

February 10, 2018

2017 Report of the Bolin Centre External Science Advisory Group

R. T. Pierrehumbert (Chair), D. Chen, E. Jansen, K. Kohfeld,
A. Lindroth, C. Parmesan, A. Rinaldo

1. Overview

The External Science Advisory Group (ESAG) attended the Bolin Days presentations on 22-23 November, 2017, and presented some of their own work in a series of brief lectures on 23 November. Two important novel features of the Bolin Days this year were presentations covering selected research by the former Ekoklim group after its first year of operation as part of the Bolin Centre, and presentations by representatives of the Human Sciences Academic Areas. The ESAG met on 24 November to discuss findings and recommendations; Prof. Nina Kirchner was present ex-officio for a portion of these discussions. All members of ESAG were present at the Bolin Days and at the ESAG meeting. Findings and recommendations were conveyed verbally by the ESAG Chair to the Bolin Centre Directorate and representatives of the Science Advisory Group. A summary of findings and recommendations is provided below. One member of the ESAG (C. Parmesan) dissented from some of these findings and recommendations; her comments are provided in Appendix A.

2. Core Bolin Centre areas of strength

To a large extent, the core areas of strength in the Bolin Centre mirror the research interests of Bert Bolin, which includes all crucial aspects of the terrestrial and marine carbon cycle. This enterprise is greatly enriched by the historical and continuing strength of MISU in cloud and aerosol physics. The common feature of these research areas is that they all engage processes with a global impact. The research presentations in these areas (RA 1,2,4 5 and 6) were uniformly impressive. It is essential to preserve these core areas of strength, and nurture their future development.

Hydrology is an extremely important subject, particularly from the standpoint of human impacts of climate change. However, the presentations on hydrology appeared to us to be less scientifically impressive than the state of the art could support. This remark does not apply to the presentation on the cryosphere, which was very much of the same high calibre as the RA 1,2,4 5 and 6 presentations. Cryospheric work (with the possible exception of work on snow cover) does not sit naturally in RA3. The presentations on hydrology suggested to us that opportunities for integration and cross-fertilization of research ideas are being missed because of the isolation of hydrology in its unique section. It is our understanding, however, that the leadership of RA3 has only recently changed, and that the new practices they have established have not yet had time to show their impact; it is to be hoped that under the guidance of the new leadership, the quality of the work in hydrology in the Bolin Centre will come up to the standard of the best the field has to offer.

Recommendation: We recommend that cryospheric research be moved to RA1 and that the name of RA1 be changed to refer to “ocean-atmosphere-cryosphere.” It would also be possible to group cryospheric research with Deep Time (RA 6), but insofar as cryospheric research is pertinent to present and future climate, as well as deep time, it sits more appropriately in RA1.

3. Challenges: Integration of Ekoklim research

Ekoklim originated as a separate research centre, with goals of its own distinct from the Bolin Centre, but was merged into the Bolin Centre approximately one year ago, where it functions as research streams RA 8 (Biodiversity and Climate) and RA 7 (Landscape Processes and Climate). It is the understanding of ESAG that this was done in response to a cut in government funding for the two centers together by an amount approximately equal to the funding of Ekoklim, though some of the original Ekoklim funding is maintained during a transitional period. This will eventually put the Bolin Centre in the position of attempting to do the work of the original Bolin Centre plus the work of Ekoklim, under the same funding level of the original Bolin Centre alone. This is not a sustainable situation, and barring the identification of additional sources of funds, some type of adjustment will need to be made in the next few years.

The impact of climate change on ecosystems, and the way changing ecosystems in turn feed back on the climate system, is an important and challenging part of understanding the human imprint on our future environment. A general strong suit of the Ekoklim presentations

is that the presenters were very successful in communicating their research to a non-specialist audience. Some aspects of Ekoklim research have the potential to fit very naturally into the generally global focus of the problems treated by the original Bolin Centre. The presentation in RA 7 on “blue carbon” is an example of work with such potential, and the work on effect of land use change on tree growth (RA 8), while less sweeping in its implications, can usefully inform the sort of dendroclimatology studies traditionally done in RA5, though in both cases work needs to be done to scale beyond the present regional focus and improve the quantitative characterization of the results. Other work done as part of Ekoklim, however, particularly the remaining RA7 presentations, tend to focus on climate effects on the microcosm. This makes for fascinating and even important science, but it is difficult to scale from these individual narratives to the bigger picture of how climate affects global ecosystems. To be sure, there is the chance that by putting together enough narratives of the microcosm, it may be possible to build up to a more global picture, but it is not clear that the Ekoklim researchers are headed in that direction, or that it is one of their priorities.

The challenge going forward is to determine how Ekoklim research can evolve in a direction where it can profit more from the synergy of being embedded in the Bolin Centre, and where it can have more productive interactions with RA 1-6. We make no specific recommendations at this point as to how the desired evolution is to be fostered, except to caution that dividing up funding so as to maintain all existing research themes in RA 1-8 is not a recipe for success, and some decisions about how to best deploy resources across all the disciplines involved will need to be made.

Recommendation: There needs to be a common strategic planning initiative in which the above-mentioned issues of integration are discussed. The Centre's recent effort to promote this integration through integrated funding calls is a step in the right direction. This type of effort helps to identify which researchers are genuinely interested in working towards the common goals of the Bolin Centre.

4. Challenges: Collaboration with Human Science Academic Area

The ESAG had concerns about the quality of the engagement of the representatives of the Human Science Academic Area with the work going on in the Bolin Centre. The talks drew almost not at all on any scientific insights from Bolin Centre research, and indeed showed very little awareness of basic climate physics. It was symptomatic that the speakers

in the Human Science Academic Area came in just for the presentations of their own group, and were not in evidence for the rest of the Bolin Days presentations. A great deal more will need to be done to create a collaboration that produces meaningful interdisciplinary research at the intersection between human and climate science.

There are deep opportunities for cross-fertilization between hard-science aspects of the climate problem and areas of the humanities and social sciences such as moral philosophy, ethics, literature, political science and economics. Engaging with the visual arts as a means to communicate the meaning of scientific results is also a potentially fruitful avenue to pursue. We found it strange that the presentations did not include any representation of Economics, as this provides one of the most fruitful and proven avenues for collaboration; the Stockholm Universitet Economics Department has a small but world-leading program in climate economics, with a proven track-record of fruitful collaborations with Bolin Centre scientists, and indeed is a world leader among economics departments in taking physical science seriously in economic modeling. There are good opportunities for constructive engagement with political science, in that political scientists in principle, provide the bridge between what scientists know needs to be done and what policies could cause that to happen, and conversely provide the expertise to analyze the physical consequences of various proposed policies (e.g. on how to price methane vs carbon dioxide emissions). The talk by Andreas Duit on The Environmental State seemed promising to us, as it contained quantitative analysis of what kinds of policies are actually enacted, which in turn provides Bolin Centre scientists with some indication of what message is getting through to policymakers.

Moving to a related matter, the ESAG is well aware of some of the controversy surrounding some of the efforts of the Stockholm Resilience Centre, but this centre does have a track record in constructive engagement between physical and ecological sciences and the social sciences. The ESAG is of the opinion that it would be worthwhile exploring the possibility that the activities of the Resilience Centre could be leveraged to contribute to ideas for productive collaborations involving Bolin Centre researchers and the social sciences.

5. General recommendations

The ESAG makes the following general recommendations:

- It is important to have a plan for leadership succession, and appointment of an interim co-leader would smooth the transition to the new leadership. The Science Advisory Group should have a role (at least consultative) in the designation of the new leader, as should the ESAG.

- The focus of the Bolin Centre should be kept on fundamental scientific research having a bearing on climate, and it is important to avoid diluting the efforts of the Centre by attempting to pursue research in too many areas. This may require some difficult decisions regarding the most promising areas to support in the future. Strategic merging of RA's , rather than creating new ones, may be a way to avoid fragmentation of Bolin Centre core research.

- Leveraging of Bolin Centre funding by external grants, including ERC grants, should be vigorously pursued. In particular, efforts to improve the success rate of ERC proposals need to be put in place. Foundation support, e.g. through the Wallenberg Foundation, is also a promising source of additional funds. To improve success rates, it is likely that Bolin Centre researchers will need to be given release time from teaching and administrative duties when writing large proposals. More generally, the ESAG is concerned that the reversion of the teaching load of Bolin Centre faculty to the very taxing Stockholms Universitet norms will make it hard to maintain the historically high research excellence and productivity of the Bolin Centre. Given financial realities, it is likely that the only way to address this threat is to increase the amount of grant funding available for teaching buy-outs.

- Core funding of the Bolin Centre from Swedish government sources is assured through 2020, but a plan needs to be made for sustaining the Centre thereafter. It is to be hoped that continued excellence of the Centre will be recognized and will merit extension of the present funding regime, but beyond that, there is much Bolin Centre research that could be Funded through the EU's Horizon 2020 program. This applies particularly to the Horizon 2020 themes on building a low carbon sustainable future. The Bolin Centre is also well positioned to take advantage of funding calls on impacts of climate change (including cryospheric effects); with improvements in collaborations with the Human Sciences area could potentially be positioned to win funding in areas that engage sociology, political science and economics.

- The targeted workshops funded by the Bolin Centre have been highly successful. They have led to prominent publications, fruitful collaborations with other institutions, and have generally helped to increase the international reputation of the Bolin Centre.

- More could be done to exploit the advantages of developing and deploying a shared modeling infrastructure that could serve the needs of multiple RA streams within the Centre, and foster deeper collaborations amongst them. For global climate modeling EC-

Earth is beginning to become a very valuable tool. The database infrastructure is a good start, but should be expanded to include archives of significant climate model simulations. A similar support infrastructure is needed to assist users with shared models (or modeling toolkits) that could advance their research goals. New climate simulations, or downscaling of existing simulations, could potentially assist Ekoklim research themes RA 7 and RA 8, and deepen collaborations between these researchers and the rest of the Bolin Centre.

- Some ESAG members have suggested that it is worth considering the establishment of special “focus regions” (e.g. the Arctic) or “focus themes” (e.g. Carbon and Climate), singled out for more intensive study and funding. These could be changed on a 3 or 5 year rotation. Alternatively, a few “Flagship Projects” could be designated from time to time.

6. Desiderata for 2018 Bolin Days

While attendance at the Bolin Days was generally good, there was a general tendency of participants to drop in just for the portion of the presentations engaging their particular interests, rather than staying for all presentations. This is no doubt due, in part, to the normal demands of an academic life (teaching, committee meetings, grant deadlines), but it would be highly desirable to find a way to encourage more of the Bolin Center members to attend the Bolin Days in their entirety. This may involve rescheduling competing demands on participants’ time. The suggestion was floated on having the Bolin Days “away” at a conference venue, but such a move would not only be expensive, it would likely reduce participation from those who are not in a position to be away from home overnight.

We appreciate the attempts by the Bolin Centre executive to minimize the administrative burden on researchers. A more "top-down" administrative approach, e.g. reserving or dedicating some of the funds to promote specific strategic directions within or between groups (e.g. topic integration calls, focus groups, or targeted areas) - could be beneficial going forward.

The ESAG is of mixed opinion about the benefits of including overview material in the Bolin Days presentation, going over organizational matters, funding issues and so forth. Some of us found that material useful, while others found it an annoying distraction from the science, but it is generally agreed that such material, if presented, should not make up more than a minor part (10 minutes or so) of the RA group’s presentation. Several ESAG members also suggested the inclusion of an annual report for the ESAG to free up time to focus on scientific advances. There was also a general sentiment that some of the RA group

presentations could do better at highlighting just the few most important accomplishments of the year, as opposed to trying to give a comprehensive overview of everything that is going on.

As a parting word, the ESAG is unanimously of the opinion that the Ceilidh is a marvelous way to celebrate the year's accomplishments, and is a tradition that should be preserved going forward. At least one ESAG member believes the Ceilidh would be enriched by expanding its scope to include a bit of the Nordic repertoire (polska, schottish, jenka, and minor-key waltzes) .

Appendix A: Dissent by C. Parmesan

I wish to voice my dissent on the 2018 ESAG report to the Bolin Center. The overall tone of the original draft was very negative about the recent incorporation of Ekoklim into the Bolin Center.

In response to comments made by the ESAG, the final draft was somewhat modified, but I still found the tone applied to the Ekoklim research to be too negative and too strongly oriented towards ecosystem-level questions and too unappreciative of the presented ecological work conducted at the population or community levels. I voiced my concerns about the 2nd draft, but was unable to get further changes made, even though there was time for revision. I'm assuming the last draft I saw was indeed sent to you, and my comments below are based on what we were sent as the "final" draft.

First, I want to emphasize how impressed I was with the research presented by the former Ekoklim groups (RA7 and RA8). Much of the research was of a quality that would be publishable in top-ranked international journals (perhaps already is), and the presentations were well-developed and clear to a diverse, interdisciplinary audience. It is notable that the first place in the poster awards was from research out of these two groups.

The report as now worded misunderstands what the bulk of ecologists do. It emphasizes the need for ecosystem-level research, which is more the realm of biogeochemistry (*e.g.* carbon-cycling and carbon budgets) than of organismal biology (*e.g.* biodiversity). It is my impression that ecosystem research is outside the expertise of most (all?) biologists at Univ. of Stockholm. Conversely, the report was unappreciative of the powerhouse of ecological work being done out of Ekoklim, and now Bolin Center, and conducted at the population and community levels - levels at which most ecologists work. The report refers to such research in a derogatory manner, suggesting all such work is only at the "microcosm" scale. This is incorrect.

Working at the species level is fundamental to ecological work, even if the questions are about community level responses or watershed-scale responses. There are many ways of linking species-level work (a more correct term than "microcosm") to other scales (such as community-level processes, or regional processes). I agree that we should encourage better integration among disciplines, but saying that biologists should, then, not work at the species-level is inappropriate and unhelpful.

That being said, it is useful to note that there are some recent efforts to connect population and community processes with ecosystem processes (*e.g.* some of the recent papers by Michel Loreau and colleagues). But note that the fundamental unit in this growing body of research is still the individual species, and the fundamental questions are still centered on impacts at the species level - *e.g.* on biodiversity resilience and stability - and on how species resilience or turnover may connect to ecosystem process stability.

For future research, I agree with the report that the Bolin Center should encourage greater integration of species-level work into the understanding of other scales, such as community responses to climate change, landscape processes, ecosystem processes and resilience at all scales to global change (human) drivers. The specific recommendation that is in the report is to integrating diverse projects at the watershed scale. I agree that such coordinated research by different RAs will help to achieve these connections among organismal levels of study.