MISTRA
The Swedish Foundation for Strategic Environmental Research

Stockholm University

Stockholm Resilience Centre

Research for Governance of Social-Ecological Systems

Mid-Term Evaluation 2013

Stockholm Resilience Centre

June 2013

Authors:
Thomas B. Johansson, the International Institute for Industrial Environmental Economics at Lund University, (Chairperson)
Marion Glaser, Leibniz Center for Tropical Marine Ecology, Germany
Eva Hellsten, Stockholm, Sweden
Peter Schei, Fridtjof Nansen Institute, Norway
Youba Sokona, South Centre, Geneva, Switzerland
Sybille van den Hove, MEDIAN and Autonomous University of Barcelona, Spain
Lucy Rist, Umeå University, supporting the panel as Scientific Secretary

Contact at Mistra: **Johan Edman, Thomas Nilsson**

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1 Main Conclusions and Recommendations

Since its inception in 2007 the Stockholm Resilience Centre (SRC) has become a world leading research centre advancing interdisciplinary research on the dynamics of inter-connected social-ecological systems. SRC´s research focus is tremendously relevant for understanding social-ecological relationships and interactions from the local to the global-level issues critical for the future of both the earth's ecosystems and human wellbeing.

The scientific contributions of SRC, as demonstrated by the Centres publications, are impressive in both quality and quantity. Many appear in the most prestigious scientific journals and citations of SRC work are abundant and equally impressive.

The establishment of ´resilience thinking´ as an integrating umbrella concept has been of great value. The diversity of approaches taken under this umbrella is large, and is growing in response to various scientific and social-ecological challenges. The SRC has also made significant contributions to international policymaking processes through their scientific contributions.

The SRC has thus fulfilled and exceeded the original expectations of Mistra and has established itself as a world leader in resilience and sustainability research. In addition SRC as become a strong entity for education in interdisciplinary sustainability research, as well as for bridging science, policy and to a lesser extent, practice (as summarised in Section 5.6). In Chapter 6, the Action Plan for 2014-2018 has been reviewed and found to be of continuing relevance to Mistra's objectives, and to the mission and vision of SRC. On the basis of this, we propose that Mistra:

- Continues to provide core funding to the SRC for the second phase, 2014 – 2018.
- Considers increasing the level of core funding to the SRC based on the arguments presented in Section 6.5 on financing.
- Considers appropriate measures to address the currently relatively low level of core-funding, thus addressing the challenge of securing long-term core funding for an organisation after the period supported by Mistra
- Carefully reviews, together with Stockholm University (SU), and the SRC itself, the new institutional situation, recognising the success of SRC, its growth and leading role globally in resilience and sustainability research, and its new placement within the SU structure. Such dialogues need to address, in addition to long-term core funding, SRC's role as a centre at Stockholm University with a Board of its own and at the same time part of the natural science domain under the Board of Science, promotion of interdisciplinary and social science staff recruitment and issues regarding PhDs with background in the social sciences, humanities and law.

Expectations of SRC in global science and policy arenas are very high. In many ways the Centre is in a uniquely influential position to continue developing its (and with this, Stockholm University's and Sweden's) successful collaborative approach to the growing challenges of global sustainability. SRC thus needs careful and responsible nurturing by all parties involved with a view towards building on, consolidating, and strengthening the considerable achievements of the past 6 years.

2 Introduction

2.1 Mid-term Evaluation

In 2005 the Foundation for Strategic Environmental Research (Mistra) issued a call for the establishment of a large-scale, interdisciplinary and internationally competitive research centre addressing sustainable governance and management of linked ecological and social systems. In response to this call, a consortium of Stockholm University, the Stockholm Environment Institute (SEI) and the Beijer Institute of Ecological Economics at the Royal Academy of Sciences (KVA) submitted a proposal for the ´Stockholm Mistra Institute´. This proposal was successful and a grant was subsequently awarded to the Stockholm consortium. The ´Stockholm Resilience Centre´ was formed in May 2007 through a Research Centre Agreement between Mistra and Stockholm University signed in January of the same year (Appendix 1). The start-up phase (2007-2009) and first regular phase of the Centre (2010-2013) are now complete. A Progress Report covering 2007-2012 (Appendix 2) and an Action Plan for a proposed second phase (2014-2018) have been submitted (Appendix 3). This report details a mid-term evaluation carried out at the request of Mistra to evaluate the Progress Report and the Action Plan (Appendix 3)

The Research Centre Agreement specifies that evaluations should be made of both scientific and organisational aspects (as defined in the agreements description of scientific orientation, goals and conditions) and shall specifically review the requirements to build a critical mass in both social sciences and the humanities as well as natural sciences and that these areas of science create a new, joint scientific foundation. In addition, Mistra specified the following criteria for this mid-term evaluation (these criteria are detailed in full in Section 4.3.1):

- Centre performance
- Scientific excellence
- Organisation, management and leadership
- Bridging science, policy and practice

2.2 Evaluation panel and timeline of activities

Mistra convened an evaluation panel of the following members:

- Prof. Thomas B. Johansson, the International Institute for Industrial Environmental Economics at Lund University, Chairperson
- PD Dr. Marion Glaser, Leibniz Center for Tropical Marine Ecology, Germany
- Fil. Lic., B. Med. Eva Hellsten, Stockholm, Sweden
- Cand. real. Peter Schei, Fridtjof Nansen Institute, Norway
- Dr. Youba Sokona, South Centre, Geneva, Switzerland

- Dr. Sybille van den Hove, MEDIAN and Autonomous University of Barcelona, Spain
- Dr. Lucy Rist, Umeå University, supporting the panel as Scientific Secretary

Panel members took part in the evaluation in their individual capacities not as representatives of their institutions. See Appendix 5 for biographies of the panel members. Johan Edman and Thomas Nilsson acted as contact persons to represent Mistra. The SRC application was submitted to Mistra on schedule on March 1st. The panel convened in Stockholm between 22nd and 26th of April, spending the 23rd and 24th in place at the SRC. During that week their evaluation was completed and a first draft of the evaluation report compiled. The report was subsequently revised by the panel via email. Sections of a draft version of the report were circulated to Mistra, SRC and Stockholm University in mid-May to provide an opportunity for clarifications and corrections of errors of fact. The final version was submitted to Mistra on May 22nd.

2.3 Structure of this report

The history of the SRC is briefly reviewed in Chapter three with a specific focus on earlier evaluation processes and findings, as well as the Centre's own self-evaluations and planning processes. Chapter four details the approach taken by the evaluation panel in carrying out its task, Chapter five the evaluation of the Centre's activities 2007-April 2013. The final Chapter documents assessment of the Centre's Action Plan 2014-2018 and provides recommendations for reflection by the Centre. The evaluation findings specifically are organised around the Centres goals as outlined in the Action Plan. Chapter one provides the main conclusions of the evaluation and summary recommendations for Mistra. Recommendations for the SRC appear throughout the Report.

3 History

3.1 Original call and application process

In 2005 Mistra invited pre-proposals to establish a large-scale, interdisciplinary and internationally competitive academic research centre addressing sustainable governance and the management of linked ecological and social systems. Strongly influenced by the Millennium Ecosystem Assessment, and further by Mistra´s own experience with programmes supporting ecosystem and natural resource management, the objective was to contribute to the field of interdisciplinary research and thus support further initiatives in the area of sustainable ecosystem management. The invitation was for a long-term joint commitment between Mistra and a Swedish University and thus only pre-proposals from vice-chancellors of Swedish universities were accepted. Mistra was of the view that the scale of the commitment necessary was beyond the scope of individual scientists or research groups, and further that a university placement was important for academic integration and interaction.

3.2 Funding decision and SRC agreement

In 2007 Mistra decided to fund the research Centre proposal the "Stockholm MISTRA institute"[1]. Subsequently, through a bilateral agreement between Mistra and Stockholm University, the "Stockholm Resilience Centre" was established at the University in the same year (during a start-up phase 2007–2009). The Centre was established as a collaborative venture between Stockholm University, the Beijer Institute of the Royal Swedish Academy of Sciences (KVA) and the Stockholm Environmental Institute (SEI). The agreement with Mistra regulates issues concerning general conditions (including strong consortium cooperation), management structure and financing, as well as long-term goals of the Centre and its strategic research orientation (Appendix 1).

3.3 Organisational placement of SRC

Originally the Centre was placed directly under the Vice-Chancellor of Stockholm University, this was considered important in emphasising the cross-faculty research endeavour of the Centre. Several existing entities were placed under the Centre umbrella; namely The Centre for Transdisciplinary Environmental Research (CTM) and the Baltic NEST project (Appendix 6).

In February 2012, the Vice-Chancellor of Stockholm University commissioned the two Deputy Vice-Chancellors to investigate the future organisation and placement of the SRC within the University (Appendix 7). The motivation of the review was to propose a faculty placement of the SRC in order to give the Centre a clearer

1 Original Stockholm Mistra Institute proposal: http://www.stockholmresilience.org/download/18.aeea46911a31274279800035608/

organisational location and thus promote its integration into the University's operations. The resulting report (dated 25th May 2012) looked at the future outlook of the Centre, its faculty affiliation and its internal organisation. A main conclusion was that "Through its unmistakable strength and international prominence, the SRC is a great asset to Stockholm University – albeit an asset which holds untapped potential. The SRC currently only offers a limited open arena where researchers from various disciplines can meet and work in an interdisciplinary fashion with the social issues that constitute the SRC's mission." Concerns were also raised about the methodological focus of SRC: "The SRC's starting point is that an interdisciplinary approach based on dynamic systems and resilience should be applied to complicated social issues such as governance and management of social-ecological systems. This methodological focus may benefit the SRC's own research, but it also entails an ideological focus that might alienate researchers with another scientific approach. A broader approach would provide greater opportunities for the SRC to keep and develop its strong position in the future should the current approaches prove to be less successful". The Deputy Vice-Chancellors report recommended SRC to be placed as an interdisciplinary centre under the Faculty of Science and proposed quite far-reaching changes to the SRC Board and, hence, the steering of the Centre. This would have required a re-negotiation of the original agreement between Mistra and the University.

The SRC responded to the report of the Deputy Vice-Chancellors (dated July 2012) in order to "clarify the Centre's mandate, research focus and operation in relation to the University". SRC pointed to its "well-defined scientific focus and mandate" based upon the long-term goals in Mistra/SU agreement, its "front-line of international research" in SRC's scientific area and that SRC "has always collaborated with researchers and research groups at Stockholm University that are interested in and open to, the SRC mandate and research focus." Furthermore, the SRC leadership stated that SRC "is an internationally recognized centre on "sustainability science" at Stockholm University. Other departments and centres at Stockholm University are leading in other scientific areas". The SRC leadership clarified that SRC had "never requested, nor been given, the task to serve as a platform for multidisciplinary environmental research at Stockholm University. Nevertheless, SRC believes that "strengthening multidisciplinary research collaboration on environmental issues at Stockholm University is very worthwhile" and that this is an activity that SRC supports and have invested time and money into achieving, but it is only loosely coupled to the SRC and not part of our mandate". However, the SRC stated that it was "willing to continue playing a facilitative role in collaboration with others to support multi-disciplinary environmental research at Stockholm University." The team-leaders of SRC also signed a letter addressed to the Vice-Chancellor (dated 31st May 2012) in which they "requested discussions and unbiased, empirically-based suggestions for improvements" of SRC, stated that the report of the Deputy Vice-Chancellors did not provide such a "clear and fair assessment of the Centre" and rather made "sweeping recommendations based upon misconceptions, weak analysis and unsupported assertions". Consequently, the team-leaders urged that the Deputy Vice-Chancellors report to be "completely rejected"(Appendix 8).

Issues surrounding the SRC were discussed by the University Board at their meeting on 28th September 2012. The final proposal from the Vice-Chancellor to the University Board, presented to the Board meeting on 9th November 2012 was to place SRC in the natural sciences, under the Board of Science, but without any changes to the SRC Board. The proposal was based on the Vice-Chancellor's view to protect the SRC's operations, its special position as an interdisciplinary and competitive research centre in sustainability science, and preserve its world-leading standing. The placement under the Board of Science would allow SRC to receive increased opportunities and administrative support within the University organi-

sation for interdisciplinary work in line with its scientific profile. The University Board decided on the 9th of November 2012 that SRC should be placed under the natural science disciplinary domain[2] under the Board of Science as of 1st January 2013 according to the proposal. (Appendix 9)

In the proposal to the University Board of 9 November 2012, the Vice-Chancellor recommended several further changes that were endorsed by the University Board, the Senior Management Team and the SRC management. It was recommended that the Board of SRC establish a preparatory, interdisciplinary body in which the two disciplinary domains at SU are represented. The body could thus serve several functions; to handle employment and educational issues and hence support decisions taken by the SRC management and Board. It was also recommended that the Board meet more than twice a year. It was furthermore recommended to empower SRC to accept PhD students with a natural science background (normally done by University departments or faculties and not by institutes/centres); move parts of the Baltic Nest Institute from SRC to the new Baltic Sea centre at SU; and move the Section for Natural Resource Management to the SRC.

These further changes have all been implemented except for the ones that rest with the Board of SRC. To date, there has been no appointment of the interdisciplinary preparatory body within the SRC, awaiting an agreement between SRC and the natural science domain on the mandate of this body.

3.4 History of previous evaluation processes and findings

The evaluation of SRC since its establishment, in addition to what was specified in the Centre agreement, has followed the Centres own evolution. As such, use has been made of previous plans, reports, and reviews, in conjunction with material from interviews. This section provides a sense of the dynamics that has characterised the SRC´s evolution to date.

3.4.1 Start up review of the Stockholm Resilience Centre 2009, by Prof. William Clark

An action plan for the first regular phase (2010-2013) was submitted to Mistra for evaluation in the spring 2009. A forward-looking evaluation was then initiated by Mistra and performed by Professor William Clark of Harvard University. It was agreed that the evaluation should be formative in nature, serving to inform the Centre's action plan for the phase 2010-2013. Mistra's terms of reference for the evaluation specified 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 was required to "have an emphasis on organisational aspects of the Centre, but also review the general scientific orientation, goals and conditions specified in the agreement" and should "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." W. Clark, in his review, summarised the intention as being to evaluate SRC after its two-year start-up in order to determine whether it is "on track" to fulfil its long-term mission, and to identify the most important changes in organisation and approach that should be given attention to help the Centre transition to being fully operational.

2 The natural science disciplinary domain is in the current organisation of the University identical to the Faculty of Science and lead by the Board of Science, note that thus the report uses the terms ´Domain´ and ´Faculty´ interchangeably for natural science.

He outlined key findings and made subsequent recommendations based on these findings[3].

3.4.2 Review of Leadership of the SRC 2009 by Jan Boström

An evaluation of the organisation and leadership at the Centre, initiated and financed by Mistra, was undertaken late in 2008 by the consultancy agency GAIA Leadership. This task included "understanding SRC's vision, mission, values, strategies, management and organisation; reflecting on the selected management and the organisational structure in relation to the SRCs continuous development, its ability to renew itself, the need for clarity, effective structure, right staff, solving problems that arise and aids to the management; finding ways of challenging SRCs collaborative partners so that they can become a stronger resource for the success of the programme; and finally elucidating and reflecting on SRC's integration into Stockholm University, in relation to the agreement." Interviews were conducted and background documents reviewed. A report was produced in 2009 and several coaching sessions took place.

3.5 Development of SRC's strategies and action plans

3.5.1 The SRC Board

The Stockholm Resilience Centre is governed by an international board, which is responsible for the strategic direction of the Centre, the scientific and communication achievements, the organisational structure and development, and the financial performance of the Centre. As such they have endorsed the documents described below.

3.5.2 Implementation strategy Start-up phase 2007-2009

This strategy focused on outlining principles and criteria regarding the intentions for Centre development rather than specific plans. The research agenda was specified by prioritising research areas together with an outreach strategy. The original Centre proposal described the organisational structure and research strategy; these were built upon in the implementation strategy without any major modifications. The strategy was reviewed and evaluated by W. Clark informing the recommendations he put forward in 2009 (see section 3.4.1).

3.5.3 Action plan 2010-2013

The mission of the Centre was clarified in this plan with the three core features for SRC research (as stated in the implementation strategy) re-emphasised; including their role in providing the overall research direction. In terms of bridging the Centre's research and resilience thinking to policy and practice various actions were outlined regarding intentions to start testing, convening, and executing. The development of an internationally competitive research school with both MSc and PhD education was also summarised, along with plans to support permanent research positions, and investments in leadership, management and administration capacity building. The plan addresses some recommendations from Clark´s 2009 review[4]. Chapter 5 and Appendix 12 specifically review what happened in response to Clark's evaluation and offer some associated recommendations.

3 William Clarks Start-up Review: http://www.stockholmresilience.org/download/18.668e42d4131b5c9d5138000835/SRC+Review+Final+Report.pdf

4 SRC Action Plan 2012-2013: http://www.stockholmresilience.org/download/18.587b3d0a1325af354a5800012283/SRC+ActionPlan+2010-2013.pdf (Annex 5 in this plan details the SRC´s response to Clark's recommendations and actions taken to address them).

3.5.4 Annual report 2012 and Progress report 2007-2012

The 2012 annual report presents some of the highlights of SRC´s achievements between 2007-2012[5] and accompanies the full progress report for 2007-2012. The progress report summarises and analyses the work and activities of the SRC during its start up phase (2007-2009) and its first operational phase (2010-2013) in preparation for the mid-term evaluation. In Chapter 5 we consider the substance of SRC achievements during this time.

3.5.5 Action Plan 2014–2018

The Action Plan outlines the Centre's key achievements to date, the activities to which the Centre is committed, and the activities it aspires to in the future. Research, academic capacity building, bridging science and policy, institutional development and financing all feature in this plan. In Chapter 6 of the report we assess these plans and make recommendations to Mistra, SU and SRC based on this assessment.

5 SRC Annual Report 2012: http://www.stockholmresilience.org/download/18.7aded12513d7b0a1c2c4d5/SRC_arsrapport_uppslag2.pdf

4 The Evaluation Process and Criteria

4.1 The Assignment

The evaluation panel was asked to evaluate the Centre against four criteria established by Mistra (see section 4.3.1 below and Appendix 4 for a detailed description of these):

1. Centre performance

2. Scientific Excellence

3. Organisation, management and leadership

4. Bridging science, policy and practice

The evaluation panel also assessed the Centre against its overarching strategic purpose – the vision and mission of the Centre – as well as its long-term goals and strategic research orientation (see section 4.3.3).

4.2 The Evaluation Approach

In preparation, the panel reviewed documents submitted for the evaluation as well as additional documents that they requested from the Centre. Documents included in the evaluation comprise but are not limited to:

- Progress report 2007-2013, including publications
- Application for funding and Action Plan for 2014-2018
- Action Plan 2010-2013 including annexes
- Action Plan 2007-2009
- Annual Report 2012
- Start-up Review of SRC (July 2009)
- Agreement between Mistra and Stockholm University (January 2007)
- Original call text (June 2005)
- Twenty key publications selected by the Centre

Prior to the visit, the Centre's management team was asked to provide written answers to a set of questions formulated by the panel, as well as evidence to support those answers where this was deemed appropriate (Appendix 10). During the visit the panel was presented with overviews of the Centre's history and present situation, in addition specific presentations of the various research themes and overviews of the Centre's administration, education and communication activities. Panel members also interviewed both senior and junior staff including PhD stu-

dents selected by SRC. The panel also met with other individuals of key importance including the Vice Chancellor, Deputy Vice Chancellor and former Vice Chancellor of Stockholm University, the Chairman of the SRC board, the Permanent Secretary of The Royal Swedish Academy of Sciences, the Director of the Beijer Institute and the Executive Director of the Stockholm Environment Institute (Appendix 11). In addition the panel sent further questions to the Centre's management subsequent to the Stockholm visit.

4.3 Elements of the Evaluation

The evaluation draws upon several elements. Thus the progress and future plans of the Centre were judged against the following: the criteria established by Mistra for this evaluation (Appendix 4), the original objectives and research orientation according to the agreement between Mistra and SU (Appendix 1) as well as the Centre's own vision and mission (including revisions to this). To this, the panel added education as a further area for evaluation.

Mistra criteria for the 2013 evaluation:

- **"Centre performance:** The centre's performance should be measured in relation to the objectives and goals specified in the agreement between SRC[6] and Mistra and further developed in SRC's Action Plans for 2007-2009 and 2010-2013. The original call text from Mistra offers additional guidance. In the call text, the objectives of the specific initiative are stated. However, the needs of the centre to show flexibility and adapt to a changing world have to be taken into account."[7]
- **"Scientific excellence:** All research ventures funded by Mistra must be of the highest scientific quality, measured against international standards. Particular attention should be paid to the centre's progress in interdisciplinary research, not only within the field of the natural sciences but also in relation to social sciences. Attention should be paid to whether the centre has developed into a strong research environment of the highest international class."
- **"Organisation, management and leadership:** As a fully established institution, the set-up and operation of the centre are key issues in this mid-term evaluation, as well as the long-term strategy for further development of the centre (e.g. leadership succession planning, attractiveness and recruitment of staff, and internal staff career opportunities)."
- **"Bridging science, policy and practice:** For Mistra, it is vital that the research funded by the foundation has an impact on society. To ensure this happens, researchers and the intended users need to work together. In this way, Mistra ventures can build bridges between research and the wider society, in support of sustainable development. Attention should be paid both to the performance of the centre in this respect and the centre's ideas of how the users' perspective could be further integrated into the research process. This criterion includes scrutiny of the Centre's communication strategy and activities."

4.3.1 Original agreement between Mistra and Stockholm University

According to the original agreement between of Mistra and SU, "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". Mistra's first criterion specifically refers to the objectives and goals specified in the original agreement and the follow-

6 The panel understands that Mistra was referring here to the agreement between Stockholm University and Mistra.

7 Original call from Mistra: http://www.stockholmresilience.org/download/18.aeea46911a31274279800035567/Mistra+invitation.pdf

ing three subsections list goals, strategic research orientation and basic conditions as they appear in that agreement.

4.3.1.1 CENTRE'S LONG TERM GOALS

- 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.

4.3.1.2 STRATEGIC RESEARCH ORIENTATION

- 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 socio-political 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).

4.3.1.3 BASIC CONDITIONS

- 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

4.3.2 SRC Vision and Mission

The current vision and mission of the SRC, as introduced in the 2010-2013 Action Plan following the Clark evaluation are:

"The *vision* of the Stockholm Resilience Centre is a world where social-ecological systems are well understood, governed and managed, to enhance human wellbeing and the capacity to deal with complex change, to enable the sustainable co-evolution of human civilizations with the biosphere.

The *mission* of Stockholm Resilience Centre is to *advance research* for governance and management of social-ecological systems to secure ecosystem services for human wellbeing and resilience for long-term sustainability. We apply and further advance research within *practice, policy and in academic training*."

5 Evaluation Panel Findings of SRC Work 2007-2013

5.1 Centre Performance

The panel used centre performance as an umbrella term encompassing performance with respect to scientific excellence; organisation, management and leadership; and bridging of science, policy and practice. Education was added as an additional area of performance. Our findings on performance are summarised in Section 5.6.

5.2 Scientific Excellence

The primary goal of Mistra and SU - the establishment of a world-leading centre in the field of inter disciplinary research on social ecological systems - has been achieved. A new integrated science under one roof is central to the SRC mission. Overall, the panel found SRC research to be innovative and of high quality. SRC has shown a dramatic evolution and has emerged as a world-leader in the field of interdisciplinary research on the dynamics of social-ecological systems. This judgement is supported in particular by publications, citation frequencies and keynote presentations at major international conferences, as well as the Centre's reputation in international and regional research and policy arenas.

This excellence is demonstrated by both quantitative and qualitative measures. Figure 1 shows that SRC scientific publications are steadily increasing over time along with the interdisciplinary and social science elements in their publication

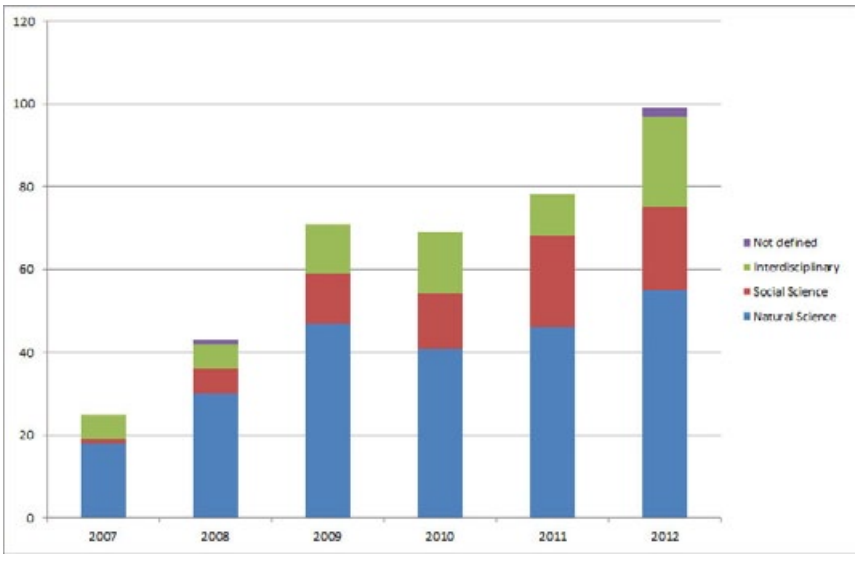


FIGURE 1. The distribution of to SRC articles in natural science, social sciences/humanities journals as classified by Web of Science.

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 3.4 PAGE 11.

FIGURE 2. SRC citations in each year as of February 21, 2013.

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 3.7 PAGE 15.

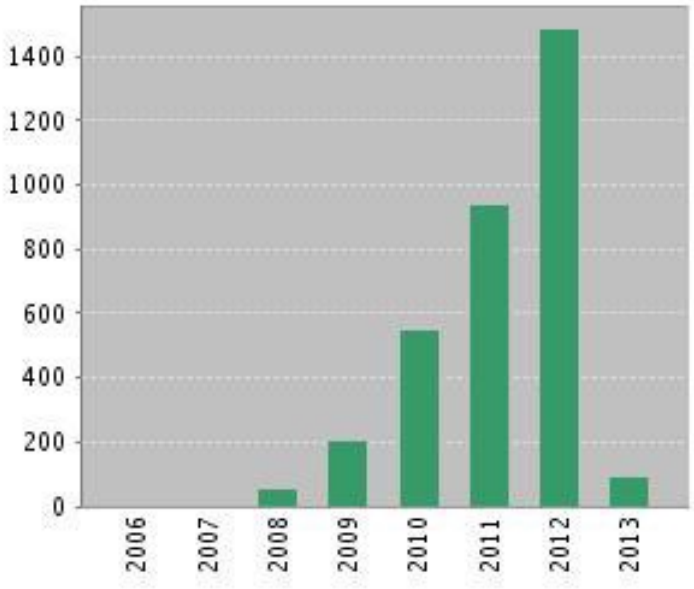
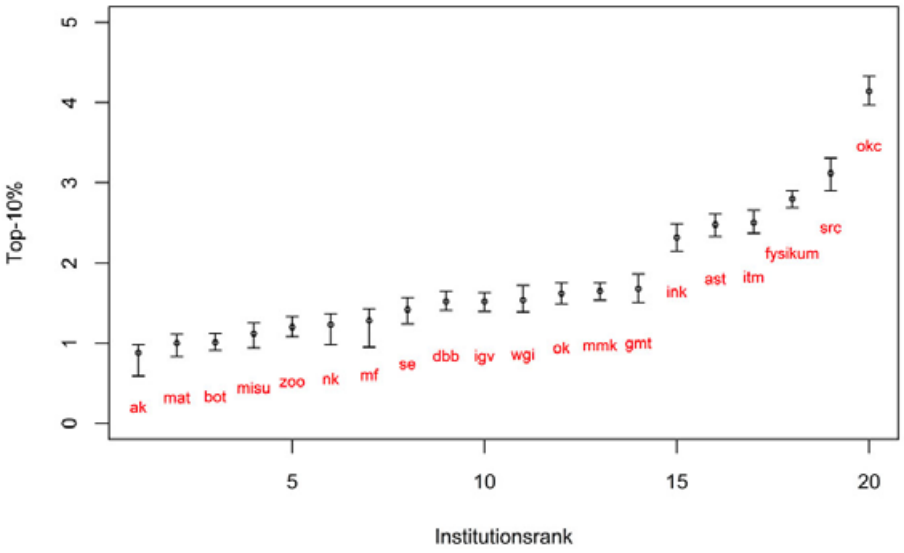


FIGURE 3. Proportion of publications in the top 10% most cited articles for different scientific areas, for 20 departments at the Science faculty. The Stockholm Resilience Centre is indicated as 'src'.

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 3.9 PAGE 20.



outputs. In combination with the impressive rise in annual SRC citations in the ISA web of science (Figures 2 and 3) this indicates that scientific excellence within its interdisciplinary arena has clearly been established by SRC.

Also notable is that SRC has established a very broad network of scientific cooperation around the world including playing a key role in Resilience Alliance which functions internationally.

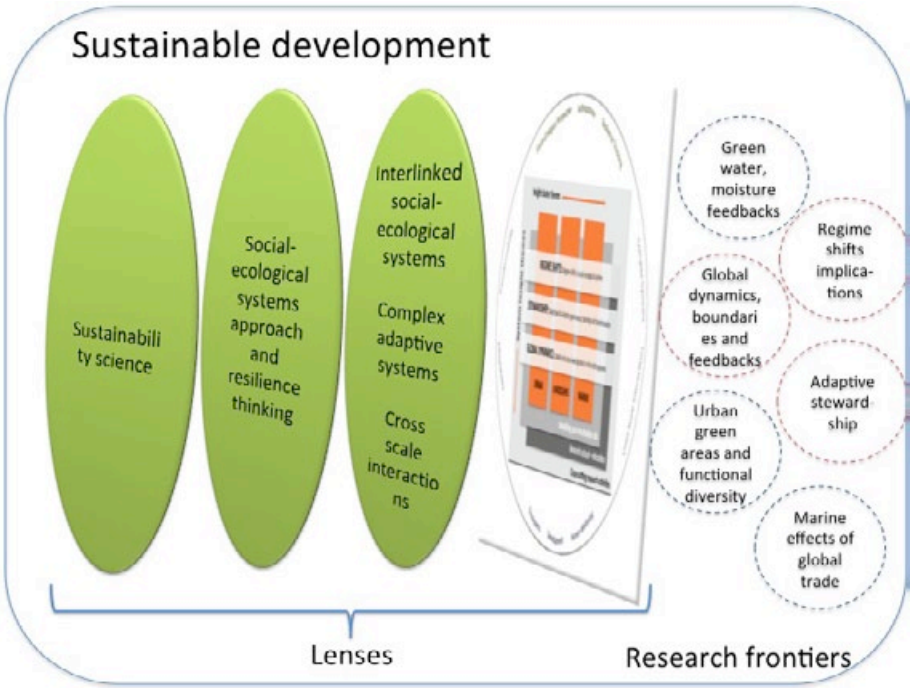
5.2.1 Framing and lenses

The SRC states that it "welcomes any approach, method, perspective, epistemology or ontology from the social sciences, humanities and natural sciences that can contribute to a deeper understanding of the challenge for governance of SES…". This is reflected in the ´framing´ of SRC research. ´Framing´ has been a prerequisite for SRC's enormous success in the very broad research field of social-ecological dynamics. The Action Plan 2014-18 (p.9) and previous documents describe three core features or ´boundary conditions´ which frame all research at SRC:

- Society and nature are regarded as interdependent social-ecological systems
- Social-ecological systems are seen as complex adaptive systems, and
- Cross-scale and dynamic interactions represent new challenges for governance and management.

FIGURE 4. SRC Research lenses.

SOURCE: PRESENTATION BY JOHAN ROCKSTRÖM 23RD APRIL 2013.



Core features of this framing are "the existence of potential tipping points (thresholds) and regime shifts and the challenges that implies; the adaptability of social ecological systems to deal with such changes, uncertainty and surprise; 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" (Action Plan 2014-18 p. 9-10). Within this research frame, four "lenses" (sustainability science, social-ecological systems and resilience, as well as SRC´s six interrelated research themes (Figure 4) which structure efforts to advance research frontiers within the context of the scientific framework of a social-ecological approach to resilience and sustainability

Among the "lenses" applied to SRC research, resilience has a firm and somewhat dominant place (see Section 6.1.2). The three consecutive SRC Action Plans show an increasing frequency in the reference to resilience concepts, which could be interpreted as SRC getting increasingly framed by this concept in particular. The resilience lens has been central for finding a ´common approach´ in this research field and in the evaluation it became clear that this has indeed been essential for the rapid success of SRC.

The SRC confirmed to the evaluation panel (Appendix 10) that the process is to "apply resilience thinking when relevant, but not in an uncritical, advocating manner".

5.2.2 Interdisciplinary research

The research structure at SRC is broad and interdisciplinary (Figure 5). SRC has a strong base in natural sciences (in particular systems ecology) and has successfully worked across disciplines in natural sciences, for example for the prominent Planetary Boundaries paper. The success of this paper clearly illustrates the contribution of SRC research.

The assessment and economic valuation of ecosystem services, as well as of the impacts of different policy measures on ecosystems, is an expanding research field of high relevance to policymaking. With its close links to the Beijer institute, SRC has developed a strong position in this area with the ability to advance research frontiers. This position holds much promise for supporting future policymaking.

SRC works in an interdisciplinary arena, as evidenced by its research themes linking ecological and social systems (see Section 5.2.2). Interdisciplinary research on "interdependent ecological and social systems" by definition requires collaboration between natural sciences and a broad range of social science and humanities disciplines. SRC welcomes staff with different backgrounds in natural and social sciences. Over the years the Centre has increased the number of staff with social science expertise and has enhanced the diversity of social science expertise through collaborations with external scientists with expertise in the social sciences.

In order to "generate new and in-depth insights for the development of decision-making systems that support long-term sustainable management at different scale levels" continued efforts towards even closer collaboration and integration of social sciences and humanities will, however, be required. This need was also stressed in Clark´s evaluation (Appendix 12).

SRC researchers are currently making excellent social science contributions to SRC´s interdisciplinary mission. However, given a historical dominance of natural sciences in environmental sciences, the means by which social parameters and dynamics are interpreted and included still requires reflection. For example, the concept of human wellbeing, which forms part of the central SRC vision, can be more comprehensively defined than currently is the case with potentially enriching implications for SRC's research on human-nature feedbacks. Additionally, natural science training specifically for social scientists is pursued by the SRC.

Difficulties in obtaining social science students are reported by some SRC staff. W. Clark's recommendation that "the center should bring critical social science perspectives on power and influence to bear on its core research questions, has been partly responded to by new approaches such as social network analysis and the analysis of markets as ecosystem drivers (Appendix 12). More creative reaching out to capacities and interaction with other framings for such analyses might enrich SRCs interdisciplinary successes.

To explore the full range spectrum of social-ecological research, there is the opportunity for a major project with major disciplinary roots in social sciences (much as the planetary boundaries work is dominantly rooted in natural sciences)

FIGURE 5. Present theme structure, activated 2010 and updated in 2013.

SOURCE: SRC ACTION PLAN 2014-2018 FIGURE 5.1 PAGE 12.

with the explicit task of "integrating the natural sciences". However, the first senior social scientist recruited in 2009 has left SRC together with the IHOPE project. However, other social science oriented projects remain at the Centre.

5.2.3 Multi-level research from local to the global

Global sustainability challenges must be addressed across the different scales of the planetary social-ecological system. In terms of scale, SRC research mainly falls into two categories: 1) local and regional case studies and 2) the planetary level approach. Strategies to investigate cross-level and multi-scale linkages are in place, for example the Programme on Ecosystem Change and Society (PECS) but these are still fairly disconnected. Although leading in the development of multi-level analyses, the SRC has potential to further develop how case studies feed into global change dynamics and vice-versa.

SRC research at the local level (i.e. case studies) on interdisciplinary social-ecological systems and management deliver valuable results. This research has, in many cases, generated a better understanding of local governance for those directly affected. SRC is aiming to accumulate a number of local case studies that would enable them to draw conclusions at a ´meta-level´ as well as other scales above the local level, and to thus provide more actionable science.

SRC research should, according to the research orientations originally set out by Mistra, also focus on "socio-political complexity and how regulations, decision-making systems and social structures influence management of the ecosystem". Within SRC research to date on local and regional case studies it has not always been possible to scientifically relate the results to national, EU and global levels. This is an area that deserves strengthening as the knowledge created by SRC research at local and regional level has the potential to influence levels at national and EU levels, which have legislative power.

Greater breadth in the multi-level analysis of social-ecological feedbacks could be achieved. For the purpose of "scaling local to global", SRC is examining links between economic variables (e.g. multi-level trade of marine ecosystem products) and regional environmental governance (e.g. Coral Triangle Initiative and ensuing leadership challenges in the face of cascading ecological crises). Use of a wider set of framing and methodological approaches in assessing impacts on ecosystem character and performance could deepen globally nested analyses of different regions of the world. This might also advance SRC work on linking science to action.

5.2.4. System insight and insight cluster themes

SRC research is currently structured under three system themes and three insight cluster themes. A credible process was established for the evolution of themes over time to maintain the adaptability of the SRC research foci in line with social-ecological change. In the words of the Science Director "Exposing ourselves to work under different group themes is the reason for our high scientific output".

5.2.4.1 URBAN

This first theme focuses on urban social-ecological systems. The approach is to view cities as integrated social-ecological systems and analyse the resilience issues that emerge from this view. The work has two parts; 1) global urban patterns and 2) more local areas of focus such as green areas and ecosystem services.

Urbanisation is one of the major processes influencing our planet and human wellbeing. Currently more than half the global population lives in cities and this is projected to reach some 70 % by 2050, at which point the global population will have grown to around 9 billion people. Design and construction of urban spaces is therefore very rapid and once built, tend to lock cities into their structures for long time periods. Research into understandings and processes around urban areas and urbanisation is therefore a critical element in capitalising on this major area for

intervention for global sustainability. Improved urban planning would have significant benefits in terms of the quality of living spaces, health, climate, air quality, mitigation through better buildings and transportation systems. The next few decades will be critical for capturing the opportunities represented by expanding urban areas.

The work on this theme at SRC is interdisciplinary and an extensive network has been established. In addition to scientific publications on this topic, the SRC has recently been a key participant in the new ´Cities and Biodiversity Outlook under the auspices of the UN Convention on Biological Diversity.

5.2.4.2 LANDSCAPES

The landscapes theme encompasses freshwater, food and ecosystem services. These three elements are intertwined and form a variety of landscapes to study and analyse dynamic social-ecological systems from a resilience perspective. In particular, the availability and accessibility of water are crucial issues for food security and human wellbeing.

The theme has been shaped following an initial focus on the prevailing situation of drought and food insecurity in semi-arid and arid regions, in particular the Sub-Saharan Africa. The research, conducted in collaboration with local communities, addresses social-ecological feedbacks, the production and governance of bundles of ecosystem services, green and blue water flows and rainwater harvesting, again taking the resilience perspective. There are plans to investigate the role of power and social networks at multiple geographic levels, technological and social innovation, trade-offs and potential synergies between different goals or ecosystem services, identifying thresholds and regime shifts, and strategies for building general and specific resilience in drylands.

The findings of work under this theme will help in developing typology and modeling approaches that contribute for better informing growing demand for interaction of science with policy and practice. This work is highly relevant for Rio related UN Conventions and for SRC's participation in the development of Global Sustainability Goals/Indicators.

5.2.4.3 MARINE

The SRC marine theme looks at how ecological, social, and social-ecological dynamics shape change in marine social-ecological systems and focuses increasingly on transformation pathways to sustainable stewardship.

Some key areas of work include work on coral reefs, the Baltic Sea, aquaculture and trade in marine resources. Fieldwork in the marine theme takes place in various areas in Europe, Africa, North and South America, Asia and Antarctica.

Over the period 2007-2012, the marine theme received the highest support from external grants (22%).

Given that the oceans constitute the biggest biome on Earth, the contribution of the marine world to global biogeochemical cycles, the importance of marine resources for a large portion of humanity, and the multiple and varied connections between human and marine systems from the local to the global level, developing research on marine social-ecological systems is of paramount importance.

The panel appreciates that the research under this theme seems to have become increasingly socio-ecological. This theme is also well connected to the other themes and has a very strong publication record. Yet the panel wonders if the different marine research pieces performed by SRC are sufficiently integrated under a coherent strategy to address marine social-ecological systems. Research on marine ecosystems goods and services could be strengthened.

5.2.4.4 REGIME SHIFTS

Regime shifts, as described by SRC, are "large, persistent, often abrupt changes in the structure and function of social-ecological systems" (Insight #2). Understanding of regime shifts is important for ecosystem governance as they often have sub-

stantial impacts on human economies and societies, tend to occur unexpectedly, and are difficult, expensive and sometimes impossible to reverse. SRC has helped document regime shifts in a range of ecological and social-ecological systems, at a range of scales. Several publications can be found about regime shifts in coral reefs, marine food webs, and agricultural systems, but also at more theoretical levels. SRC is also pioneering the application of the regime shift concept to understanding shifts that are driven purely by social-ecological feedbacks, for example poverty traps in dryland agricultural systems or guilded traps in coastal systems and unsustainable fisheries regimes. This understanding of regime shifts derives from empirical observations as well as from dynamical systems theory and mathematical modelling.

SRC research in this area also addresses how to best manage and govern the resilience of current social-ecological regimes to enhance adaptability and how to revive or transform an existing regime that might be in danger of further change or be currently undesirable. In this work, the regime shift team interacts with other teams at SRC such as with individuals from the Marine, Stewardship and Global Dynamics system insight and insight cluster themes. A particular challenge for the regime shifts theme is to find ways to develop "early warning" systems. Here, SRC goes beyond the traditional environment indicator work and has developed new ways to think about indicators. Currently "regimes" are ecologically described in SRC research and in its data bank. A linking of analyses of political regime shifts with ecological shifts, for instance in the regime shifts database is one future option to deepen the engagement of the social sciences in SRC.

5.2.4.5 STEWARDSHIP

Research under this theme is clearly aimed at biosphere stewardship and has focused on three topics: 1) adaptive governance, 2) adaptive co-management and 3) transformation. Publications focus on multiple institutional scales and draw on case studies at the international (e.g. The Global Partnership for Climate, Fisheries and Aquaculture (PaCFA)) local and regional levels (e.g. the Kristianstads Vattenrike, the Great Barrier reef, the Golbourne catchment regions), as well as the national (e.g. Sweden, Canada, Indonesia) and the transnational level (e.g. the Coral Triangle Initiative). A range of articles on leadership, collective learning, social-ecological connectivity and bridging organisations, conflict and cooperation and the problem of ´fit´ between ecosystems and management institutions has been published in interdisciplinary journals. More recently, the Stewardship theme has focused on new modes of "transformative innovation", i.e. on "new ways of doing things" in science, technology, governance and management. This has been viewed as a crucial ingredient of sustainable development. These publications have linked strategy types to phases of system change and innovation at multiple system levels and, not least through the proactive stance of the SRC (for instance in the Nobel Laureate Symposium in Stockholm in 2011), have become part of the global sustainability debate and action.

5.2.4.6 GLOBAL DYNAMICS

This theme has been developed in cooperation with the Beijer Institute. The concept of Planetary Boundaries is very much at the heart here; where SRC research has contributed substantially to the understanding of thresholds and tipping points and the potential consequences for human well-being. The point of departure for this research is the importance of establishing governance systems that maintain nature`s ability to provide ecosystem services. On the political solutions side, research under this theme identifies the need for adaptive and transformational actions towards global sustainability. The Centre has also done a number of cross-thematic global case studies, for example on the Arctic, energy, agricultural land seafood production.

The interrelationships between the various economic sectors and the lack of horizontal cooperation and coordination between them, is a serious impediment for sustainability also at the global level. SRC research here contributes to understanding the need for global governance reform to face current challenges. For example, the SRC contributed greatly to the "Planet under Pressure" conference in London in 2012.

5.3 Organisation, management, leadership

The organisation, management and leadership aspects of the Centre have had significant attention during this first operational phase. SRC´s governance appears to have developed quite adequately during these few years, which were clearly characterized by rapid organizational growth. There is evidentially a very collaborative and enthusiastic culture among the staff:

- "A great place and environment to work in" (Common response from the staff interviewed).
- " There is a high level of trust and we have fun"
- "We are only at the beginning but the Centre is already at the forefront of global research in this beginning"

SRC has had an amazingly rapid rise to the global forefront of research on environmental sustainability and global change issues. The dual leadership of Johan Rockström and Carl Folke has been very successful; they have created an extraordinary good working environment that attracts researchers from all around the world, no easy task. They have established a group of researchers with the capacity to publish and an environment that supports publication (Figure 6). The organization has a flat structure, one that appears to be appreciated by staff; "It is not a long way to the top".

The performance of SRC themes is monitored and rewarded, a factor that certainly contributes to the "razor-sharp competitive environment" described by Johan Rockström and also seen as a key feature of the SRC. Despite its productivity, the staff does not appear to be obsessed by an efficiency culture. This allows for intellectual space, for creativity, for departing from mainstream research avenues,

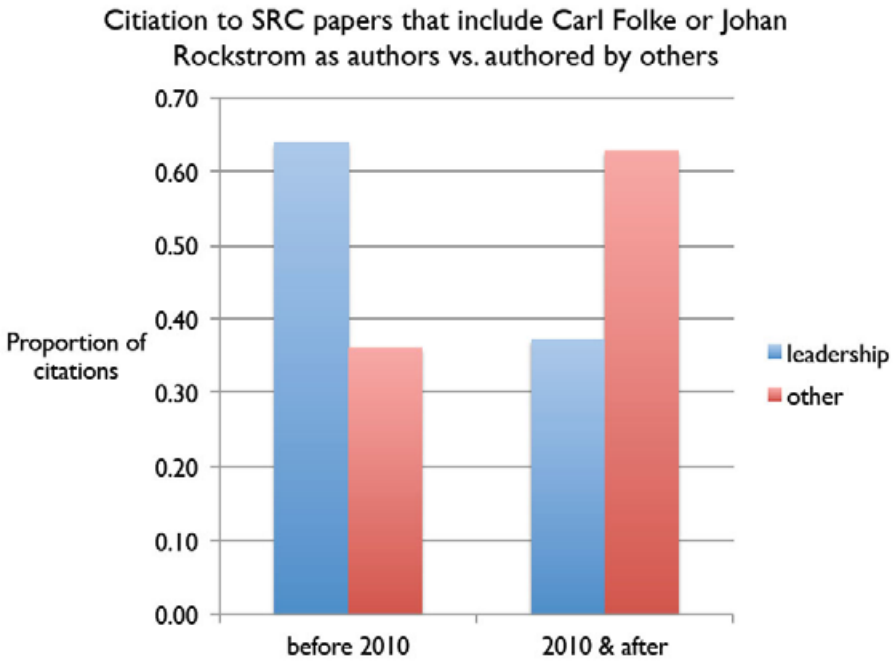


FIGURE 6. The proportion of citations to SRC papers by SRC leadership and other SRC researchers before 2010 and 2010 and after.

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 3.8 PAGE 19.

and even for the acceptance of mistakes (Johan Rockström described how the Centre has established a mock "award" for the biggest mistake).

The SRC promotes a culture of trust, transparency, openness, collaboration, and of welcoming and fostering of innovative ideas. The reflexive and learning oriented approach of the Centre is an asset (applying some of their own concepts of SES, ecosystem services, resilience, to the Centre itself which is considered as and setup as a complex system). Staff members and close collaborators of the SRC identified the following strengths:

- Importance of visiting scientists from all over the world
- Supervisors are available and open to discuss ideas
- "Here we have the possibility to learn how to do good interdisciplinary science"
- "Integration of natural and social sciences is good"
- "The leadership training I had, helped me a lot"
- The fact that we have many co-authors on each paper works in a way as a pre-peer review process and increases interdisciplinary quality

At the same time, they also stressed some challenges:

- "Sometimes you feel there are too many collaborative meetings"
- Growth beyond the present level should not be envisaged. The best institutions are "net exporters of talent"

Changes to the organisation of the Centre administration also appear to have been effective and a substantial part of the "growth ache" identified in 2009 has been eliminated. In this area SRC has followed recommendations C and D in W. Clark's review (Appendix 12) in that a Deputy Director has been appointed to oversee administrative issues thereby reducing the administrative load of the Executive and Scientific Directors. Furthermore, SRC's research team structure has been modified to better fit with research tasks, and the leadership team has been strengthened currently consisting of six persons (earlier 2 persons). The theme structure has been modified to better fit with research tasks and the communication unit has been strengthened, particular important for the Centre's policy activities.

According to the administrative director, the SRC administration considers that its role is to serve and capacitate SRC science, "...the administration serves the scientists rather than vice verse". This illustrates a particular strength with the administration seen as an integral part of the research. Combined with a genuine interest of the administrative staff for the mission and vision of the Centre this is clearly a positive situation. The communication unit has also been strengthened (Figure 7).

There appears to be good working relations with Beijer institute, under the Royal Academy of Science and SEI.

A planned move to the new Albano campus in 2017 is likely to provide significant benefits in terms of the Centre´s working environment.

From its start in 2007 until 2012, the SRC has been organized directly under the Vice Chancellor at the University. As of 2013 SRC is organised within the natural science disciplinary domain under the Board of Science. The reasons for this change are explained in chapter 3.3. During the process of reorganisation, potential drawbacks linked with the status of SRC as an interdisciplinary centre were discussed. However, the advantages for SRC from being part of the regular decision-making structure of the University were considered to outweigh disadvantages. There is some remaining uneasiness at SRC as to how this will turn out in relation to the further development of SRC and the inter-disciplinary character of the Centre which is shared by this evaluation panel.

The Natural Science domain of SU is now the natural addressee for communication between SRC and SU. In the interest of interdisciplinary excellence, discus-

FIGURE 7. Number of staff, expressed as full-time equivalents (FTE).

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 8.2 PAGE 69.

sions and dialogue with the Humanities and Social Science Domain at SU will also be important, to continue building genuinely interdisciplinary social-ecological research bringing together social and natural scientists in SRC. There is a lot of research on environmental issues at SU, and there could indeed be substantial gain for both SRC and the rest of SU if closer links between natural and social science engagement with human-nature dynamics could be developed.

5.4 Bridging science, policy and practice

Following the SRC vision and mission statement (section 4.3.3) together with the original Mistra agreement the Centre's main focus is to advance science on issues relating to sustainability that have, by definition, high societal relevance. To advance towards such a vision and perform its mission, the SRC thus has a role in bridging knowledge emerging from the scientific process with policy, society and practice. There is a strong recognition of this need amongst SRC staff and the Centre has developed and implemented a convincing strategy to address it.

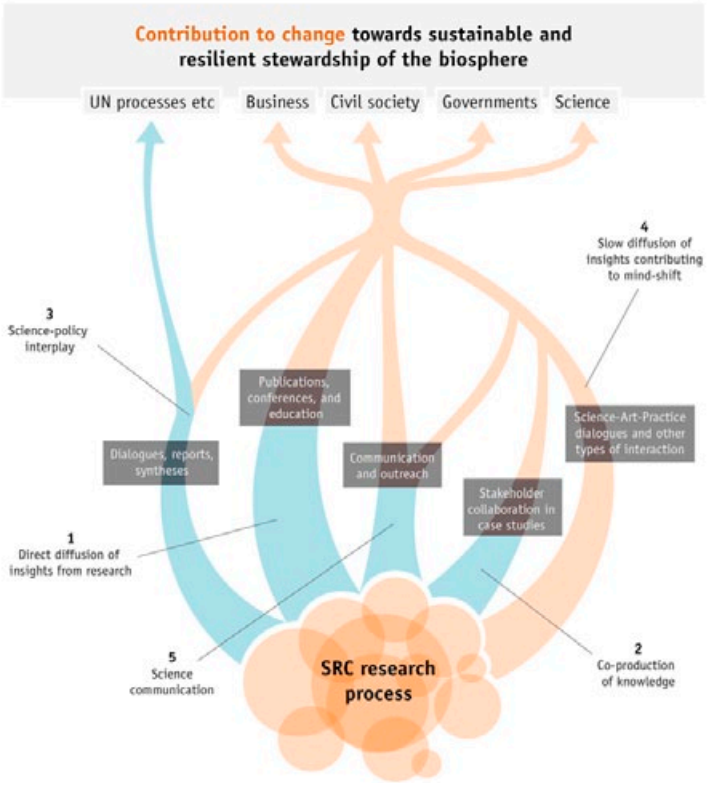
The Centre's activities in this regard are framed by a good understanding and articulation of the need to interface science, policy and practice; as well as building on a vision of dialogue and co-construction of knowledge. This understanding is anchored at the theoretical level in research and at the practical level in the collective and individual experiences of SRC staff in interfacing activities. In this sense the SRC has actively responded to recommendation A in W. Clarks evaluation (Appendix 12). However, there is a current lack of a clear strategy to identify where SRC research could have biggest impact, as well as less attention with regard to EU and other regional levels.

The SRC´s bridging strategy includes a series of 5 pathways:

- Direct diffusion of scientific insights through scientific publication, meetings, education and training;
- Research methods that also engage stakeholders in knowledge generation;
- Interplay with policy processes (e.g. UN bodies or local to regional policy arenas) through dialogues, syntheses and reports;
- Slow diffusion of insights contributing to mind-shift through, for example, various forms of science-art projects that enhance connectivity and understanding between science and practice;

FIGURE 8. Stockholm Resilience Centre´s role in knowledge generation for change.

SOURCE: SRC ACTION PLAN 2014-2018
FIGURE 7.1 PAGE 29.



- Conventional science communication or outreach and diffusion of knowledge and understanding.

This strategy weaves into a variety of dialogue approaches to the transdisciplinary development and communication of sustainability science, consisting of a combination of research, networking, interaction and outreach activities at different levels. Those pathways to advancing SRC research within practice, policy and society are depicted in Figure 8 below that highlights direct and indirect pathways to impact in different arenas of society.

A non-exhaustive list of strong points in the SRC approach includes:

- The significant impact at all policy levels of the work on the Planetary Boundaries
- The science-policy interface activities at international level, in particular in the UN system: Rio+20, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), UN Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD)
- The Nobel Laureate Symposium in Stockholm and its influence on the Rio+20 process.
- The Science Policy Interaction activities at local level and Swedish level;
- SRC significant contribution to the design of the future Albano campus, allowing knowledge and emerging ideas to be put into practice;
- Work on different knowledge systems and their possible synergies. This work is important to improve relevance and legitimacy but also credibility of the research on sustainability. It is particularly well integrated in the science-policy interface work of SRC in the IPBES and CBD processes.
- SRC work at the local level where resilience thinking can bring new perspectives into planning and policymaking

- The overall quality of the more conventional communication and outreach activities. These include an extremely high profile web site with over 15,000 visitors, the Regime shifts data base, a newsletter reaching about 5000 people as well as a Facebook and Twitter community of about 7000 people.
- The exploratory activities linking Science and the Arts which have the potential for interfacing and outreach as well offering opportunities for the Centre to deploy creativity in finding new ways of doing research.
- Multi-stakeholder trust building processes such as the 2012 Quito Dialogue Seminar on Scaling up Biodiversity Finance which was organised by SRC. This process brought together 80 representatives from governments, development agencies, UN organizations, non-governmental organizations, social movements, farmer organizations, local communities and indigenous peoples organizations, scientists and the private sector, to explore and contribute to understanding and seek to clarify areas of convergence and divergence regarding ways to scale up the mobilization of financial resources to support the achievement of the 2020 Aichi Biodiversity Targets.

5.5 Education

Since its inception, education has been an integral part of the SRCs main areas of activity, both as a vehicle to enable SRC-led student research as well as to train the next generation of leading resilience scientists. In this endeavor SRC, in collaboration with several departments at SU, has developed and promoted transdisciplinary courses and programs on environmental and sustainable development issues. Courses are offered at undergraduate, Master's and PhD levels. In 2009, a new Resilience Research School was established at the PhD level to provide academic support and training with a focus on resilience in sustainability science. In 2009 and 2010 the four MSc programs (Ecosystems, Governance and Globalization; Sustainable Enterprising; Ecosystems, Resilience and Governance; and Social-ecological Resilience for Sustainable Development) enrolled up to 100 students per year. However in 2010 SRC decided to close the Sustainable Enterprising MSc program, a legacy of the Centre for Transdisciplinary Research on the Environment at SU, because it was not well aligned with SRC area of work. SRC attracted students from all over the world and has become an attractive first career step for future thinkers on complex social-ecological systems and Sustainable Development.

SRC has also provided independent courses on i) urban social-ecological systems, ii) nature and society, and iii) Varldens eko-perspectives on sustainable development. SRC is playing a coordinating role in Resilience Alliance Young Scholars (RAYS) &

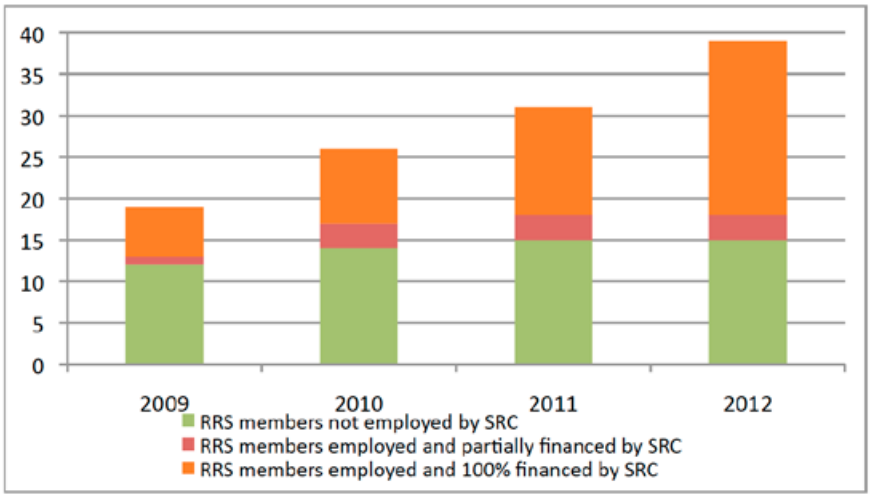


FIGURE 9. PhD student members of the Resilience Research School 2009-2012 with their employment status and sources of funding. The y-axis shows the number of students.

SOURCE: SRC PROGRESS REPORT 2007-2012 FIGURE 5.1 PAGE 32.

Beijer Young Scholar international network. In addition, SRC offers short courses for non-academic professionals such as management and business professionals. The integration of education and research also provides SRC with a platform for synthesis and a vehicle for collaboration with other research partners via students' work.

5.6 Evaluation findings in relation to original Mistra- SRC agreement

Prior to summarising our findings we reiterate the grounding of this evaluation in the four criteria provided by Mistra (see Section 4.3.1). While the Centre was also assessed against its overarching strategic purpose – the vision and mission of the Centre – as well as its long-term goals and strategic research orientation, our findings on performance with respect to the Mistra criteria specifically, along with education are summarized here (Table 1). In Appendix 12, the evaluation panel relates its findings to those provided by the start up evaluation of SRC in 2009 by W. Clark.

TABLE 1: Summary evaluation of Centre performance with respect to the objectives of the original Mistra agreement. Table content is based on the evaluations detailed in the preceding sections.

Mistra SRC agreement	Evaluation panel findings
Long-term goals	
Establish a world-leading research centre that will advance the frontier of interdisciplinary research on interdependent ecological and social systems	SRC has established itself as a world-leading centre in its area of research. Publication record and citation frequency are truly excellent (See Section 5.2)
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.	Work on multi-level governance has been done. So far SRC strength lies in the generation of knowledge about decision-making at local and global level. Strategies to investigate cross-level and multi-scale linkages are in place although they are fairly disconnected. (See Sections 5.2.3 and Sections 5.2.4.1 to 5.2.4.6)
Strategic research orientation:	
Understand the dynamics of the ecosystems (e.g. resilience, system change and diversity) and their significance for the production of ecosystem services	SRC has published a number of papers of high significance for the production of ecosystem services in highly prestigious scientific journals (see Section 5.2 and 5.2.2)
Incorporate this knowledge about dynamics into the welfare economy, economic valuation and economic policy	Ecosystem services and human well-being have been linked in interdisciplinary papers and processes (see Section 5.2.4.4)
Understand sociopolitical complexity and how regulations, decision-making systems and social structures influence management of the ecosystem,	Internationally leading work on social network analysis as well as publications on co-management and adaptive, transformative forms of management. (see Section 5.2.4.5). So far, less has been done on regulatory and implementation strategies (see Section 5.2.3).
Develop systems for the exchange of knowledge, increased participation and care that interprets and responds to signals from the ecosystem and makes learning possible,	Linking knowledge systems and interfacing science with policy and practice appears both in publications and in SRC's emerging practice of linking science to practice. The work on the Planetary Boundaries has had a significant impact making signals from the ecosystem known at all policy levels (see Section 5.4).

Mistra SRC agreement	Evaluation panel findings
Research participants, networks and dynamics at different scale levels in connected social and ecological systems,	SRC's research is located at the local, regional, national and transnational level. On the bio-geophysical side, internationally very prominent global analyses of planetary boundaries are yet to be complemented by institutional and social analyses (see Section 5.2.3).
Build adaptive capacity to manage uncertainty and change (e.g. political upheavals, natural catastrophes, and socioeconomic forces).	SRC research has provided scientific grounds to build not only adaptive capacity but also transformative capacity, which is one of the achievements of the Centre (see Section 5.4)
Basic conditions[8]	
A strong cooperative consortium between the University, SEI and KVA	A functioning consortium exists (see Section 5.3).
Critical scientific mass in both natural sciences and social sciences, including economics	A critical scientific mass exists, but with a clear need to ensure the widening and continued viability of creative social science contributions to SRC's interdisciplinary mission (see Section 5.2.2).
Possibilities to develop new and joint experience, concepts, language and methods between natural and social scientists	SRC has broad collaborations between natural and social scientists and has contributed to the development of interdisciplinary concepts, languages and methods (see Section 5.2.1, 5.2.2 and 5.3).
In-depth and qualified interdisciplinary cooperation and advancement	As above
Strong connections to similar frontier research environments over the entire world	SRC has a very broad network of scientific cooperation around the world and is part of the "Resilience Alliance" with research centers around the world. (see Section 5.2)
A good physical work environment and University of Stockholm's support for world class inter- and transdisciplinary research	The SRC is currently located at the Kräftriket, some distance from the main University Campus. SRC plans to move to the new Albano campus in 2017 (see Section 5.3). SRC has been involved in the design of the new building project. (see Section 5.4)
Capacity for qualified communication with significant users	Excellent work such as the Nobel Laureate Symposium in Stockholm influential in theRio+20 process. Processes such as the Quito dialogue also involve and provide relevant information to difficult intergovernmental negotiation processes (see Section 5.4)

8 This part of the table is not entirely up to SRC – also for SU and others. We are only evaluating SRC. The following basic conditions must be in place, according to the original agreement between Mistra and SU.

6 Assessment of Action plan for 2014-2018 – Evaluation Panel recommendations

6.1 Research for biosphere stewardship and innovation

SRC views humanity as an embedded and dependent part of the biosphere, and a major force in shaping it. Biosphere stewardship is thus a central social challenge. In the context of increasingly complex interactions between humans and nature that are replete with "unknown unknowns", and with growing awareness of planetary boundaries that limit humanity's safe operating space, resilience, adaptability and transformative innovations are seen to be required at multiple levels. This is the point of departure for SRC's engagement in sustainability science, and for its Action Plan for the 2014-2018 period.

The SRC's intention to engage more closely with changes in human values and behaviour and their implications for the biosphere points in the direction of more comprehensive engagement with the social side of social-ecological dynamics and sustainability research.

In this context, the Panel finds that regarding SRC's pioneering research on planetary boundaries, future research directions could include the following:

- Identification and analysis of elements of boundary thinking at the local level;
- Questions related to how to return into safe operating spaces where humanity has passed thresholds;
- Further identification and analysis of discernible global social tipping points and social boundaries with their effects on the biosphere;
- Further research to bring critical social science perspectives on power, democracy, justice and influence to bear on the SRC´s core research questions.

6.1.1 On the concept of innovation

In the Action Plan (p. 7), SRC states that "We are confronted with a new scientific endeavour – to generate knowledge and understanding of social-ecological dynamics supporting innovations and transformations that strengthen the capacity of the biosphere to sustain us, and translate this into operational governance and management to enable sustainable futures. Hence, research for biosphere stewardship and innovation has emerged as core focus of the SRC, and will be reflected in the SRC subtitle Stockholm Resilience Centre – research for biosphere stewardship and innovation."

The Panel finds that this subtitle is open to misinterpretation and does not do justice to the intention behind its addition. In a political context where "innovation" is the new fad supposed to solve all our problems it potentially gives the

impression that the Centre is adding innovation as a buzzword. We suggest three alternative subtitles:

- Stockholm Resilience Centre –research for biosphere stewardship
- Stockholm Resilience Centre –research for biosphere stewardship and transformation
- Stockholm Resilience Centre –innovative research for biosphere stewardship and transformation

In our view, these are more precise and reflect more accurately the fact that the aim of this research is to support the necessary transformations in ways of thinking and ways of doing.

6.1.2 On framing SRC research and resilience thinking

In contrast to SRC's title, its research framing and strategy as outlined by ´three core features´ in the Action Plan 2014-2018 does not refer specifically to resilience. (Action Plan 2014-2018 p.9) Yet the SRC mission includes the word "resilience" and the three successive SRC Action Plans show an **increasing** number of references to resilience over time. At the same time, the SRC positions itself as "welcoming any approach, method, perspective, epistemology or ontology from the social sciences, humanities and natural sciences that can contribute to a deeper understanding of the challenges of SES governance" (Action Plan 2010-1023). This is in line with the stated objective of the SRC and it is also a desire of SU colleagues as expressed to this Panel.

There are numerous advantages to the resilience approach or to ´resilience thinking´: It avoids optimization approaches which are ill-suited to complex social-ecological systems where causalities are multiple, and where values can be incommensurable and irreducible. Resilience is also an excellent interface concept between disciplines as diverse as ecology, psychology, and sociology. It may have "positive" connotations, and as such, it has thus been employed as the analytical basis for constructive action in many contexts. The collaborative spirit within SRC itself is perhaps also strengthened by this common conceptual frame and language.

On the other hand, as with any lens, one should avoid dominating or exclusive application of the "resilience lens" as it may reduce or undermine the use of other valuable lenses. Because of the evolving and dynamic nature of the resilience concept (see Appendix 13 for variations in its articulation within SRC), the resilience approach may be challenging to explain to policy-makers and other societal actors, however, resilience is rapidly receiving increased attention in policy, business and society.

Resilience is a multifaceted concept that has evolved over time. In one recent definition of resilience (Definition 4, Box 1), transformability represents a promising widening of resilience thinking. A series of novel concepts (e.g. 'social-ecological traps', 'fishing styles', and 'planetary boundaries') have been developed by SRC using this wider resilience lens and most recently nine systemic conditions that enable "all-purpose resilience" have been identified. The increasing focus on identifying "tipping points" and on managing "shifts between states", (i.e. on transformation rather than the absorption of shocks) in recent research also has the potential to move resilience thinking further into social arenas of importance for global sustainability work.

The panel gives the following recommendations:

- A critical reflection on the limitations of the resilience lens in global sustainability thinking is both scientifically and strategically advisable for the SRC at this point. This includes critical reflection on the limitations of resilience theory specifically and exploration of the role for other lenses and approaches to sustainability science. An emphasis on the wider range of conceptual interfaces possible within the SRC frame is desirable. At the same time, critical reflec-

tion may also strengthen the resilience lens by clarifying where other conceptual lenses are more appropriate. This was also a recommendation from W. Clark in 2009 (Appendix 12).

- The continued exploration of resilience thinking to include social arenas such as human well-being, equity and justice, democracy and power which are crucial in terms of their feedbacks to the biosphere and thus a more comprehensive approach to sustainability science. Scientifically, and in line with William Clark's recommendations of 2009 (Appendix 12), there is still unexploited scope to deepen and link social resilience ideas within SRCs mission. In particular, in the regime shifts work there appears to be a great deal of scope for moving from dominantly natural science to social-ecological analyses which explicitly focus on social and political regimes.
- To investigate other important areas of influence on ecosystem dynamics, tipping points, regime shifts, biosphere stewardship. We give two specific suggestions 1) the increasing use in society of chemicals (such as pesticides and industrial chemicals) and the associated pollution and build-up of harmful residues in human bodies and in ecosystems and the negative impacts on ecosystem service provision and human well-being; 2) rapidly developing new technologies (for example in the energy area, nanotechnology, biotechnology and robotics) that may in a short time have considerable implications and move social-ecological systems into unknown trajectories of development.

6.2 Academic capacity building

Strategic reflections on education within the next operational phase requires reference to the current organisational placement of SRC under the Board of Science in the natural science domain. According to the SU internal regulations, PhD students are normally only accepted by departments or faculties, and not by institutes or centres. However, SRC was given the right in the new organization to formally accept PhD students that have a background from natural science. In addition, SRC can supervise PhD students with a background in social science, humanities or law. These PhD students will be accepted by the departments in the respective faculty but will carry out their PhD work at the Centre. This arrangement is in place to ensure the interdisciplinary quality assessment of the PhD education. The evaluation panel suggest that, if this arrangement is a problem, an effort should be made to find an alternative solution that meets all requirements of an interdisciplinary quality assessment.

Academic capacity building and academic development are embedded in the vision of SRC and are critical to its mission. Achieving the Centres overall goal "to establish a world leading resilience research school that develops young scientists who will create new approaches, insights and tools for biosphere stewardship and innovation" requires sound and strong education and training investment. Building on experience and lessons from the start-up and first regular operational phases, SRC outlined in its Action Plan 2014-2018 its ambition to develop its education program over the next several years. A two step approach is proposed: 1) improving courses and programs, enhancing the capacity of the SRC to teach, mentor and administrator education, building educational collaborations and developing shareable educational resources; and 2) strengthening the established world leading resilience research school that develops young scientists who will create new approaches and tools for biosphere stewardship and innovation.

Investing in education is crucial for the development of researchers and teachers in sustainability science as indicated in the decision regarding the organisational placement of the SRC at SU. The successful implementation of the proposed education plan will greatly contribute to the achievement of the overall objective of SRC.

The panel gives the following recommendations:

- Find an alternative solution regarding PhD admission processes that satisfies requirements for interdisciplinary quality assessment if the current situation is deemed to be problematic
- Train PhD student not just in communication but also in linking research with policy and action, including training to deal with the reality of policymaking, where conflicting interests, lobbying and negotiations are omnipresent.

6.3 Bridging science, policy and practice

For the period 2013-2018 SRC intends to continue to build on, reinforce, and implement its strategy for bridging science, policy and practice. According to the summary table in the Action plan 2014-2018, SRC aims in particular at:

- Invest more actively in being its own convener;
- Contribute further to IPBES;
- Contribute to the follow-up of to the UN Rio+20 process;
- Strengthen the dialogue with business.

Some promising items in the Action Plan include:

- The continued search for new ways of bringing insights from SRC research to the attention of "agents of change";
- The increasing number of activities where SRC will be its own convener experimenting with different ways of raising impact;
- The idea to build on the experience gained with the ´Insight Albums ´ and use it as a stepping stone to scale it up to set up a Mistra platform for global synthesis is interesting both from a research perspective and from a bridging perspective.

The panel gives the following recommendations:

- Explicitly map which practitioners, policymakers, other stakeholders and processes are SRC´s priority targets. Use this mapping process to develop a strategy identifying where SRC research could have biggest impact. Such a strategy should also identify ´windows of opportunity´ early enough to be able to have an impact.
- Address the current lack of attention with regard to EU and other regional levels. Specifically SRC could engage more at the EU level, by interacting with EU policy-makers and stakeholders. This would bring many gains including reinforced access to EU research funding, and a deeper, more experimental understanding of the EU policy process which is important to integrate in some SRC policy research.
- Up to now, the involvement of SRC in activities at the global (UN) level has mainly impacted upon policy objective setting rather than on how such objectives could be implemented at the global level. For example the ´Resilient Planet´ report was criticised for not being easy to connect to implementation work. It is important that SRC broadens its efforts towards contributing to the implementation and develops the practical application of resilience concepts to a greater extent.
- For SRC to have a reflexive approach it is important that its bridging strategy be dynamic and regularly revisited to integrate what has been learned. This could be done with the engagement of users. It should also build on existing research and practices in other areas. It would also be interesting for SRC to devise a process through which key users of SRC results are involved in the reflection about the future research orientation of the centre.

- Interactions with business actors still appear to be somewhat ad hoc and would merit clarification and embedding in a specific business engagement strategy. It is also of key importance that SRC reflects on the ethical issues that might arise from its interactions with the private sector in particular, and more broadly with different types of stakeholders who may have vested interests. The Centre's bridging strategy must encompass ways to deals with possible ethical dilemmas.
- While useful the ´Insights collection´ is not formulated in language appropriate to reach a broad audience beyond the scientific community. In view of the synthetic and integrative nature of the topics, it may therefore be interesting to create a collection of non-specialist briefs based on the Insight collection. However, care must be taken that conclusions are not taken out of context, for example governance solutions perhaps valid at local level but not at other levels.
- The Centre's graphical illustration of its role in knowledge generation for change (figure 8) conveys a misleading message that bridging interactions are one-way and ´end-of-pipe´ given that all the arrows flow from SRC research processes towards "recipients of knowledge". While the strategy described elsewhere in SRC documents and discourses suggests more of a two-way flow with exchange and co-production of knowledge, these elements need further incorporation in the research process. More specifically we also recommend to explicitly include regional political bodies such as the European Union with its legislative and funding powers in the diagram or in future conceptualisations.

6.4 Institutional development, leadership, management and working culture

Based on the findings outlined in chapter five and the Action plan for 2014-2018 we conclude that the leadership of SRC has done an excellent job of developing a first class, globally recognised research institution in a very short time. Given the new challenges in the present situation, we have some recommendations to Mistra, Stockholm University and SRC regarding organisation, strategic planning and management of SRC.

Some organisational arrangements that go beyond what is presently outlined in the Action Plan 2014-2018 may be needed. We have understood that some additional organisational ideas are being discussed between the University and SRC. For example, the Vice-Chancellor recommended that the SRC establish a preparatory, interdisciplinary body in which disciplinary domains at SU are represented. The Vice-Chancellor also recommended that the SRC Board meet more than twice a year. It seems important that the SRC Board and the Faculty of Science Board are well connected and coordinated.

SRC has a challenging time ahead, both in relation to the new situation with SU, its consolidation and/or continued growth and future funding. There is a need for additional funding sources, and the relationship with the business community may have to be carefully developed. These efforts will need additional skills beyond those are included in SRC`s advisory and governing bodies today. The set-up of "SRC International Advisory Board" could be a crucial beginning, but the TOR and role of this Board have to be developed in relation to "The International Board of Directors" and other bodies at SRC. All of the challenges previously mentioned indicate that SRC will very likely need greater strategic planning capabilities. What is referred to as the "Strategic Advisory Committee (SAC)" in the Action Plan appears to be more of a science strategic advisory committee in its nature and has clearly operational skills. We recommended that the need for additional strategic skills in the International Board of Directors be revisited.

It is very important that TOR and the role of all groups, committees, teams and units are clear within SRC and compatible. We acknowledge the extension of the

Executive Team to 6 persons, but recommend that SRC continues to work for a better gender balance in the leadership. We acknowledge also the description of the purpose of the various bodies and meetings in Tables 1and 2 in Chapter 8 of the Action Plan, but feel that this could be expanded and that also the TOR and role of the leaders could be clarified. It can be a challenging task to find the right balance between growth and consolidation when expectations of SRC globally are very high. There might be some trade-offs here, and both the strategic capabilities and the internal organisation and processes may be put to some real tests.

Specifically the panel gives the following recommendations:

1. Continued dialogue between SU and SRC including examination of how to ensure a continued platform for the SRC interdisciplinary work at SU given the new organisational placement of SRC in the natural science domain under the Board of Science.
2. An Interdisciplinary preparatory body should be created as such a body will be very useful for both SU and SRC
3. Strategic consideration and pursuit of an internal balance between organising SRC for development, innovation and further growth and the consolidation of an organisation with a unique collaborative climate and some uncertainties regarding future funding.
4. Exploration of the opportunities to ensure that recruitment of social science PhD students can continue and that a diversity of PhD students with different backgrounds is fostered.
5. Gender balance in the leadership has been absent, newly established Executive group has 1 woman and 5 men, the SRC should continue to work on this issue as a priority.

6.5 Assessment of 'Financing, fundraising, budget'

6.5.1 Financing for the 2nd phase, 2013 – 2018

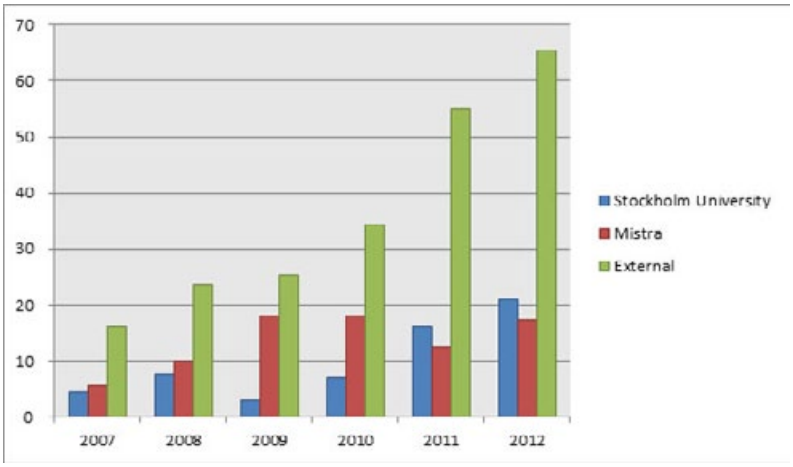
The budgets of SRC have expanded over the years from 26 MSEK in 2007 to 104 MSEK in 2012. Out of this, core financing in 2012 from Mistra has been 17 MSEK and from Stockholm University it expanded from 4.5 to 13 MSEK/yr in the 2009 to 2012 period, according to the SRC Annual Reports. The distribution between core and project funding has been essentially constant and shifted from 36% to 37% between 2007 and 2012. This level of core funding is dangerously low (Figure 10).

Core funding is essential to cover basic operating costs of the Centre (including rent of office space), to cover co-financing of education (SU pays for about ¾ of costs of SRC education), and of projects required by some funders (especially the EU) and activities related to bridging science, policy and practice as well as other outreach activities not always sufficiently provided for in project financing.

In addition, as identified in the SRC Action plan 2014-2018 there are several opportunities, with additional financial support, to benefit from an untapped potential at the Centre in a few strategic investment areas. In some of these areas, the Centre has a high immediate need for additional support; 1) investing in long-term research positions, especially in the social sciences, 2) resources for young scholars at the Resilience Research School, 3) the establishment of a platform for research synthesis, 4) a platform for dialogues (the Stockholm Dialogue initiative drawing upon the Nobel-Laureate Symposium experience) and 5) the regional research program, Programme on Ecosystem Change and Society (PECS).

Based on experiences from similar Centres in different fields, core funding should be on the order of 50% to minimise ad hoc approaches and allow for focused long-term work. It is also critical to leave enough space for truly innovative

FIGURE 10. SRC's funding 2007 – 2012 (Figures in MSEK).
SOURCE: SRC ANNUAL REPORT 2012.



thinking and ways of doing research. Thus, the core funding of SRC needs significant strengthening. Options include additional multi-year contributions from the two original partners Mistra and Stockholm University (the other original partners Beijer/KVA and SEI are not funding organisations). Foundations, public and private, would be another possibility. The private sector has also been mentioned, however, we strongly advises that private sector finance is considered with care to avoid conflicts of interests, undue influence or other ethical issues, particularly for core activities.

6.5.2 Financing after the 2nd phase

The original call of Mistra made clear that funding was intended to be in place for a maximum of a 12 year period. With no Mistra grant after the end of the second phase in 2018 only the Stockholm University core financing would remain. This would create a non-viable situation. It seems unlikely that the University will be able to fully cover the level of financing currently provided by Mistra. Other options need to be investigated and recognising that such efforts are likely to require considerable time; these efforts should be given serious attention very soon. The recruitment of a full-time fundraiser, reported during the evaluation, is a step in the right direction.

A possible strategy for Mistra could be to partially support the additional activities mentioned above (section 6.5.1) over the coming 5 years (with, for example, on the order of 5-7 MSEK/yr). Such an additional investment would provide a strong positive incentive for other donors to step in and join with additional funding, for example other Swedish Foundations. One strategic area of investment identified by the evaluation team is the opportunity to establish the SRC and thereby Stockholm University as an internationally leading institution on sustainability science coupled with an understanding of complex social-ecological interactions, resilience and cross-scale dynamics in a rapidly changing world. There is a large need to advance the area of dynamic sustainability-based social science (e.g., social science in the interface of resilience and economics; behavioural science, philosophy, political science, sociology), and the SRC has the possibility of establishing itself as an internationally leading science convener in this emerging research field.

Specifically the panel gives the following recommendations:

- Investigate options for strengthening core funding to be at least 50% to minimise ad hoc approaches and allow for focused long-term work and exploratory research into new research directions.
- Investigation of post-Mistra financing options as a matter of priority

7 Appendices

Appendix 1: Research Centre Agreement between Mistra and Stockholm University

Appendix 2: SRC Progress Report 2007-2012

Appendix 3: SRC Action Plan for 2014-2018

Appendix 4: Mistra guidance for the Mid-term evaluation of Stockholm Resilience Centre

Appendix 5: Evaluation panel members

Appendix 6: SRC Implementation strategy 2007-2009

Appendix 7: Deputy Vice-Chancellor's report 2012

Appendix 8: Comments by SRC and SRC theme leaders on Dept. Vice-Chancellors Report

Appendix 9: Decision regarding organisational placement of the Stockholm Resilience Centre and Stockholm University Board decision protocol

Appendix 10: Questions submitted to SRC prior to the evaluation week and answers received

Appendix 11: List of individuals interviewed during the panels visit to SRC

Appendix 12: W. Clark´s recommendations following the 2009 Start-up Review in relation to the panel´s current findings

Appendix 13: Resilience definitions

All Mistra research initiatives are evaluated through a peer review system on a regular basis. This is important in order to assure the quality of the initiatives. As the Stockholm Resilience Centre is currently entering a second phase of operation requiring further support from Mistra, an evaluation panel was appointed by Mistra to review the results and plans of the centre. This report contains the findings of their review.

MISTRA
The Swedish Foundation for
Strategic Environmental Research

Gamla Brogatan 36-38
SE-111 20 Stockholm, Sweden
phone: +46 8 791 10 20, fax: +46 8 791 10 29
mail@mistra.org www.mistra.org

Stockholm University

Stockholm Resilience Centre

Research for Governance of Social-Ecological Systems