





Ruta 10 km 86, Parada 21 al fondo  
Bella Vista, Maldonado - Uruguay  
Email: [info@saras-institute.org](mailto:info@saras-institute.org)  
Website: [www.saras-insitute.org](http://www.saras-insitute.org)

## Institute & Foundation

*The SARAS<sup>2</sup> Institute is a joint initiative of Wageningen University (Netherlands), the University of Uruguay Republic (UdelaR, Uruguay), the Resilience Alliance, the Education and Culture Ministry of Uruguay (Uruguay), and the Maldonado Department (Uruguay).*

*Through the advisory board the Institute has strong linkages with: the Beijer Institute of Ecological Economics (Sweden), the Stockholm Resilience Center (Sweden), the University of Wisconsin (USA), Arizona State University (USA), the University of Waterloo (Canada), the Catholic University of Chile (CASEB, Chile), the Patagonic National Center CONICET (Argentina), the University of Brasilia (Brazil), and the Doñana Biological Station-CSIC (Spain).*

SARAS<sup>2</sup> Institute original idea emerged in Holland, a summer day of 2005. At that time, the Institute's goals and preliminary structure were conceived and discussed by Marten Scheffer and Néstor Mazzeo.

In January 2006 the first document about mission, goals and structure of the Institute was written with the aid of Ruben Budelli. At this time, a meeting with Oscar de los Santos – Major of Maldonado – helped to explore the feasibility of establishing the Institute at Maldonado County. The proposal was very well received by local authorities and immediately a group was conformed (Jorge Hourcade, Ruben Budelli, Gabriel Aintablian, Hugo Fort and Néstor Mazzeo) to find the most appropriate place to locate SARAS<sup>2</sup>.

Since the summer of 2007, the SARAS<sup>2</sup> Advisory Board has been meeting in Uruguay on a regular basis, to discuss the strategy, agenda, goals and actions. Simultaneously, the working team (Ruben Budelli, Hugo Fort, Gabriel Aintablian and Néstor Mazzeo) contacted local authorities in the area of Science, Culture and Education: María Simón, Rodrigo Arocena,

Gregory Randall and Omar Macadar to engage into a collaborative process from the very beginning.

During 2008 and 2009 the Institute entered into academic life through the writing of scientific papers and research projects, which were submitted to national and international funding agencies. Some approved projects enabled the institute to put in place a Conference Cycle on relevant environmental topics for Latin America, held on a yearly basis. This set of conferences started in 2010 and have continued since then: the first symposium in 2010 was on Sustainable Futures for Hydric Resources in Latin America.

In 2009 SARAS<sup>2</sup> received a substantial financial support from the UdelaR, the Ministry of Education and Culture and, in 2011 also from the Maldonado Department. These contributions have been fundamental, and allowed to incorporate two members to the local team: Mariana Meerhoff and Nicolás Marchand.

Since 2009 several advances have been made to consolidate the Institute facilities building process and

the landscaping in the surrounding area, as part of a joint effort with the Architectural General Directorate of UdelaR (Alvaro Cayón, Gonzalo Lorenzo, Mariana Frances & Pedro Berger) and the contribution of Amalia Robledo, María Puppo and Carla Bruzzone on the landscape design.

As of July 2013, SARAS<sup>2</sup> turned into a Foundation, a milestone in the history of the Institute. Currently, the financial support mainly originates from the Ministry of Education and Culture of Uruguay, the UdelaR and the Maldonado Department.

The advisory board is integrated by: Marten Scheffer, Jordi Bascompte, Laurie Beth Clark, Steve Carpenter, Omar Defeo, Carl Folke, Pablo Marquet, Osvaldo Sala, Ana Parma, Eduardo Viola, and Frances Westley.

The Executive Committee is integrated by: Marten Scheffer, Osvaldo Sala, Isabel Bortagaray, Ana Dubra, Néstor Mazzeo, Mariana Meerhoff, Cecilia Delgado, William Rodríguez, Mariella Busnadiego and Andrés Richero.

The Administrative Board of the SARAS<sup>2</sup> Foundation involves: Néstor Mazzeo (UdelaR representative), Omar Defeo (UdelaR representative), Osvaldo Sala (Advisory Board representative), Mariana Meerhoff (Advisory Board representative), Ricardo Pereira (Maldonado representative), Virginia Fernández (MEC representative) and Matías Arim (Scientific members representative).

Finally, the Fiscal Board of the SARAS<sup>2</sup> Foundation involves: Lujan Criado (UdelaR representative), Gustavo Morales (UdelaR representative) and Julio Riella (Maldonado government representative).

## Scientific activities

For the last four years there has been a round of four symposia.

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- 2010** Continental aquatic resources
  - 2011** Artisanal fisheries
  - 2012** Transitions in terrestrial ecosystems
  - 2013** Education for uncertainty
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In the context of a series of thematic years triggered by the UdelaR (Espacio Interdisciplinario Program), the thematic year 2013 was connected to SARAS<sup>2</sup> and was about the emerging properties of the interactions between social and ecological systems.

## Networks

SARAS can be considered a net of networks. The networks are organized about specific topics independently of the disciplinary background of the researchers.

### Early warning signals

This network is aimed at developing methods and frameworks to identify early warning signals that could anticipate radical changes or critical transitions.

### Current and future climate variability and the relationship with the Uruguayan productive sectors

This network is oriented to analyze the current and future scenario of climate variability and the relationship with the key productive sectors of Uruguay.

### Adaptive management of the Laguna del Sauce (Maldonado-Uruguay) basin

The goal of this network is to develop and promote a set of adaptive strategies that enable the sustainability of the critical ecosystem services for the human wellbeing.

## Scientific papers

**2009**

### Early-warning signals for critical transitions.

**Nature** 416(3)53-59.

Marten Scheffer, Jordi Bascompte, William A. Brock, Victor Brovkin, Stephen R. Carpenter, Vasilis Dakos, Hermann Held, Egbert H. van Nes, Max Rietkerk & George Sugihara.

**2012**

### Anticipating Critical Transitions.

**Science** 338: 344:348.

Marten Scheffer, Stephen R. Carpenter, Timothy M. Lenton, Jordi Bascompte, William Brock, Vasilis Dakos, Johan van de Koppel, Ingrid A. van de Leemput, Simon A. Levin, Egbert H. van Nes, Mercedes Pascual & John Vandermeer.

**2012**

### Environmental warming in shallow lakes: a review of potential changes in community structure as evidenced from space-for-time substitution approaches.

**Advances in Ecological Research** 46: 259-349.

Mariana Meerhoff, Franco Teixeira-de Mello, Carla Kruk, Cecilia Alonso, Iván González-Bergonzoni, Juan Pablo Pacheco, Gissell Lacerot, Matías Arim, Meryem Beklioğlu, Sandra Brucet, Guillermo Goyenola, Carlos Iglesias, Néstor Mazzeo, Sarian Kosten & Erik Jeppesen.

**2012**

### Biomaniipulation as a restoration tool to combat eutrophication: recent advances and future challenges.

**Advances in Ecological Research** 47: 411-488.

Erik Jeppesen, Martin Søndergaard, Torben L. Lauridsen, Thomas A. Davidson, Zhengwen Liu, Néstor Mazzeo, Carolina Trochine, Korhan Özkan, Henning S. Jensen, Dennis Trolle, Fernando Starling, Xavier Lazzaro, Liselotte S. Johansson, Rikke Bjerring, Lone Liboriussen, Søren E. Larsen, Frank Landkildehus, Sara Egemose, & Mariana Meerhoff.

## Training programs and postgraduate

### Postgraduate courses

Water-city. Postgraduate course about urban planning and conservation of crucial aquatic ecosystem services. 2012-2014. Coordinate by Arq. Adriana Piperno and Dr. Néstor Mazzeo.

Synthetic networks. The integrated management of the basin through synthetic fluvial networks. 2013. Prof. Dr. Jose Barquín, Cantabria University, Spain. The course is oriented to analyze the current state of the art in terms of management, planning, conservation and restoration of fluvial ecosystems.

### PhD thesis

Rafael Bernardi. 2012-2015. Grassland-forest transitions in subtropical South America. Supervised by: Dr. Milena Holmgren, Dr. Marten Scheffer and Dr. Matías Arim.

### Postdocs

Carolina Crisci. 2012-2013. Implications of climatic variability on water quality of Laguna del Sauce. Supervised by: Dr. Rafael Terra & Dr. Néstor Mazzeo.

### Technology Transfer Center Climate Change and Decision Making, UNESCO-AVINA

In October 2013, the Climate Change and Decision Making Regional Center was launched. The center was created by UNESCO, the AVINA Foundation and a network of universities and institutions of the South America countries. Its main objective is to integrate the complexity, risks and opportunities of climate change in the decision-making processes of public and private sectors in the region. In this context, it will promote opportunities for exchange and discussion among leaders from various sectors who will share their experience, making the link with international leaders at the highest level of the scientific, political and entrepreneur and exchange learning experiences in order to integrate climate change challenges in the daily management of their strategies and institutions. SARAS<sup>2</sup> was actively involved in the launching of the center.

## Outreach

*The SARAS<sup>2</sup> Institute is frequently asked to participate in the study of relevant issues related to socio-ecological systems management, which is particularly conspicuous in Uruguay (at local and national levels). Some of the researches had been selected because they are representative of Institute's main research topics.*

In the last few years a comprehensive study of problems related to drinking water supply, the management of this resource and the land use took place at Laguna del Sauce and the watershed associated. The main results of this project were exposed last year and can be accessed in pdf in the following link:

<http://saras-institute.org/publications/laguna-del-sauce/>

Currently, members of the Institute are working on Agriculture Adaptation to Climatic Change (supported by MGAP-FAO) in conjunction with scientists from CURE-UdelaR (Hugo Inda, Laura del Puerto, Carolina Crisci), the Engineering Faculty-UdelaR (Rafael Terra), Meteorological National Division (Mario Bidegain) and the Humanities and Education Sciences-UdelaR (Javier Taks). The main contribution can be download from:

<http://issuu.com/institutosaras/docs/fao>

## Publications

Mario Bidegain, Carolina Crisci, Laura del Puerto, Hugo Inda, Néstor Mazzeo, Javier Taks & Rafael Terra. 2013. Variabilidad climática de importancia para el sector productivo. In: Clima de cambios, nuevos desafíos de adaptación en Uruguay, Walter Oyhantcabal, Diego Sancho and Malvina Galván (eds.). Chapter 2: 43-99, FAO 2013.

Néstor Mazzeo, Hugo Inda, Javier Taks, Rafael Terra, Mario Bidegain, Carolina Crisci and Isabel Bortagaray. 2013. Capacidad de adaptación y transformación en un clima de cambios. In: Clima de cambios, nuevos desafíos de adaptación en Uruguay, Walter Oyhantcabal, Diego Sancho and Malvina Galvan (eds.). Chapter 6: 273-284, FAO 2013.

## Future projects

### Bilateral Scientific Cooperation with Brazil

The proposal is about developing a Brazil-Uruguay working platform in the area of climate-land use changes and resilience, and the related societal dynamics. The main goal is to develop an area of academic and policy-oriented research around the following three themes:

- Futures of South America: Scenario planning in climate-land use changes and sustainability
- Anticipating critical transitions in socio-ecological systems
- The societal dynamics and governance of environmental research and policy

#### Futures of South America: Scenario planning in climate-land use changes and sustainability

This line of action-research proposes to analyze the alternative pathways for South America and provide research and policy insights to navigate the complex, uncertain present and futures through scenario thinking. South America faces many crucial and critical social, political and environmental challenges. The rising demands for food, water, housing and development must be balanced with the need to preserve

crucial ecosystem services for human well being (at regional and global scales). The evolution of the human development needs and those of environmental systems is unpredictable. South America faces significant environmental and social constraints, which present great challenges and potentially significant opportunities as well

#### Anticipating critical transitions in socio-ecological systems

The early warning signals system is aimed at anticipating critical transitions that occasionally reshape complex systems in nature. A close monitoring of early warning signals for such transitions is key, not only for advancing our understanding of the dynamics of environmental change, but also for anticipating and designing decisions that impact societies on a wide range of dimensions. These dynamics have been mainly thought in the context of ecosystems. However, it is necessary to take this reflection further, and integrate the analysis regarding the social systems in general. To meet both the challenges and the opportunities will require a new approach to problem solving. In this world marked by surprise, the only evidence of emergent patterns comes in the form of weak but persistent early warning signs.



Therefore, there is a need to build decision-making capacity that includes the ability to identify and respond to these emergent patterns. There is a need to harness the different types of human potential, skill and creativity to collectively tip the interconnected ecological, social, political and economic systems towards greater sustainability and resilience.

#### The societal dynamics and governance of environmental research and policy

The world is rapidly changing, and complexity and uncertainty define a good part of the new problems that societies face in the economic, social, and environmental spheres. Research and policy are required to provide (anticipated) insights and solutions to the emerging problems, which are increasingly more complex and crosscut by high doses of uncertainty.

The need to rely on new research solutions and policy interventions calls for new methodological and analytical frameworks that account for the complexity and interdisciplinarity of the emerging problems. It is necessary to better understand the societal and environmental dynamics in a systemic way, and reflect on the types, modalities, and functioning of institutions and governance structures required to act and react in a way that

enhances the capacity of ecosystems and the quality of human life. There is a need to find processes that support whole system transformation. These new processes must engage government, civil society, and the private sector to devise solutions to complex and intractable problems.

#### Building resilience capacity in vulnerable agroecosystems to current and future climatic variability (Sierra del Este and Basalto-Uruguay). Ministry of Agriculture, Cattle and Fisheries of Uruguay. 2014.

The main idea is to identify a set of key drivers that condition the cattle vulnerability in some specific regions with high vulnerability to dry periods (Sierras del Este and Basalto). The drivers involve different types of (sub)systems: climate (frequency and drought intensity), social (land property, associativity, etc.) and economic (credit access, among others). More in detail, the project seeks:

- To define the set of indicators in the functioning of the overall system that allows to trace the temporal evolution of the resilience capabilities both at the regional and farm levels.

- To design and monitoring system with key patterns in terms of resilience to establish in the short term.
- To assess the adaptation and transformation capacity of the cattle system in the specific region.

#### Rural landscape planning and ecosystem services conservation

SARAS<sup>2</sup> are working together with the Maldonado authorities, DINOT (National Division of Land Planning of Uruguay) and Laguna del Sauce Basin Committee about possible strategies of rural planning in order to preserve relevant ecosystem services (mainly drinking water supply). The main idea is to develop an adaptive management approach, probably the first example in rural land planning of Uruguay.

#### Regional center of river basin planning and water management

Cantabria University (Spain), the International Hydrologic Program of United Nations and SARAS<sup>2</sup> started to develop a possible regional program of knowledge exchanges between universities and water authorities from South American countries, Spain and Portugal.



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