

# **Start-up Review of the Stockholm Resilience Centre**

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## **1 Background**

This document presents the results of the Start-up Review of the Stockholm Resilience Centre. The review was commissioned by Mistra, the Swedish Foundation for Strategic Environmental Research. It was performed by Prof. William Clark of Harvard University.

The Stockholm Resilience Centre (SRC) was established on 1 January 2007. It is a joint initiative between Stockholm University, the Stockholm Environment Institute and the Beijer International Institute of Ecological Economics at The Royal Swedish Academy of Sciences.<sup>1</sup> Core funding for the Centre is provided by Mistra, with the aim *“to create a world-leading transdisciplinary research centre that advances the understanding of complex social-ecological systems and generates new and elaborated insights and means for the development of management and governance practices. The centre will advise policymakers from all over the world, and develop innovative collaboration with relevant actors on local social-ecological systems to the global policy arena.”* Mistra has committed approximately 10 million Euros to the Centre, distributed over a period of 7 years. It has allocated approximately 3.5 million Euros for a three year start-up phase (2007-2009), and the remainder for the coming four years (2010-2013). After that, a thorough evaluation will be conducted by Mistra to determine whether the grant should be continued. The Centre’s current budget from all sources is about 5 million Euros, which supports a staff of 55 full-time equivalent positions.

The agreement between Mistra and the Stockholm Resilience Centre stated that a forward looking evaluation of the Centre should be performed by Mistra in 2009. Mistra and SRC subsequently agreed that the evaluation should be formative in nature, serving to inform the Centre’s action plan for the next phase (2010-2013). Mistra’s terms of reference for the evaluation<sup>2</sup> specify that it should review progress relative to the *“overarching strategic purpose – the vision and mission – of the Centre: to conduct interdisciplinary and internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems.”* In addition, the evaluation *“should have an emphasis on organisational aspects of the Centre, but also review the general scientific orientation, goals and conditions specified in the agreement.”* Finally, *“the evaluation shall specifically review the requirements to build a critical mass in social sciences and the humanities as well as natural sciences, and that these areas of sciences create a new, joint scientific foundation.”* In summary, the intention of this review is to evaluate SRC after its two year start-up in order i) to determine whether it is “on track” to fulfil its long term mission, and ii) to identify the most important changes in organization and approach that should be given serious attention in its Strategic Plan for 2010-2013 to help the Centre transition from start-up to fully operational mode.

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<sup>1</sup> The Centre for Transdisciplinary Environmental Research (CTM) at Stockholm University and The Baltic Nest Institute (former MARE) are also parts of the Stockholm Resilience Centre.

<sup>2</sup> See “Start-up Review of Stockholm Resilience Centre” and “Appendix 1 to Research Centre Agreement Stockholm Resilience Centre.” Copies are provided as Annex 1 and Annex 2 to this report.

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The present review was carried out by me, William Clark of Harvard University, during July 2009. I used a strategy for the review developed through my earlier efforts reviewing somewhat analogous efforts by the Tyndall Centre in the UK and programs of the Consultative Group on International Agricultural Research. I also took advantage of evaluation insights gained through my participation on the scientific boards of the Potsdam Institute, the International Institute for Applied Systems Analysis and the Global Institute of Sustainability at Arizona State University.

Inputs to this review included:

- a self-evaluation by the Stockholm Resilience Centre in response to written questions I posed to them<sup>3</sup>;
- relevant administrative documents provided by Mistra and SRC, including Mistra's original call for proposals, Research Centre Agreement and SRC's Annual Reports and Board Meeting minutes;
- prior reviews relevant to this evaluation, including the Tompkins "Review of interdisciplinary environmental centres of excellence", reviews conducted of the finalist proposals submitted in response to Mistra's call for proposals; the FORMAS review of the Centre's Formel-Exc grant; and the Bostrom "Review of leadership in the SRC";
- several dozen scientific papers, books, and other professional documents produced by SRC staff and collaborators, together with the 40 "best papers" by SRC staff selected by SRC leadership;
- my own comparative analysis, using standard electronic databases, of publication patterns and rates of SRC and other institutions involved in similar research;<sup>4</sup>
- a 10 day visit to Stockholm during which I was given a power-point briefing entitled "Science evaluation of the SRC" by the SRC co-directors; met with key leaders of Mistra, SRC and its partners, and conducted round-table discussions of two groups of SRC research staff. During the visit, I also interviewed – in person or by telephone - 34 individuals including SRC leadership, board members and staff; and a cross-section of outside scholars and policy users jointly selected by me and the SRC leadership.<sup>5</sup>

A draft version of my review was circulated to Mistra and SRC in early August to provide an opportunity for clarifications or elaborations. One request for elaboration was received and has been incorporated in this final version, submitted to Mistra on September 8, 2009. .

The body of this review is organized along the lines of the charge and Terms of Reference from Mistra. I begin with my overall assessment of the extent to which the Centre's start up phase has put it "on track" to fulfill its mission and long run goals. I turn next to a consideration of organizational issues, focusing on challenge of transitioning to a fully operational program. The third section deals with the strategic research orientation of the Centre. A final section addresses the question of evaluation itself, with a goal of helping the Centre and Mistra to plan proactively for the full

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<sup>3</sup> A copy of the self-evaluation is included as Annex 3 to this review.

<sup>4</sup> Summary statistics from this analysis are included as Annex 4 to this review.

<sup>5</sup> A list of the names and affiliations of those interviewed is included as Annex 5 to this review.

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evaluation of SRC due in 2013. I have not attempted to address every item in the Research Centre Agreement referred to in the Terms of Reference for this review. Rather, I have focused on areas where there appeared to have been a substantial investment of effort over the first two years of the program, or a substantial concern on the part of Mistra or the SRC stakeholders that the question be addressed. In particular, with regard to the organization of relations with faculties, appointments and teaching programs at Stockholm University, I am convinced that the most useful thing the a foreigner can do is remain silent.

In each section of this review, I have distinguished between “Findings” (identified with sequential numbers) and “Recommendations” (identified with sequential letters). The “Findings” are the result of my effort to distill data from the many sources listed above in response to principal questions and concerns posed by Mistra and SRC leaders at the outset of the review. These findings are meant to be objective expressions of broad tendencies that transcend the opinions of single individuals, the thrust of individual program element, or the thrust of particular publications or events. I believe that they would be reasonably robust to a choice of different people to interview, different documents to inspect, different counting procedures, and perhaps even to the choice of me as reviewer. They are of course subject to refutation or amendment in response to significant evidence that I have missed. My hope is that Mistra and SRC will take them as likely approximations of reality that need to be taken into account as the Centre experiment moves forward into its operational stage.

My “Recommendations,” on the other hand, are somewhat more idiosyncratic. And although I have drawn on many good suggestions I have heard from SRC staff and leadership, the Board, and my interviewees, the recommendations certainly reflect my own biases on possible ways to address the challenges and opportunities identified in the “Findings.” I certainly hope that they will be helpful. But I am fully aware that other reviewers would have come up with other recommendations, and that no outside reviewer can be fully sensitive to all the elements of local context that should surely come to bear on ultimate decisions of what SRC should do next. Because I actually believe in the complex adaptive system perspectives that are so central to the Centre’s approach, I urge that my Recommendations be treated not as a misguided effort at top down management, but rather as a well meaning attempt to introduce some exogenous diversity into the range of options considered by the Centre and its friends as they adaptively navigate their transition into what will surely be a most interesting future.

I am deeply appreciative of the opportunity provided by Mistra to learn more about the unique and innovative approach that organization is taking to promoting useful research in support of sustainable development, to SRC for providing such an exciting guinea pig for me to study, and to the leaders, scientists and staff of both organizations for making my work on the review not only painless but a true pleasure.

## **2 Is SRC on track to achieve its strategic purpose?**

Mistra asked that this Start-up Review evaluate SRC's progress relative to the "overarching strategic purpose – the vision and mission – of the Centre: to conduct interdisciplinary and internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems."

**Finding 1: The Stockholm Resilience Centre has emerged as a world leader in the conduct of interdisciplinary research on the dynamics of inter-connected social-ecological systems. To have achieved this barely two years after its inauguration is a remarkable accomplishment indeed.**

The Centre is producing as much or more high quality research as any other institution engaged in the study of social-ecological systems, broadly defined. Within this arena, it has become one of the top places in the world with which leading researchers want to collaborate and to which they wish to send their best young graduates.

Measured by publications, my analysis shows that over the last several years, the institutions publishing the largest number of papers in the broad area of social-ecological systems, human-environment systems, sustainability science, and resilience are based at SRC, James Cook Univ., Arizona State Univ., Univ. Oxford, Univ. Wisconsin Univ. of British Columbia and CSIRO. Depending on the metrics used, SRC is at the top of the list, or one of the top 3 institutions. In quality terms, SRC has placed an impressive number of articles in the highest impact journals in the field (*Science, Nature, PNAS*), and in the journals that are the top choices for work by others in the field (e.g. *Ecology and Society, PNAS, Ecological Economics, and Global Environmental Change*). SRC researchers are clearly in demand as contributors to books, special issues of journals, and conferences organized by other leaders in the field.

Measured by recruitment success in the global market, SRC has made notable progress in attracting exciting new staff at the professorial (e.g. Crumley and Peterson), affiliate (e.g. Steffen) and post-doctoral (e.g. Biggs) levels.

Measured by convening power, the Centre's *Resilience 2008 Conference* brought together a substantial fraction of the world leaders in the field, and was referred to by several senior scholars I contacted as one of the most exciting research conferences they could remember. The SRC's convening power is also reflected in the forthcoming (and soon to be legendary) *Nature* paper on "Planetary boundaries: Exploring safe operating space for humanity." The co-authors of this paper include a Nobel Laureate, directors of most of SRC's top competitor institutions, and sundry luminaries from the natural and social science... in short, people that any scientist would be proud to have as collaborators. Several of them that I contacted readily acknowledged the leading role played by first author Johan Rockstrom and other SRC scientists in conceiving and drafting this paper. I heard similar stories about other collaborative efforts driven by the Centre.

**Finding 2: The Centre has also contributed to important policy discussions on sustainable management of social-ecological systems. It is too early to expect significant impacts from these contributions, though the increasing demand by**

**policy people for decision support from the Centre suggests that its work is viewed as being potentially useful. The Centre has not, however, yet emerged as a world leader in developing and testing new ways of linking research to action in support of sustainability.**

This is a frankly problematical finding. The first reason is simply that meaningful evaluations of real-world impacts from fundamental research are notoriously hard to do. I will turn to this problem of impact evaluation in Finding 11 and Recommendation J on evaluation in general at the end of this report. For the moment, the policy people I interviewed had generally good things to say about what they were getting from SRC. The most common complaint was that they, the policy people, wanted more help from the Centre than the Centre could provide. The long list of policy engagements provided to this review by SRC in its Annual Reports and Self Evaluation surely demonstrates that the policy world is interested in hearing from the Centre and its researchers. It is less clear that the Centre has a strategy for deciding which opportunities to engage with the policy world should be given highest priority. The Centre's somewhat opportunistic approach to picking its policy engagements has probably served it well during its start up phase, giving it exposure to a range of policy makers and arenas. It is not clear, however, that this approach will suffice for the operational stage into which the Centre is now moving. I return to this issue below at Finding 5.

A second problem is that the formulation of the "impact" goal in the founding agreement between Mistra and SRC is at best ambiguous and at worst simply muddled. I address the general need for clarifying the Centre's mission and goal statements below in Finding 3. But the goal that SRC has been working with through its start up phase is to "*generate new and in-depth insights for the development of decision-making systems that support long-term sustainable management of social and ecological systems at different scale levels...*" The most direct reading of this text suggests that the goal could be satisfied simply through excellent research on SRC's Themes 4 and 5 ("Knowledge management, learning and social networks" and "Multilevel institutions and adaptive governance"). A more ambitious reading is also possible, however. And my discussions with Mistra, together with my reading of both their call for proposals and their broader document "Applying for funding for research..." suggest that rather more may be wanted than SRC is presently providing. In particular, Mistra's statements outside of the "Agreement..." with SRC consistently refer to their intention to support "collaboration between researchers and users," "close dialogue with practitioners," that "researchers and the intended users need to work together," and that "programmes are planned in collaboration with the user communities envisioned."<sup>6</sup> Mistra's statements quoted above suggest that it believes in the importance of supporting "Mode 2" knowledge production as articulated by Gibbons, Nowotny and others. Reading the goal statement in Mistra's Agreement with SRC in light of these intentions suggests that, at a minimum, Mistra might expect SRC to be developing a plan or model of its own on what it expects to result from its researcher-user dialogues, who the dialogues should be with, and how they can most effectively be carried out. More ambitiously, Mistra might be expecting SRC to study what makes some dialogue efforts more effective than others, thus contributing to

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<sup>6</sup> All quotes are from Mistra's document "Applying for funding for research in support of sustainable development." (nd).

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basic knowledge about how to bridge more effectively the science-policy divide. I find little evidence that SRC has given such tasks high priority.

**Recommendation A: SRC and Mistra should clarify the present ambiguity over what kinds of results are expected from their agreed goal that the Centre should “generate new and in-depth insights for the development of decision-making systems.” My own recommendation is for a resolution that positions SRC to become a world leader in the experimental determination of which sorts of researcher – practitioner dialogues best promote the discovery and utilization of knowledge that fosters sustainable development.**

The clarification is necessary to avoid misalignments of what SRC on the one hand and Mistra on the other think that the Centre will be responsible for at the time of its 2013 review. My recommendation that SRC approach the clarification aggressively by experimenting with alternative approaches to its dialogue with decision makers is because the need for such research exists, and SRC is well placed to fill it with critically assessed understanding. The most exciting suggestion on how to this that I encountered in my interviews is for some sort of “Aspen-like” forum that SRC would develop as (one of) its signature products. The approach that resonated most with the scientists and decision makers I interviewed would aim to design some kind of small, elite, periodic off-the-record round table on selective issues of urgent concern to policy makers to which SRC could bring world class expertise. What would make these unique would be a determination by SRC – as a connoisseur of complex adaptive systems -- to introduce variety into the design of its forums, and to develop empirical protocols for selecting the which designs work best under what conditions.

**Finding 3: The distinctive niche in which the Centre wants to exercise its leadership and thus secure its preeminence remains unclear due to wide-spread confusion over its vision, mission and goals.**

During its start-up, SRC has been welcomed in the global community of researchers doing work on sustainability due to the reputation of its leaders and the ambiguity of its name. This will not last. Many of the people I talked to in both the research and policy worlds are anxious for the Centre to clarify what it is going to be the world’s leader in... But rather than the desired clarity, I found significant differences in perceptions of SRC’s strategic purpose and mission among Mistra, the Centre’s leadership, its Board, the research staff, and key stakeholders in the outside worlds of research and policy. Key loci of confusion involve the place in the mission and goals of policy engagement, of “sustainable development,” of “resilience,” and of the relationship of the Centre with Stockholm University. Key causes are complexity of the message, inconsistency in how the message is expressed in the Centre’s materials, and the simple absence or invisibility of the message in key outreach media such as the Centre’s Annual Report and Web site. This confusion is particularly unfortunate in that the first “critical feature” of success identified in the Tompkins report for Mistra (on interdisciplinary environmental science Centres of excellence) was “*a unifying purpose... a strong mission and clearly stated core values... frequently used and expressed.*” The lack of clarity and consistency regarding the vision, mission and goals are potentially damaging at all levels,

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from the conduct of external review to the allocation of the leadership's time, to confusion of research staff over how they are supposed to allocate their effort between research and policy outreach.

### **Recommendation B: SRC should use the transition from its start-up phase i) to reformulate a powerful and succinct statement of its vision, mission, and goals, and ii) to design and implement a strategy for consistent promulgation of that statement.**

The Centre needs better to define itself. The language of its vision, mission and goals needs to be simpler and more succinct than is now used. The new text clearly needs to be consistent with the Centre's mandate from Mistra, the vision of its leaders, and the needs of its partners. But if the Centre is to sustain its emergent leadership position, the mission language also needs to resonate with the world beyond proponents of resilience and the MEA. The objective of the reformulation should be to tell the world what SRC is going to be the best at, and how SRC is going to achieve that goal. This statement needs to be simple enough that everyone associated with SRC can (and will) remember and repeat it with minimal variation. The amalgam of vision and mission statements I encountered in this review seems to have been assembled by a committee or consultant with little view of their purpose in mind. What exists now seems the result of an effort to please everyone by inserting favorite words or paragraphs wherever they could be fit within the texts. Fixing this is not a task that can be staffed out. Centre leadership and Mistra leadership should sit down in a small room with a small piece of paper and emerge only when they have constructed the clearest and most succinct message they can produce. Were I doing this, I would start with some of the language in Mistra's "Applying for funding for research in support of sustainable development" and in the SRCs "Research framework." But wherever the Centre starts with this process, it should think clearly about audience. For example, the target for the vision statement (society and policy makers?) is almost certainly different from that for the mission and goal statements (the staff being recruited and doing the work?). Once a clear and succinct statement has been drafted, SRC should test the statement on a couple of key target audiences, see what it actually conveys, and revise as necessary until what is being heard is the same as what is being said. The result then needs to be stabilized – not locked in stone, to be sure, but also not allowed to randomly mutate into different versions suiting particular individuals but confusing and diluting the idea of a Centre that is more than the sum of its parts. (In words the Centre has used in other contexts, beware the poverty trap...)

As these vision and mission statements are being reformulated, the Centre needs to be developing and implementing a strategy for consistently communicating them to its multiple stakeholders (including research staff). This strategy, at a minimum, needs to attend to getting a consistent and conspicuous message into the Centre's Annual Reports, Web site, recruiting materials, and major announcements.



### **3 Is SRC's organization appropriate for making the transition from start-up to full operation?**

The second overarching question posed by Mistra for this review was whether the organization and structures developed by SRC over its start up phase need to be revisited as the Centre moves toward full operation. To address this question, I first review the evidence on how well the Centre's organization worked during start up, and then turn to challenges of the future.

**Finding 4: The Centre's organizational structure has generally served it well during its start-up phase. Its leadership arrangements, its use of the Board, and its organization of open research "platforms" have all contributed to create an atmosphere of enthusiastic innovation and experimentation in pursuit of a good cause.**

The Centre's somewhat unusual dual **leadership arrangement** has worked remarkably well. A great deal of this is clearly due to the particular individuals involved. Carl Folke and Johan Rockstrom have inspired their staffs, colleagues and collaborators with their drive and vision for the Centre and their collegial approach to running it.

The Centre's **Board** has brought a wealth of helpful outside perspectives to bear on its start-up activities. Indeed, most of the "Findings" reported in this review have already been noted by the Board during its annual meetings, and discussed with the Centre's leadership. Some of the Board's observations and suggestions have resulted in significant changes in the Centre's directions (e.g. the addition of a cross-cutting research theme on "Global SES change.")

SRC has developed an **effective research platform**, embodied in its themes matrix (e.g. as portrayed on pg. 24 of the Annual Report 2008). This has facilitated linkages among scientists across disciplines; among Stockholm University, SEI, the KVA and a variety of other research institutions in Sweden and abroad; and more generally among knowledge producers in academia and users in government, business and civil society. The themes matrix has been appropriately fluid during the start up phase, allowing for new ideas and new people to find homes of their own.

The Centre's leadership and research platform (together, of course, with its financial resources) have helped it to **recruit and nurture** a remarkably talented and diverse group of scholars. It has provided them with a protected and enabling work environment. The result has been a gratifying frequency of creative interaction across disciplines and research projects, accompanied by a proliferation of original research ideas collaborative publications.

**Finding 5: The Centre's very success in its start-up phase has resulted in what the co-directors have called "growth-ache." This has a variety of symptoms, the most significant of which is the accelerating erosion of the Centre's most precious resource: the time its leaders and research staff need for the demanding work of doing world-class interdisciplinary research. This current situation is almost certainly unstable and unsustainable. The Centre's rapid success at start-up means, paradoxically, that it is now the wrong size. As it moves into its operational phase, SRC must either shrink its ambitions or expand its capacity.**

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The Centre's "growth ache" ("growing pains" is a common term in some countries) is a complex set of symptoms that affect different members of the staff in different but generally unpleasant ways. Leaders struggle to find enough time to also be researchers, key management tasks are increasingly slighted, and pressures to produce products and funding for individual research themes risk driving out the thematic interactions and "blue sky" thinking that have fueled so much of the Centre's most exciting intellectual accomplishments to date. One cause of these "growth ache" symptoms is the growing internal "supply" of initiatives fostered by the Centre's innovation orientation. Another is the growing external "demand" induced by the Centre's growing reputation among scholars and policy makers in Sweden and around the world. The net result is the accelerating erosion of the Centre's most precious resource: the time its leaders and research staff need for the demanding work of doing world-class interdisciplinary research. To survive as the Centre of Excellence that its start-up success has positioned it to become, SRC must almost certainly transition over the next years either to an organization substantially more focused and less ambitious, or to an organization with enough more capacity that it can fulfill the expectations that its first two years have created.

**Recommendation C: The SRC should resolve its current "growth ache" by growing up, not down, as it transitions from start-up to full-scale operation. Accomplishing this will almost certainly require significant transformations in current management arrangements, the composition of the research staff, relationships among the consortium partners, and the Centre's agenda and core budget. What each of those transformations should be, and how they will be accomplished, should be central features of the Centre's Strategic Plan for 2010-2013.**

To resolve the Centre's growth-ache by retreating to a small operation would squander much of the potential associated with the Mistra grant. But the challenges of transitioning to a larger but sustainable mode of operation in the next phase of the Centre's development should not be underestimated. Conceiving, drafting and implementing a strategic plan to achieve sustainable scale-up will require a significant investment on the part of the Centre's leadership, staff, Board and partners. I present my findings and recommendations on some of the individual elements that such a strategic plan should almost certainly address immediately below.

**Finding 6: The SRC's transition from start-up to operational status can usefully be looked in the context of the private innovation "start-ups" with which the world has more experience. That analogy would suggest that the organizational and leadership arrangements that served to launch the enterprise are not likely to be the same as those needed to take it to scale. In particular, the analogy suggests that effective "beyond start-up" operations require disproportionately more investment in management (relative to innovation) than does start-up itself. And that the comparative advantage of innovators – in this case SRC's co-directors – is not likely to be in managing large, complex operations.**

Let me begin by recognizing that the analogy to private start-ups is at best flawed and could be misleading. But many of those I talked with for this review raised the

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analogy and thought it was worth pursuing. If they are right, at least two implications of the finding noted above are worth disentangling.

First, with regard to the amount of good management that an operational, “right sized” SRC will need, experience unambiguously says that the answer is “more than you think:” interdisciplinary programs require more management than monodisciplinary ones; international programs require more management than intranational ones; co-production of useful knowledge through collaboration with policy makers requires more management than simply broadcasting scientific findings into the cacophony of messages deluging policymakers. There were indications in my interviews and examination of the internal management documents of the Centre that its ability to meet its management needs have not kept up with the growth of the organization and the demands placed on it. As SRC moves towards operational fulfillment of the interdisciplinary, international, and science-policy ambitions described in its proposal to Mistra, it will need to invest much more substantially in management than is the norm for academic projects and programs.

Second, if the Centre’s intellectual leaders continue to be tasked with trying to meet these increasing management demands, they will at best lose what little remains of their time for research, training and innovative policy collaboration. At worst, they will not only stop doing what they are indispensable for, but also – like most academics -- turn out to be only mediocre managers when excellent ones are needed.

The text-book solution to the challenge of taking innovative firms to scale is to appoint a senior manager – often referred to as a chief operating officer (COO) or chief executive (CEO) whose special skill is in running things, not innovating things. In this model, the organization’s founding innovators are retained in senior positions (sometimes “chairman,” sometimes “chief scientist,” etc.). The goal of the senior executive is to free the innovators to innovate (and mentor other innovators) by taking over all of the mundane tasks that the innovators are not uniquely good at, and organizing the organization to function efficiently so that its employees too can spend more of their time productively. The biggest problem is with the text book “COO” solution in the context of research programs is that most academics are disinclined to treat seriously a research program that doesn’t have a distinguished academic at its head. Research organizations have therefore, in general, kept to the idea of scientist directors (or co-directors), while appointing more junior managers as “executive directors” or “deputy directors.” This in turn raises the problem, however, that such relatively junior positions seldom carry the “clout” needed to represent the organization in serious negotiations or program development. Many innovation-based businesses have moved beyond this bias against managers who are not scientists, as have some of the world’s best hospitals (which are no longer run by medical doctors). Most academic research groups have not. There is no obvious model for SRC to follow.

**Recommendation D: In its transition from start-up to full operation, SRC should give high priority to the reorganization of senior management tasks and responsibilities. The goals should be i) to substantially increase the time available to the co-directors for research and innovation by reducing the administrative load on them, and ii) to substantially increase the efficiency and effectiveness of how the Centre is run.**

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It seems almost certain that any reorganization should retain the present de facto division of responsibilities that has Carl Folke providing the science leadership central to the Centre's goal 1, and Johan Rockstrom the policy outreach leadership central to the Centre's goal 2. On the management issue, SRC could be daring and try to be the pace setters in showing how to solve the start up problem for academic research organizations with a brilliant COO appointment. Or it could be more conventional and try to build a strong administrative group around the new "deputy director" position that has recently been established.<sup>7</sup> Success should be measured by the extent to which the Johan Rockstrom and Carl Folke are freed up to spend much more of their time focused on the core innovative science and policy opportunities facing the Centre as it moves into its operational phase.

### **Finding 7: The transition of the Centre from start up to a fully operational and sustainable enterprise will require a strategy for increasing the number of professional staff and their long term commitment to the SRC's core mission.**

A good part of the "growth ache" problem is that there are simply too few qualified people available to do the work that the Centre has undertaken. The Centre pursued a recruiting strategy during its start up period designed to bring a variety of people quickly onto the staff. This meant borrowing people from elsewhere, hiring them for specific grants or otherwise limited periods, or appointing them part time. As already noted, this had the desired impact of letting SRC ramp up quickly and of maximizing the variety of ideas and perspectives available as the Centre put itself on the map. As a long term strategy, however, this approach falls short on at least two counts.

To spread the load of intellectual leadership and mentoring now performed almost solely by the SRC leaders and a very few permanent faculty, more senior people are needed who will spend substantial and regular time at the Centre over the long term.

The young investigators needed as the next generation of leaders in research on social-ecological systems lack a transparent pathway for career development through their work with the Centre. SRC's work is drawing them into forms of interdisciplinary, team-based research and of engagement in bridging science-policy boundaries that are not usually rewarded in conventional academic departments. At present, the Centre's young investigators – especially those from outside Sweden -- see little clear prospect for advancement or permanent employment within SRC. They therefore feel pressures to focus on relatively more conventional research than they would like, and have little less incentive than they might to invest in "public good" aspects of the Centre's work.

### **Recommendation E: The Centre, working with the leadership of Stockholm University and its other partners, should create a substantial number of permanent academic positions that are closely associated with the SRC and aligned with its mission. These positions need to become available over the next 3 years if they are**

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<sup>7</sup> The scheduling of this review did not allow me to spend significant time talking with SRC's new Deputy Director Olof Olsson about his view of what the Deputy position does and should entail. Nothing written in this review should therefore be taken as a comment on how that function is presently being carried out, or the extent to which it is an adequate solution to the challenges identified in the review.

**to contribute substantially to the successful transition of the Centre from start up to a fully operational and sustainable enterprise.**

Mistra's decision to anchor the competition won by SRC in universities created both hazard and opportunity. The hazard is that since the competition – and now SRC – is university based, the only positions that really carry weight will be ones with full academic sanction, i.e. professor, lektor, or biträdande lektor. The opportunity is that the international reputation of the SRC can help bring to the university a flow of truly exceptional appointments. Creating a set of permanent academic appointments associated with the Centre is thus by far the most effective way to seize the opportunities and solve the shortcomings of the present staffing of SRC.

The specific number, timing and distribution of positions that will best serve the Centre's transition are not topics on which this reviewer can express any particularly informed opinion. The case for about 10 positions over the next three to five years suggested by the Centre in recent draft strategy documents is consistent with the level of effort being developed by SRC's competitors. Those academic leaders outside of Sweden that I interviewed in the course of this review also felt the 10 position target to be plausible, especially if it was used strategically to achieve a balance of disciplinary backgrounds consistent with the Centre's mission.

With an appropriate distribution of ranks and terms of appointment, such positions could both attract the additional senior professors that are needed for to strengthen the Centre's program leadership, and provide the incentive to attract and retain the best young researchers. Given SRC's ambitions to solidify and retain its stature as a world leading centre for the study of social-ecological systems, a well publicized international competition should be conducted to fill the permanent positions.

**Recommendation F: SRC should promptly develop a meaningful and transparent system for evaluating research staff performance and awarding promotions.**

SRC's strategy appropriately includes appointment of young scholars from both Sweden and the wider world. These scholars are building their careers. They therefore need not only mentoring at SRC, but also a transparent means of being sure what is expected of them and how they are doing. There is a lack of clarity at present regarding how much these people are expected to spend on their own research, interdisciplinary or team research, policy outreach, and institution building. Likewise, there is confusion over who gets appointed to lead themes and why.

Especially in a research institution where a significant fraction of the staff will not hold permanent positions, regular and transparent evaluations are essential. Several of my interviewees told horror stories about other research Centres in which, 10 or 20 years after their start-up, the permanent team or theme leaders were essentially the staff who had been left behind after all the really good ones were hired away to other institutions. SRC spends enough of its time studying the consequences of different selection rules in complex systems that it would be particularly sad for it to fall prey to such a survival-of-the-least-desirable recruitment processes.

Another reason for this recommendation is the need for SRC to generate some sort of reliable signal to the outside world about how well its scholars performed during their time at SRC. For those on a permanent faculty track, such signals may already be

available. For those not on such tracks, they are not. Many research institutions adopt systems of regular review and promotion along a “ladder” that consists of “scientist”, and “senior scientist.” Others have more steps. The important thing is that the system be transparent and understandable not only in Sweden but on the international stage where SRC is searching for staff, and sending its alumnae.

These job definition and evaluation issues can sometimes be handled informally in small research groups where everyone comes from the same country or culture. For international groups such as SRC, with different expectations and different traditions of interactions among junior and senior scholars, it cannot.

#### **4 Is the strategic research orientation of the SRC appropriately matched to its objectives and ambitions?**

**Finding 8: The Research Centre Agreement between Mistra and SRC specified a long list of research objectives and orientations that were to be pursued by the Centre. Most or all of these seem to have been addressed in one form or another over the last two years of work.**

That said, this is not in my view a particularly useful finding. The Centre is pursuing an aggressive, innovative research program into the broad area described in its mission statement(s). The original list of “strategic” orientations is not very strategic.

**Recommendation G: The “framework” and “challenge” questions SRC has identified and promulgated in recent work<sup>8</sup> seem a plausible evolution of the initial “orientation” statements and should probably replace them as strategic guidelines as Mistra and the Centre work to define evaluation targets for the 2013 review.**

**Finding 9: As acknowledged by Centre leadership and Board, an unfinished task of the Centre’s start-up period is its continuing effort to identify and engage the full range of relevant social science theory and methods into the core of SRC’s work.**

Recent appointments are significant steps in the right direction, and a small but increasing number of Centre papers are as sophisticated and exciting as anything out there in their treatment of the “human dimensions” of environmental change. Nonetheless, most of the “social-” in the Centre’s synthetic and conceptual work on “social-ecological” systems comes across as rather technocratic in character. The Centre appears to be more comfortable with approaches drawing from policy analysis and economics than with those confronting issues of power, social inequity, or who gets to frame the socio-ecological discourse. For some problems, this is fine. But to illuminate and support approaches to sustainable development of ecosystems in those many real world situations where politics and interests matter, its not. The Centre will need to

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<sup>8</sup> For example, the powerpoint “Self evaluation” briefing provided to me by the SRC leaders

identify and engage scholars with expertise in these areas, and cultivate respect for their views across the present research staff.<sup>9</sup>

**Recommendation H: The Centre should develop and implement a strategy for reaching outside its comfort zone to bring critical social science perspectives on power and influence to bear on its core research questions.**

The determination of who gets to use natural capital for what purposes is one of the most deeply political of all human activities. Wars are fought, people are thrown off their land, and bribery and intimidation are everywhere dense in the processes that determine the future flows of ecosystem services. The fact that much of what passes for scholarship on such issues is little more than ideology and advocacy should not be allowed to obscure that facts that they are central to SRC's agenda and that some of the best social scientists have a lot of things to say about them. The Centre's success will be measured by many in terms of how creatively and consistently its researchers and research programs reach out to engage such people. The Centre has board members and research staff who can identify good places and people to start with. The recent STEPS Centre symposium on "Reframing Resilience," attended by several SRC scholars, illustrates the sorts of valuable insights and interactions that could emerge from a sustained engagement around resilience ideas by scientists based in the ecological and power politics camps.

**Finding 10: The Centre faces a critical choice over how to use its research platform. One use would be primarily to advocate, illustrate and apply "resilience thinking." Another would be to become the world leader in critical evaluation and testing of theory about complex socio-ecological systems in general, and resilience propositions in particular. These are not obviously compatible uses.**

A substantial fraction of the highest profile research papers published by the Centre over its first two years of existence have been "framework" articles about resilience thinking, or reviews, or exploratory theory/modeling pieces. This mix makes lots of sense for a start-up organization, and has gotten the Centre's name and ideas widely disseminated within its peer communities. But if the same mix were to persist over the next 3 years of work, many of the Centre's greatest admirers would be deeply disappointed. In particular, there exists a widely spread conviction that for the Centre to realize its strategic potential, it now needs to move beyond its current advocacy of "resilience thinking" or "complexity thinking." Instead, many hope that over the next several years the Centre will take the lead in carrying out the systematic appraisal – even testing – of the extent to which and conditions under which such thinking actually leads to better understanding of how particular socio-ecological systems work and can be managed. Clarification on this issue by Centre leadership is especially important for

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<sup>9</sup> The word 'power' shows up exactly once on 1 page of the three books I was given to illustrate SRC research. The journal articles produced by SRC researchers are less allergic to power and interest issues, but even they still show a strong bias for the ecological view of social-ecological systems.

junior research staff, many of whom are unsure whether serious critiques or tests of resilience thinking are encouraged or only tolerated by the leadership.

**Recommendation I: SRC should use the occasion of its transition from a start up to a fully operational program to make a major commitment to the critical evaluation of resilience thinking as a means of advancing such thinking to the next level of explanatory power and practical utility.**

This commitment could start with a compilation of the principal propositions or theories promulgated by resilience thinkers. It could move on to a scholarly review of what the published literature has to say for *and against* those propositions. Most ambitiously, it could then turn to a serious program of long term comparative empirical research, conducted across a range of the Centre's "Insight Cluster Themes" (i.e. specific ecosystems) to test, extend and revise the most potentially significant propositions to emerge from the literature review. SRC could not carry out such an ambitious effort on its own. But it could anchor such an effort better than any other research group in the world, and use the effort to bring the best scholars of social-ecological systems from around the world into the SRC orbit. A program of this sort would constitute a major commitment of SRC resources. But my reading and interviews suggest that it might also do more than any other task the Centre might undertake to bring about a radical advance in resilience thinking, and to firmly establish SRC on the map as a world class research establishment with rigor second to none.

## **5 How should the SRC be evaluated in the future?**

This question was not posed by Mistra in the original Terms of Reference for this review, but was added after my discussions with Mistra early in the review process.

**Finding 11: A central and gratifying finding of this review is how self-reflective and learning-oriented the Centre already is. As a result, most of what I "found" has already been noted by the Centre's leadership and Board. They have begun to address many of the findings and targeted some of them for attention in the process that is producing the Strategic Plan for 2010-2013. But although the SRC has noted the need for a systematic approach to evaluating its products and impacts, it has not yet developed such an approach. This has almost certainly resulted in an undervaluation by me of the Centre's accomplishments and impacts.**

**Recommendation J: SRC should develop and implement a systematic means for articulating, measuring and reporting on progress toward achieving its mission and goals. One good point of departure for the design of such an evaluation system would be the "Results Based Management" (RBM) framework originally developed by the Canadian International Development Agency<sup>10</sup> and subsequently applied to**

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<sup>10</sup> Canadian International Development Agency. 1996. "Results-based management in CIDA: Policy statement." [http://www.acdi-cida.gc.ca/cida\\_ind.nsf](http://www.acdi-cida.gc.ca/cida_ind.nsf).



**natural resource management programs of the Consultative Group on International Agricultural Research.<sup>11</sup>**

A good evaluation system would both facilitate SRC's own adaptive learning and increase the chances that future external evaluations will be as relevant and well informed as possible. The discipline of converting broad goals into specific and measurable indicators of achievement is almost always helpful in clarifying mission. This is especially true for complex organizations such as SRC and the other Mistra ventures that attempt simultaneously to conduct fundamental research and to achieve tangible impacts on the wider world. The dynamic data bases required to populate such evaluation frameworks almost invariably turn out to be significant time savers in the preparation of internal documents such as progress reports and annual reports. Overall, serious evaluation takes substantial resources, but usually repays the investment – especially in organizations committed to adaptive learning.

Many approaches to evaluation are possible. I have recommended one that I am familiar with, have adapted and find the most useful of any I know for evaluating research based efforts to change the use, management and policy of natural resource systems at multiple interacting scales. Of particular importance in the RBM approach is its orientation to working backward from desired impacts on the world through the sequence of steps needed to connect research to those impacts. From what I have learned of SRC's challenges and opportunities, the Centre could design an RBM evaluation framework adapted to its own particular context, and would benefit greatly from doing so as part of its strategic planning effort to complete the transition from start-up to operational enterprise. In case the Centre wishes to follow up on this suggestion, I have provided links below to a couple of pages I wrote for another evaluation in which I describe the RBM approach before applying it to a complex, long term global research program on ecosystem management.<sup>12</sup> A summary is provided in Annex 6 to this review.

## **6 Annex Materials**

### ***6.1 Terms of reference for this review***

### ***6.2 Agreement between Mistra and SRC: Appendix 1***

### ***6.3 SRC's self-evaluation for this review***

### ***6.4 Analysis of publications***

### ***6.5 Persons interviewed for this review***

### ***6.6 Results-based-management evaluation framework***

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<sup>11</sup> William C. Clark et al. 2006. "Report of the External Review of the Systemwide Program on Alternatives to Slash and Burn." Rome: Consultative Group on International Agricultural Research. (<http://www.worldagroforestry.org/downloads/publications/PDFS/rp14754.pdf> ).

<sup>12</sup> Ibid., pp. 13-18, 93-95. (<http://www.worldagroforestry.org/downloads/publications/PDFS/rp14754.pdf> )



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## Start-up Review of Stockholm Resilience Centre

### Background

The Stockholm Resilience Centre is an international centre for the advancement of transdisciplinary research for governance of social-ecological systems with a special emphasis on resilience – the ability to deal with change and continue to develop.

The Stockholm Resilience Centre was established on 1 January 2007. It is a joint initiative between Stockholm University, the Stockholm Environment Institute and the Beijer International Institute of Ecological Economics at The Royal Swedish Academy of Sciences. The Centre for Transdisciplinary Environmental Research (CTM) at Stockholm University and The Baltic Nest Institute (former MARE) are also parts of the Stockholm Resilience Centre.

The aim is to create a world-leading transdisciplinary research centre that advances the understanding of complex social-ecological systems and generates new and elaborated insights and means for the development of management and governance practices. The centre will advise policymakers from all over the world, and develop innovative collaboration with relevant actors on local social-ecological systems to the global policy arena.

The Centre is funded by Mistra, the Swedish Foundation for Strategic Environmental Research. In June 2006 Mistra decided to invest 105 million Swedish crowns (approximately 10 million Euros or 13 million USD) in the creation of the Stockholm Resilience Centre.

Mistra's grant is distributed over a period of 7 years, with approx. 3.5 million Euros during a three year start-up phase (2007-2009), and then about 6.5 million Euros during the coming four years (2010-2013). After that, a thorough evaluation will be conducted before Mistra's Board of Directors makes a decision about a continuation.. All in all, the Centre's yearly budget is expected to be about 5 million Euros, or more, once it is up and running including support from other sources.

In the agreement between Mistra and the Stockholm Resilience Centre it is stated that a forward looking evaluation of the Centre will be performed by Mistra in 2009. The

evaluation should have an emphasis on organisational aspects of the Centre, but also review the general scientific orientation, goals and conditions specified in the agreement.<sup>1</sup> It is also stated that the evaluation shall specifically review the requirements to build a critical mass in social sciences and the humanities as well as natural sciences, and that these areas of sciences create a new, joint scientific foundation.

The evaluation was originally planned to be based on a progress report for the start-up phase (2007-2009) and an action plan for the first regular phase (2010-2013). Mistra has decided to pursue a slightly different route where the evaluation will provide valuable input to the management of the centre as well as to Mistra.

Instead of producing a progress report to be used in the evaluation, the Centre will be asked to answer a set of questions based on the expected outcome of the start-up phase. The action plan for the next phase (2010-2013) has not yet been prepared by the centre. Instead, it will be done after the forward looking evaluation. The plan will most likely be improved by using the results and recommendations of the evaluation.

If Mistra is satisfied with the results of the evaluation and the action plan for the next phase, Mistra will make funding available for the next phase in accordance with the new action plan.

## Terms of reference for the start-up review

### **REVIEWER**

The start-up review of the Stockholm Resilience Centre should be carried out by an internationally renowned and highly respected senior researcher. Mistra is extremely pleased that Dr William C. Clark, Harvey Brooks Professor of International Science, Public Policy and Human Development at John F. Kennedy School of Government, Harvard University has accepted to do the job.

### **BACKGROUND MATERIAL**

The review will be based on the following background material:

- Research Centre Agreement “Stockholm Resilience Centre” (2007-01-01)
- Action Plan for the start-up phase (2007-2009)
- Annual Report 2008 (including list of staff and publications)

### **TIME PLAN FOR THE REVIEW**

The review will consist of the following components:

- Reading of background material (July, 2009)
- Preparing for the data collection (July 2009)
- Data collection (interviews) on location in Stockholm (end of July, 2009)
- Data analyses and completing the report (August, 2009)

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<sup>1</sup> See under Item 1 ”Basic conditions” in Appendix 1 to Research Centre Agreement “Stockholm Resilience Centre.”

#### **CRITERIA FOR THE EVALUATION**

The Centre will be reviewed against its overarching strategic purpose – the vision and mission of the Centre – to conduct interdisciplinary and internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems.

The Centre activities will also be evaluated against

- the Centres long-term goals,
- the strategic research orientation of the Centre, and
- the basic conditions that must be in place to assure the success of the Centre

as they are presented in Item 1 “Basic conditions” in Appendix 1 to Research Centre agreement “Stockholm Resilience Centre”.

#### **STRATEGY AND METHODS**

As a basis for the evaluation, the Centre management will be asked to give written answers to a set of questions based on the evaluation criteria, including the evidence that the management feels is most relevant to supporting those answers. The questions will be sent out in the end of June, and are expected back not later than July 20.

The written answers will be further explored in interviews with:

- Presidents of the involved universities/institutes
- Centre management and other key individuals
- Researchers
- Users

The interviews will be carried out as group interviews with 2-5 interviewees in each group. The Centre will be asked to present a time plan for the interviews.

#### **EXPECTED OUTCOME**

Mistra is expecting an evaluation report of not more than 25 pages, including advice and recommendations to Mistra and to the Centre to be considered in the action plan for the next phase (2010-2013). Deadline for the report is September 1, 2009.

#### **COSTS**

The work is expected to take 20 days, including reading, interviewing and reporting.

## **Appendix 1 to Research Centre Agreement “Stockholm Resilience Centre”**

### **General Terms**

#### **1. Basic conditions**

Based on the instructions in Mistra's call, the Centre's basic scientific orientation, goals and conditions are as follows:

The strategic purpose of establishing the Centre is to conduct interdisciplinary and internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems.

The Centre's long-term goals are to:

- Establish a world-leading research centre that will advance the frontier of interdisciplinary research on interdependent ecological and social systems.
- Generate new and in-depth insights for the development of decision-making systems that support long-term sustainable management of social and ecological systems at different scale levels, to ensure the ecosystem's ability to provide services to society.

The strategic research orientation of the Centre is to:

- Understand the dynamics of the ecosystems (e.g. resilience, system change and diversity) and their significance for the production of ecosystem services,
- Incorporate this knowledge about dynamics into the welfare economy, economic valuation and economic policy,
- Understand sociopolitical complexity and how regulations, decision-making systems and social structures influence management of the ecosystem,
- Develop systems for the exchange of knowledge, increased participation and care that interprets and responds to signals from the ecosystem and makes learning possible,
- Research participants, networks and dynamics at different scale levels in connected social and ecological systems,
- Build adaptive capacity to manage uncertainty and change (e.g. political upheavals, natural catastrophes, and socioeconomic forces).

The following basic conditions must be in place:

- A strong cooperative consortium between the University, SEI and KVA
- Critical scientific mass shall be created in both natural sciences and social sciences, including economics
- Possibilities to develop new and joint experience, concepts, language and methods between natural and social scientists shall be created
- In-depth and qualified interdisciplinary cooperation and advancement
- Strong connections to similar frontier research environments over the entire world
- A good physical work environment and University of Stockholm's support for world class inter- and trans-disciplinary research
- Capacity for qualified communication with significant users

## Memo

To: Files

From: Bill Clark

Subject: Self Evaluation of the SRC by its co-directors (July 2009)

In preparation for the Mistra review of SRC, I began with the Terms of Reference for evaluation specified by Mistra, in particular the “Basic Conditions” listed in Appendix 1 to the Research Center Agreement between Mistra and the SRC. (These conditions are reproduced in **bold type** in what follows). I then converted the “Basic Conditions” into questions I posed to the SRC leadership asking for their own views on data relevant to an evaluation of the conditions. I added some additional questions of my own. (These questions by me are reproduced in *italic type* in what follows). Finally, the SRC co-directors replied with written responses to my questions. (These responses are reproduced in normal text below). I subsequently used the SRC’s responses as a major data source to guide follow up reading and interviews I carried out for the review.

**1) The strategic purpose of establishing the Centre is to conduct interdisciplinary and internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems.**

*1a) Who are your 5 principal competitors, anywhere in the world? That is, if Mistra were not supporting the SRC but wanted to pursue the same strategic purpose from a base that might be anywhere in the world, what would be the short list of candidates? These may be other Centers, university departments or programs, or research institutes. Please write a couple of sentences about what you perceive to be each competitors principal strengths and weaknesses relative to SRC.*

We have not thought of other groups or people working on issues of sustainability as competitors, but rather as collaborators, current and potential. The sustainability science field is by necessity broad and different groups have different focus and emphasis, to various degrees overlapping and complementary, which in our view generates fruitful diversity to address the fundamental challenges that humanity is facing. To us, humanity is part of and shapes all ecosystems but is also fundamentally dependent on Earth's life-support systems for a prosperous societal development. Hence, our focus of the sustainability science agenda is on complex interdependent social-ecological systems and in particular governance and management of land- and seascapes, locally, regionally and globally, and in relation to ecosystem services and long-term sustainability, recognizing the cross-scale interplay, possible thresholds and regime shifts and true uncertainty.

The SRC has emerged from a longer international research tradition here in Stockholm with the Natural Resource Management group at Dept. Systems Ecology (where e.g. the Odums and Holling have been active) and its role in the development of Ecological Economics and later the Beijer Institute at the Royal Swedish Academy of Sciences, where we have had interactions with IGBP, IHDP etc., and the Stockholm Environment Institute in the science-policy interface. Our research agenda has many similarities to the

way You describe sustainability science in PNAS Feb. 2007 and also the Kates et al. 2001 Science paper.

We are very open for collaboration with anyone that conduct internationally competitive academic research in the area of sustainable management and care of interdependent social and ecological systems. The issues require international collaboration, some with actors that are close to our focus, some far away from our focus but with particular competencies required to address aspects of the research agenda, to explore and for novelty.

There are those that we collaborate with continuously, like the different institutes, centers and researchers of the Resilience Alliance (e.g. Arizona State, James Cook University, Alaska Fairbanks, Indiana State, Emory, Wisconsin, Waterloo, Tyndall/UEA, South African partners), many scholars engaged with the Earth System Science Partnership (e.g. IGBP, IHDP, Diversitas, GECHS) of the CGIAR-system (e.g. IWMI, ICRISAT, ICRAF, World Fish), scholars of the Vulnerability network (for example through SEIs work and networks on vulnerability and adaptation), at various departments of Stanford, Princeton, Columbia, Minnesota, Vermont, and also Harvard (e.g. Centre for History and Economics via Paul Warde), Manitoba, McGill, Australian National University, CSIRO Canberra, Wageningen, Tilburg, PIC, etc. There are those with whom we interact less regularly or recently have initiated collaboration, like DRIFT, Erasmus Univ., Rotterdam and RMNO in the Netherlands, the STEPS Centre in Brighton, researchers at Leeds and in Sheffield, Oxford, LSE, Öko-institute Berlin, Michigan State, and several scholars engaged with the sustainability science initiative (e.g. Louis Lebel, Eric Lambin, Roger Kasperson, Kazuhiko Takeuchi, David Cash, Gilberto Gallopin, Bob Corell).

In addition, different themes of SRC collaborate with groups, institutes and networks like Earth System Governance, the European Association of Environmental and Resource Economics, various societies for Ecological Economics, International Association for the Study of Common Property, Integrated History and Future Of People on Earth (IHOPE) and NCEAS in Santa Barbara, various marine groups (e.g. Maine, Vancouver, Dalhousie and in Europe through Baltic Nest networks), various urban groups (e.g. Bangalore, Cape Town, Istanbul, New Orleans, Canberra), freshwater groups (e.g. Kassel, New Hampshire, Newcastle, Kwazulu Natal, University of Dar es Salaam), economists engaged with sustainability (e.g. networks of the Beijer Institute), scholars dealing with knowledge systems, learning and networks (e.g. Berkes, Plummer, Armitage, Tabura, Stoll-Kleman, Pelling, Pahl-Wostl, Frank). We also have collaboration with many scholars, institutes and universities in East Africa, Asia and to a lesser extent in South America.

There are many potential collaborators or those that we have initiated a dialogue with, but where collaboration has not yet started, e.g. IIASA, economists and human geographers increasingly interested, researchers at Swedish Universities, and other sustainability sciences scholars and institutes like Lennart Olsson's and Stefan Anderberg's team in Lund. Now that we are moving from the start-up to a more permanent phase, we are intending to compile a comprehensive list of all collaborators.

*1b) Who are the half dozen leading scholars of such research who are active today but NOT actively engaged in doing research at or with SRC? Of these, whose views on SRC and its achievements would you most respect? Is there anyone who I might place on such a list that you would rather I did NOT ask for their views about SRC? (Explain if appropriate, but feel free to just declare that some people are in your view inappropriate).*

Our main competitors would most likely be identified among those mentioned above. There are of course many scholars that we do not currently actively collaborate with but that we very much respect include Bonnie McCay, Billy Turner, Tom Dietz, Robert Scholes, Veerabhadran Ramanathan, Pam Matson, Richard Norgaard, Tim O’Riordan, Kerry Smith, MS Swaminathan, Hal Mooney, Madhav Gadgil, Ruth de Fries, Gordon Orians, Anthony McMichael, William Moomaw, and of course You and your Harvard group.

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**2) The Centre's long-term goals are to: Establish a world-leading research centre that will advance the frontier of interdisciplinary research on interdependent ecological and social systems.**

*2a) What is SRC’s strategy for assessing how well it is doing in meeting these goals? What is its current assessment of its own success, ie. where does SRC think it is doing well, and where less well? What is the principal evidence on which these conclusions are based?*

We are still in the build-up phase and have started the discussion internally and with the SRC Board on how to evaluate progress. Our progress to date is summarized in the Annual Reports that you have received.

The SRC mission statement is as follows;

Stockholm Resilience Centre will work to advance the understanding of complex social-ecological systems, and generate new and elaborated insights and means for the development of management and governance practices,

- through internationally recognized inter- and transdisciplinary research that integrates social science, the humanities and natural sciences
- by fostering an international arena for science, practice and policy dialogues,
- through capacity building by providing academic programmes and inputs to academic curricula and training,
- and through strategic communication for improved policy and decision support, with the aim of securing ecosystem services for human wellbeing and building resilience for long-term sustainability.

We are pleased with the scientific output and its content produced so far, but it is too early to evaluate to what extent our recent publications are having an impact. We also think that the way we have structured the SRC provides dynamic platforms for integrating the sciences, focusing on problems, combining inductive and deductive work, theory and practice. We have been surprised, and to some extent overwhelmed, by the large interest from policy and practice within Sweden and internationally for our



perspective, work and new centre. The less developed part so far is the capacity building and the training, but we are in the process of starting a PhD school at the SRC linked to a restructuring of our Master program on ecosystems, governance and globalization. The communication part has been working very well. We look forward to hear your views of how such an assessment could be performed.

The evidence is reflected in the impact factors of journals where we have published and contracts with publishers, the amount of invitations we receive for plenary presentations, workshops and similar academic activities, the interest from students and researchers worldwide to visit and collaborate; the active participation in various practice and policy processes, ranging from on the ground work with a diverse set of stakeholders in projects in different parts of the world, to meetings with key people in business and policy, engagement with Swedish organizations (GOs and NGOs), National and European Union processes, and UN-organizations, especially the follow-up processes of the Millennium Ecosystem Assessment with UNEP, ICSU and other actors.

*2b) What do you see to be the half dozen most important research questions at the frontier of interdisciplinary research on interdependent ecological and social systems? (It should not be expected that SRC would be working on all of these questions). Please provide a sentence or two on why you think each selected question belongs in this list. What are the one or two seminal publications by scholars who are NOT SRC staff or affiliates on each of these questions? What are the most important one or two contributions by SRC scholars to each of the questions on which the Center is working?*

Although we would have loved to, during the last few weeks we have not had the possibility to discuss this fundamental question with theme leaders and other scholars of the SRC, because of the impossibility to gather at this time of the year in Sweden. But the five questions that You raise in your 2007 PNAS sustainability science editorial about transcending the concerns of foundational disciplines and focusing on understanding the complex dynamics that arise from interactions between human and environmental systems is very pertinent to us. The first four in your list are addressed by SRC researchers, often emphasizing the interplay between gradual and abrupt change and in particular associated management and governance challenges. In our overall research framework (described in the Annual Reports) we stress the following: the existence of tipping points (thresholds) and regime shifts and the challenges it implies, the adaptive capacity of social-ecological systems to deal with such changes, uncertainty and surprise, and the ability to steer away from undesired regimes and possibly even transform social-ecological systems into new improved trajectories that sustain and enhance ecosystem services and human wellbeing.

A few examples of important articles that come to my mind include Dietz et al. 2003 Science on adaptive governance, Young et al. 2006 GEC on global challenges in the context of vulnerability, resilience, adaptation, Eakin and Webhe 2007 Climatic Change on local vulnerability and social-environmental system resilience, Curran et al. 2004 Science on Borneo deforestation and global drivers, Turner et al. 2003 PNAS on vulnerability and 2007 PNAS on land use change, Jackson et al. 2001 Science and

Hilborn et al. 2003 ARER on historical overfishing, Möllman et al. 2009 GCB on regime shifts in the Baltic Sea, Kirch 2005 ARER on archeology and global change, Cash et al. 2003 PNAS on boundary organizations, Norgaard 2008 Cons.Biol on the Millennium Ecosystem Assessment Process, Kristjanson et al. 2009 PNAS on agriculture, diverse knowledges, action, Aswani and Hamilton 2004 Env. Cons. on combining indigenous and scientific knowledge, Lenton et al. 2008 PNAS on regional tipping points, Lansing 2003 ARA on complex adaptive systems, Peters et al. 2004 PNAS on cross-scale interactions and nonlinearities, Ludwig et al. 2001 ARES on the new challenges for ecologists. But again we would have liked the input from our colleagues on this question as well. Papers in our journal Ecology and Society are not suggested.

Concerning the central contributions by SRC scholars, we have emailed a dozen papers (pdf-files) to you. We also attach our report to the Formel-Exc (the Centre of Excellence), supported by the Swedish research council Formas, which is an essential grant of the Stockholm Resilience Centre running for five years with one and a half year remaining.

**(Goals continued...) Generate new and in-depth insights for the development of decision-making systems that support long-term sustainable management of social and ecological systems at different scale levels, to ensure the ecosystem's ability to provide services to society.**

*2c) What do you see to be the half dozen most important contributions that SRC has made to such decision making systems? What do you see as the most important instances in which SRC has tried to support decision making but has failed? (In each case, please provide a couple of sentences explaining your views, and the evidence on which they are based).*

We have in various science-policy fora, ranging from Swedish, European (e.g EU), and International arenas (e.g., UN) shared our scientific insights and communicated, based on our research work, the fundamental role of the planetary life-support base for human development (and the transformations this fundamental – but obvious – insight has for economics and governance in general), the role of bridging organizations and adaptive co-management, the significance of ecosystem services in landscape and also urban management, the development towards an ecosystem approach in marine management and ecosystem stewardship in general, and of urgent need for a widened approach to freshwater governance and management for food security and sustainability. All these science-policy interactions are carried out in the context of our broader definition of resilience, highlighting the challenge for policy making of complex adaptive systems and the need for preparedness and resilience to turn shocks and crises into opportunities for innovation and development.

It is too early to assess the success or failure as these impact and outcome processes are slow and many times difficult (not to say impossible) to attribute to single sources of output processes. We do experience an effect of the timely launch of an international transdisciplinary research centre on resilience for sustainability, given the growing

interest in resilience thinking and practice, which has resulted in a large interest in tapping our knowledge in different policy processes.

Below is a handful of our contributions in science-policy bridging as a decision support. Our Baltic Sea research, through our Baltic Nest Institute (BNI) program, provides the Baltic Sea governance structure (through Helcom, the body for collaboration among riparian States in the Baltic Sea region) with evidence for their decisions on eutrophication loads into the Baltic. This research is based on integrated land-water-atmosphere modeling, and increasingly incorporates resilience theory (exploring ecological tipping points as a result of multiple interactions among biological, chemical and physical systems in the seascape), with the aim of widening the scope to the broader governance and management domain. SRC inputs to Helcom were key to the recent decision on allocation of allowed nutrient loads of nitrogen and phosphorus among riparian states to the Baltic.

We are actively involved in the TEEB initiative (on The Economics of Ecosystems and Biodiversity) initiated by the European Commission. This is an important process to advance the economic case for conservation of biological diversity and ecosystem services. Our contribution to this work is, e.g., to emphasize the role of biodiversity as a source of resilience, and the importance of ecosystem functions for regulating the ecological preconditions for human wellbeing.

The Swedish government launched a couple of years back an international Commission on Climate and Development, which presented its results earlier this year. The Commission was hosted at SEI, and SRC was deeply involved in contributing our social-ecological research on governing and managing for resilience to climate change (with an emphasis on linking ecosystem management with climate adaptation and poverty alleviation). As part of the Commission expert group we were actively involved in communicating our research into the Commission, which has as its target the Copenhagen negotiations in December 2009. Here is an example where we did not succeed as expected from the start. The role of the environment (and active stewardship of ecosystems) as key to both mitigation and adaptation, particularly among vulnerable communities in poor tropical countries, was in the end not highlighted as strongly as we at first were expecting and hoping for.

EU is in the process of defining its priorities for future research investments (the 8<sup>th</sup> Framework program), and the SRC has been and is involved in various meetings to contribute with thinking, perspectives and priorities on the importance of further investments in resilience and sustainability science.

We have identified the follow-up process of the Millennium Ecosystem Assessment (MA) and the process to establish an Intergovernmental Panel on Biological diversity and Ecosystem Services (IPBES) as a priority science-policy process. We support the Swedish government in their international work to promote a strong follow-up to the MA, and we engage actively with the international community (e.g., with UNEP, ICSU, IUCN and WRI) in supporting a knowledge based follow-up process.

We have been involved in promoting resilience thinking in developing academic research and capacity building in African universities, by giving an input to a pan-African meeting on future university developments, and through our research in e.g., Madagascar (which after a heads of state visit at the centre resulted in a MoU between the Centre and the Malagasy government).

We have established a MoU between the Centre and Unesco, with the purpose to design and carry out joint projects and contribute to decision making tools for sustainable development policy and management of ecosystems.

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**3) The strategic research orientation of the Centre is to:**

*3a) What have turned out to be the most important elements of SRC's strategy for achieving progress toward its goals? Why?*

The overall research framework has helped us turn away from multidisciplinary uncoordinated research, to inter- and increasingly transdisciplinary research. The way we have structured themes (see figure below) as interactive platforms within and between themes has proven very helpful.

*3b) Which strategies have failed or fallen short of expectations? Why?*

The vulnerable parts have been in finding sufficient time for bringing the right people at the SRC together at the right time. We have had a bit of “growth ache” (a Swedish proverb) caused by the rapid expansion, large policy demand and new relational processes with the Stockholm University. But now we are increasingly in a consolidation phase and during the spring 2009, we have started more internal processes and strategic meetings for navigating the research landscape and the centre as a whole.

*3c) What one or two new strategic initiatives are your highest priority for the next 5 years? Why?*

We intend to, and have to some extent already started a process of joint cross-thematic research initiatives of the centre, strategic initiatives both in terms of content and process. The central one is on Global Resilience where we draw on expertise in several of the themes to address global change in relation to life-support capacity of ecosystems and the biosphere as a whole (see editorial in Global Environmental Change by Folke and Rockström that explains why). The planetary boundaries work and governance challenges in this context as well as the economics challenges will be in focus. We will draw on our comparative advantage of cross-scale competencies and resilience thinking. Another similar initiative is around management and governance of the Baltic Sea, where the Baltic Nest group and the rest of the centre will strengthen collaboration and also with practice and policy. The Baltic Sea has high priority in Sweden and also in the European Union. A third one that has been discussed is comparative studies of governance and management of ecosystem feedback in different areas of the world, including the Baltic

drainage basin, Millennium Ecosystem Assessment follow-up. Biosphere Reserve-sites, Resilience Alliance-sites, in East Africa, Bali, Sahel, Lake Victoria, Ethiopia, Drakens mountains, Madagascar, Stockholm, Montreal-scape and other urban sites. Most likely, these three efforts will feed into each other, be part of various international collaboration and the recent ICSU initiative the Program on Ecosystem Change and Society (PECS). We are also developing joint databases at the centre for these purposes.

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**4) The following basic conditions must be in place:**

*4a) What is the evidence on which a fair appraisal of SRC's success in achieving each of these basic conditions should be based? What is SRC's self-assessment of the extent to which it has fully met each of these conditions? (Please provide a few sentences on each. Also rate your success on a scale of 1 to 5, where 1 is unsatisfactory, 3 is satisfactory, and 5 is excellent).*

**A strong cooperative consortium between the University, SEI and KVA.**

This is a key pre-condition for short and long-term success of the Centre. There are tremendous synergies to build-on, while at the same time the challenge of establishing a clear institutional complementarity on the longer term. Work still remains in this domain, particularly to further develop institutional links and collaborative efforts. Our success so far is estimated as a weak 3.

**Critical scientific mass shall be created in both natural sciences and social sciences, including economics.**

Here we have put most of our efforts in the initial build-up phase of the Centre. We have a strong group of scientists across a wide range of academic backgrounds, and even though work remains, we are satisfied with progress so far. A challenge we have is to get a good balance between full-time and part-time researchers, to have closer "team" feeling among all SRC staff, after a period of "growth ache". Overall though, we estimate this parameter as a 4.

**Possibilities to develop new and joint experience, concepts, language and methods between natural and social scientists shall be created.**

This is a slow-variable, both within and outside our Centre. We invest tremendous efforts in developing internal working methods for transdisciplinary research. We estimate that we have so far reached a satisfactory 3 level, but that much remains to be done.

**In-depth and qualified interdisciplinary cooperation and advancement.**

We are still developing our core research program, particularly the long-term in-depth areas of research where the Centre will, hopefully, contribute the most profound new insights. This is an ongoing endeavour, where we e.g., now are developing our new

landscape and seascape modeling lab, and our resilience research school. Given the early state in our develop, we consider this to be a 4.

### **Strong connections to similar frontier research environments over the entire world**

Our basic model for the Centre is an international centre with close collaborative links with the best research environments in the world. We have experienced a strong interest from around the world for collaboration, which has made this work relatively easy. We are not starting from scratch, nurture networks and develop new ones. Much remains, particularly to concretize early-day ideas, but overall we consider the progress to be more than satisfactory (4-5).

### **A good physical work environment and University of Stockholm's support for world class inter- and trans-disciplinary research**

We receive very important support from the University, but we need more support in order to really fulfill our ambitions and the expectations from Mistra. We are currently in the process of expanding our centre in the short term into new physical premises, and are planning for a long-term move into a new building. The physical environment is very important for a transdisciplinary endeavour such as ours, and much work remains (2-3).

### **Capacity for qualified communication with significant users**

For a young research centre in an academic working environment, we dare say that we have scored higher than expected, very much thanks to excellent staff and synergies between the strong constellation with SEI, Albaeco, the Academy and the Stockholm University (4-5).

*4b) Based on what you have learned over the last 2 years, which of the above conditions do you now believe to be most essential to fulfilling the SRC's strategic purpose and goals? Which least essential? Which are the one of two new conditions that you believe it will be most important to add to your list of things to be accomplished in the next 5 years?*

It is difficult for us to rank the basic conditions required for success. They all must be fulfilled in varying degrees from satisfactory-excellent, for overall success. However, our assessment after two years is the overarching priority to invest in our scientific activities, both in terms of the enabling environment, the quality of staff, and our external collaborations. We are very keen on advancing our research school, which we believe is an important institutional development at the Centre (apart from the huge value of investing in the next generation of inter- and transdisciplinary thinkers and doers), and will help to establish an even stronger sense of centre identity among colleagues and further strengthen and continuously develop our research framework and agenda.

New conditions. 1. Additional, flexible and strategic long-term research funding to establish SRC even more firmly as a permanent institution. Mistra provides an important basis for our Centre, but less than 50% of the funding. The success of the SRC at the current level of operation is to a large extent dependent on externally funded and often short-term research projects. We need to gradually appoint permanent “tenure” positions at the centre to build organizational resilience.

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*5) Development of a capacity to work across disciplines is a recurring theme in the Mistra charge to SRC.*

*5a) Please provide two or three specific examples of the most significant interdisciplinary or transdisciplinary research published to date by SRC. Say why you rate these works as your top accomplishments.*

We have sent you about a dozen articles as pdfs and two books will be available when you arrive. Some of the articles are summarized in our Annual Reports, especially in the 2008 report. Some are more based in ecology and others more in the social sciences, and several are interdisciplinary and even transdisciplinary in terms of both content and authorship. We are most happy with the two books in this sense and the papers by Galaz et al. 2009 in *Frontiers*, Ernstsson et al. 2008 in *Ecology & Society*, Olsson et al. 2008 in *PNAS* and also Gordon et al. 2008 in *TREE* may be good samples.

In the word file with the lists of recent abstract Rockström et al. in revision for *Nature* and Walker et al. in revision for *Science* as well as Chapin et al. in review *TREE*, Crona and Parker in manus for *Ecology & Society*, Schultz et al. submitted to *World Development*, Steneck et al. in review *Frontiers*, Walker et al. in press *Environmental and Resource Economics* and Westley et al. for *Ecology & Society* are among those that reflect transdisciplinary collaboration.

*5b) For comparison, please indicate two or three of the best interdisciplinary studies published elsewhere over the last 5 years “in the area of sustainable management and care of interdependent social and ecological systems.”*

Again, we would have liked to do this with our SRC colleagues, but Young et al. 2006 *GEC* on global challenges in the context of vulnerability, resilience, adaptation, Kristjanson et al. 2009 *PNAS* on agriculture, diverse knowledges, learning and action, Lenton et al. 2008 *PNAS* on regional tipping points, and Winfree & Kremen 2009 *Proc.Royal Soc.B* on biodiversity and ecosystem services as part of the ecological foundation may serve as good comparisons.

*5c) Please describe the two or three most effective management approaches you have used to build capacity for such research. What approaches used by your competitors have you seriously considered but rejected? Why?*

We are trying to manage for emergence by providing platforms for collaboration, provide arenas for trust building and framing the research agenda in a joint direction, what we

previously have referred to as framed creativity. We try to avoid becoming a conventional disciplinary university department and in particular a hotel-like centre where researchers do their own thing uninterested and disconnected from each other. Mistra performed an excellent overview, by Emma Tompkins, of criteria for success in interdisciplinary work, which has inspired us and, to the extent possible, we try to develop a flat organization with collective action processes.

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*6) Surprises and lessons learned:*

*6a) What have been your greatest surprises in how the SRC has actually developed over the last two years?*

The unexpected demand from practice, policy and media and the overall international interest that we continuously receive. The timing of establishing the SRC seems very good.

*6b) What are the most important new lessons you have learned about running such an enterprise?*

It takes continuous adaptive management, networking, active team work and preparedness for confronting new challenges, and actively working towards creating temporal space for long-term research processes and collaborative arenas.

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*7) Finances:*

*7a) Please provide a financial account of income and expenditures over the life of the SRC, organized to help illuminate what of the activities listed above have been given what levels of support.*

We will provide you with a more detailed financial account when you arrive. In general, the Centre, in 2008, had a total turnover of some 40 MSEK, of which 10 MSEK originates from the Mistra grant. The University provides 6 MSEK (effectively to give the Centre the infrastructure to work). The Baltic Nest Institute is our largest individual program, with approximately 9 MSEK in total grants. Our education budget is approximately 1.5 MSEK. External grants account for 11 MSEK, of which ~7 MSEK originates from Formas, ~2 MSEK from Sida and 2 MSEK from other sources.

*7b) If a new donor offered to increase the SRC's budget by 30% on a permanent basis, what would be your highest priorities for use of the new resources?*

We would like to announce four Lectureships (comparable to tenure positions) with the following emphases;

1: Comparative analyses of global policies and institutional arrangements for combating climate change and the interactions with planetary boundaries and human life-support systems.



2: Comparative analyses of the effects of policies and practices on the capacity of land- and seascapes to generate ecosystem services, conducted in specific regions in different parts of the world that are undergoing transformations.

3: Development of integrated modeling tools to assess social-ecological resilience at a range of spatial and temporal scales. The models will be able to capture effects of changing drivers (e.g. climate impacts, emerging global markets) on resilience and ecosystem services.

4: Development of adaptive strategies to deal with changes in social-ecological resilience based on multiple sources of information including narrative, qualitative and quantitative data and historical records in addition to more traditional monitoring and remote sensing.

*7c) If the SRC's budget were to be cut by 30% on a permanent basis, what activities would you cut?*

The most likely part that we would cut, if forced to, is the urban social-ecological focus, because it is likely that this novel and very much needed research area may be able to secure funding from other sources. It is presently competing with two others for a new Mistra funded initiative.

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*8) Oversight and advice:*

*8a) What is your strategy for securing outside advice and guidance?*

We are very open to outside advice and try to stay in tune with international developments. In the early stages of any new research initiative of the centre, we engage in inclusive processes with our collaborators and internally discuss with the advisory board, theme leaders, centre management.

*8b) What do you see as the most important function of your International Board to date? What have been its greatest contributions to the SRC development? How could the Board be used more and for specific tasks?*

The board represents widespread expertise and knowledge invaluable for our centre and also serve as a key bridge with Stockholm University, since the SRC is placed parallel with the four University faculties (schools) and directly under the Vice Chancellor and the University Board. All board members are strongly engaged in the strategic development and centre progress and the scientists on the Board are taking part in our activities engaged with the four missions (research, science/practice/policy, capacity building, communication) of the SRC.

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*9) Please provide a complete list of impacts, outputs and publications.*

### Annex 3: Self Evaluation of the SRC by its co-directors (July 2009)

You should have received the Annual Reports, about a dozen pdf-publications, a list of articles in progress, the report to the Formel-Exc centre of excellence, and an editorial of Global Environmental Change. Moving from the start-up phase into the first real phase of the SRC we intend to develop various performance indicators in addition to scientific output, capturing scientific impacts and contributions, and linked to our goals and vision. We also hope to be able to distinguish between general indicators and specific/trademark indicators (e.g. modes of doing research, SRC culture, commitment to staff, external interest/ability to attract), and if possible develop indicators that capture e.g. geographic reach, network structures, impact of ideas and results on practice and policy, and innovation. We had a constructive discussion with our board on this topic and would very much appreciate your advice during our discussion in Stockholm.

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*10) Please suggest any questions that you believe I should ask as part of the evaluation that are not covered in the listing above.*

(None provided)

*Many thanks for your help.*

**SRC Review -- Analysis of Relevant Publications**

Search for 'soci\*-ecological system\*' OR 'soci\*-environ\* system\*'  
 OR 'human-environ\* system\*' OR 'resilien\*' OR 'sustain\* science'  
 (Source: Web of Science, accessed July 2009)

**Question: Which INSTITUTIONS publish most in this field?**

**Data for 1999-2009**

<b>Institution Name</b>	<b>Record Count</b>	<b>% of 4329</b>	<b>Cum</b>
STOCKHOLM UNIV + Royal Swedish Acad	105	1.9%	1.9%
JAMES COOK UNIV	76	0.9%	2.8%
UNIV WISCONSIN	72	1.7%	4.5%
ARIZONA STATE UNIV	61	1.4%	4.3%
UNIV BRITISH COLUMBIA	51	1.2%	5.4%
UNIV OXFORD	51	1.2%	6.6%
CSIRO	47	1.1%	7.7%
US FOREST SERV	46	1.1%	8.8%
UNIV CALIF BERKELEY	43	1.0%	9.7%
UNIV E ANGLIA	43	1.0%	10.7%
STANFORD UNIV	42	1.0%	11.7%
UNIV WASHINGTON	42	1.0%	12.7%

**Data for 2007-2009**

<b>Institution Name</b>	<b>Record Count</b>	<b>% of 1698</b>	<b>Cum</b>
JAMES COOK UNIV	48	1.9%	1.9%
STOCKHOLM UNIV + Royal Swedish Acad	36	1.8%	3.8%
ARIZONA STATE UNIV	32	1.9%	5.7%
CSIRO	27	0.8%	6.5%
UNIV OXFORD	27	1.6%	8.1%
UNIV WISCONSIN	26	1.5%	9.6%
UNIV BRITISH COLUMBIA	23	1.4%	11.0%
UNIV CALIF BERKELEY	22	1.3%	12.2%
UNIV CALIF DAVIS	22	1.3%	13.5%
OREGON STATE UNIV	21	1.2%	14.8%
UNIV E ANGLIA	21	1.2%	16.0%
UNIV WASHINGTON	21	1.2%	17.3%
US FOREST SERV	21	1.2%	18.5%
UNIV QUEENSLAND	19	1.1%	19.6%
UNIV WAGENINGEN & RES CTR	19	1.1%	20.7%
UNIV ARIZONA	18	1.1%	21.8%
UNIV CALIF SANTA BARBARA	18	1.1%	22.9%
COLORADO STATE UNIV	17	1.0%	23.9%
STANFORD UNIV	17	1.0%	24.9%
UNIV CAMBRIDGE	17	1.0%	25.9%

### SRC Review -- Analysis of Relevant Publications

Search for 'soci\*-ecological system\*' OR 'soci\*-environ\* system\*'  
OR 'human-environ\* system\*' OR 'resilien\*' OR 'sustain\* science'  
(Source: Web of Science, accessed July 2009)

Question: Which JOURNALS publish most in this field?

#### Data for 1999-2009

Source Title	Record Count	% of 4329	Cum
ECOLOGY AND SOCIETY	131	3.0%	3.0%
PNAS	63	1.5%	4.5%
ECOLOGICAL MODELLING	59	1.4%	5.8%
FOREST ECOLOGY AND MANAGEMENT	57	1.3%	7.2%
ECOLOGICAL ECONOMICS	50	1.2%	8.3%
MARINE ECOLOGY-PROGRESS SERIES	46	1.1%	9.4%
ECOLOGICAL APPLICATIONS	44	1.0%	10.4%
GLOBAL ENVIRONMENTAL CHANGE-HUMAN	43	1.0%	11.4%
ECOSYSTEMS	42	1.0%	12.4%
ECOLOGY	39	0.9%	13.3%

#### Data for 2007-2009

Source Title	Record Count	% of 1698	Cum
ECOLOGY AND SOCIETY	89	5.2%	5.2%
PNAS	37	2.2%	7.4%
ECOLOGICAL ECONOMICS	28	1.6%	9.1%
GLOBAL ENVIRONMENTAL CHANGE-HUMAN	28	1.6%	10.7%
MARINE ECOLOGY-PROGRESS SERIES	28	1.6%	12.4%
FOREST ECOLOGY AND MANAGEMENT	27	1.6%	14.0%
ECOLOGICAL MODELLING	26	1.5%	15.5%
CORAL REEFS	21	1.2%	16.7%
ECOLOGICAL APPLICATIONS	21	1.2%	18.0%
BIOLOGICAL CONSERVATION	18	1.1%	19.0%

Question: Which INDIVIDUALS publish most in this field?

#### Data for 1999-2009

Author	Record Count	% of 4329	Cum
FOLKE, C	42	0.97%	1.0%
CARPENTER, SR	21	0.49%	1.5%
BERKES, F	20	0.46%	1.9%
BELLWOOD, DR	17	0.39%	2.3%
CHAPIN, FS	15	0.35%	2.7%
JANSSEN, MA	15	0.35%	3.0%
ADGER, WN	14	0.32%	3.3%
ANDERIES, JM	14	0.32%	3.6%
ELMQVIST, T	14	0.32%	4.0%
WALKER, B	13	0.30%	4.3%
OLSSON, P	12	0.28%	4.6%
PETERSON, GD	12	0.28%	4.8%
HUGHES, TP	10	0.23%	5.1%

## Annex 5: Persons interviewed for this Review

NAME (First)	NAME (Last)	GROUP	Relation	INSTITUTION	POSITION
Rolf	<b>Annerberg</b>	User, Funder		FORMAS	Director General
Oonsie	<b>Biggs</b>	Researcher	Staff	SRC	Postdoc, thresholds, metrics
Kåre	<b>Bremer</b>	Partner		Stockholm Univ	Vice Chancellor
Steve	<b>Carpenter</b>	Researcher		Univ Wisconsin	Professor
Thomas	<b>Elmqvist</b>	Researcher	Staff	SRC, Stockholm Univ	Prof. Natl Resources, theme leader
Ola	<b>Engelmark</b>	Funder		MISTRA	Chief Executive
Erik	<b>Fellenius</b>	User		Swedish EPA	Director of Research Secretariat
Carl	<b>Folke</b>	Partner	Lead	SRC	Scientific Director
Clas-Uno	<b>Frykholm</b>	Funder		MISTRA	Director of Evaluation
Victor	<b>Galaz</b>	Researcher	Staff	SRC	Theme leader, adaptive governance
Line	<b>Gordon</b>	Researcher	Staff	SRC, Stockholm Univ	Asst Prof, water / ecosystems
Roger	<b>Kasperson</b>	Researcher	Board	Clark Univ	Professor
Simon	<b>Levin</b>	Researcher		Princeton Univ	Professor
Pamela	<b>Matson</b>	Researcher		Stanford Univ	Dean
Jacqueline	<b>McGlade</b>	User	Board	EEA	Executive Director
Åsa	<b>Norrman</b>	User		Swedish Min of Envir	Staff
Olof	<b>Olsson</b>	Partner	Staff	SRC	Deputy Director
Per	<b>Olsson</b>	Researcher	Staff	SRC	Theme leader, adaptive governance
Gunnar	<b>Öquist</b>	Partner, Beijer		KVA	Secretary
Henrik	<b>Österblom</b>	Researcher	Staff	SRC	Theme leader, governance marine
Elinor	<b>Ostrom</b>	Researcher	Board	Univ. Indiana	Professor
Garry	<b>Peterson</b>	Researcher	Staff	SRC	Leader, modeling group
Johan	<b>Rockström</b>	Partner	Lead	SRC	Executive Director
Thomas	<b>Rosswall</b>	Researcher	Board	CCCP	Chair, Steering committee
John	<b>Schellnhuber</b>	Researcher		Potsdam Institute	Director
Lisen	<b>Schultz</b>	Researcher	Staff	SRC, Stockholm Univ	Postdoc
Uno	<b>Svedin</b>	Funder, Researcher		FORMAS, SRC	FORMAS Dir International Affairs, Prof.
Per	<b>Thege</b>	User		Swedish EPA	Head of International Dept
Bill	<b>Turner</b>	Researcher		Arizona State Univ	Professor
Arild	<b>Underdal</b>	Researcher	Board	Univ. Oslo	Professor, Political Science
Brian	<b>Walker</b>	Researcher	Board	CSIRO, Australia	Research fellow
Frances	<b>Westley</b>	Researcher	Board	Univ. Wisconsin	Professor
Anders	<b>Wijkman</b>	User	Board	Eur Parliament	member

**CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH**

**SCIENCE COUNCIL**

**Evaluation and Impact Assessment of the  
Alternatives to Slash and Burn Programme**

Report of the  
External Review of the Systemwide Programme on  
Alternatives to Slash and Burn  
(ASB)

Review Panel: William Clark (chair), Arnaldo Contreras, Karl Harmsen

FINAL -- September 19, 2005

**Science Council Secretariat**

**Food and Agriculture Organization of the United Nations**

## Results Based Management (RBM) approaches for iNRM reviews

CGIAR has long recognized the absence of generally accepted methodologies assessing the impact of iNRM programs (e.g., TAC Standing Panel on Impact Assessment. 2000. Impact Assessment Workshop. Rome, May 2000). As Barrett (2003, para 75) notes, “Impact assessment is far more complicated than simply establishing whether research goals have been met and whether the resulting science is of high quality. The complications arise not only because of the lags involved between scientific discovery and the manifestation of the value to society of those discoveries, but also because of problems of attribution when so many different entities contribute to the scientific, market, institutional and regulatory environment in which human behavior ultimately takes places.”

As part of his long-standing program of research on evaluation and impact assessment methods, the Chair of the present Panel had collaborated with ASB before his appointment to this Review in exploring appropriate methods for grappling with these difficulties in designing its own programs (Liu, 2004; Thaker, 2005). Drawing from that work and its own experience, the Panel adopted for this Review the “Results Based Management” (RBM) framework originally developed by the Canadian International Development Agency.<sup>1</sup> The RBM framework recognizes the difficulties of attributing ultimate impacts to particular programs by focusing instead on the broader category of “results.” RBM defines a “result” as “a describable or measurable change resulting from a cause-and-effect relationship.” It then characterizes programs in terms of a *chain* of results leading from initial problem formulation through research to ultimate impact. Based on the Panel’s prior experience and its preliminary analysis of the ASB program, we adopted for this Review a modified RBM-based framework developed for ASB by Liu (2004). This framework is summarized in Figure 1 and described below.

*Sequences of results:* We extended the original RBM framework to include the sequence of causally linked results summarized in Table 1-A.<sup>2</sup> We refer to these results as a “sequence” rather than using the “chain” image adopted in the original RBM framework because our preliminary review of ASB suggested the iterative character of causal linkages in its work. Most particularly, as suggested by the circular form of Figure 1, we wish to capture the feedback of impacts (or lack thereof) on strategic goal- and priority-setting. More generally, we want to emphasize the possibility of adaptive feedback at each step along the causal sequence.

*RBM, evaluation, and impacts:* The conventional separation between impact assessment and evaluation has been an awkward one to bridge in many reviews. We found the RBM framework, as modified above, to offer a useful means of integrating these two tasks and perspectives. When speaking of *impact assessment*, we focus in this Review on the results of ASB that take place “outside” the boundaries of the ASB Programme and beyond its immediate control.<sup>3</sup> Our “assessment” thus includes the “top” part of Figure 1, and the latter three results in the sequence reproduced immediately above (i.e. uptake, outcomes and [ultimate] impact). This “outside” perspective on assessment is an important means of implementing the CGIAR view that research findings and innovations results do not become a *global* public good until they are taken up by the broader global community (see Barrett, 2003).

When speaking of *evaluation*, we focus on the sequences of results that take place “inside” ASB and that thus can in principle be directly manipulated through by Programme management. Our “evaluation” thus includes the “bottom” part of Figure 1 and the first four

results in the sequence reproduced immediately above (i.e. priority setting, inputs, activities, and outputs).

We realize that this depiction of the complex relationships between impact assessment and evaluation is oversimplified. We have nonetheless found it a productive and logical way to organize our Review. In particular, we begin in Chapter 2 with our assessment question: “What have been the ultimate impacts of ASB on the world outside the Programme?” We then turn in Chapter 3 to the evaluation question of “How effective and efficient has ASB been in performing the core functions that are intended to result in its impacts?”

*Scales of results:* We introduced a further modification to the RBM framework to reflect the complication that ASB (like many other iNRM programmes) is an emphatically multi-scale effort, seeking to promote change on the ground even as it produces the global public goods central to its mission. In order to capture this multi-scale character of the Programme, this Review considered results across the three spatial scales on which ASB operates: *global* (associated with Programme activities at the system-wide level), *regional* (associated with the Programme’s regional and national efforts), and *local* (associated with the Programme’s individual benchmark sites). We attempted to consider both results restricted to a single scale, and results emerging from cross-scale interactions. In keeping with the global public goods goals of the CGIAR, however, we focused our Review on results at the global and to a lesser extent regional level.

*Categories of results:* We used the modified RBM framework to review three broad categories of results to which ASB seeks to contribute. We define:

- \* *Knowledge* results range from basic understanding of human driving forces of land use at the forest-agriculture margin, to creation of new methods and data sets important for understanding those sources.

- \* *Action* results include innovations in technologies and practices, policies, and institutions.

- \* *Capacity* results encompass human resources, finance, physical facilities, and institutional structures that give the world the ability to produce ongoing results relevant to the ASB domain.

We note that these categories are not altogether separable. Research output is disseminated to potential users through publications, seminars and technical debates. This is aimed at having an impact on people’s knowledge – how they think about resource management at the margins. But some of the direct consumers of such knowledge are decision makers and policy advisors. So research can directly influence action as well. Second, research may directly induce technological changes on the ground not only by developing new devices but also by promoting farmers’ adoption of new technologies, or new practices of combining physical inputs to generate desirable products. Third, research may contribute to the adoption of government policy reforms that change the incentive environment and thus shape the actions of producers and consumers in directions that are desirable from society’s standpoint. Finally, both research and direct action may increase the capacity of the system to produce more and better results in the future. The Panel has attempted to keep these backwards and forwards linkages in mind, even as it uses the categories introduced above to structure its review.



## The dilemma of attributing causality

For each category and scale of result, our review has attempted to follow the RBM approach in developing a multi-link causal sequence of intermediate results connecting initial program *priorities* and *inputs* through intermediate *activities* and *outputs*, to *uptake*, *outcomes* and ultimate *impacts*.

There are two difficulties with this (or any other) approach to attribute causation of changes in high order ideas or actions to particular discoveries or interventions. The first is the problem of multiple causation. The RBM framework acknowledges that the degree to which results can be confidently attributed to program-specific inputs and actions decreases as one moves “along” the sequence from inputs toward ultimate impacts on the state of the world. (We would add that it also decreases as one moves from local to global scales of operation.) This is because ASB is only one of many “actors” and influences affecting issues of development and/or conservation in the forest and/or agricultural systems of the humid tropics. Changes observed in those systems since the ASB’s inception may therefore be due to ASB activities, to independent activities and influences, or to interactions between the activities of ASB and others. An evaluation of ASB’s role, relevance and impacts would ideally be assessed against a background of the research, action, and policy that would have taken place in its absence. That “no-ASB” case is, of course, ultimately unknowable, though could perhaps be approximated through comparison with regions where ASB has not played an active role.

The RBM framework makes a first stab at the attribution problem simply by disaggregating causes and effects into the chain or sequence described above. At each step along the sequence, there exists the potential for additional external contributions to the results at the next step. By insisting on clarity about measurable attributes of results at each successive stage, a review can at least aspire to a reasonable balance between confidence in attributions (highest at the early stages of the sequence), and relevance of results (highest at the later stages of the sequence). To complement this general property of the RBM approach, the Panel took the additional step of determining the most significant changes that have been *observed* in the ASB domain (land use at the agro-forest interface in the humid tropics) over the last decade, with no regard to whether ASB has played a role in causing those changes (see Chapter 2: Impacts/historical context). We then asked whether significant *correlations* exist between those observed patterns or change and the patterns that might reasonably have occurred if the ASB results we have documented had exerted a dominant influence on them. Finally, in the conclusions to our assessment, we attempt the more difficult and uncertain task of evaluating the extent to which such correlations can be said to reflect *causal impacts* of ASB.

A second and related problem concerns how a Review can achieve an independent view of major changes in a domain such as that occupied by ASB. The easiest way for a Review Panel to shape a perspective on major changes in a field is through the eyes of the program it is reviewing. The logical fallacy of taking this course is clear, but this does not stop many reviews from letting the program they are reviewing implicitly define the major changes against which it will be assessed. (This does not imply impropriety on the part of either the reviewers or the reviewed program. It does imply that time-limited reviewers and reviewees often take the easy way out and focus on what the program knows best – i.e. its own accomplishments.)

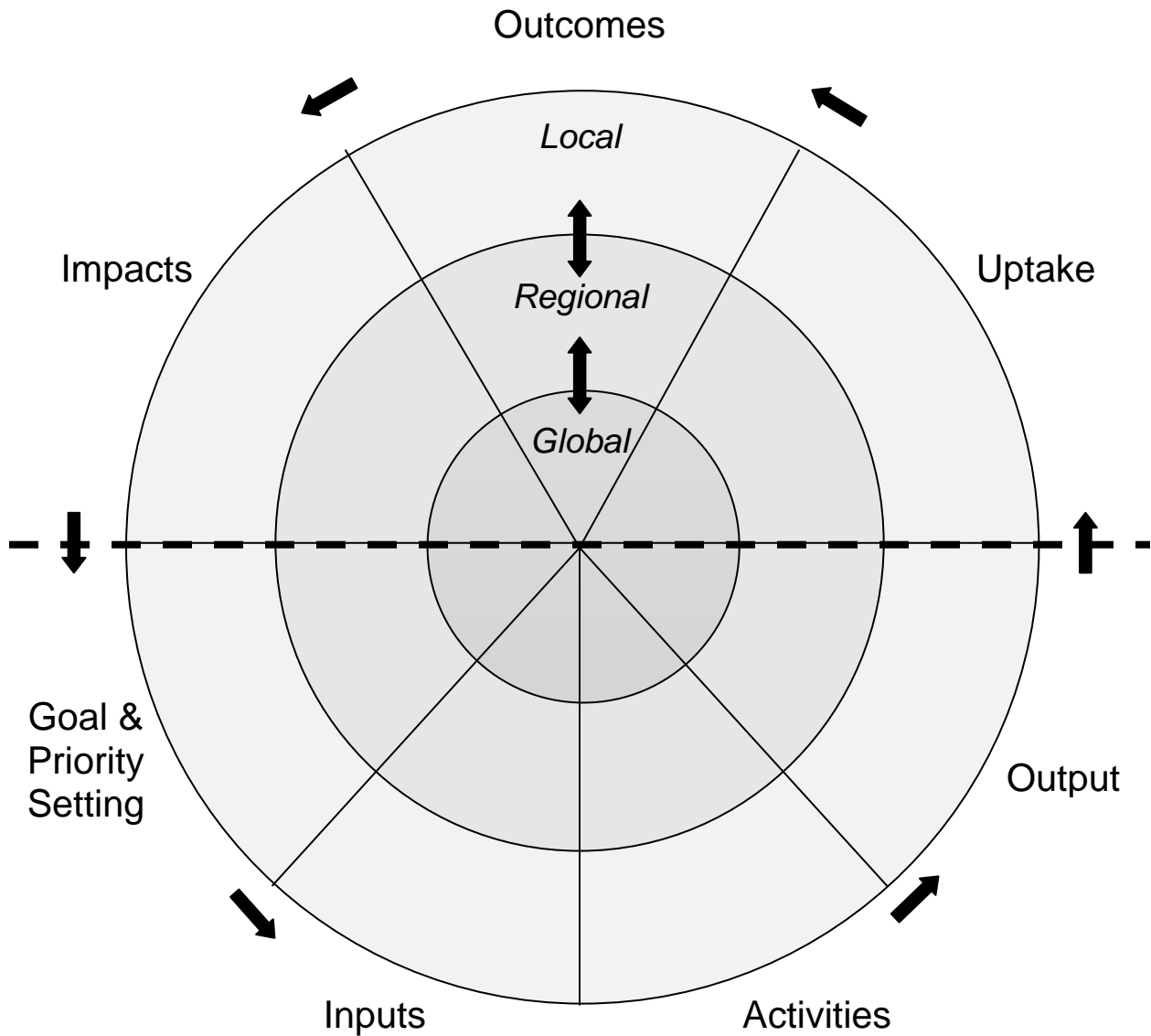
To mitigate the potential distortions of letting the ASB program and review define themselves entirely from the perspective of the program’s activities, this Panel adopted what we call the “Gold Standard” approach. This amounted to identifying a limited series of recent and relevant documents that are viewed by expert scholars and policy analysts to represent

authoritative perspectives on ASB's domain, but that were NOT assembled or edited by ASB authors.<sup>4</sup> Based on our conversations with the independent experts noted above (see also Annex III), we selected the "Gold Standard" references listed in Table 1-B. We then used these "Gold Standard" documents in three ways. First, they became our source of information for our documentation of "Historical changes" in ASB's domain as referred to above and characterized in depth in Chapter 2 (Impacts/Historical context). Second, to the extent that the "Gold Standard" documents cite or otherwise refer to results of the ASB Programme, they became one important piece of independent evidence (i.e. evidence not selected for our review by the Programme) of uptake and outcomes that are results of ASB efforts. We present this analysis in Chapter 2 (Uptake and Outcomes). Finally, where the "Gold Standard" documents themselves represent significant "impacts" (e.g., the World Bank's strategy and operations documents for shaping lending related to forestry), we examine the extent to which they pay particular attention to whether the authors of those documents attribute their content to the influence of ASB.

The Panel is aware of many shortcomings of the "Gold Standard" approach. Foremost among these is that others may well have picked different "standards." At a minimum, however, our explicit selection of a set of reference cases specifies at least one non-self referential standard against which to measure ASB's achievements, and provides the opportunity for others to suggest explicit changes in those standards. We also guard against over reliance on the "standards" by considering a variety of other, more conventional sets of evidence in conducting our Review. All in all, however, we believe that the "Gold Standard" approach has served us well, and might well be emulated by other reviewers.

**AN ASSESSMENT AND EVALUATION FRAMEWORK FOR THE ASB PROGRAM:**

***OUTSIDE ASB* (Impact Assessment)**



***INSIDE ASB* (Evaluation)**

### **Table 1-A: Causal Sequence of Results used in this Review**

(modified after CIDA's RBM framework)

#### **Internal to ASB (Evaluation)**

- a) *Goal and Priority setting* (strategic problem framing and priority setting by ASB)
- b) *Inputs* (organizational, human and material resources assembled by ASB in response to its priorities, e.g., grants)
- c) *Activities* (programmatic actions undertaken by ASB, resulting from its mobilization of inputs, e.g., research, coordination)
- d) *Outputs* (products produced as an immediate result of the activities of ASB, e.g., reports posted to its web site, articles submitted to journals, innovations developed at its field stations)

#### **External to ASB (Assessment)**

- e) *Uptake* (initial changes in the outside world resulting in its uptake of ASB outputs, e.g., decisions of journals to accept ASB papers for publications, or of farmers to adopt ASB innovations);
- f) *Outcomes* (medium term, higher order results in the outside world that are the consequence of the combined uptake of multiple outputs, e.g., citation of ASB publications; recommendation of ASB innovations by one farmer to another; recognition by leading groups of ASB as the authority on a particular topic);
- g) *Impacts* (ultimate long term results relevant to poverty, conservation, and economy dimensions of ASB goals that follow from its outcomes, acknowledging that other factors may also be important, e.g., changes in practices of farmers, lending organizations, researchers).

**Table 1-B: “Gold Standard” Reference Points for this Review**

This table lists the documents selected by the Panel for its “Gold Standards” approach. Our selection was based on our own knowledge and on the views of a number of the outside experts we interviewed for this Review. From a variety of candidates, we selected those listed below with a bias toward authoritativeness, independence (of ASB), recent publication, and balance across the research, innovation, and policy dimensions of ASB’s domain.

*Basic understanding of human-environment dynamics relevant to ASB’s domain:*

\* Millennium Ecosystem Assessment. 2005. “Ecosystems and human well-being” and continuing topical and subregional assessments

(<http://www.millenniumassessment.org/en/Products.aspx?>);

\* E. Moran and E. Ostrom, eds. 2005. “Seeing the forest and the trees: Human-environment interactions in forest ecosystems.” (Cambridge: MIT Press);

\* Louisa E. Buck, Thomas A. Gavin, David R. Lee, and Norman T. Uphoff. 2004. “Ecoagriculture: A review and assessment of its scientific foundations.” (Ithaca: Cornell University);

\* B. Campbell and J. Sayer. 2003. “The science of sustainable development: Local livelihoods and the global environment.” (Cambridge: Cambridge Univ Press);

\* Intergovernmental Panel on Climate Change (IPCC). 2000. “Land use, Land use change and forestry.” Special Report to the IPCC. [http://www.grida.no/climate/ipcc/land\\_use/](http://www.grida.no/climate/ipcc/land_use/)

*Policy and technology relevant to ASB’s domain:*

\* FAO. 2005. “The State of the World’s Forests: 2005” (Rome: FAO);

\* World Bank. 2004. “Sustaining forests: A development strategy” (Washington, World Bank).

\* A. Molnar, Sara Scherr and Arvind Khare. 2004. “Who Conserves the world’s forests?” Community driven strategies to protect forests and respect rights.” (Washington: Forest Trends). [http://forest-trends.org/documents/publications/Who%20Conserves\\_long\\_final%202-14-05.pdf](http://forest-trends.org/documents/publications/Who%20Conserves_long_final%202-14-05.pdf);

\* Sara Scherr, Andy White and David Kaimowitz. 2003. “A New Agenda for Forest Conservation and poverty reduction: making markets work for low income producers” (Washington: Forest Trends and CIFOR). <http://www.forest-trends.org/documents/publications/A%20New%20Agenda%20Book.zip> ;

\* A. Angelson and D. Kaimowitz, eds. 2001. “Agricultural technologies and tropical deforestation.” (Wallingford: CAB International).

## 1 ENDNOTES

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<sup>1</sup> Canadian International Development Agency. 1996. “Results-based management in CIDA: Policy statement.” [http://www.acdi-cida.gc.ca/cida\\_ind.nsf](http://www.acdi-cida.gc.ca/cida_ind.nsf).

<sup>2</sup> One modification, suggested by Liu (2004), was the introduction of the first term in the sequence to accommodate iNRM focus on participatory priority setting. Another, coming from our own experience, involved differentiating “outputs” (an original RBM “result”) from “uptake” of those outputs (a term not used in the original RBM framework) in order to let us differentiate between *ASB*’s actions in producing outputs, and the outside world’s uptake of those outputs.

<sup>3</sup> Should other CGIAR programmes and *ASB*’s regional partners such as NARs be treated as “outside” the Programme and thus one focus of the impact assessment? To answer in the affirmative risks setting up an assessment framework in which a Programme could score high without ever influencing anyone except members of the CGIAR “club” – a situation that would come close to the legendary economy that functioned because everyone took in one another’s laundry. To answer in the negative, however, would seem to imply that i) *ASB* has control over how the other CGIAR centers take up and react to its outputs, ii) that *ASB*’s (and other SWPs) might get good assessment marks even if they proved totally irrelevant to the Centers that host them. On balance, the Panel concluded that other CGIAR centers and partners should be treated as part of, but not synonymous with, the “outside world, and thus one focus of our assessment.

<sup>4</sup> Some of these documents end up including substantial contributions by *ASB* authors. But we view this as reflecting a judgment by the independent experts responsible for assembling or editing the relevant documents that they viewed *ASB* authors as essential contributors to an authoritative document. The Panel has satisfied itself that the documents we have listed were formulated independently of *ASB*.