Presentation of the preliminary maps of Andean SELSs and discussion of other essential variables that contribute to the final definition of the SELS.

Proposal: Participatory Land Observatories for a Sustainable Andes: Leveraging the tools of Earth observation and land system science to build a network of socio-ecological observatories for the Andes (ROSA).

The workshop was held virtually on 17th March, 2023, at 3 pm CET, with 3-hour duration. This workshop aimed to present a preliminary map of Andean Socio-ecological Land Systems (SELS) and discuss other essential variables that contribute to the final definition of the SELS. The workshop was programmed with four presentations of expert speakers, after a brief presentation of welcome and introduction to the proposal, a space for discussion, and a conclusions section to close the event (Figure 1 program). Twenty-four participants attended the workshop representing all the Andean countries; researchers from Brazil, Italy, Germany, Canada, and Switzerland participated as well (table 1). We counted on the facilitation of CONDESAN.
This workshop corresponds to the module 1 of a series of three modules to be developed until June 2023 (Concept), organized by researchers from Instituto de Ecología Regional (IER) and Instituto de Investigaciones Territoriales y Tecnológicas para la Producción del Hábitat (INTEPH) from Universidad Nacional de Tucumán - CONICET (Argentina), Freie Universität Berlin (FUB - Germany), Universidad de Los Andes (Venezuela) and Global Land Program (GLP).
Before the workshop, we shared a kit of materials useful for the development of the workshop.

The first, introductory presentation, was about the subclassification of SELS for the Andean region, based on a map of South America SELS developed by a group of interdisciplinaries specialists (Zarba et al 2022). In this context, SELS are understood as land typologies that allow a spatial classification based on biophysical and socioeconomic similarities between regions. This map constitutes the starting point to generate the Andean SELS map, which in its initial version has 13 SELS and 5 SERs (Socio-ecological regions), including seven dimensions (biophysical, biological, land cover, economic, demographic, political, and cultural). We expected that with this workshop we would be able to critically analyze the variables used for the Andean SELS map; in particular, we were interested in evaluating which variables could be changed or added, whether changing the spatial scale of analysis of the different variables is necessary/useful, and also which variables are important to measure at a more local scale in the monitoring sites/observatories. Now, why is it important to develop a SELS map for the Andes in the context of ROSA? The presentation highlighted that this map combines biophysical and socioeconomic attributes, spatially and explicitly (incorporating the

human dimension), offering an initial support for a better-integrated observatory network at the regional level, providing a geographic framework that offers context to on-site observations, and allowing the identification of under-represented regions.

On the second, third and fourth presentations, we were introduced to available datasets potentially useful for ROSA and the Andean SELS map. First Ferran Gascón presented the products developed by ESA. ESA CCI data catalogs are available from different missions, covering several decades and using a coherent methodology. Then James Thornton introduced us to the Geo Mountain's data portal. He also talked about an ongoing project aiming to identify essential socioeconomic variables for global mountains. Finally Carmen Ponce presented the products of a previous CONDESAN project, the socio-environmental indicator platform of the Andean region. In this platform they make available to the users a series of datasets gathered through a thorough survey of a variety of sources and pre-analyzed for the Andean region.

Along the presentations, speakers and attendants highlighted several points that required discussion and definition: spatial resolution of the variables to be used, temporal coverage, temporal resolution, acknowledge data limitations, and spatio-temporal gaps on available variables. We discussed the selection of parameters and variables useful for monitoring through the ROSA initiative and those for defining the Andean SELS map.

In the last section, we focused again on the variables for defining the Andean SELS map. It consisted of an open discussion where participants shared their opinions on the current and potential variables keys to represent the distinctive characteristics of the different regions. Some ideas included incorporating dual residences and migration, incorporating ethnicity maps, indicators of degradation, open dumps, exploring the potential of citizen science. To foster discussion we proposed an interactive activity where we asked participants to write down what they consider key variables and their potential sources (further explained in the next section).

e-Survey on key variables to define/characterize SELS

We developed an open-answer survey (using the mentimeter tool, see Annex) during the workshop to assess participant's perception about the key variables to characterize Andean SELS, available at a continental scale for the Andes. In the survey, we asked participants to indicate the source of the information and differentiate if they are field-based variables, variables from remote sensing or if they are derived from statistical databases (eg. censuses).

The most important results derived from this survey included:

- It would be important to include more variables in the analysis. The variables suggested were:

1. Criosphere changes and glacier cover area derived from remote sensors (e.g. ESA).
2. A more detailed analysis of the cover of Andean ecosystems and classifications of biogeographic regions for the Andes.
3. Bioclimatic indexes that are already available (as those generated by CAN for the Tropical Andes).
4. Analysis of the distribution of endemic species.
5. Luminosity indicators of population density.
6. Labor mobility and other censal statistics.
7. Disaster risk indicators (extreme events, e.g. for hydrological extreme events).
8. Forest cover, deforestation/regeneration, via remote sensing.
9. Censal information derived from institutions like CEPAL or national censuses, including socio-economic indicators linked with poverty/income inequality/indigence/gender disparities.
10. Variables linked with environmental conflicts (e.g. ejot.org??).
11. Consider databases like the Political Institutions and Political Events datasets (PIPE).

- It would be important to integrate/complement the continental spatial analysis with field observations in the monitoring sites.
- It is important to consider that international institutions like the World Bank base their statistics in their perception of the key problems and priorities and there are heuristics that need to be taken into account.

Other files derived from the first workshop
A list of Bullet point workshop 1 (presentations and attendants' comments).
File with useful links shared during the workshop

Time (GMT -5)	Content	Speaker
8:30 - 8:35	Greeting to the audience	Saskia Flores (CONEDSAN)
8:35 - 8:45	Welcome and introduction to the workshop	Julieta Carilla (IER, UNT-CONICET)
8:45 - 9:15	Presentation of the preliminary map of the Andean socio-ecological territorial ecological territorial systems (SELS)	Lucía Zarbá (INTEPH, UNT-CONICET)
9:15 - 9:35	Earth Observation data for ROSA	Ferran Gascon (ESA)
9:35 - 10:05	Essential socioeconomic variables in Mountains	James Thornton (Geo Mountain)
10:05 - 10:25	Platform of Socio-Ecological Indicators of the Andes	Carmen Ponce (GRADE)
10:25 - 10:35	Survey on assessment of relevant variables to be included in the map	Saskia Flores (CONDESAN)
10:35 - 11:20	Discussion	Luis D. Llambí (CONDESAN) y Lucía Zarbá (INTEPH, UNT-CONICET)
11:20 - 11:30	Synthesis	Julieta Carilla (IER, UNT-CONICET)

Figure 1. Program of the First Workshop, and flyer of speakers

Table 1. List of attendants

	Name	Afiliation	Country
1	Agustina Malizia	IER, UNT-CONICET	Argentina
2	Camilo Rodríguez Beltrán	UDD	Chile
3	Carmen Ponce San Roman	GRADE U. York	Canada
	Ezequiel Araoz	IER, UNT-CONICET	Argentina
5	Ferran Gascon	ESA	Italy
6	Francisco Cuesta	UDLA	Ecuador
7	Francisco Román	CONDESAN	Peru
8	Julieta Carilla	IER, UNT-CONICET	Argentina
9	Laszlo Nagy	Universidad de Campinas	Brasil
10	Lucía Zarbá	INTEPH	Argentina
11	Luis Daniel	A@A	Venezuela
12	Luis Phillips		
13	Manuel Peralvo	CONDESAN	Ecuador
14	María Piquer-Rodríguez	FUB	Germany
15	James Thornton	Geo Mountain	Switzerland
16	Nicolás Cuvi	Flasco	Ecuador
17	Oriana Osinaga Acosta	IER, UNT-CONICET	Argentina
18	Patricia Breuer	Universidad del Desarrollo	Chile
19	Petra Wallem		Chile
20	Ricardo Grau	IER, UNT-CONICET	Argentina
21	Saskia Flores	CONDESAN	Ecuador
22	Sergio Ceballos	IER, UNT-CONICET	Argentina
23	Tina Lerner		
24	Wanderley Ferreira	UCC	Bolivia