



ANNUAL REPORT 2015



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Institute & Foundation

The SARAS² Institute is a joint initiative of Wageningen University (The Netherlands), the University of the Republic (UdelaR, Uruguay), the Resilience Alliance, the Ministry of Education and Culture of Uruguay (Uruguay), and the Municipality of Maldonado (Uruguay).

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).

The South American Institute for Resilience and Sustainability Studies (SARAS²) 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.

SARAS² 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 SARAS² to shape a new generation of broad visionary thinkers and creators.

The idea of SARAS² Institute was originally conceived in 2005 between Dr Marten Scheffer (Wageningen University) and Dr Néstor Mazzeo (UdelaR). 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 SARAS² 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 SARAS² began meeting regularly to discuss guidelines and redefine the Institute's main features, targets and goals.

The Institute's academic life began between 2008 and 2009 with various scientific publications and several research project proposals presented at national and international level. In connection with the approved projects, a five year programme of annual conferences on relevant topics in Latin America was established. The cycle of annual conferences started in 2010 with the topic "Sustainable Future for Freshwater Resources in Latin America". In 2009 SARAS² was granted a substantial support from the University of the Republic (UdelaR). Thank to this contribution, Dr Mariana Meerhoff joined the work team. There was also economic backing from the Ministry of Education and Culture. In 2011 additional support from the Municipality of Maldonado was granted for the building construction in the coastal village Bella Vista.

In December 2012, SARAS² was established as a foundation to facilitate legal and administrative management.

During 2015 the first phase of SARAS² building at Bella Vista was finished, the construction was funded by Education

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 Busnadiago (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:

2010	Sustainable Futures for Freshwater resources in South America
2011	Sustainable Futures for Artisanal fisheries in Latin America
2012	Transitions in terrestrial ecosystems
2013	Education for uncertainty
2014	Imagining resilience: Art-science collaboration for sustainability
2015-2016	Seeking sustainable pathways for land use in South America

Networks

SARAS² 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.

scenarios of climate variability and the relationship with key productive sectors of Uruguay.

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

This network is oriented to analyze the current and future

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 SARAS². Maldonado.

society and journalists related with climate change issues from several LA countries. Organized by UNESCO and AVINA, several universities of South America and SARAS². Montevideo.

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 SARAS². Maldonado

July. Open public debate about problems and difficulties of the drinking water supply service related to Laguna del Sauce. Analysis of the crisis occurred during autumn 2015: main features and lessons learnt. Co-organized by Punta del Este League, union of Neighbours of Punta Ballena, Del Sauce Lagoon and Del Diario Lagoon, OSE-UGD, CURE-UdelaR and SARAS². Maldonado.

September. SARAS² 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 SARAS². SARAS² postulated the project "Contribution to a Water Sustainability program in Uruguay" to this program in January 2015. The activities coordinated by SARAS² in the context of this project were:

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 SARAS². 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

August. II Regional symposium about Climate change and decision making. Representatives of private and public sector, academia, civil

1. Open public conference: "Management of fresh water quality in the USA: a vision on

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 riparian forests and grasslands in subtropical South America (Uruguay)".
- Lic. Iván Raniero Hernandez Salmeron. Thesis: "Tree seedling removal and emergence at the ecotone between riverine forests and grasslands in subtropical South America (Uruguay)".

- Lic. Bart Verdijck. Thesis: "Tree seed dispersal patterns at the ecotone between riverine forests and grasslands in subtropical South America (Uruguay)".

- Lic. Jasper Buijs. Thesis: "Tree patch configuration, structure and composition 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 Lüring (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 política 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.

- May 27th, Expert workshop on Climatic-intelligent agriculture in Uruguay, (Taller de Expertos sobre el Perfil Uruguayo de Agricultura Climáticamente Inteligente), organized by MGAP and Centro Internacional de Agricultura Tropical.
- May, 29th and 30th, 98° Congress of the farmer federation (Congreso Federación Rural), organized by Federación Rural.
- August 13th, Colloquium on the Laudato Si Encyclic (Coloquio sobre la Encíclica “Laudato Si”), organized by Konrad Adenauer Stiftung.
- August 18th, Eutrophication and harmful algae workshop (Jornadas sobre eutrofización y floraciones algales nocivas), organized by CARU (Uruguay River Administration Commission), Colón, Argentina.
- December, 2nd ,3rd and 4th. Workshop Science, Technology and the 2030 Agenda for Sustainable Development (Ciencia, Tecnología y la Agenda 2030 para el Desarrollo Sostenible, Taller de Expertos), organized by UNESCO, AUCI and Center for Science Diplomacy.

Diffusion and Communication

SARAS² 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.

Training programs

Teaching and training activities are crucial for SARAS². 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..

Postgraduate courses

Third Course-Workshop Water-City interactions: small streams of Salto. 6-10 August 2015. University of the Republic (UdelaR) and SARAS²

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 SARAS². Montevideo.

Postdocs

Carolina Crisci. 2013-2015. Implications of climatic variability on water quality of Laguna del Sauce. Supervised by: Dr. Rafael Terra & Dr. Néstor Mazzeo.

Publications 2009-2015

SCIENTIFIC PAPERS

2015

Dual thinking for scientists. *Ecology and Society* 20(2): 3. <http://dx.doi.org/10.5751/ES-07434-200203>.

Scheffer M, Bascompte J, Bjordam TK, Carpenter SR, Clarke LB, Folke C, Marquet P, Mazzeo N, Meerhoff M, Sala O & Westley FR.

2014

A special has been published in November synthesizing the results of the 2012 SARAS² 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.

The forgotten half of scientific thinking. Opinion.

PNAS. Vol.111 (17): 6119. April 29.

Scheffer, M.

Co-management in Latin American small-scale shellfisheries: assessment from long-term case studies. *Fish and Fisheries*: 32, 29-39

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

2013

Impacts of climate variability on Latin American small-scale fisheries. *Ecology and Society* 18 (4): 30.

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

2012

Anticipating Critical Transitions. *Science* 338: 344:348.

Scheffer, M.; Carpenter, S.R.; Lenton, T.M.; Bascompte, J.; Brock, W.; Dakos, V.; van de Koppel, J.; van de Leemput, I. A.; Levin, S. A.; van Nes, E. H.; Pascual, M. and Vandermeer, J.

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.

Meerhoff, M.; Teixeira-de Mello, F.; Kruk, C.; Alonso, C.; González-Bergonzoni, I.; Pacheco, J.P.; Lacerot, G.; Arim, M.; Beklioglu, M.; Brucet, S.; Goyenola, G.; Iglesias, C.; Mazzeo, N.; Kosten, S. & Jeppesen, E.

Biomanipulation as a restoration tool to combat eutrophication: recent advances and future challenges. *Advances in Ecological Research* 47: 411-488.

Jeppesen, E.; Søndergaard, M.; Lauridsen, T.L.; Davidson, T.; Liu, Z.; Mazzeo, N.; Trochine, C.; Özkan, K.; Jensen, H.S.; Trolle, D.; Starling, F.; Lazzaro, X.; Johansson, L.; Bjerring, R.; Liboriussen, L.; Larsen, S.; Landkildehus, F.; Egemose, S. & Meerhoff, M.

Governance and governability of coastal shellfisheries in Latin America and the Caribbean: multi-scale emerging models and effects of globalization and climate change. *Current Opinion in Environmental Sustainability* 4: 344-350.

Defeo, O. & Castilla, J.C.

2009

Early-warning signals for critical transitions. *Nature* 416(3)53-59.

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

Book chapter: **“Aguas urbanas en Uruguay: Avances y desafíos hacia una gestión integrada”** (Urban waters in Uruguay: advances and challenges towards integrated management), in Desafíos del agua urbana en las Américas. Perspectivas de la Academia de Ciencias (Challenges of urban water in the Americas: perspectives of the Academy of Sciences). Roldán, G.; Torregrosa, M.L.; Vammen, K.; González, E.J.; Campuzano, C.; Hidalgo, H. & de la Cruz Molina, A.; (eds). IANA- UNESCO, México. pp: 544-573.

Capandeguy, A.; Piperno, A.; Quintans, F.; Sierra, P.; Alonso, J.; Chreties, Ch.; Cuadrado, A.; Gamarra, G.; Guido, P.; Martínez, J.P.; Mazzeo, N.; Mena, M.; Rezzano, N.; Sanguinet, G.; Taks, J.; Goyenola, G.; González, E.; López, J.; Matos, A.; Sabaño, O.; Santos, C.; Saravia, M.; Silveira, L.; Arocena, R. & Aubriot, L.

Book chapter: **“Navegando una transición múltiple”** (Navigating a multiple transition), in Recursos hídricos: usos, tecnologías y participación social (Aquatic resources: uses, technologies and social participation). Café Tertulia, Colección 2/3. Espacio Interdisciplinario. pp: 29-36.

Mazzeo, N.; Steffen, M.; Inda, H.; Goyenola, G.; Clemente, J.; Teixeira de Mello, F.; Iglesias, C.; Pacheco, J.P.; & Sciandro, J.

2014

Book: **“Ambiente”**. (Environment) Serie Nuestro Tiempo, MEC.

Meerhoff, M. and Oyhantcabal, W.

2013

Book chapter: **“Capacidad de adaptación y transformación en un clima de cambios”** (Adaptation and transformation capacity under a climate of change), in Clima de Cambios: Nuevos Desafíos de Adaptación en Uruguay (Climate of change: new challenges for adaptation in Uruguay), Oyhantcabal, W.; Sancho, D.; and Galván, M. (eds.). Chapter 6: 273-284, FAO.

Mazzeo, N.; Inda, H.; Taks, J.; Terra, R.; Bidegain, M. and Crisci, C.

Book chapter: **“Variabilidad climática de importancia para el sector productivo”** (Climatic variability relevant for the productive sector), in: Clima de cambios, nuevos desafíos de adaptación en Uruguay, Oyhantcabal, W.; Sancho, D. and Galván, M. (eds.). Chapter 2: 43-99, FAO. Bidegain, M.; Crisci, C.; del Puerto, L.; Inda, H.; Mazzeo, N.; Taks, J. & Terra, R.

2010

Book: **“Bases técnicas para el manejo integrado de Laguna del Sauce y cuenca asociada”**. (Technical basis for the integrated management of Sauce Lake and its catchment)

Acuña, C.; Alcorta, R.; Caffera, M.; Carballo, C.; Clemente, J.; Crisci, C.; del Puerto, L.; García-Rodríguez, F.; Fort, H.; Fosalba, C.; García, S.; González-Bergonzoni, I.; Goyenola, G.; Hourcade, J.; Iglesias, C.; Inda, H.; Jeppesen, E.; Kausas, S.; Kröger, A.; Lagomarsino, J.J.; Larrea, D.; Leicht, E.; Mazzeo, N.; Marchand, N.; Marroni, S.; Masdeu, M.; Meerhoff, M.; Méndez, G.; Pacheco, J.P.; Pérez Güida, V.; Scheffer, M.; Sciandro, J.; Steffen, M.; Rodríguez, A.; Teixeira- de Mello, F.; Vianna, M. and Vidal, N.

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.





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