGD project: What have we learned and what are we still missing? Stefan Wiemer, ETH Zurich Carbon dioxide capture and storage in power generation and process industries Marco Mazzotti, ETH Zurich</p> <p>15.15-15.45 Coffee break</p> <p>15.45-17.45 Challenges in integrated water resource management Chair: Mario Schirmer, Eawag Challenger: Andrea Rinaldo, EPFL How to conserve and protect water resources when the well is not dry: experiences from Switzerland Janet Hering, Eawag The fourth urban water revolution comes to the American West David Sedlak, University of California, Berkeley Many users – one river, collaboration in transboundary water management Bernhard Wehrli, Eawag and ETH Zurich, and José Pedro Matos, EPFL</p> <p>18.30 Conference dinner in downtown Zurich</p>	<p>09.00-11.00 Natural hazards and risks in Alpine environments – from science to early warning systems Chair: Manfred Stähli, WSL Challenger: Marcel Hürlimann, BarcelonaTECH The grand challenges of natural hazard and risk management in Alpine environments Dave Petley, University of East Anglia, Norwich Scientific bases for building early warning systems Dani Or, ETH Zurich Early warning systems in Alpine environments Nils Hählen, Abteilung Naturgefahren, Amt für Wald, Kt. Bern</p> <p>11.00-11.30 Coffee break</p> <p>11.30-13.00 Monitoring and long term data repositories – challenges and perspectives Chair: Konrad Steffen, WSL Challenger: Jerry Schnoor, University of Iowa The challenge of coordinating global climate observations – is it possible to implement a «system of systems»? Carolyn Richter, Global Climate Observing System, World Meteorological Organization, Geneva The challenges of building and maintaining large environmental data repositories Michael Lehning, WSL and EPFL Needs and benefits of environmental data repositories for society Peter Binder, MeteoSchweiz, Zurich</p> <p>13.00-14.00 Buffet lunch</p> <p>14.00-16.00 Sustainable land use in densely populated countries Chair: Janine Bolliger, WSL Challenger: Felix Kienast, WSL and ETH Zurich Sustainable Land Use: Trade-offs in a dynamic world Peter Verburg, VU University Amsterdam The conservation of biodiversity in dynamic landscapes Loïc Pellissier, ETH Zurich Sustainable land use in mountainous regions Adrienne Grêt-Regamey, ETH Zurich</p> <p>16.00-16.30 Coffee break</p> <p>16.30-18.30 Final discussion: Dialog between politics and science – reality or fiction? Moderation: Dieter Imboden, ETH Zurich How to share knowledge between science and policy Paul Messerli, former president of the Platform Science and Policy, Swiss Academy of Sciences (SCNAT) Panel discussion Participants from politics: Tiana Angelina Moser, National Councillor, Beat Jans, National Councillor; Marcel Tanner, University of Basel, and Detlef Günther, ETH Zurich</p> <p>18.30 Apéro riche</p>