

Climate change

Science for climate change policy-making: applying theory to practice to enhance effectiveness

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This paper reviews the major organizations that mediate interactions between the scientific community and climate change policy-making in Switzerland. Based on seven case studies that analyze the effectiveness of policy recommendations issued by the Advisory Body on Climate Change Research and Policy, the paper demonstrates the practical insights that can be gained by applying boundary organization and advocacy coalition framework theory to the design of such institutions. Better integration of the social and management sciences could improve the ability of the Advisory Body on Climate Change Research and Policy to perform hybrid management functions essential to integrate science more effectively into decision-making processes.

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THE PAPER BEGINS with an overview of the main institutions operating at the science–policy interface in the Swiss climate policy subsystem. The second section considers the effectiveness of the policy recommendations made by one of these institutions — the Advisory Body on Climate Change Research and Policy — based on a discussion of their salience, credibility and legitimacy. This is followed by insights drawn from relevant theory regarding the nature and role of science in policy-making, to suggest how the effectiveness of the organization might be enhanced. These observations and insights make a strong case for the practical benefits of linking theory and practice with respect to science–policy interface institutions, as has been suggested in recent academic literature (see, for example, Cash *et al.*, 2003).

In 1988, the climate research community took the initiative via the Swiss Academy of Sciences (SAS) to launch ProClim–, which was originally known as the Programme Climatologique Suisse and conceived as a permanent interdisciplinary Swiss national climate research program. In 1992/93, ProClim– was redefined by the SAS Board as the Swiss Forum for Climate and Global Change, broadening its scope to encompass all issues related to global environmental change and defining its niche as a platform for research coordination and an interface between the research community and decision-makers across sectors of society (see Box 1).

With time, Swiss academic researchers came to recognize the value added by ProClim– and its services. In turn, the organization could count on the

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broad support of the Swiss academic community (SAS, 1997), which gave ProClim– the necessary legitimacy to develop its policy interface function with the private sector, government and parliament.

In the second half of the 1990s, the Federal Government and Parliament also took initial steps to build appropriate new institutional interfaces. A Parliamentary Group on Climate Change was launched in September 1996 by federal lawmakers to establish a workable institutional interface between Parliament and the scientific community, with the aim of transmitting the latest scientific results to parliamentarians, serving an early warning function and stimulating informal discussion on the necessary political response measures among politicians from all political parties (see Box 1). The Group meets for a working lunch during each parliamentary session to hear and discuss presentations by experts on breaking issues of political relevance. ProClim– was appointed to serve as the secretariat of the Group.

On the Government side, an Advisory Body on Climate Change Research and Policy (referred to

throughout the rest of the paper as the OcCC¹) was created in 1996 by two federal departments to formulate recommendations on questions regarding climate and global change for politicians and the federal administration. In practice, it also provides a unique platform for sustained, science-based dialog among its approximately 30 members from research, the private sector and Government, who serve as a cross-sectoral and multi-disciplinary ‘think tank’ regarding climate change issues.

The OcCC has strong and direct linkages to the Swiss Government (mandate, core and project financing, non-voting members), the Swiss Parliament (two of the OcCC’s three presidents have been members of Parliament), the private sector (experts from individual enterprises in the financial services sector, a business association, Energy Agency of the Private Sector), and the scientific community (via ProClim–, which serves as the body’s secretariat).

The mandate of the OcCC is quite extensive (see Box 1). The OcCC regularly nominates the scientific expert who participates on the official Swiss negotiating delegation for each UNFCCC (United Nations Framework Convention on Climate Change) Conference of the Parties and sends its own members in an observer capacity under the ProClim– umbrella.²

Alone, and with co-sponsorship of the Swiss Agency for Environment, Forests and Landscape and others, it conducts workshops and provides scientific assessments on issues of particular relevance to Swiss climate policy, such as extreme weather events, secondary benefits of greenhouse gas emission reductions or the most important results of the IPCC (Intergovernmental Panel on Climate Change) *Third Assessment Report* from a Swiss perspective

Box 1. Main institutions in Swiss science–policy interface

ProClim–: Swiss Forum for Climate and Global Change (www.proclim.ch/HomePage.html)

Initiated in 1988 as an independent organization of the Swiss Academy of Sciences, the objectives of ProClim– are to: (i) integrate Swiss research in international programs; (ii) provide support for interdisciplinary collaboration and dialog; and (iii) facilitate information exchange and dialog with decision-makers.

Parliamentary Group on Climate Change (www.proclim.ch/Misc/ParlGrClimateChange.html)

Initiated in 1996 to transmit the latest scientific results to parliamentarians and to stimulate informal discussion on response measures across party lines, the Group has hosted nearly 30 lunch seminars during parliamentary sessions, most recently (2003/04) on “Heat waves and adaptation for cities”; “Climate change facts and actions: Overview for new parliamentarians”; “Geothermal power: potential, barriers and reality”; and “The summer 2003 heat wave”.

Advisory Group on Climate Change Research and Policy (OcCC, www.occc.ch/index_e.html)

The Advisory Group was launched in 1997 to serve as an interface between science, the federal administration, the cantons, and the public. It offers these stakeholders its findings, knowledge, ideas, and opinions concerning questions about the climate system and has an explicit mandate to:

- observe and judge the evolution of:
 - worldwide research and its results concerning climate mechanisms and climate change and its causes and impacts,
 - national and international measures required to avoid hazardous anthropogenic climate changes and their impacts, especially based on the work of IPCC and the subsequent conferences of the UN Framework Convention on Climate Change,
 - the climate system, especially with regard to the relevance to Switzerland;
- formulate recommendations regarding:
 - Swiss research priorities and research coordination, as a basis for political decisions,
 - national and international measures required to avoid dangerous anthropogenic climate change and to lessen and avoid damage to people and objects,
 - the negotiating position of the Swiss delegation in international negotiations,
 - the response to climate change in Switzerland.

(OcCC, 2002a). The OcCC undertakes various public information activities (often together with ProClim-), ranging from periodic information to workshop reports, public information events and press conferences.

Policy recommendations – history/evaluation

A new era of proactive science advice via the OcCC

It was not until the OcCC was put in place in 1996 that the scientific community³ had the opportunity to take a proactive role in climate (research) policy development on a regular basis, as opposed to merely critiquing draft legislation during formal consultation processes via the Swiss Academy of Sciences. The mandate and activities of the Advisory Body can be grouped into three general functions:

- acting as an interface between the research community and stakeholders on climate change issues;
- tracking and assessing trends in climate change science, impacts and response strategies; and
- making recommendations to the Government on Swiss research policy and domestic and international climate policy.

The rest of this paper focuses on the third function — public policy advice. The following case studies describe each of the policy recommendations made by the Advisory Body on Climate Research and Policy through to mid-2003 and provide a qualitative assessment of their credibility, salience and legitimacy (see Table 1 for a summary). These three factors have been found to be key determinants of the effectiveness of scientific information in influencing

Credibility, salience and legitimacy have been found to be the three key determinants of the effectiveness of scientific information in influencing policy responses

policy responses (Clark *et al*, forthcoming; Cash *et al*, 2003). In the following section of this paper, these results are discussed in the context of theory regarding boundary institutions and policy change, which offers insights on how the effectiveness of the OcCC might be enhanced in practice.

Swiss climate research (September 1998) After the completion of the National Research Program ‘Climate Changes and Natural Disasters’ in 1997 and the expiry of the Swiss Priority Program ‘Environmental Technology and Research’ in 1999, Switzerland no longer had a dedicated research program on climate and global change. Drawing on ProClim-’s previous effort to elaborate a concept for coordinated transdisciplinary research (Ritz and Lys, 1997), the OcCC identified six crucial measures to ensure the efficiency of future contributions by Swiss climate and global change research teams to sustainability related research at the highest international level (OcCC, 1998).

These recommendations addressed research policy and were directed at institutions involved in setting research funding priorities (National Science Foundation, Federal Office for Education and

Table 1. Analysis of Specific OcCC Policy Recommendations (1996–2003)

Policy/issue area	Recommendation	Effectiveness	Salience	Credibility	Legitimacy
Swiss research priorities and research coordination	Swiss climate research (1998)	high	yes	yes	yes
	Managing future flood events (1998)	+/-	no	yes	yes
	Research gaps and priorities in agriculture (2000)	low	no	yes	no
National measures to avoid dangerous anthropogenic climate change	Implications of secondary benefits for Swiss climate policy (2000)	low	no	yes	yes
	Budget neutral price reduction of diesel and natural gas/biogas fuels (2002)	high	yes	yes	yes
	SwissEnergy funding (2003)	low	no	no	no
National measures to lessen/avoid damage to people and objects	Managing future flood events (1998)	+/-	no	yes	+/-
International measures to avoid dangerous anthropogenic climate change	none				
International measures to lessen/avoid damage to people and objects	none				
Negotiating position of the Swiss delegation in international negotiations	Negotiation results of UNFCCC COP7 (2002)	low	no	no	no

Science). In parallel, four members of the OcCC were on the Commission that was appointed to develop a new strategy for environmental research and the sustainable development of Switzerland, and ProClim— reviewed the resulting report.

The subsequent decision by the Government to establish National Centers of Competence in Research (NCCR) — long-term research programs implemented in areas of vital strategic importance for the advancement of science in Switzerland, for the country's economy and for Swiss society — is consistent with these recommendations, and they are well-reflected, for example, in the design of the NCCR North–South.⁴

Yet the OcCC recommendations would not have been as influential if they had not been based on an underlying ProClim— concept document on coordinated transdisciplinary research (Ritz and Lys, 1997). This report was the culmination of a nine-month process initiated by ProClim—, embraced by the Conference of Swiss Scientific Academies and co-financed by the Swiss National Science Foundation to provide input from individual researchers on the design of the new concept for Swiss environmental research.

The end result was a series of 18 theses that provided a conceptual, thematic and methodological framework for future global change research. The transparent, inclusive and collaborative process to produce the report resulted in an output that was scientifically credible and perceived as legitimate by key stakeholders.

Managing future flood events (December 1998, 2003) Extreme weather events have been a focus of OcCC activity from the outset. At the end of 1998, on the basis of expert meetings and a workshop, OcCC published its first assessment report on the effects of extreme precipitation events (OcCC, 1999). The report contained a set of guidelines for responding to future high-water levels, directed at three stakeholder groups: research policy/funding agencies; insurance companies; and policy-makers at various levels of government. In addition, as a result of rain- and snow-fall developments in February 1999, the OcCC organized a press conference in March to warn of the increased risk of springtime flooding that could be expected as a result of snowmelt.⁵

These recommendations were probably the most broad-based issued by the OcCC to date, as they dealt with research needs and policy prescriptions for both the private sector and various levels of Government. The report was transmitted to the Federal Council, directors of key Federal Government agencies, research funding agencies, and the global change research community, and was made public at a press conference that received excellent coverage. Although some decision-makers were part of the assessment process itself, the OcCC did not follow up with key target audiences to track the implementation of recommendations.

Measures taken by cantons and at the national level since 1993 do appear to have improved flood protection, as evidenced by the minimal damages in Wallis in 2000, compared with previous flood events (Hohmann, 2003). Whether the OcCC recommendations of 1998/99 played a role in their implementation has not been documented, but the body was successful in sounding an early warning about an impending flood event. The OcCC has continued to address extreme events, and recently issued more comprehensive recommendations (OcCC, 2003a).

Research gaps and priorities in agriculture (April 2000) At the request of the Federal Agriculture Office, the OcCC created a seven-person *ad hoc* working group to provide its assessment of research needs and priorities to address issues related to atmosphere–climate–agriculture interactions. The group had neither a mandate, nor the resources, to produce a comprehensive, in-depth analysis. Instead, it issued a short report that provided feedback on the Agriculture Office's own preliminary problem analysis and outlined priority research questions, the need for coordination with forestry carbon sink research and monitoring and the importance of a good linkage between applied and pure research and the integration of Swiss research in international efforts (OcCC, 2000a).

The exercise was perceived as an attempt by the Federal Agriculture Office to instrumentalize the OcCC to lend credibility to its decision to subsume the Research Station for Agricultural Chemistry and Environmental Hygiene (which had already been demoted to operation as an Institute of Environmental Protection and Agriculture in 1996) into the Swiss Federal Research Station for Agroecology and Agriculture (Ritz, 2003). As a result, the report consciously skirted the political issue and was drafted with an emphasis on the important contribution that high-quality Swiss research can make to international efforts to solve global environmental problems.

The Working Group of the OcCC stressed the importance of research at the climate–atmosphere–agriculture nexus and recommended that existing Swiss expertise be promoted. Because of the differing objectives of the 'client' on the policy side and the OcCC, and the fact that the institutional decision had in essence already been taken, the recommendations were neither particularly salient nor effective, and had no real impact on the policy outcome.

Implications of secondary benefits for climate policy (August 2000) In its synthesis report on the outcomes of a two-day workshop it conducted in November 1999, the Advisory Body on Climate Research and Policy made the following recommendations (OcCC, 2000b, page 32):

- Switzerland is to set long-term, binding targets to reduce greenhouse gas emissions (such as

foreseen by the CO₂ Law by 2010), to enable the economy to prepare accordingly.

- Reduction targets must be reached efficiently, at the lowest possible costs to the economy. This requires the implementation of economic instruments, if targets cannot be reached voluntarily. Legal provision to achieve reduction targets should be defined for the largest possible group of emitters (that is, averaging).
- Sector-specific reduction targets (that is, targets differentiated by emitter group), however, are economically inefficient.
- Switzerland is to play a leading role in climate policy, especially in order to draw the greatest possible secondary benefits from technological innovations (first-mover advantage).

These recommendations were either vague or consistent with existing Swiss policy. With respect to the first three bullet points, for example, the Swiss CO₂ Law had already gone into effect in May 2000, and contained carbon dioxide reduction targets for heating fuels and transport fuels in the year 2010 of 15% and 8%, respectively, compared with 1990 levels. The Law stipulates that these targets are to be met primarily through voluntary means, with a CO₂ tax (a “market economic instrument”) to be implemented should the voluntary approach not achieve the required results.

On all these points, the OcCC ‘recommendations’ merely reflected the policy that had been implemented previously, so they came too late to have had an influence on the policy outcome. The last point is neither specific nor clear, so it is difficult to judge whether the call has been heeded to the satisfaction of the OcCC.

The main message of the report is that reducing greenhouse gas emissions not only will protect the global climate system, but also will result in substantial additional benefits at the national level, which in their own right justify a rapid implementation of effective measures to reduce greenhouse gas emissions (OcCC, 2000b, page 33). This received significant media attention and has been cited in parliamentary debates, for example, in the context of the discussion about whether diesel fuel tariffs should be reduced (see below).

The report delivered an authoritative assessment of an important policy issue⁶ and was communicated to the public and decision-makers in the form of a press conference. This contributed to its credibility and legitimacy, even if the report’s climate policy ‘recommendations’ merely echoed existing policy and were therefore not particularly salient.

OcCC Position Paper on the results of COP7 (February 2002) The OcCC put out a position paper on the results of the Seventh Session of the UNFCCC, which took place in Marrakech in 2001 (OcCC, 2002b). Similar to the previous case, the recommendations in this document were for the

most part very general (for instance, a call for Switzerland to push for “challenging climate protection targets” for the second commitment period, or to apply the Kyoto mechanisms domestically under strict ecological and social guidelines, without further specifying what “challenging” targets or “strict” guidelines might imply). Some were consistent with existing Swiss policy (for instance, Swiss support for legally binding sanctions, a call to meet Kyoto obligations mainly through domestic measures, a call to regulate the domestic use of carbon sinks such that they meet Kyoto requirements).

Others were ultimately unsuccessful (for instance, a call for ratification of the Kyoto Protocol before the World Summit on Sustainable Development in August 2002⁷). The only unclear case was the demand that the Swiss emission trading system be designed to be compatible with the EU Emission Trading System; it is still not clear whether the emerging Swiss system can be linked with the EU system,⁸ and the OcCC did not take up this issue in its own work program.

According to the Director of ProClim– (Ritz, 2003), the main purpose of the statement was not to influence Swiss climate policy, but rather to communicate the importance that the OcCC places on the Kyoto process, to bolster public support for Swiss ratification of the Kyoto Protocol and to enhance the reputation of the OcCC as the authoritative body for climate policy and research advice. No parallel statements were issued in conjunction with other sessions of the Conference of the Parties, and there are currently no plans to issue any *ex ante* international climate policy recommendations.

OcCC Position Paper on diesel fuel price reduction (August 2002) In March 2002, the Swiss Council of States adopted a proposal to reduce the price of diesel fuel (fiscal tax reduction), to provide an incentive for people to switch from gasoline- to diesel-driven cars and thereby reduce carbon dioxide emissions.⁹ Based on an issue paper prepared by 15 scientific experts (three of whom are members of the OcCC) and approved by both the Board of ProClim– and the Swiss Academy of Science’s Commission for Atmospheric Physics and Chemistry (OcCC, 2002c), the OcCC took a position on the Parliamentary proposal, rejecting a reduction of the tax on diesel.

With respect to natural gas/biogas fuels, the OcCC expressed the opinion that increasing the relative price of gasoline with respect to these fuels could make sense, but only if this effect were achieved by increasing gasoline prices (the proposal called for tax breaks for natural gas and biogas). The responsible Parliamentary Commission was notified of the ongoing OcCC analysis. Two persons involved in this analysis were subsequently invited to present testimony (Statement, supporting documentation (OcCC, 2002c)) to the Commission at a hearing, and several days later these outputs were made public at a press conference.

The OcCC analysis played a critical role in the National Council's rejection of tax breaks for diesel: in the end, Parliament agreed to lower taxes on only natural, liquid and biogas fuels

In her Foreword to OcCC's 2002 Annual Report, OcCC's President, who is a member of the National Council, stated that "the competent and objective argumentation against reducing taxes on diesel provided by OcCC/ProClim— to political decision-makers is extremely important" (OcCC, 2003b). In the end, the National Council rejected tax breaks for diesel and, in June 2003, Parliament agreed to lower taxes on only natural, liquid and biogas.

It is generally agreed that the OcCC analysis played a critical role in this policy outcome, which can be attributed to: timely delivery of a broadly based scientific analysis of the proposal; early and effective communication with members of Parliament, facilitated by parliamentary members of the OcCC; opportunity to take a position on a specific policy proposal; direct participation in the Parliamentary decision-making process (expert testimony in Commission hearings); and influence on public opinion (via a media event).

OcCC Position Paper against cuts to SwissEnergy (May 2003) Launched in 2001, SwissEnergy is a ten-year program to meet constitutional and legislative mandates to promote energy efficiency and the use of renewable forms of energy, to achieve the objectives of the country's energy and climate policies and, thus, to pave the way for a sustainable energy supply. As a result of projections for an unexpectedly large budget deficit in 2004 (approximately CHF 3.5 billion, compared with a total income of CHF 47.9 billion), which is considered to be mainly structural and not cyclical in nature, the Federal Council and the Swiss Parliament elaborated a deficit reduction program in 2003.

The original proposal of the Federal Council called for SwissEnergy (which had a budget of CHF 55 million in 2003) to be cut entirely, despite its verified positive impact on the Swiss economy and its important role in Swiss energy and climate policy. It also offered two alternative plans to compensate for the loss of federal subsidies, namely regulatory measures and an incentive tax earmarked specifically to provide funding for SwissEnergy at the 2003 level. In response, the OcCC submitted a position paper to the Federal Council and issued a press release (OcCC, 2003c), which recommended that the Federal Council rethink its decision to cut the program, without commenting on the two alternative plans.

As a result of the formal budget consultation process, which demonstrated broad support for SwissEnergy from numerous interest groups and sub-national government entities and no consensus on the two alternative plans, the final proposal from the Federal Council included a budget cut of CHF 35 million, leaving SwissEnergy with CHF 20 million annually (beginning in 2006), in the view of the Federal Council enough to maintain a credible energy and climate policy (Federal Council, 2003). The Parliament ultimately restored all but CHF 10 million to the program, leaving SwissEnergy with a budget of CHF 45 million.

Although the result of the formal consultation process and the final political outcome were consistent with the OcCC recommendation to rethink the decision to cut the program, the impact of the OcCC effort was likely minimal, as the importance/value of SwissEnergy were never in question (rather, the debate was about the overall tradeoffs in the larger budget negotiation process).

Insights from assessment of OcCC recommendations

The mandate of the Advisory Body on Climate Change Research and Policy was extended by the responsible departments for four years on 1 January 2001. However, the OcCC has yet to implement management systems that would allow the Body systematically to evaluate the effectiveness of its activities. As a result, this paper provides a qualitative and anecdotal assessment of the effectiveness of OcCC initiatives to influence sectoral policy-making, in particular climate change policy.

The Advisory Body was given the task of formulating recommendations in four policy/issue areas (see Box 1), which have been broken down into a set of more discrete issues in Table 1. Consistent with the growing body of scholarship in the social studies of science, the author's personal assessment of the recommendations made to date by the OcCC suggest that policy advice has been most effective in those cases where it was:

- salient to decision-making processes (that is, targeted at specific policy decision processes for which scientific/technical advice was politically relevant and coordinated to provide input at the appropriate stage(s) in the decision-making process);
- judged to be credible (for instance, backed by authoritative scientific assessments); and
- perceived to be legitimate by relevant decision-makers, which is largely a function of the process used to arrive at the recommendations.

Even in cases where two of these three criteria were judged to have been met, effective outcomes could not be unequivocally documented.

Saliency refers to the relevance of policy advice or assessment to the needs of decision-makers. The

strength and focus of OcCC policy advice to date lies in the domain of preparatory advice in the “pre-policy-making phase” (Hohmann, 2003), involving describing problem conditions and supplying information about their causes (even before policy-makers are confronted with a need to decide among alternative courses of action) so as to raise awareness or to propose causal relationships that can advance understanding (MacRae and Whittington, 1997, page 27). The OcCC’s ongoing work on extreme events, or its consideration of the implications of IPCC assessments for Switzerland, for example, provide preparatory advice to policy-makers and the public at large.

Although background assessments offered by the scientific community without a clear political mandate can be a valuable contribution to the knowledge base, their direct policy impact is generally limited. As Mayda (2000) has pointed out, information is “not policy-relevant because it exists, but only if and to the extent it is, in fact, used to develop a policy”.

The current OcCC focus on pre-policy-making enlightenment¹⁰ has been at the expense of providing public policy advice.¹¹ As discussed later in the paper, this emphasis may be an artifact of a postpositivist conception of science–policy interaction (Table 2), dominance of the natural sciences and the failure to consider OcCC’s role in policy-making and the institutional landscape.

A dialog within the OcCC (with its mixed expert–government membership) to identify the contributions the Advisory Body could make at the problem definition, alternative courses of action and implementation stages of actual policy-making processes could be fruitful; it would clarify the frontier between science and policy and would encourage a shift to an approach more accountable to policy (Table 2).

Even after seven years of operation, the OcCC has not been fully integrated into the official context of policy-making and politics in Switzerland, which reflects classical–modernist political institutions.¹² An example is the development of Switzerland’s climate policy legislation, the CO₂ Act, which went into effect in the year 2000. The scientific community made expert knowledge on climate change publicly available, but the scientific community played no role in setting the level of emission reductions or in the analysis of alternative policy options. The Law was formulated by the Swiss Administration, and submitted to Parliament by the Federal Council for approval.

Within this traditional political context, there is no institutionalized pathway for the OcCC to participate in decision-making. Also, the OcCC does not systematically track the business cycles of the Federal Government (Federal Council, Administration) for relevant domestic and foreign policy issues for

Table 2. Overview of theoretical constructs of science–policy interfaces and the role of science in decision-making

Disciplinary approach	Theoretical construct	Role of science	Form of interface	Direct science counterpart
Scientific-philosophical	Logical postpositive empiricism	Production of objective, rational, neutral body of knowledge (scientific facts) as basis for decision-making	Institutions or mechanisms to deliver scientific facts for use by non-science	Interface institutions or mechanisms
Sociological	Constructivist boundary work (Gieryn, 1995; Star and Griesemer, 1989)	Partner in demarcation of boundary between science and non-science to preserve cognitive authority of science	Co-production of boundary objects/standardized packages	Non-science
Political-economic	Principal–agent theory (Braun, 1993; Guston, 1999)	Performer of services (research) delegated by patron	‘Contractual’ relationship defined by patron	Patron of science outputs (politicians)
Political–economic plus sociological	Boundary organization theory (Guston, 1999)	Equal partner in negotiation of boundary between science and politics	Negotiated frontier between distinct social worlds (science and politics), accountable to both	Boundary organization (agent of both science and politics)
Political–managerial	Concept of hybrid management (Miller, 2001a)	Participant in hybrid management (hybridization, deconstruction, boundary work, cross-domain orchestration)	People, artifacts, and institutions that mix elements from scientific and political forms of life	Agents of hybrid management (including boundary organizations)
Political–dynamic	Network theories, such as the actor coalition framework (Sabatier and Jenkins-Smith, 1993)	Neutral, member in actor coalition or active policy broker	Sharp line, proactive trans-coalition mediation by policy broker	Different political actor coalitions

which its science-based public policy analysis and advice might be particularly relevant to policy-makers (Ritz, 2004).

Greater integration of political scientists in the work of the OcCC could help identify promising entry points into decision-making processes and focus efforts on issue areas where scientific/technical analyses/advice are salient to policy processes. As the case of SwissEnergy shows, OcCC advice is not relevant in all climate-relevant policy decisions, as scientific/technical inputs are not always the central issue.

Lessons from the management sciences, particularly with respect to strategic planning and evaluation techniques, could also improve the effectiveness of the OcCC's policy advice. Research for this paper indicates that the needs of Government end-user(s) and other target audiences (as well as the specific role of the OcCC in meeting them) have not been assessed and articulated explicitly. Informally, the Government members of the Body can express their anticipated needs, but have not done so systematically.

Similarly, strategic goals and a conscious, coherent and outcome-oriented strategy to pursue them are lacking. Introducing a formalized strategic planning process that ensures a continuous dialog between science and decision-makers to define a mission statement, goals, strategic priorities, and periodic work programs would enable the OcCC to deliver relevant and timely inputs into political decision-making processes. It would also provide a basis for monitoring and evaluation of policy recommendations after they are issued and facilitate direct engagement with target audiences regarding the utility and implementation of policy recommendations.

The OcCC currently relies on a rudimentary input-output analysis, rather than a system for the evaluation of OcCC goals, processes and/or outcomes. In its annual reports, the OcCC generally provides information on:

- inputs (that is, resources such as money, staff or facilities);
- activities (that is, what the OcCC does with inputs to fulfill its mandate, such as conducting workshops, performing assessments, informing the public); and
- outputs (that is, direct products of OcCC activities, such as reports, written recommendations, other publications).

It also provides summary status reports on substantive issues of climate change science and climate policy developments. Other than keeping records on addressees for its products, the number of reports printed and distributed, collecting media reports on its events/products, and tracking statistics on web site 'hits', for example, the OcCC has no control or management systems in place to continuously evaluate the outcomes of its recommendations or other

products. Shifting the focus from simple accountability for process to accountability for results necessitates consideration of outcomes, not just outputs (McNamara, 2004; Mercer, 2004), which could improve the salience and, hence, the effectiveness of the OcCC from the perspective of both the Swiss Government and the scientific community.

Credibility refers to the adequacy of technical evidence and arguments that underlie policy advice, based on accepted methods and best professional practice. In some cases, it appears that the Advisory Body on Climate Change Research and Policy, for a number of reasons, may lack the credibility to issue influential policy advice proactively.

As a boundary institution without any inherent political or institutional weight in formal decision-making processes, the scientific credibility of the OcCC depends on relevant research being conducted in Switzerland and abroad. Whereas the Advisory Body can draw on a well-established natural science research base to support its climate assessment efforts (for instance, on the impacts of climate change on the incidence of extreme events in Switzerland), the Swiss social science community represents a fragmented and much thinner base for climate policy research, analysis and related recommendations (Jochimsen, 1996; Lehmann and Rieder, 2002, pages 43–46).

One of the difficulties facing the social sciences is a lack of incentive to engage in environmental research: funding levels outside the few relevant national research programs remain small and are insecure, endowed chairs for environmental social science research are scarce or non-existent, and academic promotion and reward systems generally fail to give credit for applied research that does not always deliver new empirical data or theoretical advances.

Academics operating under such framework conditions, in turn, may be reluctant to evaluate or, on the basis of their findings, advocate specific government climate change (research) policies, for fear that future funding may be jeopardized (Bürgenmeier, 2004); they may therefore steer clear of public policy research and analysis. Of the 479

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peer-reviewed journal articles by Swiss authors included in ProClim's *Global Change Abstracts: The Swiss Contribution* in 2002, only 14 dealt with climate and global change policy; for 2003, 23 policy-relevant articles were included among a total of 501 papers (Müller-Ferch, 2004).

A lack of a critical mass of social science expertise to deliver authoritative climate policy guidance (or a failure to mobilize it effectively) might help explain why the OcCC since its inception in 1996 has yet to issue recommendations on international measures to avoid dangerous anthropogenic climate change (mitigation) or to lessen, or avoid, damage to people and objects resulting from climate change (adaptation): it has only once commented on the negotiating position of the Swiss delegation in international negotiations (see Table 1). If this expertise is not available in Switzerland, the OcCC will need to ensure that such capacity is built, or in-source it through international partnerships.

The policy sciences and the discipline of public policy analysis, in particular, are not represented by the academic membership of the OcCC. Also, it appears that the non-voting Government members of the OcCC, if they have such specialized know-how regarding the tools and methods of policy analysis,¹³ have not chosen to apply it in the OcCC context.

Recognition of a basic policy analytical framework (Irwin, 2003, page 25), use of appropriate social science analytical methods (for instance, cost-benefit analysis, decision-tree analysis, simulations or models, vision exercises) and attention to the resulting quality of recommendations and assessment of their outcomes are tools of the public policy analysis discipline that have not been internalized by the OcCC. The organization is dominated by the natural sciences and thus operates under different norms, practices, ideas, and discourses (see, for example, the discussion of hybrid management in Miller (2001a, page 483)). This weakness has also been detected in the work of international hybrid organizations such as the Intergovernmental Panel on Climate Change (Mayda, 2000).

Since 2001, the National Center of Competence in Research 'Climate Variability, Predictability and Climate Risks' has stimulated economic research and modeling (in particular, integrated assessment of policy measures, analysis of financial and economic instruments, and implications of international economic instruments for domestic policy) that can deliver relevant scientific inputs for preparatory assessments and public policy analysis, resulting in recommendations regarding Swiss domestic and foreign policy.¹⁴ Yet the OcCC still suffers from the reality and the perception of a lack of a comprehensive social scientific basis for policy recommendations. As a result, organizations and individuals responsible for climate change (research) policy, and citizens who must often approve it, might not recognize the Body as competent in questions of domestic and foreign policy formation, and the Swiss

Government has no obligation to respond to OcCC recommendations or take them into account in the policy-making process, except in the normal course of formal consultation procedures.

Legitimacy is a question of perception and is generally higher in cases in which policy recommendations have been produced in such a way that divergent values and beliefs of involved stakeholders and decision-makers have been respected, and opposing views and interests duly acknowledged and treated in an unbiased way.

With respect to climate policy recommendations, the OcCC generally appears to have had greater influence in cases where its recommendations were backed by new, broad-based scientific assessments that it mandated to address current policy issues. This is because the legitimacy of the OcCC, which portrays itself, and is largely perceived, as a science-based advisory body, is derived almost exclusively from public trust in the scientific method to produce objective, or at least politically unbiased, inputs into the policy discussion (although even this trust can no longer be taken for granted). In other words, the OcCC must back up its positions with serious scientific assessments or policy analysis based on best professional practice; otherwise, the organization is just another interest group, whose claims have no particular legitimacy in the policy-making process.

The section on 'Saliency' pointed out that the focus of OcCC's work to date has been on preparatory advice. Given that the OcCC has also engaged in direct policy advocacy (for instance, its rejection of a proposal to reduce taxes on diesel), however, this emphasis does not appear to have been purely deliberate. Instead, there are signs that the OcCC implicitly embraces the scientific-philosophical positivist approach that there is a fundamental distinction between value-free science and value-driven policy, and that the OcCC, to remain accountable to its mainly natural science constituency on the science side, at least inadvertently demonstrates a preference for the more solid terrain of preparatory 'scientific' inputs.

Yet there is growing recognition of the need to "create institutions that draw on the multiple knowledges and perspectives of citizens without sacrificing reason and rigor" (Jasanoff, 2002, page 377). As a result, the positivist view in which science is defined as being context-insensitive (that is, monolithic, politically neutral, immune to cultural and historical conditioning), yet at the same time, policy prescriptive, is gradually giving way to a new philosophy of science that acknowledges the trans-scientific nature of many public policy issues.

This new perspective (Nowotny *et al*, 2002) recognizes that democratic interests can only be served if science is publicly transparent and accountable (Jasanoff, 2002), thus leading to calls for interactive consensus-based or 'deliberative' approaches to handling science in policy processes (Hajer, 2003). Were the OcCC to fully embrace this paradigm of a

new social contract between science and society (Nowotny *et al.*, 2001), it could have a profound impact on political decision-making, such as on the ability of different groups to exert power in decision-making processes.

In delivering its ‘science-based’ assessments and recommendations, however, the OcCC has tended to draw an artificially sharp boundary between science and other forms of knowledge and experience, and has relied on the ‘scientific’ nature (rational, objective, unequivocal) of its outputs as the primary justification for their policy relevance. In so doing, it has neglected to make transparent the inherent value judgments underlying its analyses, as well as to implement an institutionalized public validation mechanism. Thus the OcCC’s products generally do not constitute true boundary objects or hybrids, which would meld “normative/technical judgments so that they meet the epistemological and normative criteria of multiple expert, policy, and public audiences” (Miller, 2001a) (see Table 2), which may jeopardize their legitimacy beyond the narrow scientific community itself.

Whereas this section has highlighted some of the valuable contributions that various social science disciplines could make to strengthening the OcCC, the following section explores how relevant theory, with an emphasis on boundary organization and actor coalition theory, might be applied to enhance the ability of the Advisory Body on Climate Change Research and Policy to deliver effective policy advice that is salient, credible and legitimate.

Applying the relevant theory

In addition to theory development and empirical research in policy analysis and political decision-making, there are four principle ways that the scientific community can contribute directly to climate change decision-making, by:

- providing a sound scientific basis for policy decisions (research expertise);
- informing the public and decision-makers on climate change science and policy options (information, assessment);

- undertaking public policy analysis, resulting in advice to decision-makers or independent policy advocacy; and
- participating in collaborative decision-making processes.

To date, the role of the Swiss scientific community in shaping global change research policy or climate policy has scarcely been studied. The fourth pathway is particularly poorly developed in Switzerland (even though the direct democratic elements of the political system provide for (general) popular initiatives, formal consultative processes and mandatory and optional referenda on constitutional changes and federal acts or decrees) and has not been practiced with respect to climate change policy. The need to address calls for a new social contract between science and society in the Swiss context was highlighted above.

The other three, more traditional, functions have been divided between ProClim–, the Parliamentary Group on Climate Change, and the Advisory Body on Climate Change Research and Policy, as shown schematically in Figure 1. This section discusses the relationship between the functions of these bodies and theoretical constructs of science–policy interfaces and the role of science in decision-making (for an overview, see Table 2).

In general, ProClim– gives priority to relationships within the overarching social world of ‘scientific research’ (that is, integration of Swiss research in international programs; support for interdisciplinary collaboration and dialog) and to the necessary linkages among scientists, policy-makers and the public at home and abroad (that is, various public information vehicles; information exchange and dialog with decision-makers; advice for research policy; annual Global Change Days). The primary role played by the scientific community in the Parliamentary Group on Climate Change, which is non-partisan and regularly attracts law-makers from across the political spectrum, is to bring to the attention of decision-makers policy-relevant scientific developments (early warning function) or to present snapshot assessments of the state of scientific understanding of issues of relevance for political decision-making.

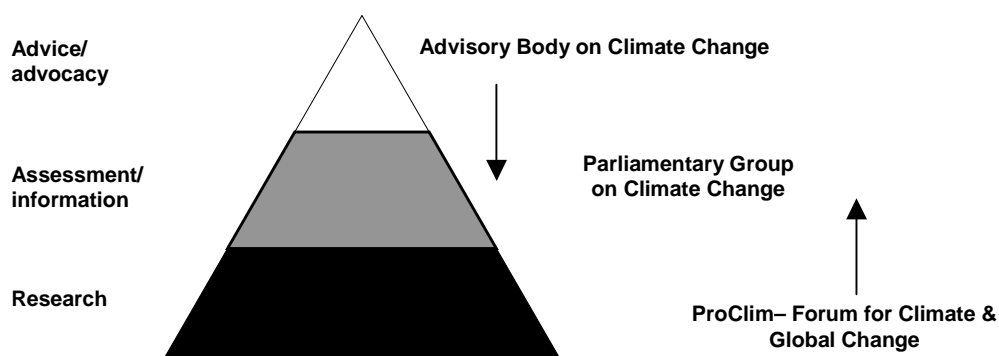


Figure 1. Modes of scientific influence on climate change policy and relevant Swiss institutions

The basic functions of both ProClim– and the Parliamentary Group on Climate Change are consistent with the somewhat outdated post-positivist empiricist model of ‘speaking truth to power’ (Table 2). They largely function as gateways (or firewalls) between the ideal realms of scientific fact and non-scientific political value judgment.¹⁵ In contrast, the OcCC must engage in boundary work to carry out its dual Government advisory/independent policy advocacy mandate successfully. The provision of scientific advice to policy-makers is a classic example of boundary work (Table 2), and social studies of science have found that the blurring of boundaries between science and policy can lead to more productive policy-making, but can also represent a risk to one or both social worlds (Guston, 2001).

The theoretical distinction between boundary organizations and the concept of independent intermediary agencies is helpful in understanding the nature and potential of the OcCC: whereas boundary organizations engage in the co-production of mutually instrumental boundary objects and standardized packages (Star and Griesemer, 1989), which augment the creation and transfer of usable knowledge, intermediary agencies, as the name implies, merely mediate between the social worlds of science and policy, with each maintaining its own rules, procedures and norms of accountability.

As discussed in the previous sections, perceptions of the salience, credibility and legitimacy of policy recommendations will determine their success in shaping policy outcomes. Boundary organizations increase the prospects for success by creating common rules, procedures and norms of accountability that serve to align perceptions with respect to these intermediate variables, in essence creating new social worlds at the boundary of science and policy. According to Miller (2001a, page 488), “hybrid management ... is the glue that links scientific, political, and other institutions together in modern political economies”, and it implies that boundary organizations must have the capacity to put scientific and political elements together (hybridization), take them apart to reveal the tacit and often value-laden assumptions embedded in their construction (deconstruction), establish and maintain boundaries among different forms of life (boundary work), and coordinate activities taking place in multiple domains (cross-domain orchestration).

In general, although the theory of boundary organizations would suggest that the OcCC’s membership (mix of scientists and decision-makers from the public and private sector) and mandate to provide science-based policy advice both position it well to perform hybrid management functions, the Body has for the most part refrained from engaging in such tasks, stressing the importance of delivering independent scientific advice, with an emphasis on the pre-policy-making phase. As a result, the OcCC is viewed by external actors primarily as an agent for early warning and delivery of scientific inputs,

Boundary organization theory suggests great potential for the Swiss Advisory Body on Climate Change Research and Policy to enhance its effectiveness by adopting a conscious strategy to place greater emphasis on boundary management functions

rather than of hybrid management and (deliberative) policy analysis. Yet boundary organization theory (Miller, 2001b; Cash *et al.*, 2003) suggests great potential for the OcCC to enhance its effectiveness by adopting a conscious strategy to place greater emphasis on boundary management functions.

Another instructive perspective from which to consider how the OcCC might better fulfill its mandate as a boundary organization is the advocacy coalition framework (ACF) (Sabatier, 1993; Sabatier and Jenkins-Smith, 1999). The ACF is one of the major network interpretations of the policy process (see Table 2), which emphasizes cognitive factors (beliefs, values) as drivers of policy change (and, conversely, sources of inertia). It has been applied to complex issue areas such as environmental protection.

A recent analysis of the Swiss CO₂ Law identified three actor coalitions in the climate policy subsystem: government, business and greens (Lehmann and Rieder, 2002). That the beliefs and values embodied in the government should demonstrate this level of consistency reflects the fact that, in contrast to many other multicultural societies, Swiss society is held together by a collective Swiss political-cultural heritage and a set of common values, which create a stable context for policy-making (Arquit Niederberger and Schwager, 2004). In fact, Switzerland, on the basis of its new Constitution, has chosen to frame its foreign policy priorities in global stewardship terms, not in terms of narrow national interest. Cognitive theories have thus been found to be quite relevant under the Swiss direct democratic system of consensual politics, perhaps even more so than power- or even interest-based theories (Arquit Niederberger and Schwager, 2004).

Under the ACF, individual researchers or social world(s) of scientists can assume one of three roles; they can:

- remain neutral and outside the primary actor coalitions (exerting no direct influence on the policy-making process);
- belong to one of the actor coalitions in the Swiss climate policy subsystem (that is, government, business or greens); or

- engage as neutral policy brokers in proactive efforts to bring about policy learning (Table 2).

Based on case study analysis, application of the policy broker label to the three Swiss science-policy interface institutions discussed in this paper¹⁶ appears to be inappropriate, as they have seldom performed an active mediation function among the policy coalitions; rather, they, for the most part, deliver scientific ‘facts’ (objective, rational, politically neutral body of knowledge that presents a single, coherent understanding of reality) to non-scientific end-users, relying on passive enlightenment, rather than active mediation to bring about policy change.

The Advisory Body on Climate Change Research and Policy has been mistakenly characterized as a mere ‘offshoot’ of ProClim— and a neutral policy broker under the ACF framework (Lehmann and Rieder, 2002). As documented earlier, the OcCC, in a number of cases, has advocated specific policies, which is inconsistent with the neutral policy broker role. Furthermore, the OcCC has not emphasized hybrid management tasks, some of which are complementary to those attributed to policy brokers, such as serving as an agent for policy-oriented learning across coalitions.

In practice, although the OcCC was conceived as a forum for networking among scientists, business and the legislative and executive branches of Government, the organization is structurally part of the Government coalition, and shares its core policy belief with respect to climate change policy, namely that there is a need for decisive Government intervention in markets (Lehmann and Rieder, 2002) to protect the climate system from dangerous changes driven by anthropogenic greenhouse gas emissions. The private-sector members of the OcCC are climate change risk experts from the financial services sector, the director of a business association for ecologically oriented management and an independent consultant linked to a public–private energy agency, none of whom represent the documented prevailing value system of the business coalition (that is, minimal government intervention and the primacy of economic competitiveness over environmental concerns (Lehmann and Rieder, 2002).

Thus, although the OcCC includes members from the private sector, the prevailing business coalition is not represented (and neither is the green coalition). For this reason, the ACF framework would suggest that the OcCC may find it difficult to be the mediator that it is mandated to be, even though its institutional space corresponds to the characteristics of a boundary organization. In the ACF framework, working with like-minded experts from the private sector within the government coalition is not the same as engaging the business coalition with its different core values. The membership of the OcCC does not ensure a full and equal engagement of all actor coalitions, which could be a barrier to effective policy recommendations that enjoy legitimacy across coalitions.

Furthermore, recent theory development has expanded on the original ACF framework by suggesting that not only beliefs, but also interdependencies, are an important factor in explaining changes in and between policy subsystems (Fenger and Klok, 2001). The OcCC is financially fully dependent on the Federal Government for core funding.¹⁷ The inherent tension between its broad mandate to deliver science-based opinions on climate change issues, on the one hand, and its financial dependency and cognitive convergence with the administration coalition, on the other, may help explain why the OcCC to date has never issued *ex ante* recommendations on the negotiating position of the Swiss delegation in the context of UNFCCC/Kyoto Protocol negotiations (see Table 1), nor undertaken (or performed independent assessments of) policy research to critique existing domestic and international policies (such as the Swiss CO₂ Law or the UN Kyoto process) and, on that basis, to make relevant climate policy recommendations.

As the ACF would predict, there is easy and strong coordination between the OcCC and the Swiss Administration within the Government coalition, but no significant policy learning. To achieve policy learning across coalitions, experts from each of the competing coalitions would have to be engaged in a process of “justifying positions and rethinking core beliefs” (Sabatier and Jenkins-Smith, 1993).

Both the ACF and boundary organization theory point to the importance of bringing about policy change of engaging actors with differing norms and belief systems to create new cognitive social worlds. It is increasingly recognized that, to be legitimate, “decision-making processes and their outcomes must meet the epistemological and normative criteria of multiple expert, policy, and public audiences” (Miller, 2001b). This has profound implications for the policy-making process and the role of organizations such as the OcCC in it, because successful hybrid management leads to new institutional rules, new norms of appropriate behavior and new conceptions of legitimate political intervention (Hajer, 2003).

There is no evidence of a conscious OcCC strategy to create a hybrid social world by developing standardized methods or creating boundary objects (see Star and Griesemer, 1989), for example, a common set of socio-economic scenarios for greenhouse gas emissions and marginal abatement cost curves to use as a basis for evaluating different policy options, or agreement on a target level or range of atmospheric concentrations of greenhouse gases below which dangerous anthropogenic interference with the climate system could be avoided. In other words, science is not directly implicated in the policy- and decision-making process.

The political context in which the OcCC functions shapes expectations of the role that science can/should play in policy-making. As indicated

previously, the traditional political context does not offer an institutionalized pathway for the OcCC to participate in decision-making, but it is precisely with respect to relatively new political issue areas, such as global climate change, that classical political institutions are poorly equipped to respond effectively. New political spaces demarcated by terms such as 'voluntary agreements' and 'public-private partnerships' are beginning to emerge; this may provide more promising entry points into decision-making for the OcCC.

Conclusion

Since 1992, a number of institutions have been established in Switzerland to serve as science-policy interfaces in the field of climate change. This analysis of the policy recommendations of the Advisory Body on Climate Change Research and Policy resulted in a number of general insights:

- Existing classical-modernist political institutions limit the role that the OcCC can play in the policy-making process, but the OcCC has yet to take advantage of emerging points of entry into politics created by new political spaces (Hajer, 2003), such as the voluntary agreements that are being negotiated within the framework of the Swiss CO₂ Act.¹⁸
 - In Switzerland, the science-policy interface is still largely regarded by both science and politics as a means of making objective scientific knowledge available to decision-makers ('speaking truth to power'). The potential for policy brokerage or hybrid management services to facilitate decision-making, which is the essence of sustainable development, is not yet widely appreciated.
 - For a number of reasons, the science-policy interface institutions generally serve as agents to provide preparatory scientific input into the policy-making process, rather than shaping and engaging in public policy analysis or decision-making processes.
 - The climate change (research) policy recommendations issued by the OcCC are generally not derived from systematic public policy analysis of alternative options that has been publicly validated, but represent policy preferences articulated by (predominantly natural) scientists on the basis of scientific assessments.
 - Examples of successful policy advice by the OcCC have been characterized by salience with respect to the political process, as well as favorable stakeholder perceptions of the credibility and legitimacy of the recommendations.
 - The OcCC could be more effective in shaping public policy choice, if it paid more attention to hybrid management/policy broker functions and opportunities for facilitating policy learning within and outside of traditional political institutions.
- Analyzing the Swiss science-policy interface institutions from the perspective of various theoretical frameworks for explaining decision-making processes and the role that science plays in them can provide practical insights for their improved focus, design and operation. Similarly, insights from the management sciences to improve strategic planning, management and evaluation could enhance the effectiveness of the OcCC, particularly if it strives to strengthen its hybrid management function.

Based on this analysis of the OcCC's first seven years of operation and given that its mandate must be renewed at the end of 2004, a thorough evaluation of its role in climate policy decision-making processes and its effectiveness from the perspective of both the Swiss Government and the Swiss scientific community might yield performance gains that would benefit both decision-makers and society. The seven case studies suggest that the OcCC must pay greater attention to the policy relevance of its initiatives, the academic underpinning for its public policy analysis and the importance of hybrid management tasks, if it is to improve its ability to deliver professional and effective policy advice that is salient, credible and legitimate.

Social science research regarding the role of, and the effective means for, science to contribute to the solution of societal problems (such as boundary organization theory, adoption of hybrid management, collective decision-making processes) could aid in improving science-policy interface institutions in Switzerland and abroad. The OcCC is well placed to develop its hybrid management function and to take on the crucial challenge of "coordination of democratic processes with the contributions, methods and challenges of the sciences" (Heineman *et al*, 2002, page 15), but greater integration of social science disciplines is needed to enhance the influence of the OcCC in decision-making processes.

Notes

1. The French acronym is used universally; it originates from the original name of the body, *Organe consultatif en matière de recherche sur le climat et les changements climatiques*.
2. With the establishment of the OcCC in 1996, numerous tasks and activities originally undertaken by ProClim— on an informal basis were formally mandated by the Government to the OcCC. In its role as Secretariat of the OcCC, however, ProClim— continues to execute many of these tasks at the request of the OcCC. Despite some ambiguity about the respective roles (as reflected in the two organizations' Annual Reports), the strong personnel union and shared office space and infrastructure ensure that duplication of effort is minimized.
3. The OcCC is not a purely scientific body: in addition to academic researchers, its membership includes experts from the private sector, a parliamentarian and 11 non-voting Government representatives.
4. The NCCR North-South (www.nccr-north-south.unibe.ch) focuses on international research cooperation and promotes high-quality disciplinary, interdisciplinary and transdisciplinary research with the aim of contributing to an improved

understanding of the status of different syndromes of global change, of the pressures these syndromes and their causes exert on different resources (human, natural, economic), and of the responses of different social groups and society as a whole.

5. Switzerland did indeed experience the anticipated flooding in May of 1999, as a result of heavy rainfall and increased snowmelt.
6. The report was based on an investigation initiated by the OcCC, which produced a preliminary background paper that served as the basis for in-depth discussions among some 80 experts from the private sector, research and Government during a two-day Workshop.
7. Switzerland did not ratify the Protocol until 9 July 2003, as the 111th party.
8. The European Union (EU) emission trading system (EU-ETS) is an absolute cap and trade system that is mandatory for installations in major emitting sectors, whereas the Swiss system is voluntary and based on relative targets established for companies or groups of companies. The EU and Swiss Government would have to negotiate linking arrangements.
9. As diesel engines are more efficient than gasoline engines, diesel cars emit less carbon dioxide per kilometer driven than cars that run on gasoline (even though, because of its lower energy density, gasoline emits less carbon dioxide per liter).
10. The function served by preparatory advice has also been referred to as "enlightenment", as opposed to the more direct problem-solving associated with policy analysis (Weiss, 1979, page 429).
11. As pointed out by MacRae and Whittington (1997, page 28), preparatory advice differs from public policy analysis in that it does not guarantee finding the best policies and risks being less relevant to policy choice.
12. In fact, in establishing the OcCC, a conscious strategy to keep the Body out of the day-to-day business of the federal agencies and Parliament was adopted (Ritz, 2004).
13. See, for example, MacRae and Whittington (1997).
14. For further information on NCCR Climate Work Package 4 "Climate Risk Assessment", see <<http://ecolu-info.unige.ch/~nccrwp4/index.htm>>, last accessed 6 December 2004.
15. There are some notable exceptions, but space does not permit their treatment in this paper.
16. According to Sabatier, policy brokers seek to maintain the level of political conflict within acceptable limits in order to reach a reasonable solution to the problem in question. Such actors participate in policy subsystems to offer their special expertise, but are neutral with respect to the policy dispute among the actor coalitions (Sabatier, 1993, page 129; 1999, page 122). Lehmann and Rieder (2002) referred to ProClim-, the Parliamentary Group on Climate Change, and the Advisory Body on Climate Change Research and Policy all as policy brokers.
17. With the exception of reserves carried over from 2002 (CHF 15,000), the entire 2003 Budget of the OcCC (CHF 315,000) was based on contributions from the Swiss Agency for Environment, Forests and Landscape (OcCC, 2003a) (in 2002, US\$ 1 = CHF 1.6; in 2003, US\$ 1 = CHF 1.3).
18. An example is the recent proposal by the Swiss private sector to establish a voluntary Climate Penny Fund: Although this proposal opened the door for the OcCC to engage in policy analysis and hybrid management to create appropriate criteria, methods and measures, it chose not to engage with the business coalition. Instead, it issued a critique of the plan, consistent with the prevailing view of the Government coalition with which it is associated. In the end, the business coalition was able to take advantage of compelling factors external to the climate policy subsystem to bring about a major policy shift to make significant reliance on the Kyoto mechanisms a "politically correct" option (Arquit Niederberger, in preparation).

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