

## CCES News 10

### Scientific Events

#### Save the date: CCES 2014 Conference 'Research, Education, and Dialogue for Environment and Sustainability – Achievements and Challenges', February 26, 2014

Analyzing and understanding the complex causes, mechanisms and extent of past, current and future environmental change and its impacts on sustainability from a scientific as well as a societal perspective is the goal of CCES. Since its implementation in 2006, this goal has been pursued within the scope of 25 large interdisciplinary and inter-institutional research collaborations. Furthermore, CCES has realized a number of initiatives to foster the dialogue on sustainability issues and the dissemination and adoption of sustainability know-how

with various stakeholders outside science. The CCES 2014 Conference 'Research, Education, and Dialogue for Environment and Sustainability – Achievements and Challenges' taking place at ETH Zurich on Wednesday, February 26, 2014 will provide the platform for the presentation and discussion of CCES research highlights and dialogue activities of the past three years. Save the date now!

Contact: [info@cces.ethz.ch](mailto:info@cces.ethz.ch), phone 044 632 85 37  
Conference information: [www.cces.ethz.ch/conference2014](http://www.cces.ethz.ch/conference2014)

### Education

#### Apply now for the CCES Winter School 2014 'Science Meets Practice'

The impressions of the Winter School participants 2013 were again vast and the learning processes deep and enriching: Group dynamics of exceptionally high quality, intellectually stimulating, challenging because of diverse cultural and disciplinary backgrounds of the participants, enhanced competence in dealing with multiple conceptions and perspectives for making interactions between science and practice happen. As one of the participants mentioned in the final feedback round: «I feel very much encouraged that other

people are reflecting about these topics in the whole world and also in different generations, but in the end now I feel a little bit sad to go back into the system we've represented before.» The CCES Winter School not only dedicates room for reflection on scientific activities and interactions with society but also shows ways to deal with the challenges at the science-practice interfaces. «We all had that interest before for what science should be within society and how it should engage with practice. But now I don't feel alone anymore in that quest.» You can also become part



Stakeholder workshop on the opportunities, challenges, and implementation of the energy transition on a community level during the third CCES Winter School 2013. Photo: C. Zingerli, CCES.

of this: The call for applications for the CCES Winter School 2014 is open now. Flyer, online application form, and further information are available at [www.cces.ethz.ch/winterschool](http://www.cces.ethz.ch/winterschool).

CCES Winter School 2014, 'Propstei Wislikofen', January 6 to 9 and February 3 to 6, 2014. Application deadline is September 30, 2013.

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## ETH students studied the successful restoration of the river Thur

Over the last decades, more and more waters have been revitalized to restore their natural functions and to improve flood protection. In the context of the CCES RECORD Catchment project, 16 ETH students from the Master program Human-Environment Systems studied the river restoration of the Thur in Niederneunforn/TG ([www.uns.ethz.ch/translab/cs\\_former/2012](http://www.uns.ethz.ch/translab/cs_former/2012)). The results show that the river restoration project can be considered a success, both from an ecological and public perspective. Some concerns were, however, expressed about the transparency of the financial information available to the public. Results and project progress were presented twice to a stakeholder group with representatives from the municipalities of Neunforn, Thalheim, Altikon and the canton of Thurgovia. These two events were also communicated in the local newspaper «Andelfinger Zeitung». To conclude the study, a booklet for the



Students discussing their results with stakeholders. Photo: TdLab, ETH Zurich

public with the main results has just been published (see [www.uns.ethz.ch/pub/tdpub/csbooks/CS\\_2012\\_Broschuere\\_V03\\_Web.pdf](http://www.uns.ethz.ch/pub/tdpub/csbooks/CS_2012_Broschuere_V03_Web.pdf)).

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This activity makes part of the CCES RECORD Catchment project: [www.cces.ethz.ch/projects/nature/Record](http://www.cces.ethz.ch/projects/nature/Record)

## Outreach

### Insights into rapid mass movements at Scientifica 2013

The CCES project TRAMM – Triggering of Rapid Mass Movements in Steep Terrain – will demonstrate new tools for the early warning of landslides, snow avalanches and debris flows at ‘Scientifica 2013’, the annual public exhibition of ETH Zurich and the University of Zurich, taking place from August 30 to September 1, 2013. This year, the overarching topic of ‘Scientifica’ is «risk» ([www.scientifica.ch](http://www.scientifica.ch)). TRAMM will both highlight the risks for people and infrastructure resulting from rapid mass movements and show

new innovations that may mitigate these risks in the future. In a virtual landscape, visitors will have a chance to discover where shallow landslides form and how far they travel before they stop. In addition, they will experience how the sound of a collapsing sample of soil or snow can be used to predict imminent hazards.

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This activity will be organized by the TRAMM project: [www.cces.ethz.ch/projects/hazri/tramm](http://www.cces.ethz.ch/projects/hazri/tramm)

## Research

### Taking stock of Switzerland’s methane emissions

The CCES project MAIOLICA investigated land-surface interactions and their effect on greenhouse gas fluxes, and generated a wealth of experimental data for terrestrial and lake ecosystems with a particular focus on fluxes of methane (CH<sub>4</sub>). For a complete accounting of human-made and natural CH<sub>4</sub> sources on a national level, these observations need to be upscaled with geostatistical information on the distribution and activity of individual sources. Such a task is performed routinely by the Swiss Federal Office for the Environment (FOEN) for the annual National Inventory Report (NIR,

FOEN 2013) of Switzerland’s greenhouse gas emissions. However, the NIR only considers anthropogenic CH<sub>4</sub> emissions but no natural sources and sinks. The main goal of MAIOLICA Synthesis was thus to develop a complete methane budget for Switzerland by combining information from the NIR, MAIOLICA, and other research projects. A major outcome of this work is a detailed, spatially explicit inventory of anthropogenic and natural methane fluxes (Figure 1a). Already in the framework of MAIOLICA, an inventory of anthropogenic emissions had been developed by the

company Meteotest for the year 2007. This inventory has now been updated for 2011 and extended with new layers representing CH<sub>4</sub> emissions from wastewater treatment and natural sources and sinks (Figure 1b). Globally, natural emissions from wetlands, oceans, wild animals and biomass burning contribute more than one third to the total emissions and are thought to be the main drivers of the observed large interannual variability of atmospheric CH<sub>4</sub>. In Switzerland, however, most wetlands were drained and emissions from wild animals are almost negligible as compared to emissions from cattle. Hence, natural emissions are estimated to contribute only 3% to the Swiss total even if semi-natural emissions from hydroelectric res-

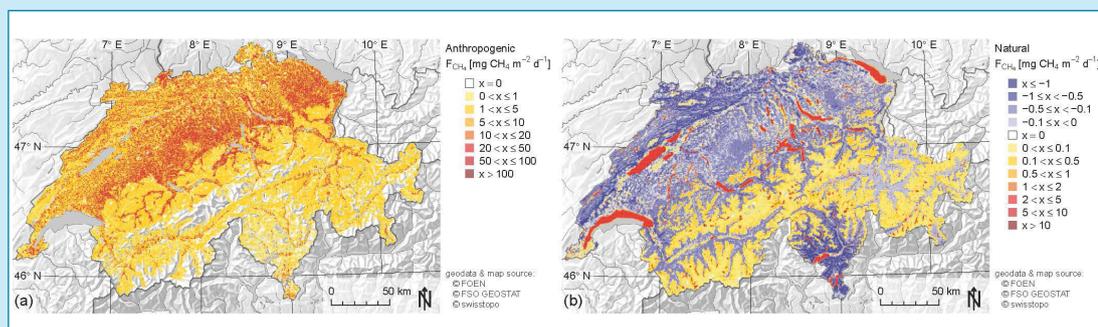
ervoirs are included. The agricultural sector with its emissions from ruminants and manure management is by far the largest CH<sub>4</sub> source (>80%), followed by landfills (8%) and the distribution of natural gas (7%). The gridded inventory will be of particular value for atmospheric modeling studies of regional CH<sub>4</sub> sources and has already proven its value for the interpretation of airborne and ground-based CH<sub>4</sub> observations over Switzerland.

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This study makes part of the MAIOLICA project:  
[www.cces.ethz.ch/projects/clench/maiolica](http://www.cces.ethz.ch/projects/clench/maiolica)

## References

FOEN: Switzerland's greenhouse gas inventory 1990–2011. Submission of 15 April 2013 under the United Nations Framework Convention on Climate Change and under the Kyoto Protocol, Federal Office for the Environment (FOEN). 2013.

Hiller et al., Anthropogenic and natural methane fluxes in Switzerland synthesized in a spatially explicit inventory, manuscript in preparation, 2013.



**Figure 1:** Swiss CH<sub>4</sub> fluxes from (a) anthropogenic (agriculture, energy, waste) and (b) natural contributors (wetlands, lakes and reservoirs, wild animals, forest uptake). Note the ten times smaller scale for natural fluxes. Sources: background map: ©swisstopo; geostatistical data: ©Swiss Federal Office for the Environment (FOEN), and ©Swiss Federal Statistical Office (SFSO), GEOSTAT.

## Genetic diversity along altitudinal gradients may facilitate response to environmental change

Genetic diversity is an important prerequisite for the species' ability to respond to environmental change, for instance in the course of global warming. We surveyed the scientific literature to investigate whether animal populations are genetically adapted to different environments along altitudinal gradients, which can serve as spatial surrogates for some of the temporal changes expected under global warming. Based on about 100 publications, we found that genetically-based phenotypic differences between popu-

lations from different altitudes are common and taxonomically widespread, involving traits such as mass, wing size, tolerance to thermal extremes and melanization. Evidence for a role in altitudinal adaptation also exists for a number of anonymous molecular loci and candidate genes, most prominently hemoglobin. These results suggest that populations from different altitudinal environments may harbor substantial genetic variation. This diversity may facilitate the response of species to environmental change.

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This research is a result of a CCES synthesis project jointly accomplished by the CCES projects ENHANCE, [www.cces.ethz.ch/projects/sulu/ENHANCE](http://www.cces.ethz.ch/projects/sulu/ENHANCE), and BioChange, [www.cces.ethz.ch/projects/clench/BioChange](http://www.cces.ethz.ch/projects/clench/BioChange)

## Reference

Keller, I., Alexander, J.M., Holderegger, R. & Edwards P.J. Widespread phenotypic and genetic divergence along altitudinal gradients in animals. Submitted manuscript, available from I. Keller upon request.