The South American Institute for Resilience and Sustainability Studies (SARAS\textsuperscript{2}) is an emerging transdisciplinary institute designed to generate critical insights allowing South America to build sustainable futures. It seeks integration across a broad range of knowledge using innovative approaches and integrating social and natural sciences, mathematics and arts.

SARAS\textsuperscript{2} is now housed in a custom-designed building recently finished at the coast of Uruguay, providing space and facilities for workshops, courses and academic residencies, thus serving as a hub for the emergence of novel cooperative networks. We envision the kind and intense interaction at SARAS\textsuperscript{2} to shape a new generation of broad visionary thinkers and creators.

The idea of SARAS\textsuperscript{2} Institute was originally conceived in 2005 between Dr Marten Scheffer (Wageningen University) and Dr Néstor Mazzeo (UdeAR). In January 2006, a first document was drafted and at the same time, the Mayor of Maldonado Mr Oscar De los Santos was approached in order to explore the possibility of establishing SARAS\textsuperscript{2} Institute in that department. With the strong support of the Municipality, a search for a suitable location started. Since the summer of 2007, the Advisory Board of SARAS\textsuperscript{2} began meeting regularly to discuss guidelines and redefine the Institute’s main features, targets and goals.

Through the Advisory Board, the Institute has strong linkages with: the Beijer Institute of Ecological Economics (Sweden), the Stockholm Resilience Centre (Sweden), the University of Wisconsin (USA), the Arizona State University (USA), the University of Waterloo (Canada), the Catholic University of Chile (CASEB, Chile), the Patagonic National Centre CONICET (Argentina), the University of Brasilia (Brazil) and the University of Zurich (Switzerland).
SARAS INSTITUTE

and Culture Minister and Municipality of Maldonado. At present, the Ministry of Education and Culture (MEC), UdelaR and the Municipality of Maldonado provide the main economic support.

The Advisory Board advises and supports the Director on scientific projects, strategy, fundraising and operational issues, as necessary. It is integrated by: Marten Scheffer, Jordi Bascompte, Laurie Beth Clark, Steve Carpenter, Omar Defeo, Carl Folke, Pablo Marquet, Osvaldo Sala, Ana Parma, Eduardo Viola, Frances Westley, Mariana Meerhoff and Jorge Marcone.

The Scientific Director is Néstor Mazzeo. The Executive Committee is integrated by: Marten Scheffer (Director), Osvaldo Sala (Co-Director), Ana Dubra (Executive Secretary), Néstor Mazzeo (Scientific and Relationship Director), Mariana Meerhoff (Advisory Board Executive member and in charge of Human Resources), Paula Bianchi (Communications Officer), Cecilia Delgado (Accountant), William Rodríguez (Lawyer) and Mariella Busnadiego (Notary).

The Administrative Board of the SARAS² is in charge of the Foundation’s management and representation. Current members: Dr. Néstor Mazzeo (UdelaR representative), Dr. Juan Cristina (UdelaR representative), Dr. Osvaldo Sala (Advisory Board representative), Dr. Mariana Meerhoff (Advisory Board representative), Arch. Ricardo Pereira (Maldonado representative), Dr. Virginia Fernández (MEC representative) and Eng. Rafael Bernardi (Scientific members representative).

Finally, the Fiscal Board of the SARAS² Foundation involves: Lujan Criado (UdelaR representative), Gustavo Morales (UdelaR representative) and Julio Riella (Municipality of Maldonado government representative).

Scientific activities

In the last six years there has been a series of international scientific conferences:

<table>
<thead>
<tr>
<th>Year</th>
<th>Topic</th>
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<tbody>
<tr>
<td>2010</td>
<td>Sustainable Futures for Freshwater resources in South America</td>
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<tr>
<td>2011</td>
<td>Sustainable Futures for Artisanal fisheries in Latin America</td>
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<tr>
<td>2012</td>
<td>Transitions in terrestrial ecosystems</td>
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<tr>
<td>2013</td>
<td>Education for uncertainty</td>
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<tr>
<td>2014</td>
<td>Imagining resilience: Art-science collaboration for sustainability</td>
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<tr>
<td>2015-2016</td>
<td>Seeking sustainable pathways for land use in South America</td>
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Networks

SARAS$^2$ can be considered a net of networks or a facilitator of networks. The research networks are organized around specific topics, independently of the disciplinary background of participant researchers.

Besides the above mentioned topics, each involving a series of international participants, other networks include:

**Early warning signals**
This network aims at developing methods and frameworks to identify early warning signals that could anticipate radical changes or critical transitions in both nature and society.

**Current and future climate variability and the relationship with the Uruguayan productive sectors**
This network is oriented to analyze the current and future scenarios of climate variability and the relationship with 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 series of adaptive strategies that will enable the sustainability of the critical ecosystem services provided by this reservoir (such as drinking water) for the human wellbeing.

### Main Activities Developed During 2015

**February.** Rehabilitation strategy of Del Diario Lagoon ecological status. Final report of the external evaluation performed by Prof. Alberto Basset, Prof. John M. Baxter and Dr. Graham R. Daborn. Process organized by civil organizations, Municipality of Maldonado and SARAS$^2$. Maldonado.


**August.** II Regional symposium about Climate change and decision making. Representatives of private and public sector, academia, civil society and journalists related with climate change issues from several LA countries. Organized by UNESCO and AVINA, several universities of South America and SARAS$^2$. Montevideo.

**September.** SARAS$^2$ received the visit of Dr. Amina Pollard from the Environment Protection Agency (EPA) of USA. The visit of Dr. Pollard (leader of the Office of Water in charge of the National Lakes Assessment) was funded by the US Embassy through the Embassy Science Fellow Program 2015 granted to SARAS$^2$. SARAS$^2$ postulated the project “Contribution to a Water Sustainability program in Uruguay” to this program in January 2015. The activities coordinated by SARAS$^2$ in the context of this project were:

1. Open public conference: “Management of fresh water quality in the USA: a vision on the framework, challenges and successes” (Gestión de la calidad del agua en los EE.UU.: una visión del marco, los desafíos y éxitos) September 9th, CURE and SARAS$^2$. Maldonado

2. Postgraduate Course for students and technical staff: “Monitoring and Assessment to Support Freshwater Management”, September 14th to 18th, Organized by Facultad de Ciencias and CURE (UdelaR), PEDECIBA and SARAS$^2$. Montevideo.

3. Workshop for high technical staff, policy makers and academics: “Agricultural activity and freshwater quality. Evaluation, Monitoring and Remediation of surface waters” (Actividad agropecuaria y calidad del agua. Evaluación, monitoreo y...
remediación en agua superficial),
September 22nd to 23rd,
Organized by Facultad de Ciencias,
CURE (UdelaR), DINAMA, and
SARAS². Montevideo.

4. Technical Meeting with
DINAMA (National Directorate
of Environment of Uruguay)
Director and technical staff
to discuss the measures for
ameliorating water quality in
Santa Lucía River catchment.
Montevideo.

5. Initiation of cooperation
agreement between EPA and
DINAMA, facilitated by SARAS²
and UdelaR.

September 2015 to January 2016.
CURE and SARAS² hosted the
following MSc students from
Wageningen University:

• Lic. Rocío Martínez Cillero. Thesis: “Tree
seedling recruitment at the
ecotone between riverine forests
and grasslands in subtropical
South America (Uruguay)”.

seed dispersal patterns at the
ecotone between riverine forests
and grasslands in subtropical South America (Uruguay)”.

seedling removal and emergence at the
ecotone between riverine forests
and grasslands in subtropical South America (Uruguay)”.

Activities coordinated by Milena
Holmgren, Rafael Bernardi and Néstor
Mazzeo.

October. 1-day workshop on
Transitions forest-grasslands
in Uruguay: knowledge and
management. Organized by CURE
(UdelaR), Wageningen University and
SARAS². Maldonado.

November. Public conference of
Dr. David Harvey: “Alternative
development and use of
natural resources: conflicts and
contradictions”. Co-organized by
CURE, Facultad de Arquitectura
(UdelaR) and SARAS². Maldonado

November. SARAS² also participated as
judge in the National Fair of
(primary and secondary school)
Science Clubs 2015. Organized by
the National Directorate of Science
and Technology (DiCyT) of the
Ministry of Education and Culture.

SARAS² also granted the Award for
Sustainability and Resilience. This
annual activity gathers thousands
of children, teenagers and adults,
aiming at promoting Science and
Technology public appropriation.
Montevideo

December. Rehabilitation of
eutrophic aquatic systems,
resilience mechanisms and
possible restoration strategies.
With Dr. Miquel Lürling (Wageningen
University) and Dr Paula de Tezanos
Pintos (Universidad de Buenos Aires).
Co-organized by CURE, OSE-UGD,
OSE, Ministry of Housing, Land
Planning and Environment (MVOTMA)
and SARAS². Series of activities that
involved an open public conference
in Maldonado and several meetings
with managers and decision makers
involved in the drinking water supply
and environmental strategies, in
Maldonado and Montevideo

December. Open dialogue about
environment, journalism and
society. The cycle initiated in 2015
aims at generating an exchange
scenario between journalists and
several actors within environmental
issues. The first meeting, entitled “An
integrated look to water” focused on
how journalism communicates water
quality-related topics. Co-organized
by UNESCO, MVOTMA and SARAS².

The staff of SARAS² was invited to participate in the following activities as invited speakers:

• Abril 17 th and 18 th. Binational Workshop:
Environmental policy and challenges. (Taller binacional:
La politica y los desafíos ambientales), organized by
Fundación Konrad Adenauer (KAS).

• May 26th, Water Symposium: Sustainable Development
and effects on the Environment and Society (Agua:
Desarrollo Sostenible e Incidencias en el Ambiente y
la Sociedad), organized by Fundación Iniciar for Global
Action.
Training programs

Postgraduate courses

Third Course-Workshop Water-City interactions: small streams of Salto. 6-10 August 2015. University of the Republic (UdelaR) and SARAS.

First course of Structure and functioning of ecosystems and socio-ecological systems. First semester in Facultad de Ingeniería and second semester in Facultad de Ciencias (UdelaR).

Postgraduate Course for students and technical staff: “Monitoring and Assessment to Support Freshwater Management”, September 14th to 18th, Organized by Facultad de Ciencias and CURE (UdelaR), PEDECIBA and SARAS.

Postdocs


Diffusion and Communication

SARAS activities and outputs have increasing visibility. Specific strategies of diffusion and communication were enforced for each activity. Those strategies aimed at national and regional levels, and involved actions to reach local and national newspapers, radio programs, TV programs and Social Networks.

Teaching and training activities are crucial for SARAS. We aim at contributing to the academia but also to the organizations with management and decision-making responsibilities. We therefore promote the exchange and integration of participants from these diverse sectors in several of our education activities, and expect to expand them further in the future.
SCIENTIFIC PAPERS

2015

2014
A special has been published in November synthesizing the results of the 2012 SARAS workshop: Grass-woodland transitions: determinants and consequences for ecosystem functioning and provisioning of services. Journal of Ecology 102:1357-1362.
Sala, O.E. and Maestre, F.T.

Scheffer, M.

Defeo, O.; Castrejón, M.; Pérez-Castañeda, R.; Castilla, J.C.; Gutiérrez, N.L.; Essington, T.E. and Folke, C.

2013
Defeo, O.; Castrejón, M.; Ortega, L.; Kuhn, A.; Gutiérrez, N.L. and Castilla J.C.

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.


Defeo, O. & Castilla, J.C.

2009
Scheffer M1, Bascompte J, Brock WA, Brovkin V, Carpenter SR, Dakos V, Held H, van Nes EH, Rietkerk M, Sugihara G.
BOOKS & BOOK CHAPTERS

2015


2014
Book: “Ambiente”. (Environment) Serie Nuestro Tiempo, MEC.
Meerhoff, M. and Oyhantcabal, W.

2013
Ongoing and Future projects

SARAS² aims at contributing to develop a national program of monitoring and control of surface fresh waters and to strengthening water management governance, through a variety of projects and initiatives.

Rural landscape planning and ecosystem services conservation
SARAS² is working together with Maldonado Municipality authorities, DINOT (National Directorate of Land Planning, MVOTMA Uruguay), Facultad de Economía (UdelaR) and Laguna del Sauce Basin Committee on possible strategies of rural land planning 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.

Strategies to mitigate agricultural effects on fresh waters
Via cooperation with Aarhus University of Denmark. Involved institutions: MVOTMA, MGAO, MEC. This cooperation, facilitated by SARAS² and UdelaR, aims at translating to Uruguay some of the lessons learnt during a very successful history of recovery of the quality of surface waters through a combination of mitigation strategies and national policies applied in the last 30 years in Denmark. A cooperation agreement already exists between UdelaR and Aarhus University regarding education programs, and we aim at incorporating management and policy exchange.

National monitoring program of freshwater ecosystems.
SARAS², Cantabria University (Spain), UdelaR and a network of Ministries of Uruguay related to aquatic resource management are working to develop a national monitoring program of aquatic resources based on the synthetic network paradigm and considering the decentralization process of the country. Together with this effort, SARAS² is facilitating a cooperation agreement with the EPA of USA with the same general purpose.
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 cattle vulnerability in some specific regions with high vulnerability to dry periods (such as Sierras del Este and Basalto, north Uruguay). The drivers involve different types of (sub)systems: climatic (the frequency and intensity of drought), 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 capacities both at the regional and at the farm levels.
• To design a monitoring system with key patterns in terms of resilience to be established in the short-term future.
• To assess the adaptation and transformation capacity of the cattle system in that specific region.

SARAS² is working together with Wageningen University and CURE-UdelaR on mechanisms of transition between forests, savannas and grasslands in Uruguay, seeking to understand such dynamics to enhance ecosystem services and provide scientific support for management. This involves field experiments with graduate international and national students.