

# Supplementary material

To the article “How to Build a Cross-Disciplinary Institute”

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## Vision Statement

*SARAS generates critical insights allowing South America to build sustainable futures characterized by resilience and the capacity for transformation. It produces such insights through integration across a broad range of knowledge using innovative approaches, ranging from mathematical models to arts. In its atmosphere brilliant minds find peace to think deeply. At the same time, the kind and intense interaction at SARAS shapes a new generation of broad visionary thinkers and creators. The design and place of the SARAS building provide the context essential to such innovative synthesis.*

## Why SARAS?

(Summarized by Carl Folke)

SARAS will put the South American research community in the centre of the international interdisciplinary research arena on sustainability, foster collaboration between SA and leading international scientists on resilience and sustainability worldwide and simultaneously serve as a hub for integrating researchers and PhD-students throughout South America to enhance the capacity of the region to deal with global change and necessary transformations.

SARAS will combine the powers of science, arts and the humanities for exploring and developing deeper understanding of the challenges and potentials of global change for human development, with a focus on South America. Explicit interaction between science, arts and the humanities in relation to global change is rare. South America holds great potential for such unique collaborations that will generate new insights and innovative knowledge integration with powerful images and major implications for sustainable futures.

SARAS will develop new ways of teaching and training for knowledge integration that will be exemplary worldwide.

In many SA countries there is lack of an independent and confident scientific group that could be taken as reference for political and social environmentally-related problems. In this sense, SARAS will 1) become a permanent reference on sustainability issues that could overcome

short-term and in many cases drastic changes in the political context; 2) be used by policy makers and the society as a whole in order to provide potential solutions/opinions to assess particular social-ecological problems.

The above is particularly important in SA, because of: 1) the critical importance of natural resources and ecosystem services in SA economies; 2) the unwise and erratic management practices of them; 3) the lack of long-term policy directed to provide a sustainable use of ecosystem services founded on solid social-ecological knowledge; 4) the lack of interdisciplinary studies directed to address the intrinsic complexity of social-ecological systems; 5) the lack of integration of key stakeholders when planning and implementing policy for sustained use of natural resources (governance issues).

In SA there is the largest gradient in socio-economic conditions and in the extent of the impact by humans on ecosystems (i.e. from the most pristine to the most polluted worldwide). These gradients could be seen as model systems directed to identify the mechanisms operating beyond human actions.

## Why South America?

(Summarized by Osvaldo Sala)

SARAS is focused on South America and its headquarters are located in Uruguay because South America is an extraordinary laboratory to make progress in understanding and training on issues related to sustainability and resilience of social and ecological systems. South America is such an extraordinary laboratory because of four reasons:

1. Large social and environmental contrasts exist in South America
2. History of turbulent change and transformation in social and environmental realms
3. A rich artistic understanding of transformation
4. Strong link of people to natural resources and the environment

South America harbours strong social and environmental contrasts. The largest pristine ecosystems of the world such as the Amazon Forest are usually juxtaposed to the most degraded ecosystems of the world. Erosion, soil degradation, and air and water pollution are common phenomena that coexist within the region with the largest reservoir of biodiversity in the world. South America has the largest social and economic inequalities of the world. Rich neighbourhoods contrast with adjacent shanty towns. Similarly, large inequalities exist between city and rural environments, and in health and education. These strong differences could be used to identify the mechanisms creating inequalities and suggest strategies to achieve sustainability.

The South American Region has had a history of turbulent change and transformation. Politically, the region has recently shifted from dictatorships to democracies and includes a more distant history of colonialism and liberation. Environmental transformation has been huge driven by pre-colonial civilizations and currently by agricultural expansion.

South America has nurtured an artistic community that has carved a unique international niche based on its ability to depict sudden transformation. For example, the magical realism pioneered

by Gabriel García Márquez is an extraordinary representation of this ability to articulate and understand change.

People in South America are strongly linked to natural resources. A large fraction feeds itself with the food that they raise and consequently are directly affected by pests and droughts. Similarly, most South Americans meet their health needs using local species and traditional medicine. The scarcity of resources limits the ability for buffering people from natural disasters including droughts and floods that severely affect their livelihoods.

## Why Synthesis?

(Based on a report of an NSF group headed by Steve Carpenter, current version edited by Marten Scheffer)

Synthesis is the process of putting together disparate data, concepts or theories to create new knowledge, tools or other innovations. Synthesis is essential for progress in ecology and the environmental sciences, which are inherently interdisciplinary. Ecology is centrally and traditionally one of the biological sciences, yet it embraces elements of the geosciences and social sciences. Moreover, applied ecology connects closely to engineering. Computational sciences are essential in all forms of ecology and environmental science, and the co-evolution of ecology and cyber-infrastructure greatly accelerates synthesis.

Synthesis is increasingly important due to changes in knowledge itself, the culture of the discipline, and society's demands for education and information. The huge and growing body of knowledge confounds traditional mechanisms of innovation and is manageable only through synthesis. Because synthesis engages diverse scientists with diverse expertise, it is capable of vetting vast amounts of information for use by other scientists, educators or society.

Education demands synthesis, because it depends on integration of information. Conversely, education is essential for synthesis, because we need more experts trained in the skills of synthesis. These skills are not within the purview of any one discipline, yet they can and must be taught. Obviously, in its education and training SARAS should focus particularly on skills & tools for knowledge integration, interdisciplinary collaboration. (It will rely on University departments for disciplinary knowledge.)

Synthesis is also a good focus for SARAS because this kind of centers can bring unique capabilities and unmatched opportunities for synthesis due to the intensity of interaction among scientists, great diversity of participation, emergence of new networks among scientists, financial and logistic efficiencies, and the close interaction of ecology with cyber-infrastructure and education. The high tenor of creativity, innovation and productivity at Centers simply cannot be matched by any other mechanisms for synthesis.

### ***Why the full continuum of approaches from science to policy?***

(summarized by Pablo Marquet with scheme by Frances Westley)

While SARAS is committed to synthesis, it will not rigidly limit itself to this particular domain in the range of approaches from fundamental science to policy. One of SARAS unique features is its commitment with the generation of knowledge that transcends disciplinary boundaries, and

capitalizes on synthesis and integration (knowledge without walls). In particular, we support the view that the Resilience and sustainability of the human enterprise on earth requires synthesis and integration of knowledge within science in a dialog with the arts and humanities. We see this as one of most important transformation that need to happens in order to tackle the global problems humanity faces and to assure that we will create a sustainable future with better humans making better decisions on how to interact among themselves and with the environment. A fundamental component of our strategy is to produce societal/policy changes through the training of new generation of scientists in the culture of transdisciplinary work and integration. Thus, our mission is the generation of knowledge, through synthesis and integration, and its dissemination through training and education in a way that it becomes a source of policy changes.

## Why Art?

(summarized by Frances Westley)

The goal of SARAS is sustainable futures and resilience for South America. As a science and research driven initiative, we are focused on the role of new knowledge in contributing to this goal. Within that we anticipate a number of steps in moving from knowledge to action to solve problems (see schematic representation above).

Within that continuum our expertise/interest is located mostly around knowledge integration – with particular emphasis on the integration of science, arts and humanities. This is because our interest is in transformation, in creative questioning and in holistic explanations/approaches. This is something we feel is shared by both artists and scientists.

- ❖ Science and art are the two central expressions of human creativity. As that, they could bring mutual contributions to the creation process.
- ❖ Art is a strong way to impact society with a different language that reaches people with very different educations and backgrounds (popular appeal and contact)
- ❖ Art takes synthetic and holistic approaches – inherently understands the complexity and interconnection of system variables
- ❖ Art is often concerned with transformations (see Why South America)

## How to Design the Building?

The physical environment of an institute has tremendous impact on social dynamics. Since the right kind of interaction is crucial for the synthesis we envision, the building has to be designed specifically for that. We can learn a lot from earlier mistakes and successes in this sense. If you google “cave and commons” a lot can be found on this philosophy and related ones for shaping workspace. Talking to a range of scientists that have worked and interacted in many places a few commonly emerging suggestions are:

- Have a common area with informal corners with sofa's, armchairs, a big espresso machine etc.
- Have a 'bar' where cocktails etc. are served at 5 or so creating a habit for everyone to meet there before dinner and chat informally (*the roof terrace?*).
- Have many large windows
- Have a good outside space with shade, seats, and a *roof terrace*
- Have differently sized tables where small groups can meet
- Have numerous whiteboards, and/or possibility to write (erasable) on the windows and tables
- Have *no offices for scientists* (people come to cooperate, not to isolate themselves; they can work on the desk in the sleeping room, connected by wireless network)

### **Specific Space requirements:**

- Meeting room for 40 + Two rooms for 10
- relatively large informal common area with sofa-corners
- 10 high quality sleeping rooms (with bathroom; no tv needed, but good working desk and good beds) + 20 simpler sleeping facilities
- Two cottages that can hold a family or small group (5+5) (again should have good working desk and beds)
- Offices for secretary and managing director
- Kitchen + dining room for 40 + bar
- outside: shade; walking paths; pool(?); barbeque; working/sitting corners
- shaded roof terrace with a view of the Sierra de las Animas and the Ocean

### **Technical facilities:**

- Fast wireless internet
- Printers and 2 desktop computers (most will bring their lap-tops)
- Video conferencing facility
- Lots of blackboards (or whiteboards with pens and erasers that work)

### **Guiding the design and construction**

- These visions of the building by the future users need to be well and completely communicated to the architects taking part in the open call for the design. The advisory board should be involved in judging the competing designs.
- It is very important that construction is closely guided to ensure that the resulting building and grounds make the best use of the natural features of the site and buildings that meet the vision of the designers.
- Also, there should be good long-term management goals for the vegetation, landscaping etc.?