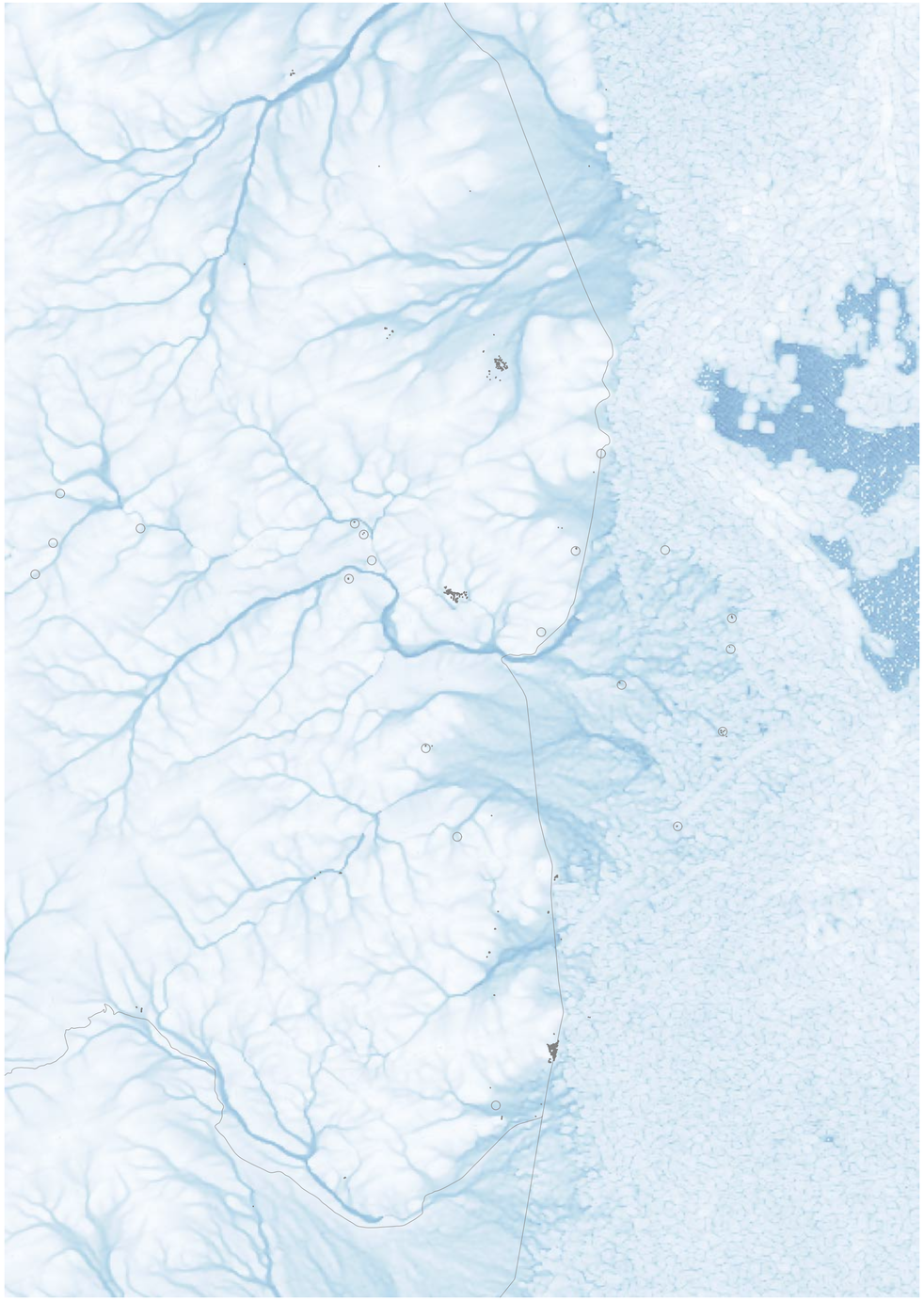


Proposing a transition from the Contact Zone

Unveiling opportunities for negotiation in the context of lithium extractivism in the Puna de Atacama

Angela Ferrero
Msc Thesis
Urbanism BK TUDelft
June 2025

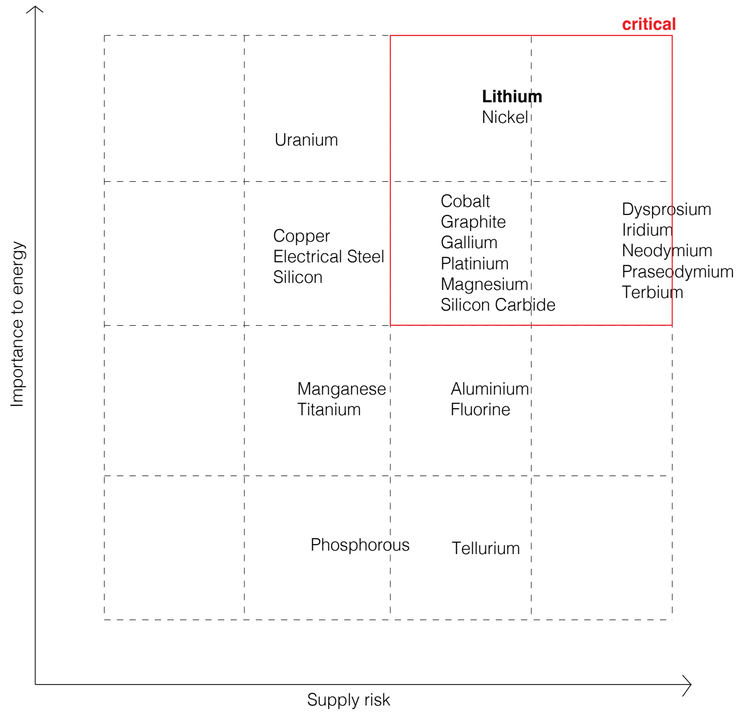
Motivation

“While some are discussing the future, others are already there, taking lithium as quickly and cheap as possible.
The invasion of international capital into the salares is done in the name of sustainability. In order to stop polluting the environment of big cities, the distant ecosystems of the south are sacrificed. Their fauna, their water, their peoples way of life”

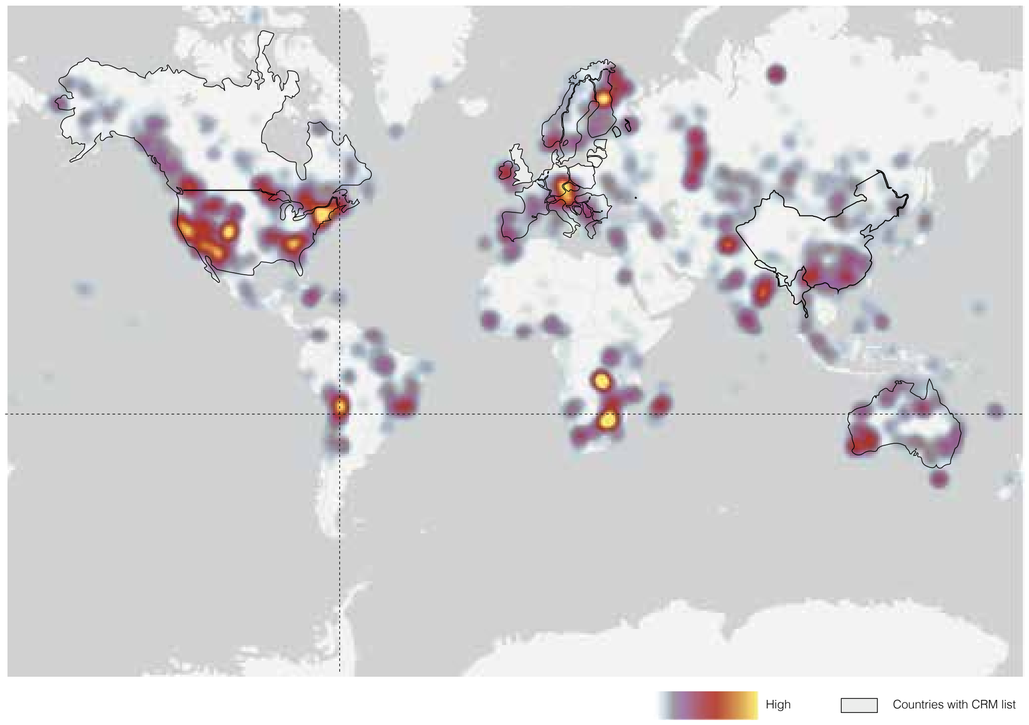
(En el nombre del litio, 2019)

Politics of a Transition

Critical Raw Materials



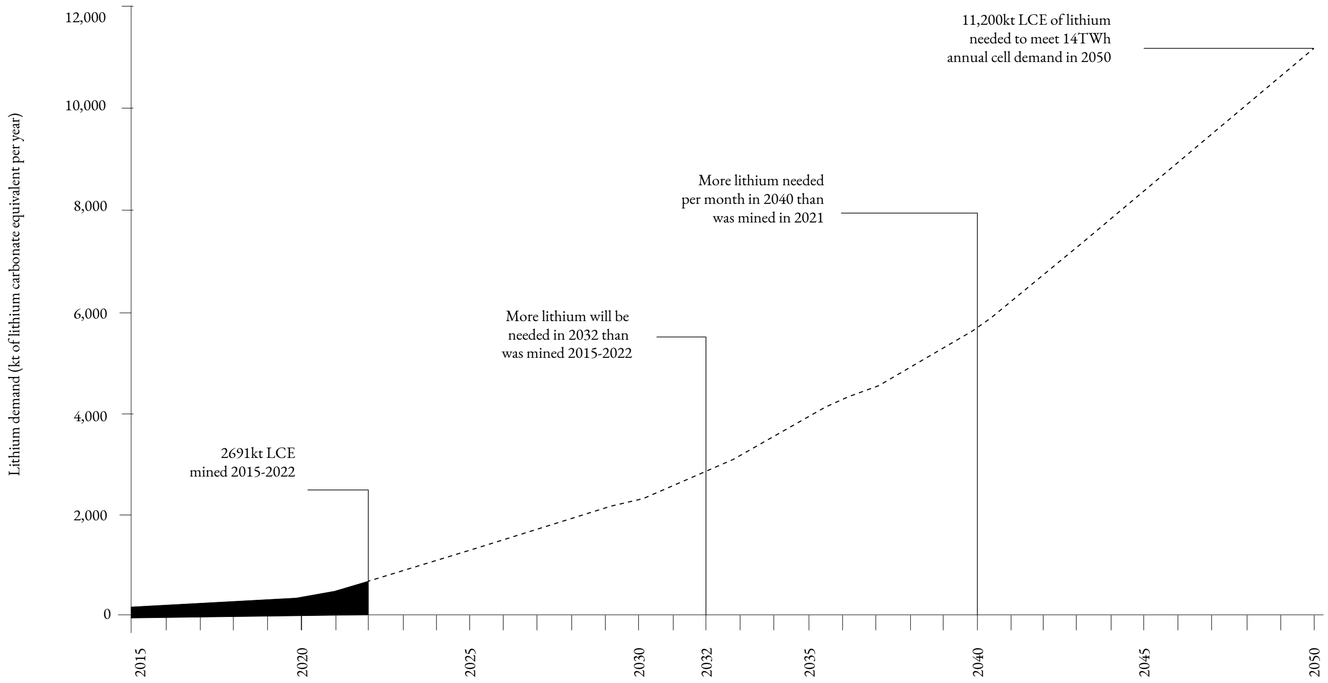
Criticallity of CRM 2025-2035
Source: US Energy,2023



Global CRM locations
Source: USGS,2023

Politics of a Transition

Lithium demand projections

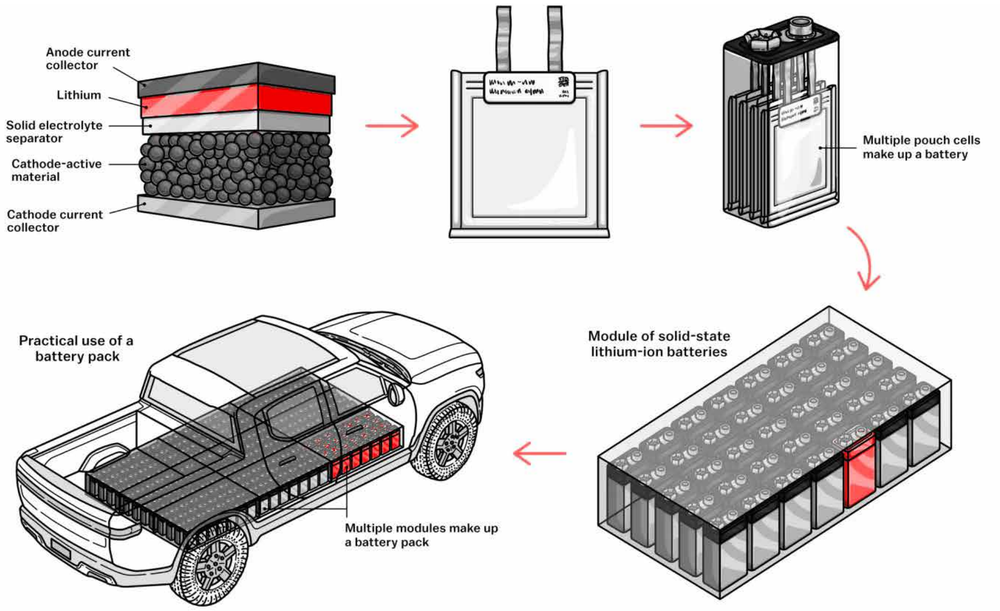


Lithium demand projections
Source: Benchmark minerals, 2023

Politics of a Transition

Li-ion batteries

Advertisement of an Electric Vehicle
Source: Newsroom



Li-ion battery
source:www.vox.com

Lithium extraction methods

Conventional method: Hard Rock Extraction

Western Australia’s Greenbushes mine (Credit: Alamy)

Non-Conventional method: Brine Extraction and evaporation

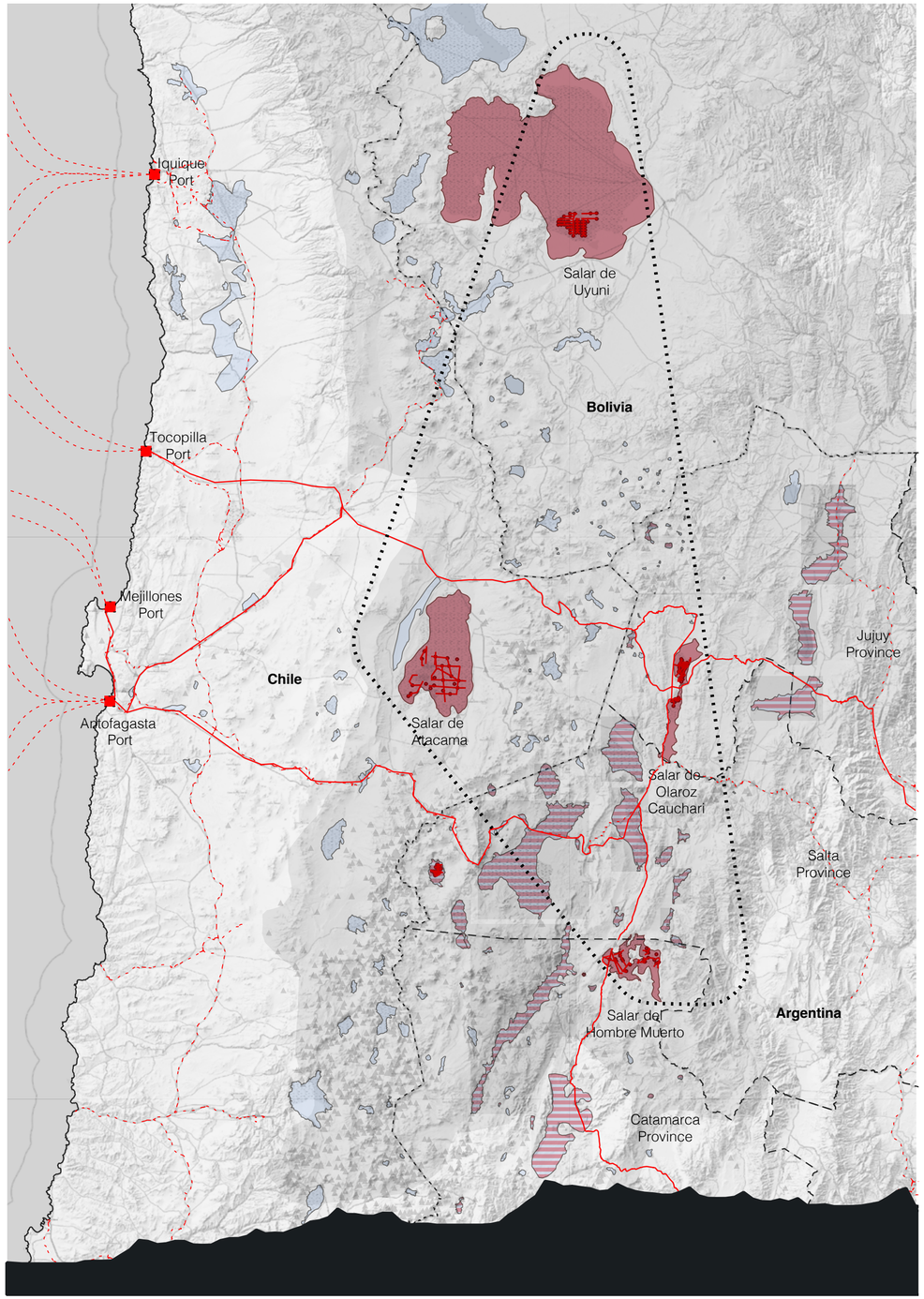
‘Lithium Fields’ in the Salar de Atacama salt flats in northern Chile.Tom Hegen

The Lithium Triangle

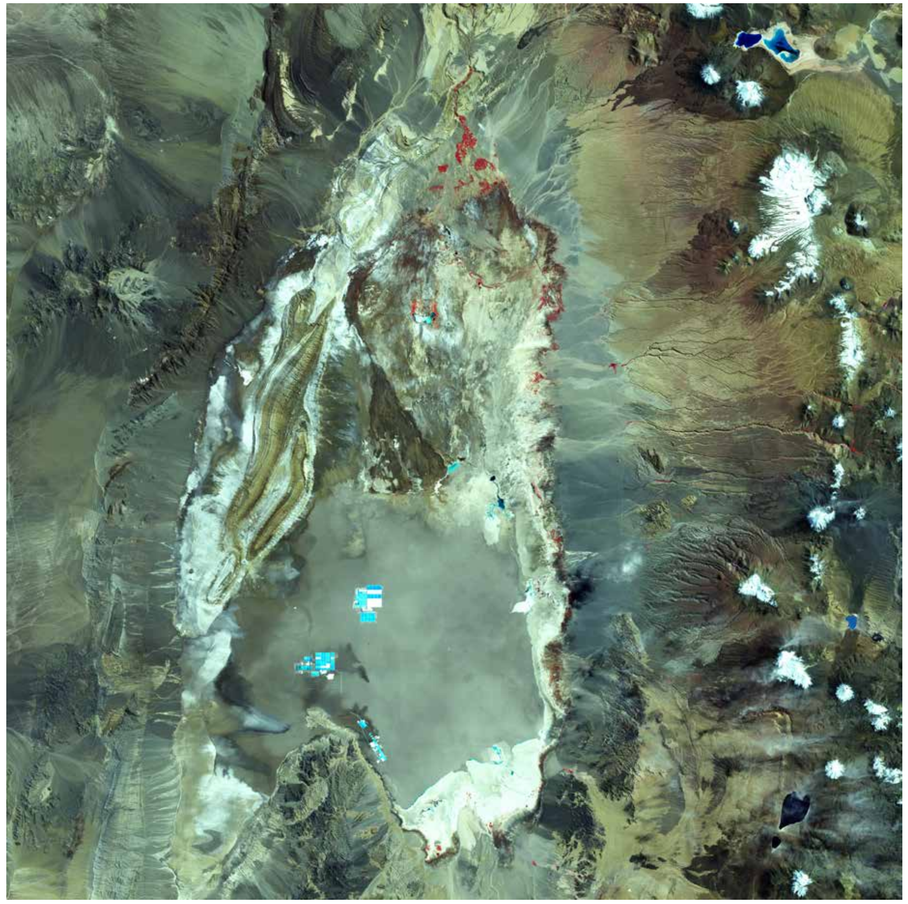
Puna Region
Salar
Salar with lithium ocurrence
Salar with lithium operations
Lithium extraction infrastructure
National Limit
Provincial Limit
Railway
Road infrastructure
Port

50km

N



The Lithium Triangle

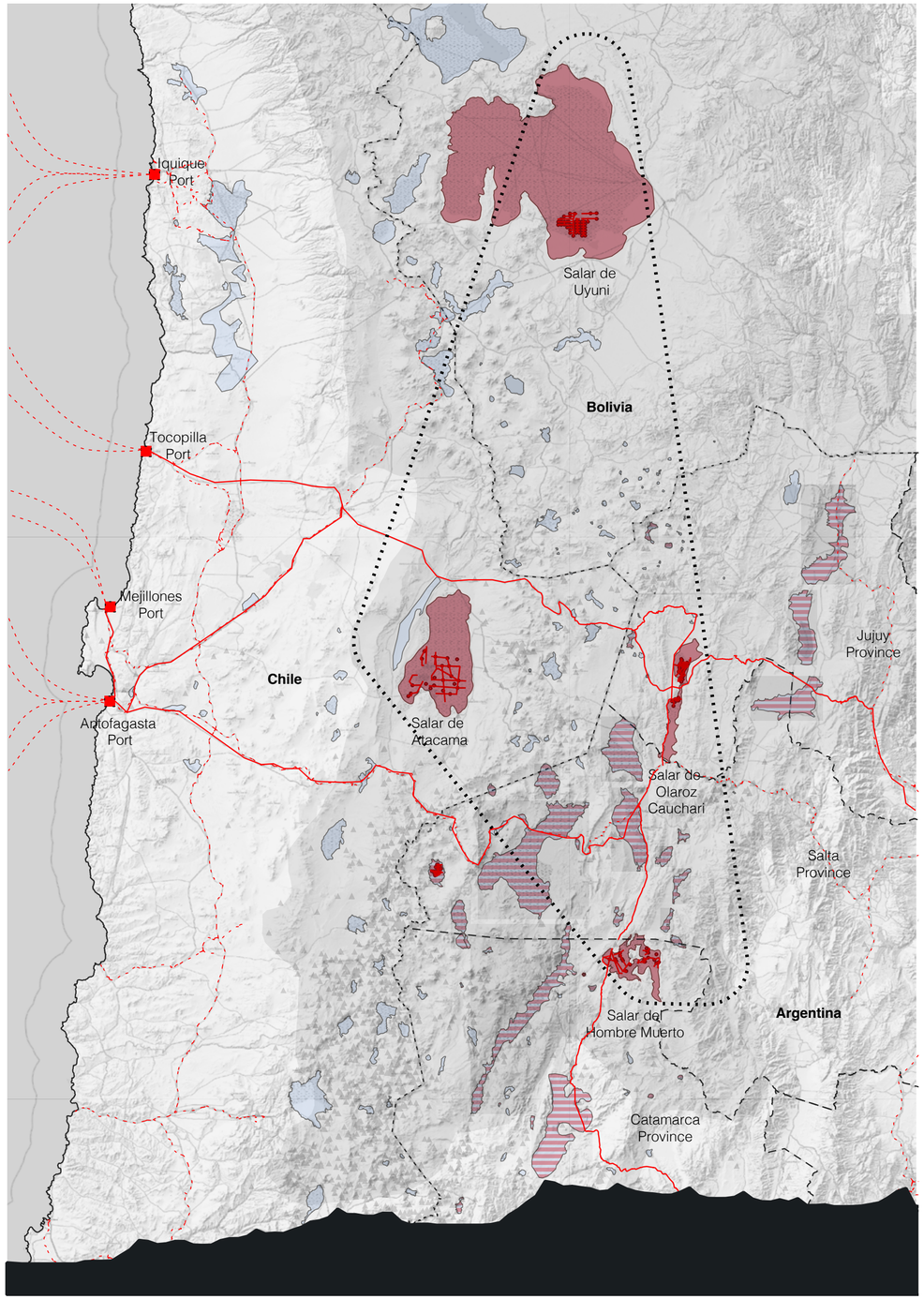


Salar de Atacama, Chile
Source: NASA Earth Observatory ,2011

Puna Region
Salar
Salar with lithium ocurrence
Salar with lithium operations
Lithium extraction infrastructure
National Limit
Provincial Limit
Railway
Road infrastructure
Port

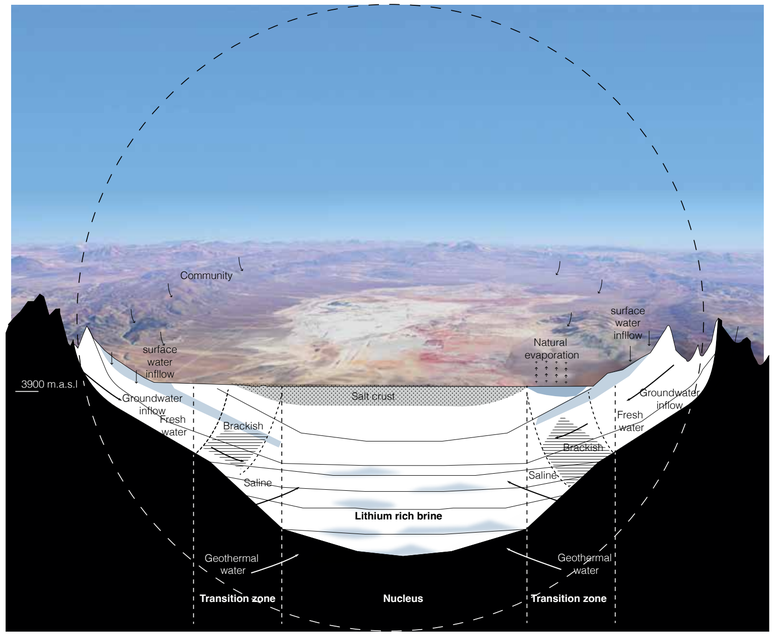
50km

N

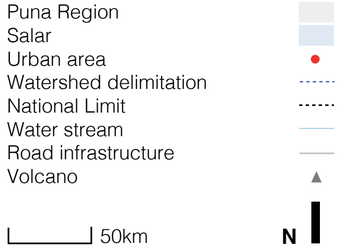


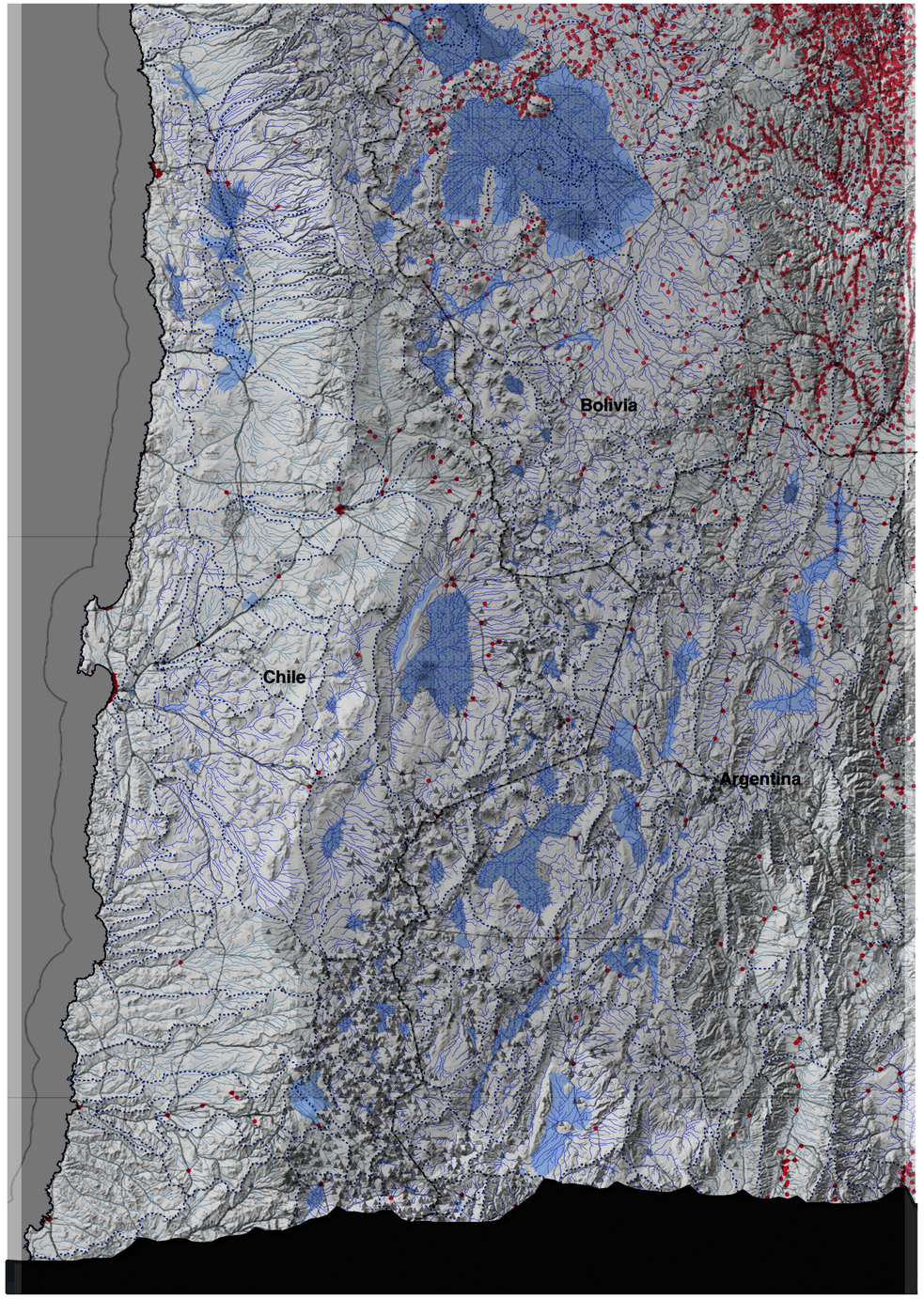
The Puna is not only a resource area

Endorheic Watersheds

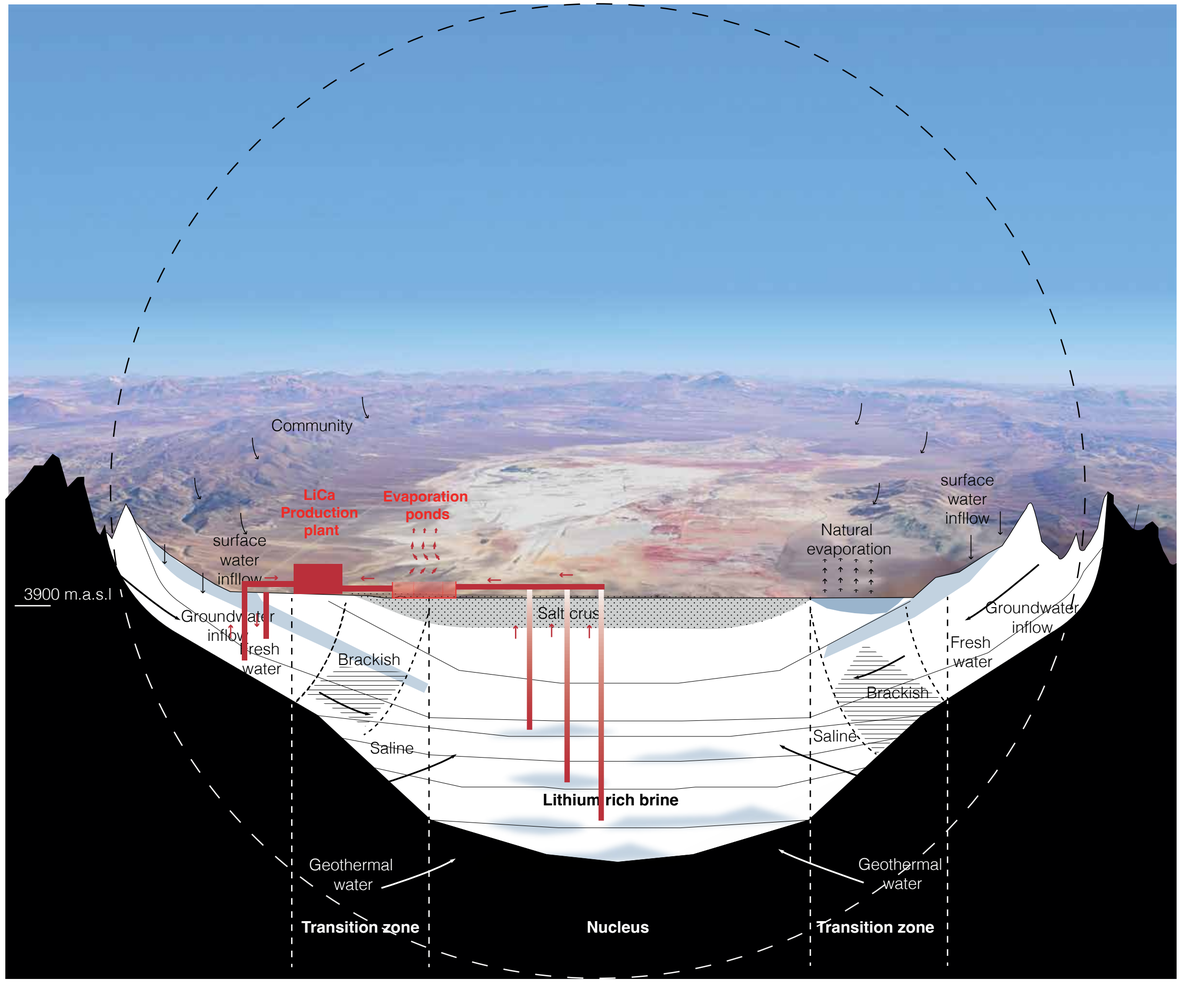


Scheme of the water cycle in Andean Salares.





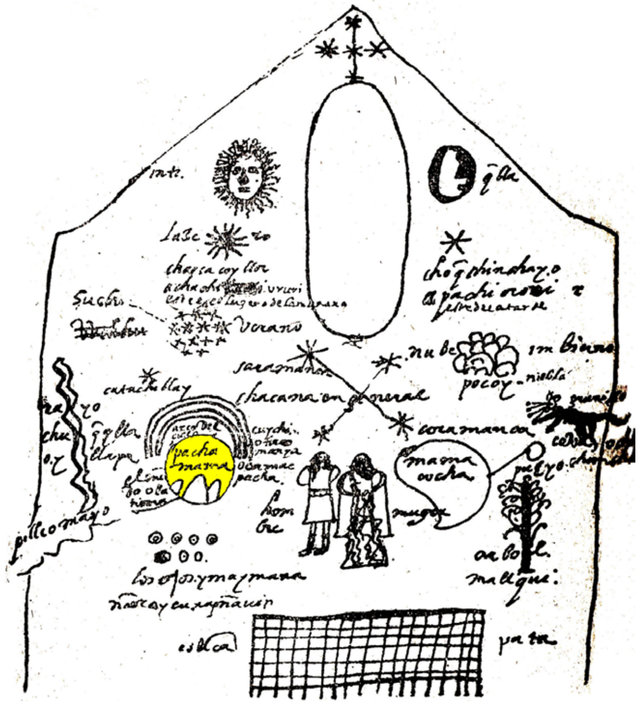
The Puna is not only a resource area



Scheme of the water cycle in Andean Salares.

Contact Zone

Andean Ontologies



Representation of Pachamama in the cosmology. Juan de Santos Pachacuti Yamqui Salcamaygua (1613)

Salinas Grandes community doing an offering to the Pachamama
By Florencia Montoya

Contact Zone

Water depletion in local communities

Source: Lucila Pellettieri

Contact Zone

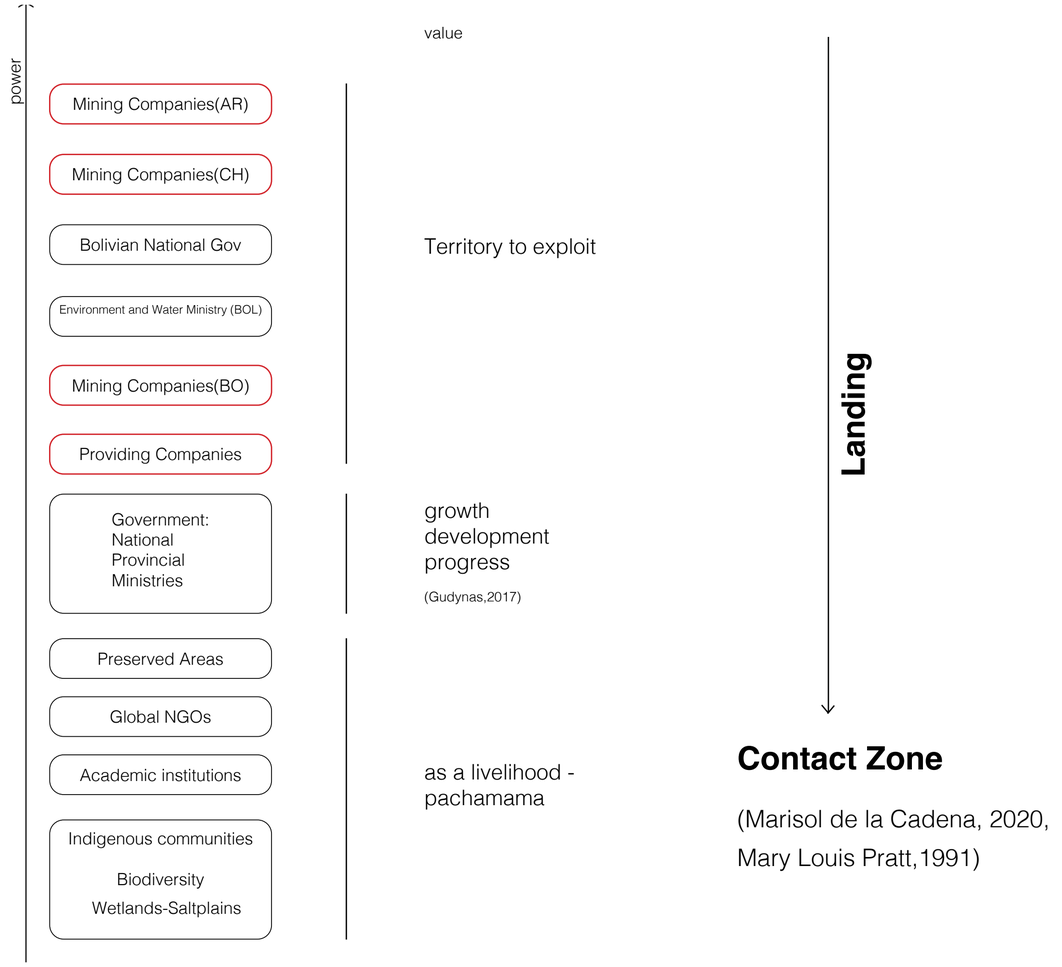
Risk of extintion of endemic species

Andean Flamingos
Source: Ossian Lindholm

Contact Zone

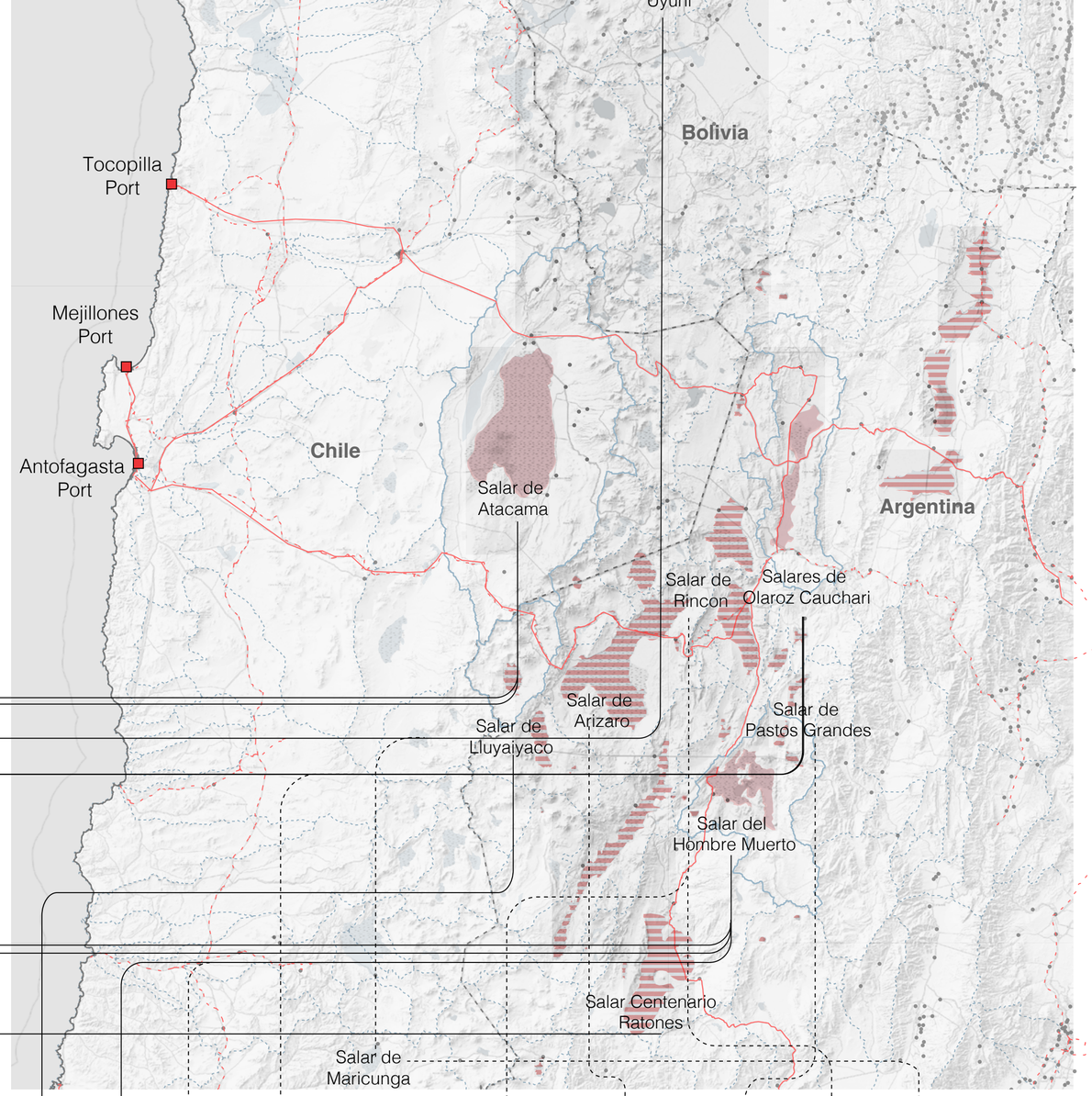
Power Imbalance

Clash of Ontolgies



Problem Field

Urgency
Acceleration and expansion of extractive frontiers



Project / Salar	Salar de Atacama	Salar de Atacama	Hombre Muerto (Fénix)	Salar de Olaroz	Salar de Uyuni (Pilot)	Atacama	Cauchari-Olaroz	Sal de Vida	Tres Quebradas	Centenario-Ratones	Mariana	Sal de Oro	Sal de Oro	Cauchari-Olaroz	Uyuni + Coipasa	Rincón (Salta)	Arizaro	Pastos Grandes	Rincón Litio	Salar de Maricunga
Company-Country of origin		SQM (Chile), Albemarle (U.S.A.)	FMC (U.S.A.), Livent (U.S.A.)	Orocobre (Australia), Toyota Tsusho (Japan)	YLB (Bolivia)	Albemarle (U.S.A.)	Lithium Americas (Canadá), Ganfeng (China)	Allkem (Australia)	Zijin Mining (China)	Eramet (France), Tsingshan (China)	Ganfeng Lithium (China)	POSCO (South Corea)	POSCO (South Corea)	Lithium Americas (Canadá), Ganfeng (China)	YLB (Bolivia), CATL (China), CBC (China)	Rio Tinto (UK/ Australia)	Lithium South Development Corporation (Canada)	Galan Lithium (Australia)	Argosy Minerals (Australia)	Codelco (Chile) + private
State	Exploration	Production	Production	Production	Pilot plant-No commercial production	Production	construction / Production	construction	construction	Production / ramp-up	Production	Hydroxide plant in operation	Expansion	Expansion	exploration-construction stages: projection of production in:					
	1969	1984	1997	2013	2015 2020	2021	2022	2023	2023	2024	2024	2024	2025	2025	2025	2026	2026	2026	2028	2030

Problem Field

Operational Landscapes

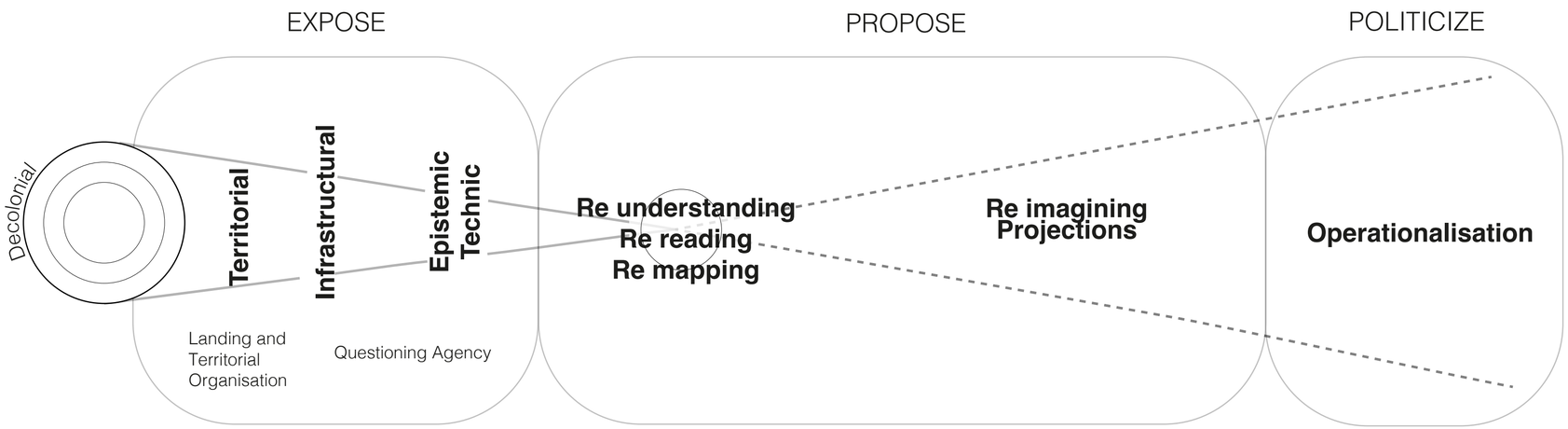
Power lines on route between Atacama Salar extraction plants
and Mejillones Port, Weinberg 2023

Research Question

How can a territoriality* of brine extractivism on the Puna de Atacama be achieved with a balance of power over the territory for a truly ecologically, politically and economically sustainable future?

*Territoriality is much more than a strategy for the control of space,is both a social as well as a historical product (Delaney 2005, Escobar, 2008, Sassen 2013,Peluso and Lund, 2011).

Research structure

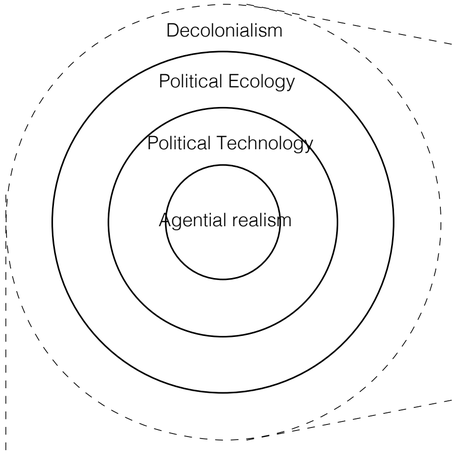


unveil dissect critique

Theoretical approach and Sub Research Questions

EXPOSE

scale *Epistemic* *Onto Epistemic* *Territorial* *Infrastructural* *epistemic*



RQ: How can a territoriality of brine extractivism on the Puna de Atacama be achieved with a balance of power over the territory for a truly ecologically, politically and economically sustainable future?

Landing and Territorial Organisation

SRQ1: What conflicting territorial ontologies emerge in the operational landscapes of lithium mining, and how are they constituted? How do these ontologies shape territorial organisations, and what are the socio-environmental impacts of them?

Srq2: What are the points of intersection and friction between dominant extractive territorial logics and local territorial practices? In what ways do these encounters generate both conflict and potential opportunities for more plural and equitable territorial governance?

Questioning Agency

SRQ3: How has the agency of local communities historically evolved, and what forms does it take in current decision-making processes regarding territorial governance?

SRQ4:What are the agential cuts -mechanisms, instruments, and practices- through which the shaping of territory is negotiated in the context of the Salar de Olaroz and Laguna de Guayatayoc?

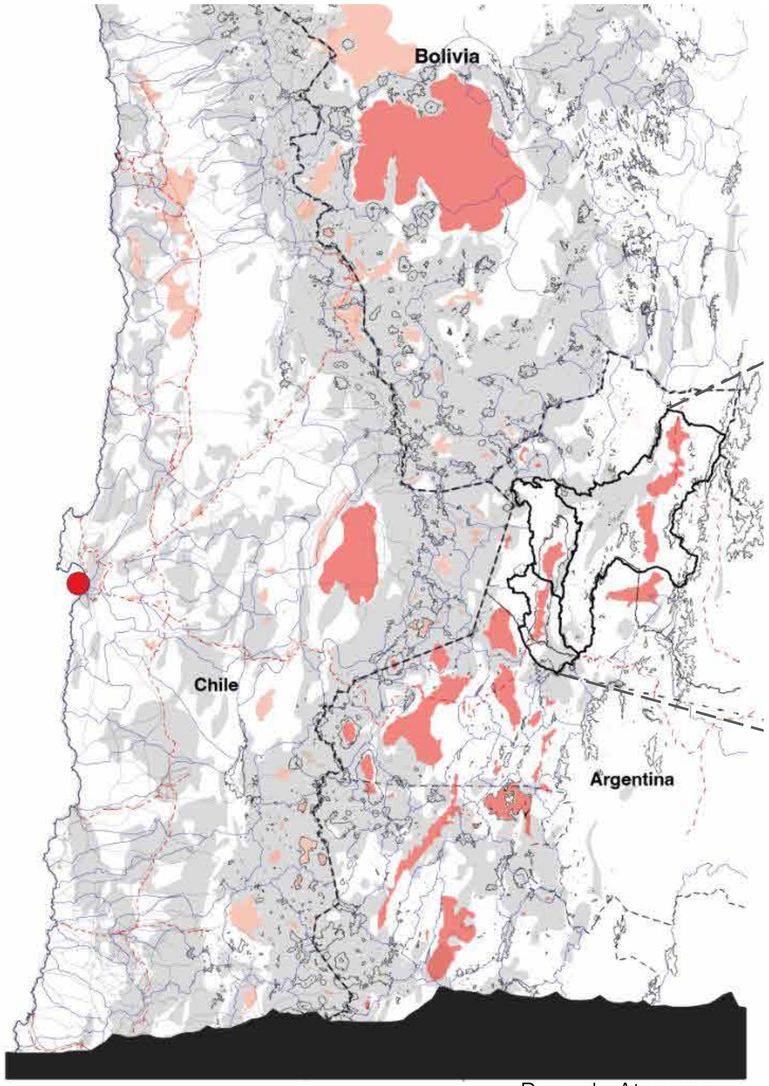
SRQ5: How is the territory interpreted, measured, and represented? Which knowledge and tools are taken into account in the production of territorial knowledge?

Thinking about a just negotiation

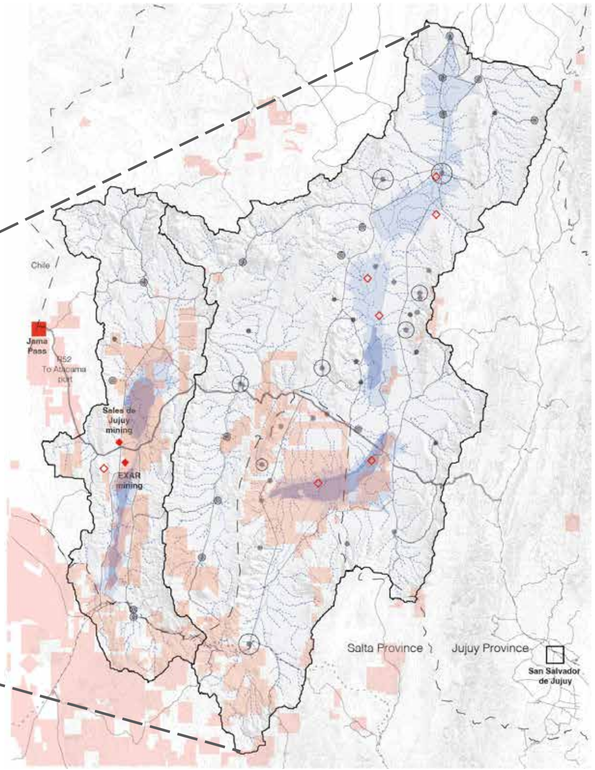
SRQ6: What forms of intervention could be proposed to enable equitable negotiation processes and spatial justice among diverse territorial actors?

Case Study

Olaroz Cauchari and Salinas Grandes
y Laguna de Guayatayoc Watersheds



Puna de Atacama



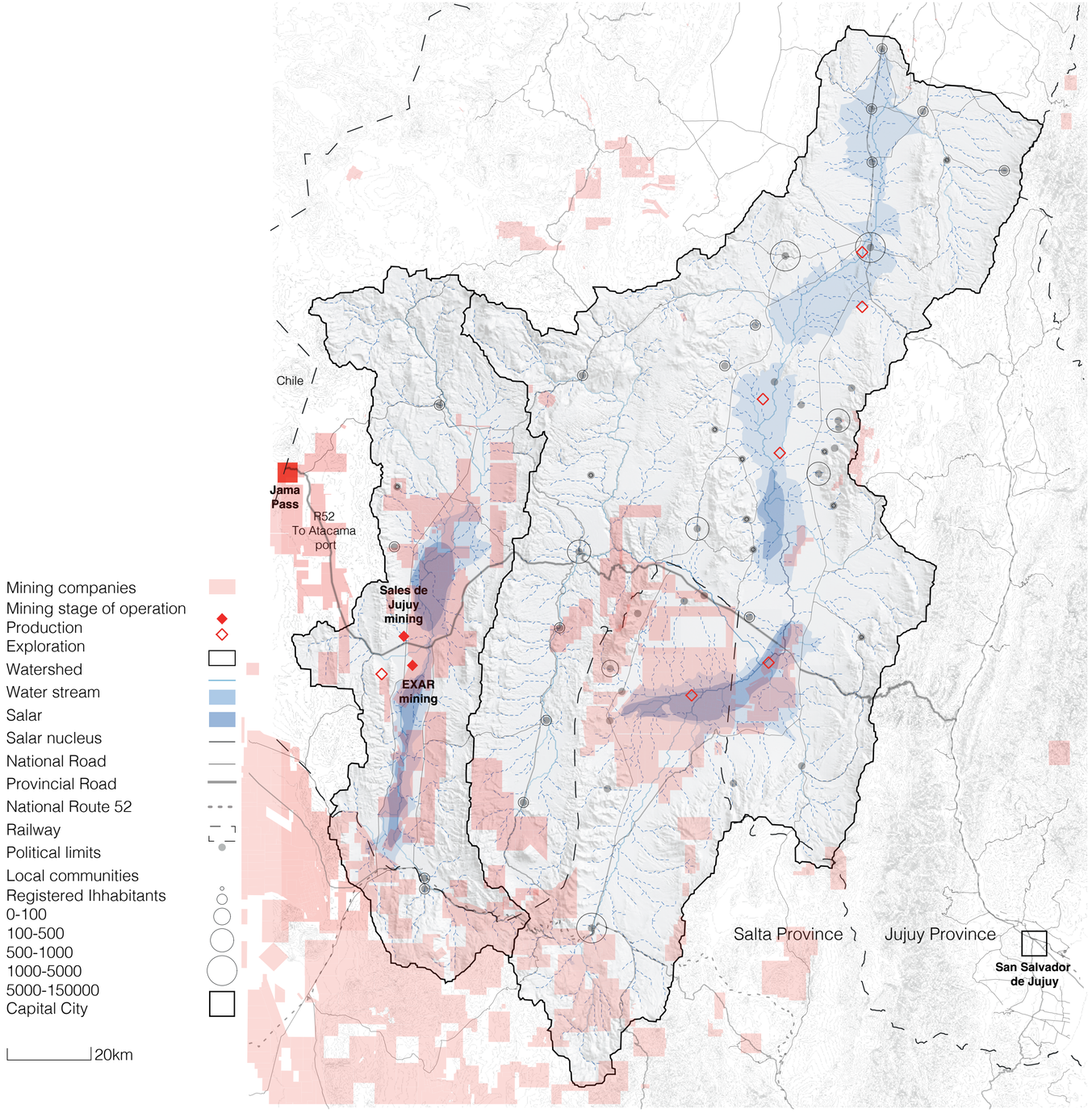
Olaroz Cauchari Watershed

Salinas Grandes and Laguna de Guayatayoc Watershed

Salar with lithium extraction
Antofagasta Port
Watershed
National Border
Railway
100km

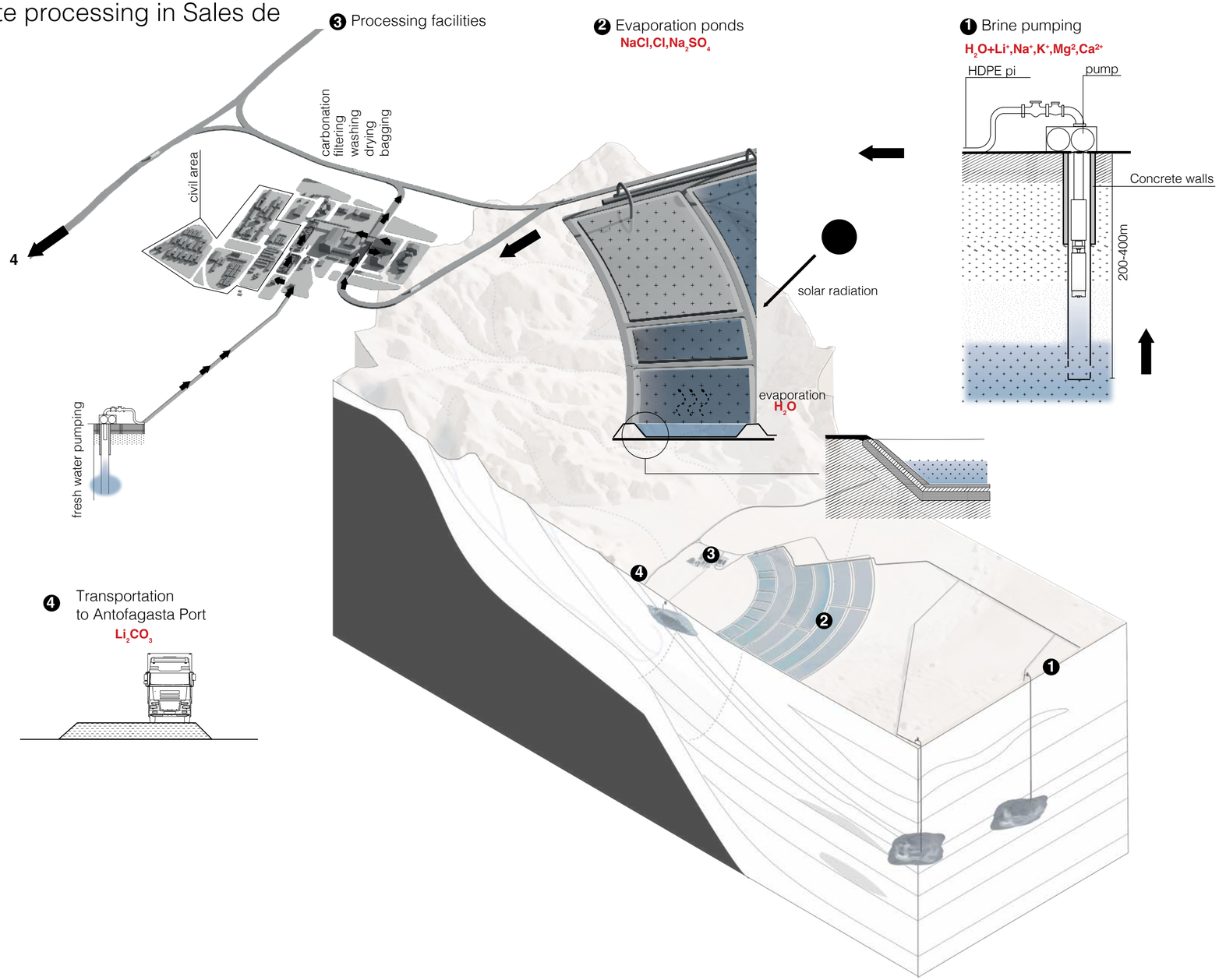
Case Study

Olaroz Cauchari and Salinas Grandes y Laguna de Guayatayoc Watersheds



Lithium mining non-conventional process

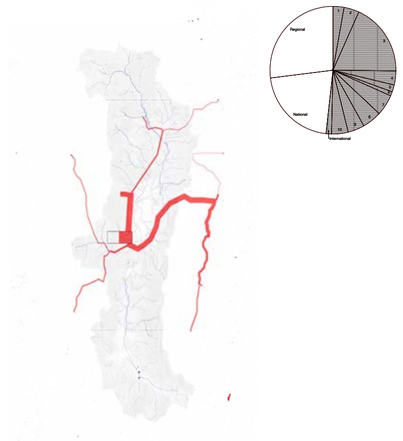
Brine Extraction and Lithium Carbonate processing in Sales de Jujuy, Olaroz Watershed



Territorial Organsation

Extractivist Ontology alterations

Sales de Jujuy Brine extraction and Lithium Carbonate processing facility in Olaroz Cauchari Watershed inputs



labour

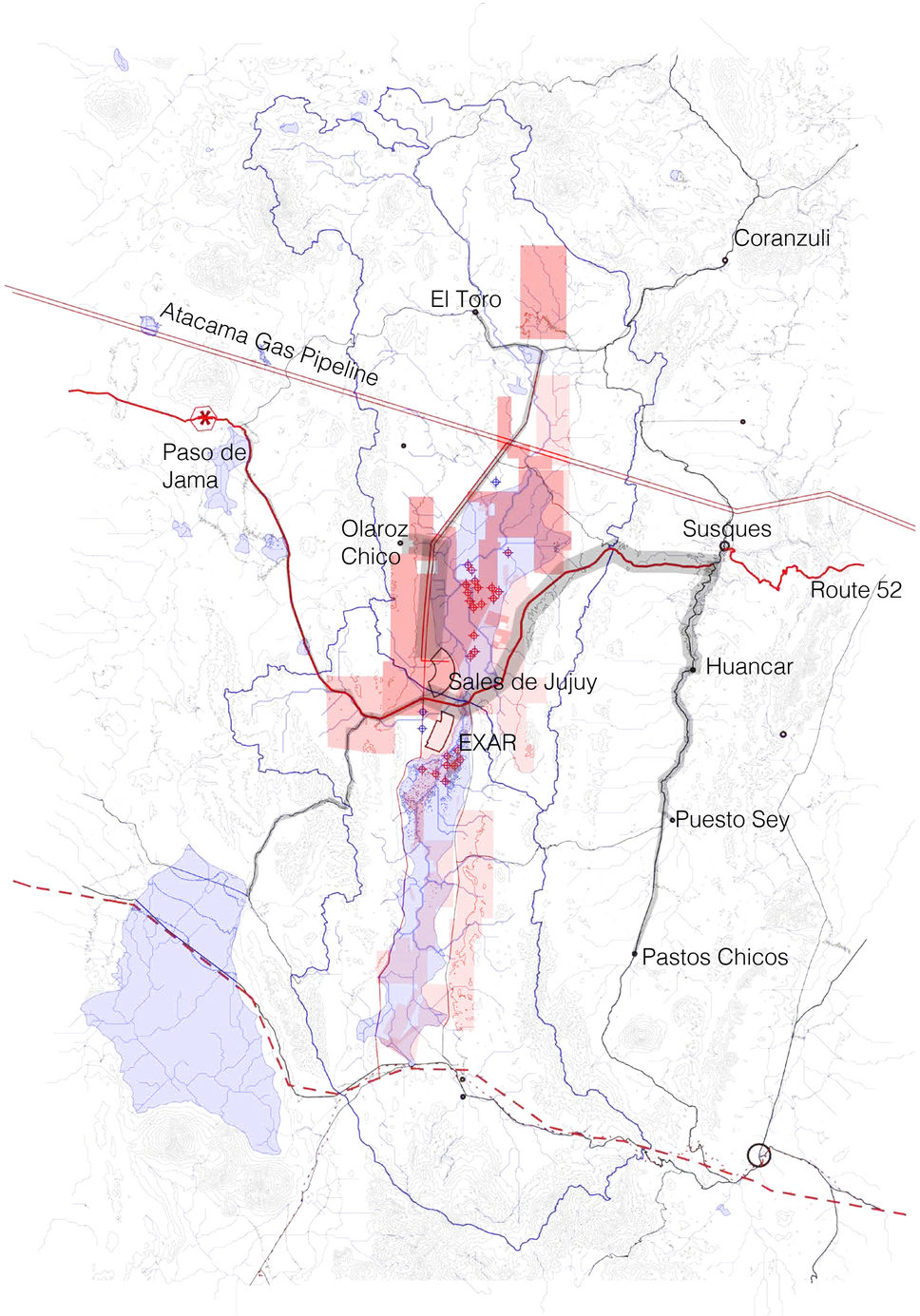
brine and fresh water

Mine concessions producing Lithium Carbonate
Sales de Jujuy S.A mining lot
Minera EXAR mining lott
Mine Compound and Evaporation ponds
Atacama Gas Pipeline
Railway
Energy line
Route
Labour
Communities
Route infrastructure
Paso de Jama

Watershed
Water stream
Salar
National Border

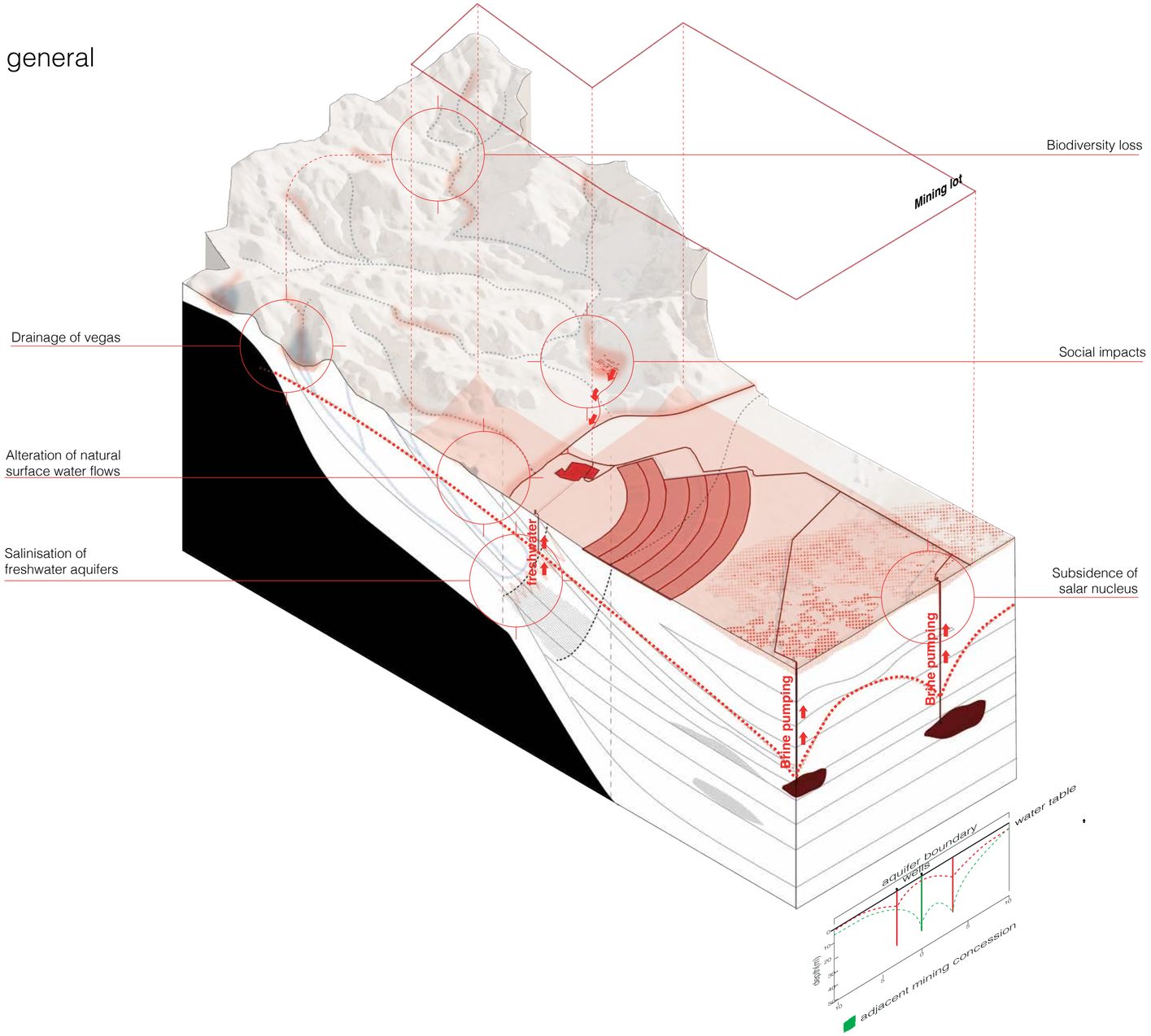
N

25km



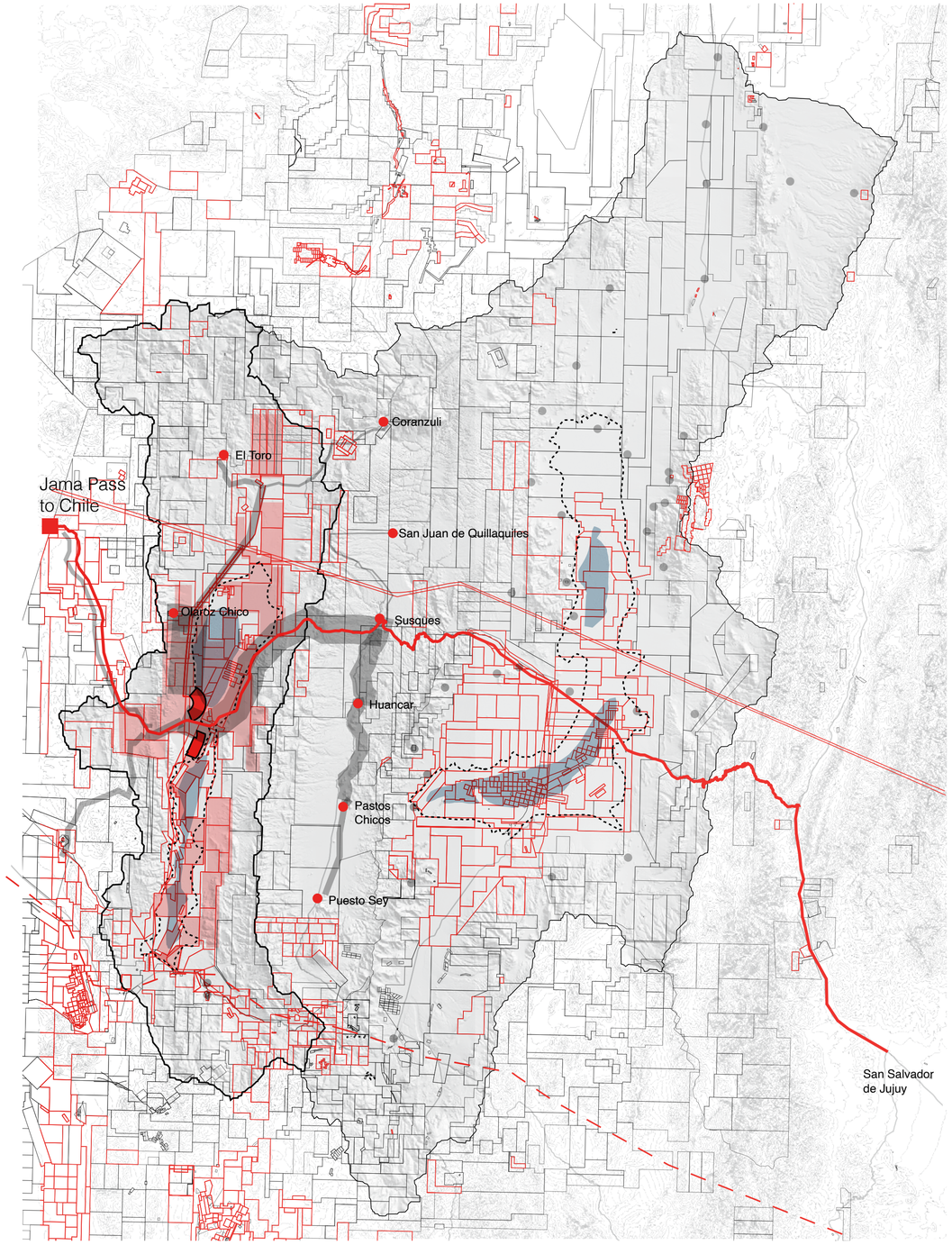
Territorial Organsation

Extractivist Ontology alterations.
Brine extraction and Lithium Carbonate processing general alterations



Territorial Organsation

Extractivist Ontology alterations:
Mining cadaster as a Political Technology



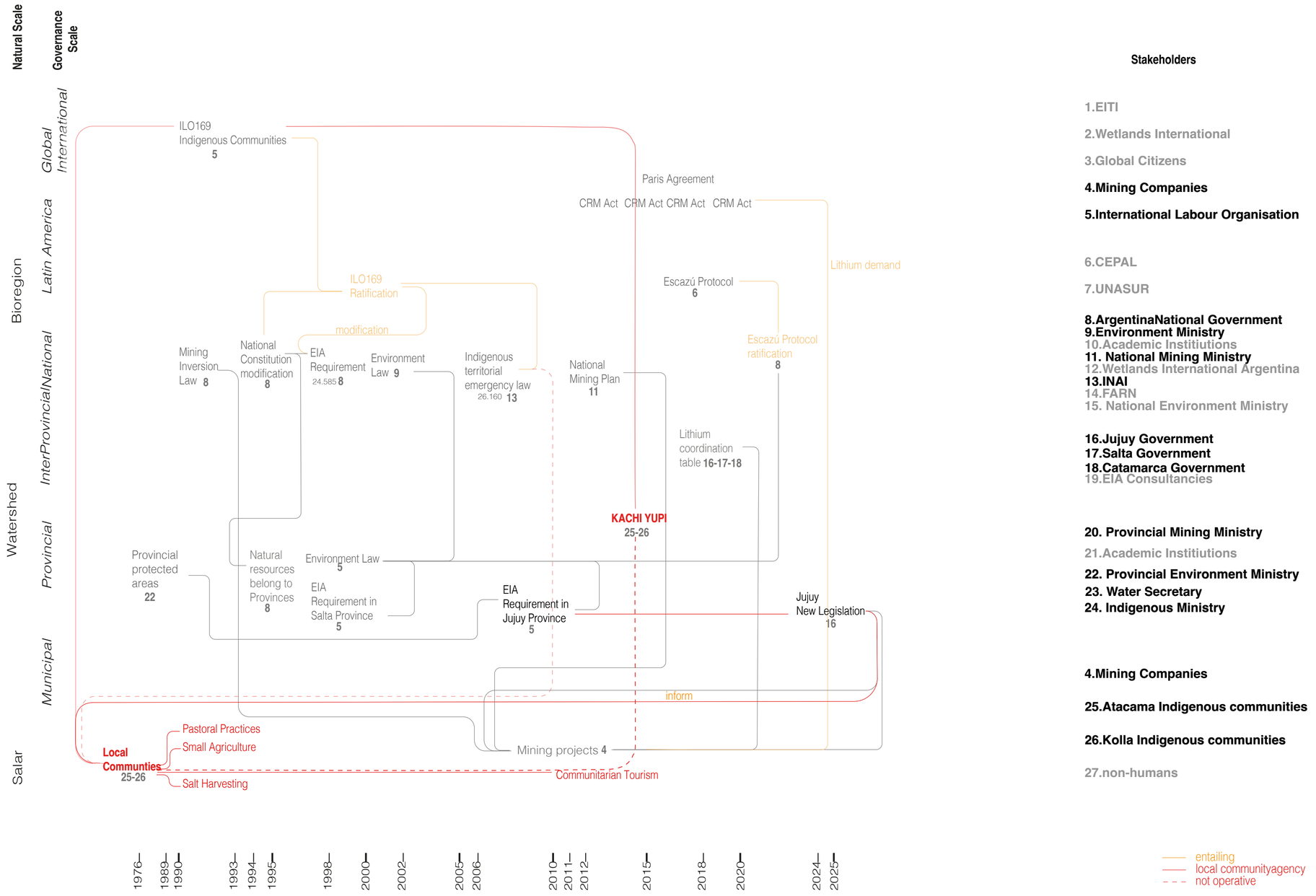
Watershed
Lithium mining production
Mining cadaster concession
Mining cadaster solicitude
Salar Nucleus
Saline area
Communities working in the mine
Communities
Atacama Gas Pipeline
Route 52
Energy line

20km

N

Researching Governance

Agency map



Stakeholders

1.EITI

2.Wetlands International

3.Global Citizens

4.Mining Companies

5.International Labour Organisation

6.CEPAL

7.UNASUR

8.ArgentinaNational Government
9.Environment Ministry
10.Academic Instituitions
11. National Mining Ministry
12.Wetlands International Argentina
13.INAI
14.FARN
15. National Environment Ministry

16.Jujuy Government
17.Salta Government
18.Catamarca Government
19.EIA Consultancies

20. Provincial Mining Ministry
21.Academic Instituitions
22. Provincial Environment Ministry
23. Water Secretary
24. Indigenous Ministry

4.Mining Companies

25.Atacama Indigenous communities

26.Kolla Indigenous communities

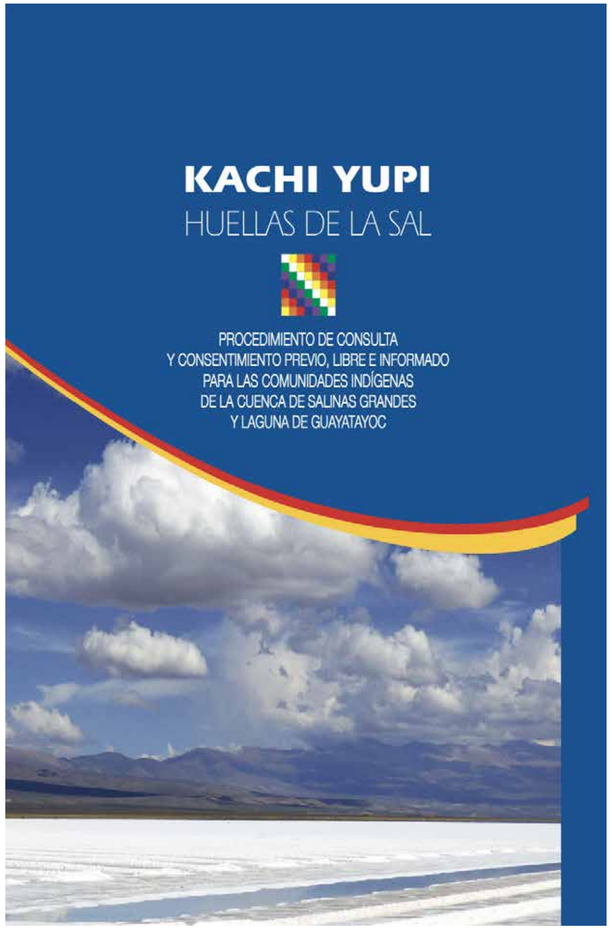
27.non-humans

entailing
local communityagency
not operative

Researching Governance

Dimension	EIA category	Discipline - actors	Tools / Methods	Current scales of implementation	Measurement - information	Problems / Abstractions	Possible scales
Environment	Geology and seismicity	Geology, Seismology, Geotechnical Engineering	Seismic risk mapping, core sampling, fault analysis	Mining lot boundaries	Mineralisation - soil type	Reduces the land to a geotechnical substrate abstracting geological formations from the socio-environmental systems they underpin	**Region - zones**
soil	Geomorphology	Physical Geography, Geomorphology, Earth System Science	Slope stability, terrain classification, erosion modeling	Mining lot boundaries	Soil quality	Treats soil as fragmented landforms; abstracting ecological and cultural feedbacks they interact with	**zones**
water	Hydrology	Hydrology, Environmental Engineering, Physical Geography	Surface water modeling, water balance studies	Mining lot boundaries	Water quantity	Omits basin interconnections and hydrosocial and biological relations.	**watershed - subbasin-microbasin**
	Hydrogeology	Hydrogeology, Groundwater Science	Aquifer models, pumping tests, drawdown curves	Mining lot - somewhere in the watershed		It often treats groundwater as a closed system, overlooking how those hydrological shifts affect surface ecosystems, traditional land uses, and the social fabric of local communities	
	Hydrochemistry	Geochemistry, Environmental Chemistry	Brine chemistry, contamination thresholds, trace element analysis	Mining lot - somewhere in the watershed	Water quality - *Industrial standards*		
non-human	Biology	Biology, Ecology, Conservation Science	Biodiversity surveys, indicator species, ecological value metrics	Mining lot boundaries	Composition, abundance	Tend to isolate biological variables, overlooking abiotic factors as salinity shifts due to brine extraction or geomorphic alterations that can affect habitat structure over time.	**Micro**
people	Cultural	Anthropology, Indigenous Studies, Cultural Geography, Environmental Humanities	Oral histories, ritual mapping, participatory workshops	Communities close to the mining lot, legal registered communities		Culture treated as static or symbolic without integration with geophysical or ecological data missing a broader understanding of the location in a watershed or the relationship with other activities.	**Cultural proposed, negotiated scale**
	Socioeconomic	Sociology, Economics, Human Geography, Political Economy, Development Studies	Livelihood assessments, cost-benefit analyses, statistical surveys	Community unit, conventional measurement	*Jobs, income, infrastructure development*	Focuses on market values excluding livelihood autonomy and mutual parenting care networks	

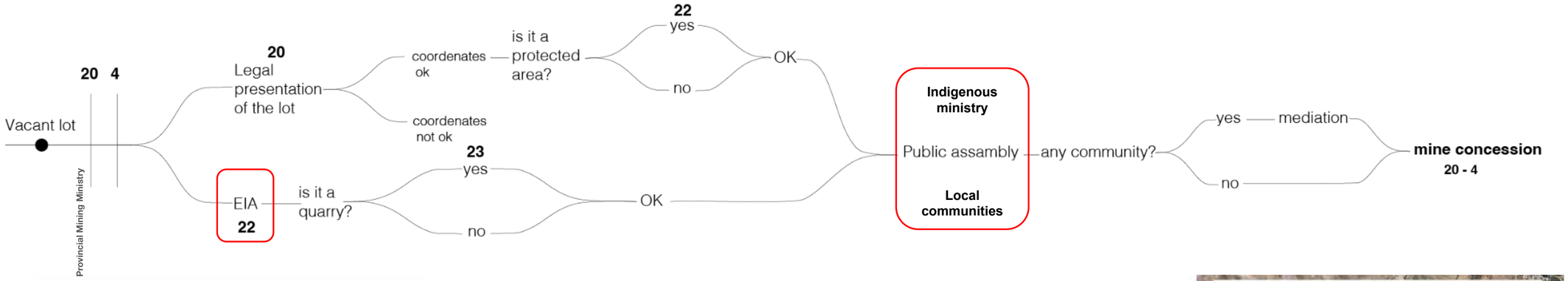
Environmental Impact Assesment Analysis

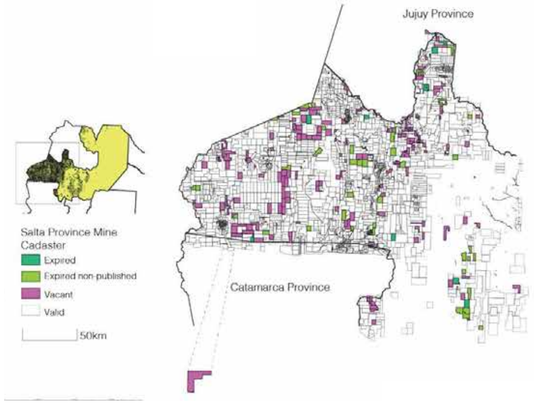


KACHI YUPI Protocol for free prior and infromed consent.

Researching Governance

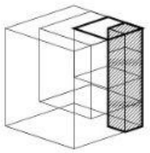
Mining concession process





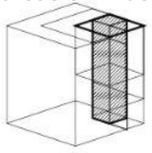
Provincial mining cadaster

Province



Mining lot

EIA direct and indirect areas of influence



Mining lot

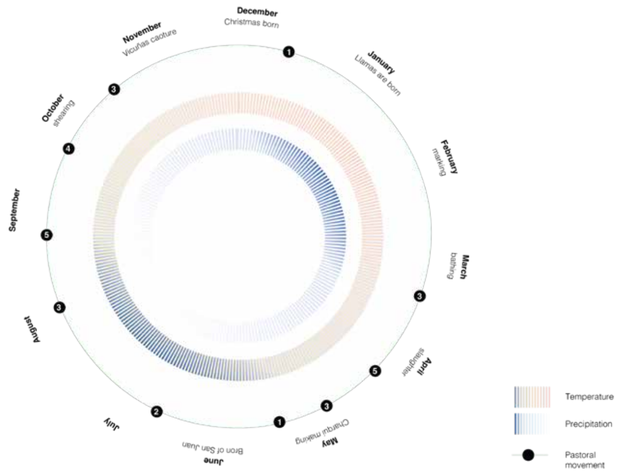
Conclusion on EXPOSE

“Without water there is no life”
Mesa de las 33 comunidades
Source: www.chequeado.com

Conclusion on EXPOSE

Salt Harvester
Source: Bajo La Sal

Source: Bajo La Sal

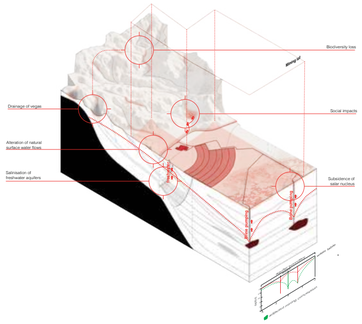


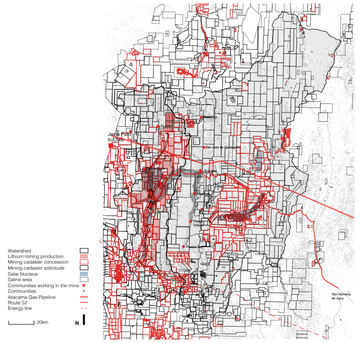
Pastoral movements according to seasons seasons

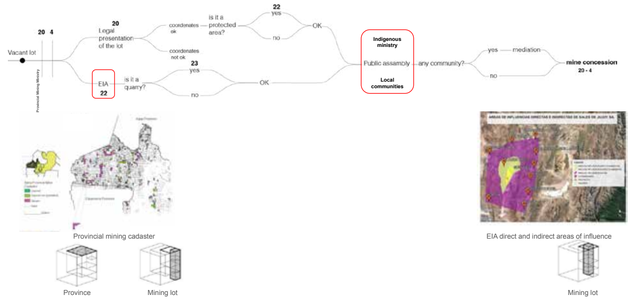
Conclusion on EXPOSE

The current system is linear and siloed, failing to capture the complexity of the Puna de Atacama. Its fragmented representations by certain agencies contribute to the production of unjust territorialities. The tools and processes through which territory is read, governed, and regulated act as political technologies (Elden, 2011) that systematically exclude the presence and knowledge of local human and non-human actors.

How can we imagine and propose distributed agency or nature-culture preservation in this context?







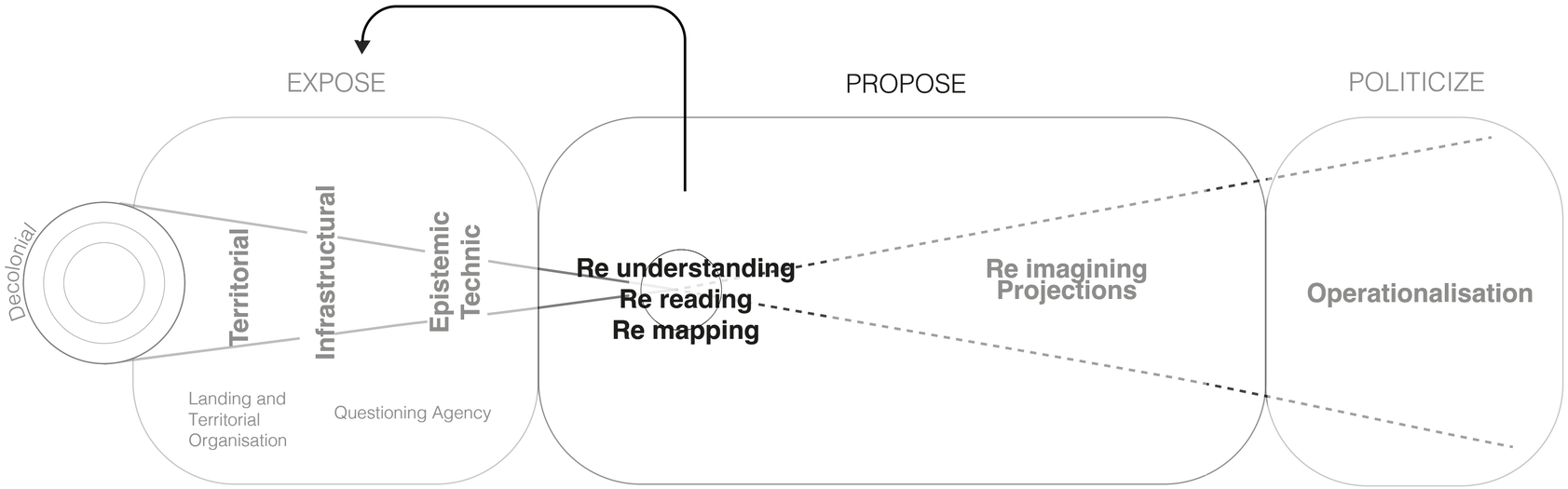
Conclusion on EXPOSE

The current system is linear and siloed, failing to capture the complexity of the Puna de Atacama. Its fragmented representations by certain agencies contribute to the production of unjust territorialities. The tools and processes through which territory is read, governed, and regulated systematically exclude the presence and knowledge of local human and non-human actors.

How can we imagine and propose distributed agency or nature-culture preservation in this context?

We must first challenge the epistemological foundations of territorial governance.

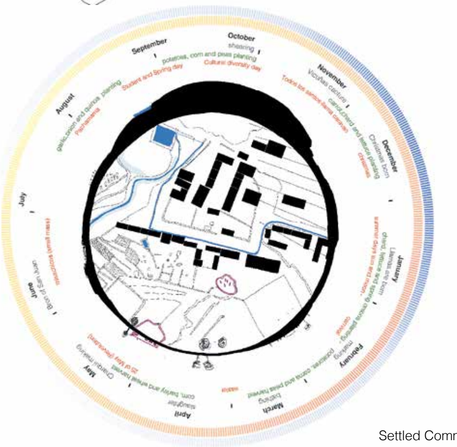
From EXPOSE to PROPOSE



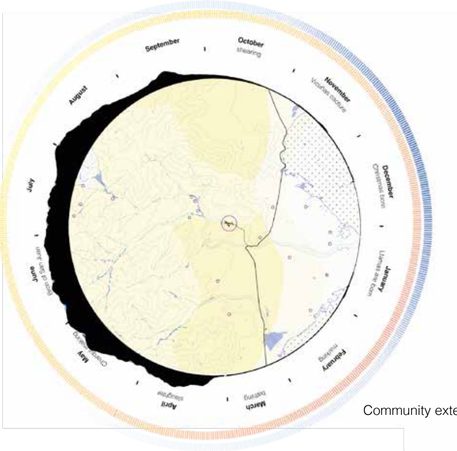
How?

Through Andean principles of Permission and Respect, acknowledging the territory as living, relational nature as a co-created natureculture process.

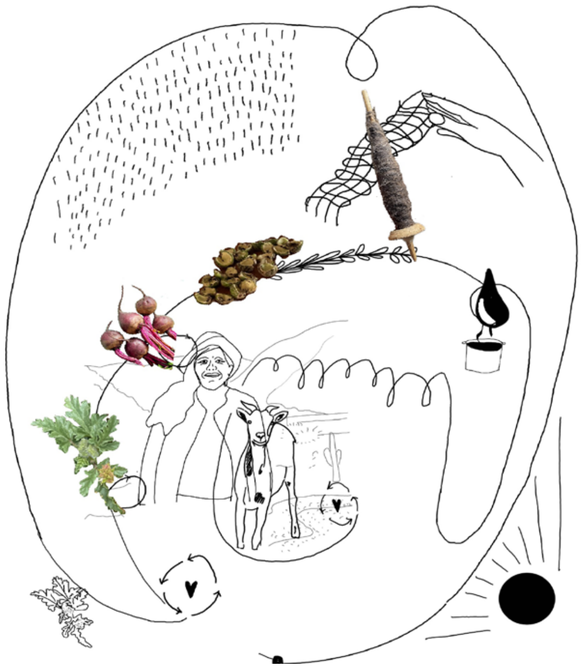
Every day practice



Settled Community

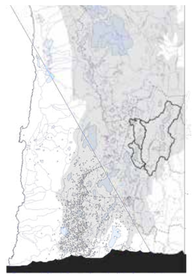


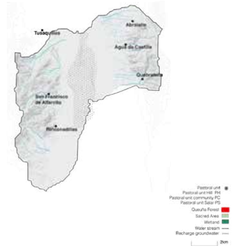
Community extension

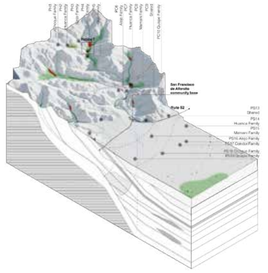


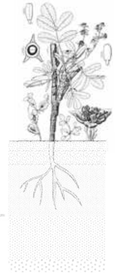
PROPOSE

	Category	Current Disciplines- actors	Proposed possible Relational spatial Disciplines-actors						
soil	**Geology and Seismicity**	Geologist, Seismologist	Urban Planner, Environmental Lawyer, Political Scientist	Seismicity	Structure		x	stratugraphy lithology	Mineralisation - soil type
	Geomorphology	Geomorphologist	Landscape Architect, Cultural Geographer, Urbanist	Physiogeographic characteristation				geoforms	Soil quality
water	**Hydrology**	Hydrologist	Community Water Management Experts, Ecologists, Urban Planner		watershed delimitation	sub basin delimitation, channels and microbasins	morphometry and network analysis - characterization of rivers and streams		Water quantity
	Hydrogeology	Hydrogeologist	Local Knowledge Experts, Hydrochemist			saline area	Identifications of aquifer types		
	Hydrochemistry	Hydrochemist	Environmental Health Specialist						Water quality
Non-humans	**Biology**	Ecologist, Biologist	Ethnobiologist, Urban Ecologists			wetland areas and biodiversity importance	x		Composition, abundance
people	**Cultural**	Anthropologist, Cultural Geographer	Heritage Specialist, Linguist		ancestral heritage - cultural practices	heritage areas			
	Socioeconomics	Sociologist, Economist	Political scientist	Governance scales - provinces	Governance scales - provinces		x		
	Spatial		Urban Planning, Urban Design, Landscape design, Geography			roads and entire configuration			









Region | **Watershed** | **sub-basin** | **Negotiated scale** | **Nodes** | **Micro scale**

Local Communities

PROPOSE

EIAs

Public Documents

Public Datasets

Mining companies documents

Critique on existing information

Fieldwork

Antropology

Biology

Etnobiology

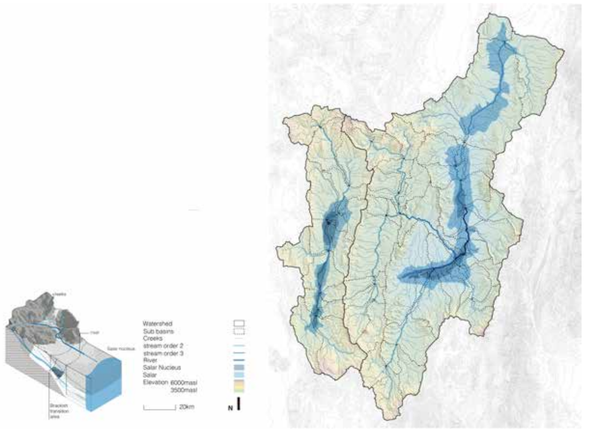
Chemistry

Hydrogeology

Geology

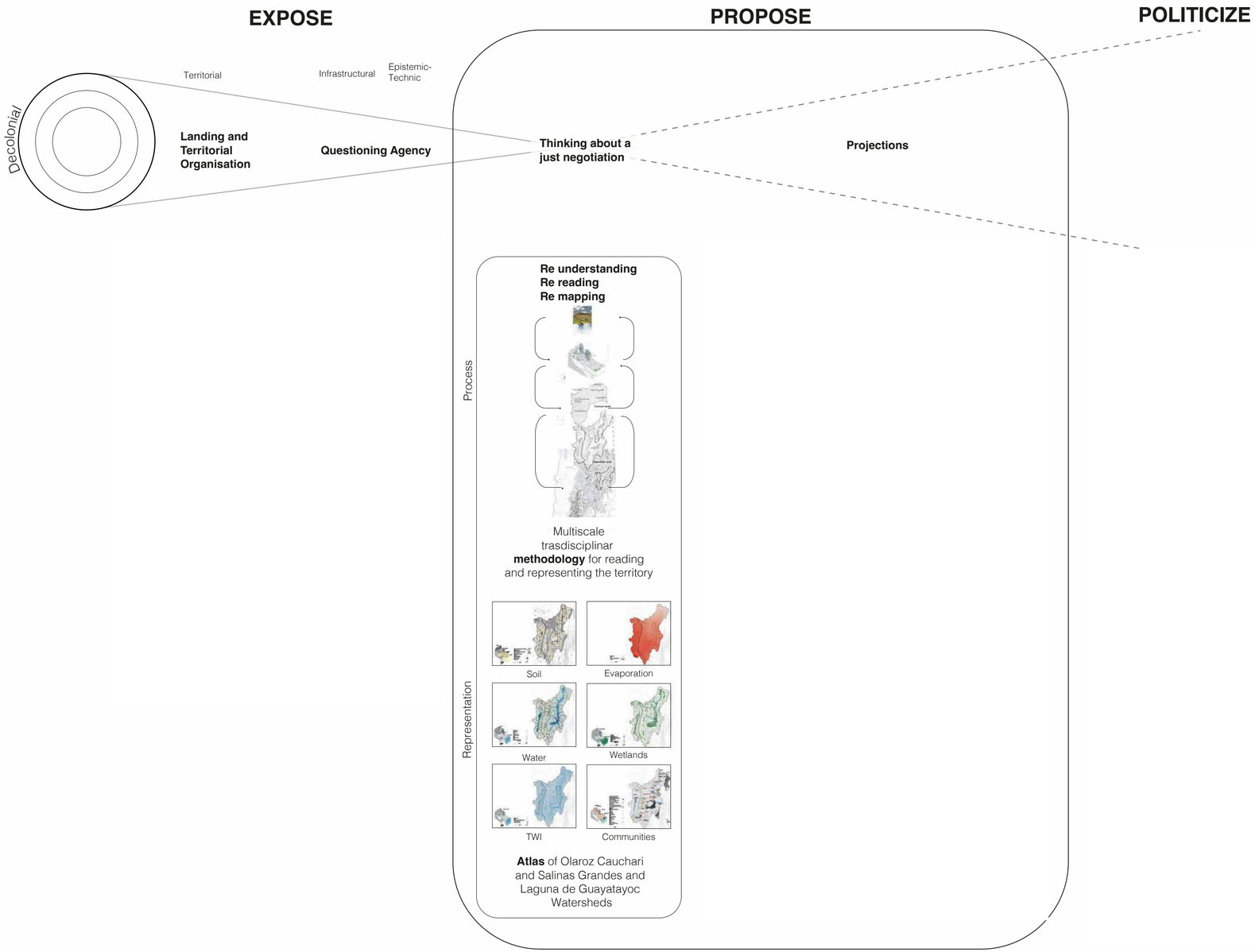
Sociology

Translation of information by other disciplines



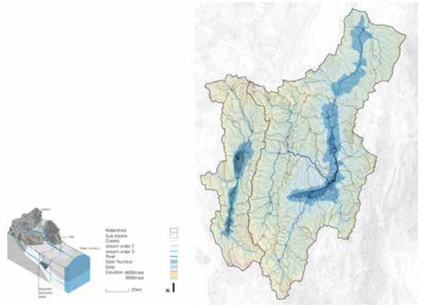
Processing and creation of new knowledge

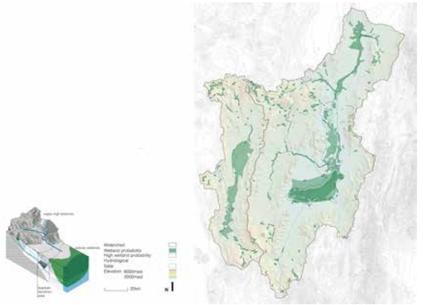
Re-Understanding

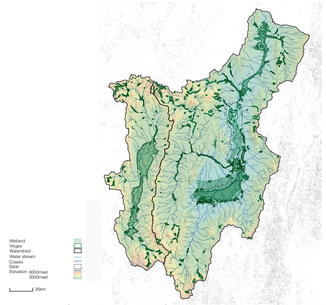


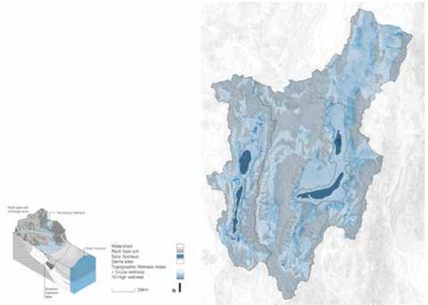
PROPOSE

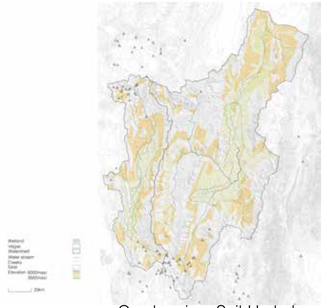
Re-representation of Olaroz Cauchari and Salinas Grandes y Laguna de Guayatayoc Watersheds.

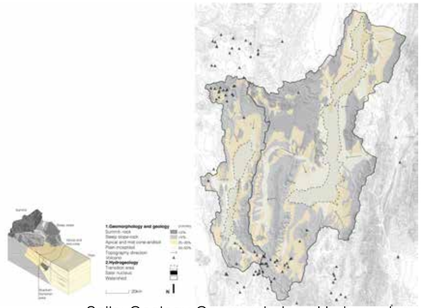

Hydrological Analysis

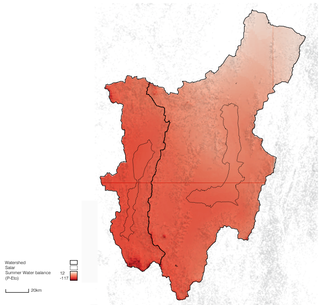

Wetlands

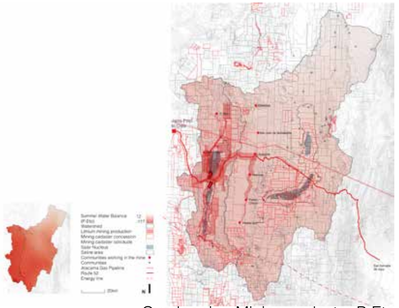

Overlapping Soil-Wetland-Elevation

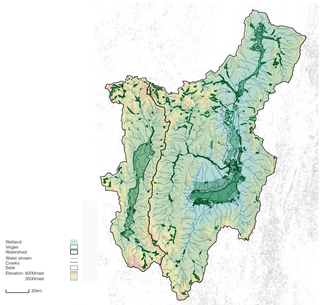

Overlapping Soil-TWI

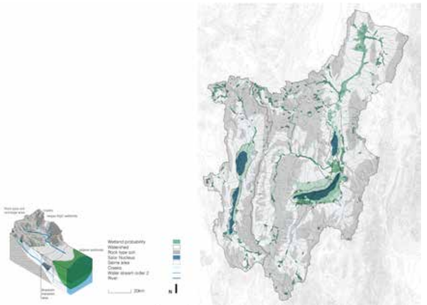

Overlapping Soil-Hydrology

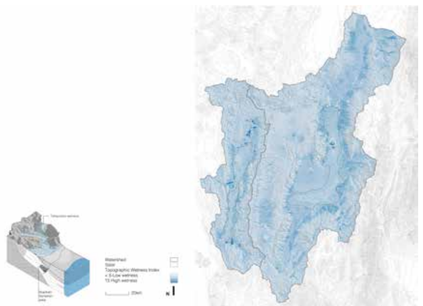

Soils: Geology-Geomorphology-Hydrogeology

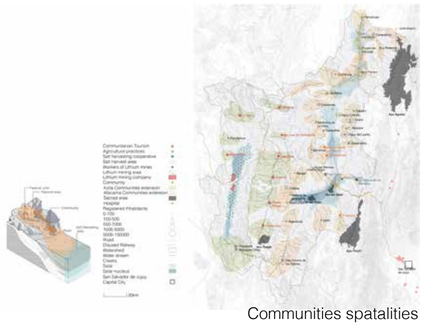

Precipitation-Evapotranspiration

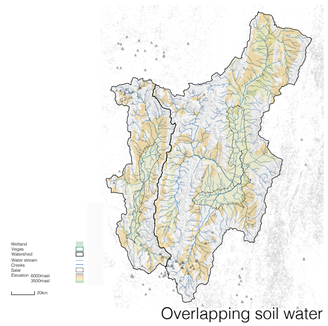

Overlapping Mining cadaster P-Eto

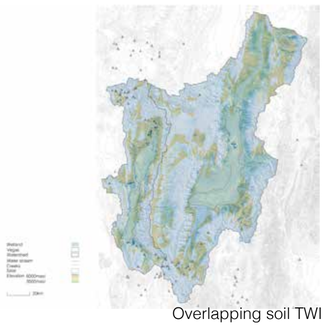

Overlapping Wetland communities

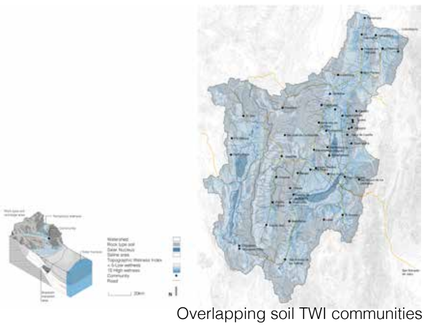

Overlapping Wetland-soil - Hydrology


Topographic wetness index


Communities spatalities

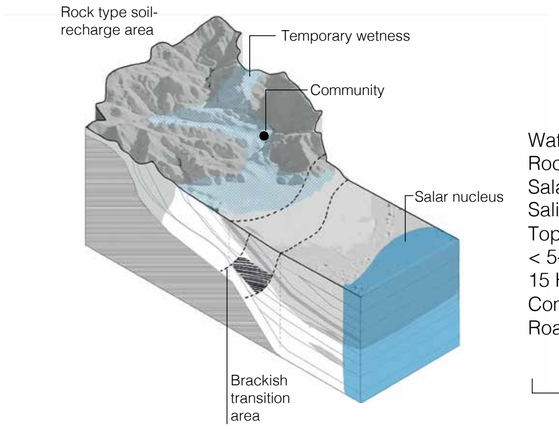

Overlapping soil water


Overlapping soil TWI


Overlapping soil TWI communities

Re-Representation of Olaroz Cauchari and Salinas Grandes y Laguna de Guayatayoc Watersheds.

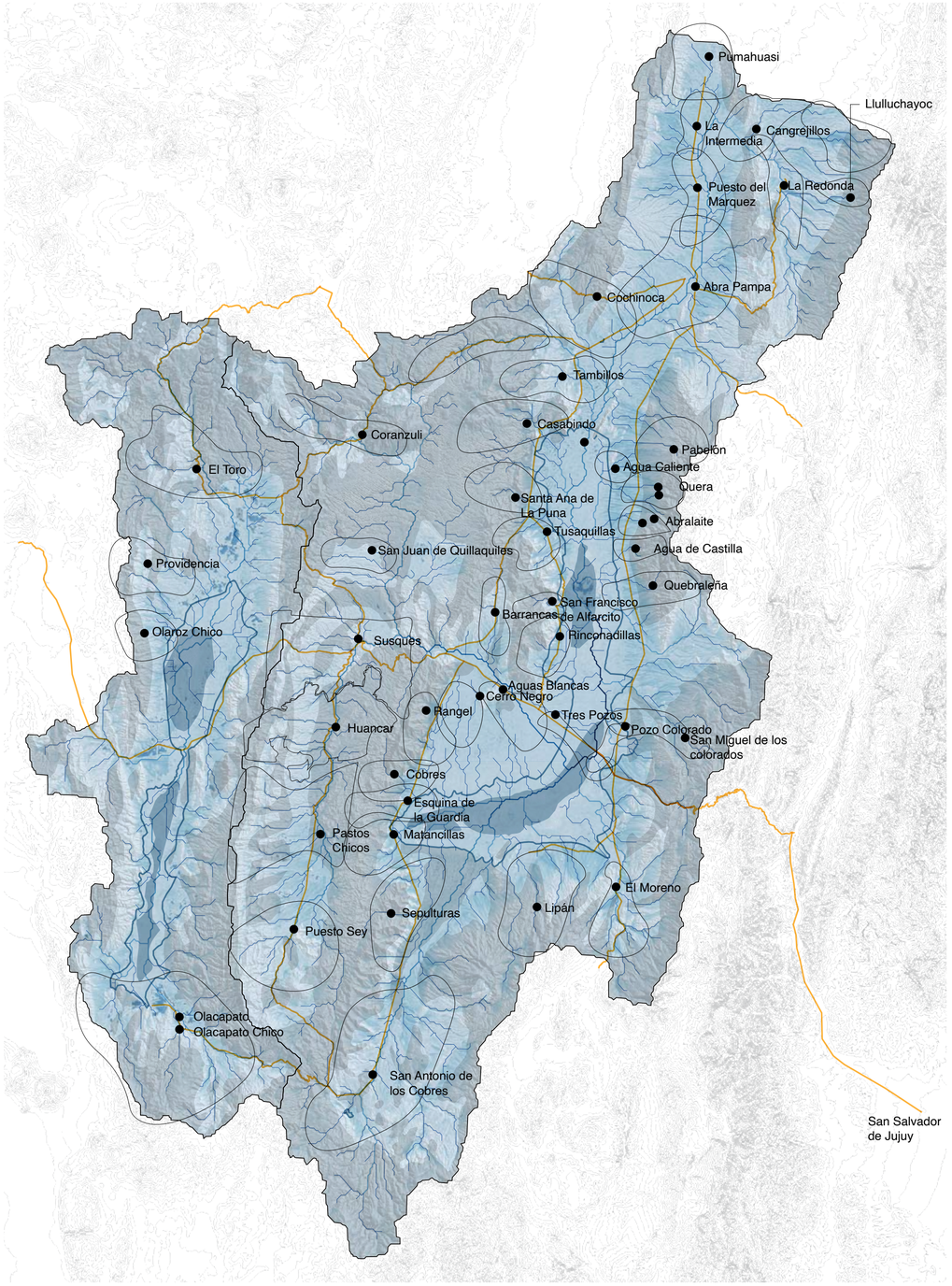
Geological, Hydrological and Topographic Wetness Index in relation with Andean Spatialities



Watershed
Rock type soil
Salar Nucleus
Saline area
Topographic Wetness Index
< 5-Low wetness
15 High wetness
Community
Road

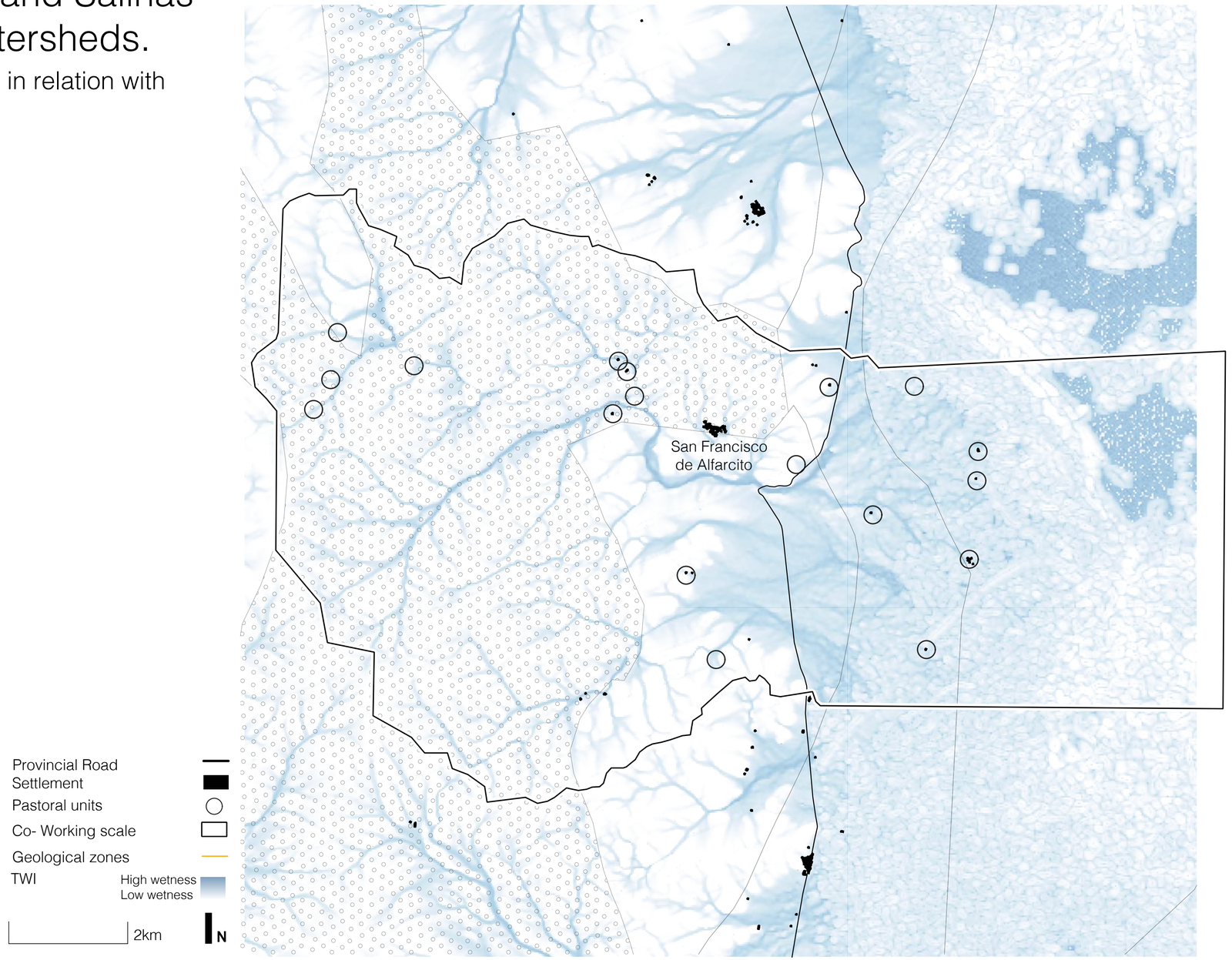
20km

N



Re-Representation of Olaroz Cauchari and Salinas Grandes y Laguna de Guayatayoc Watersheds.

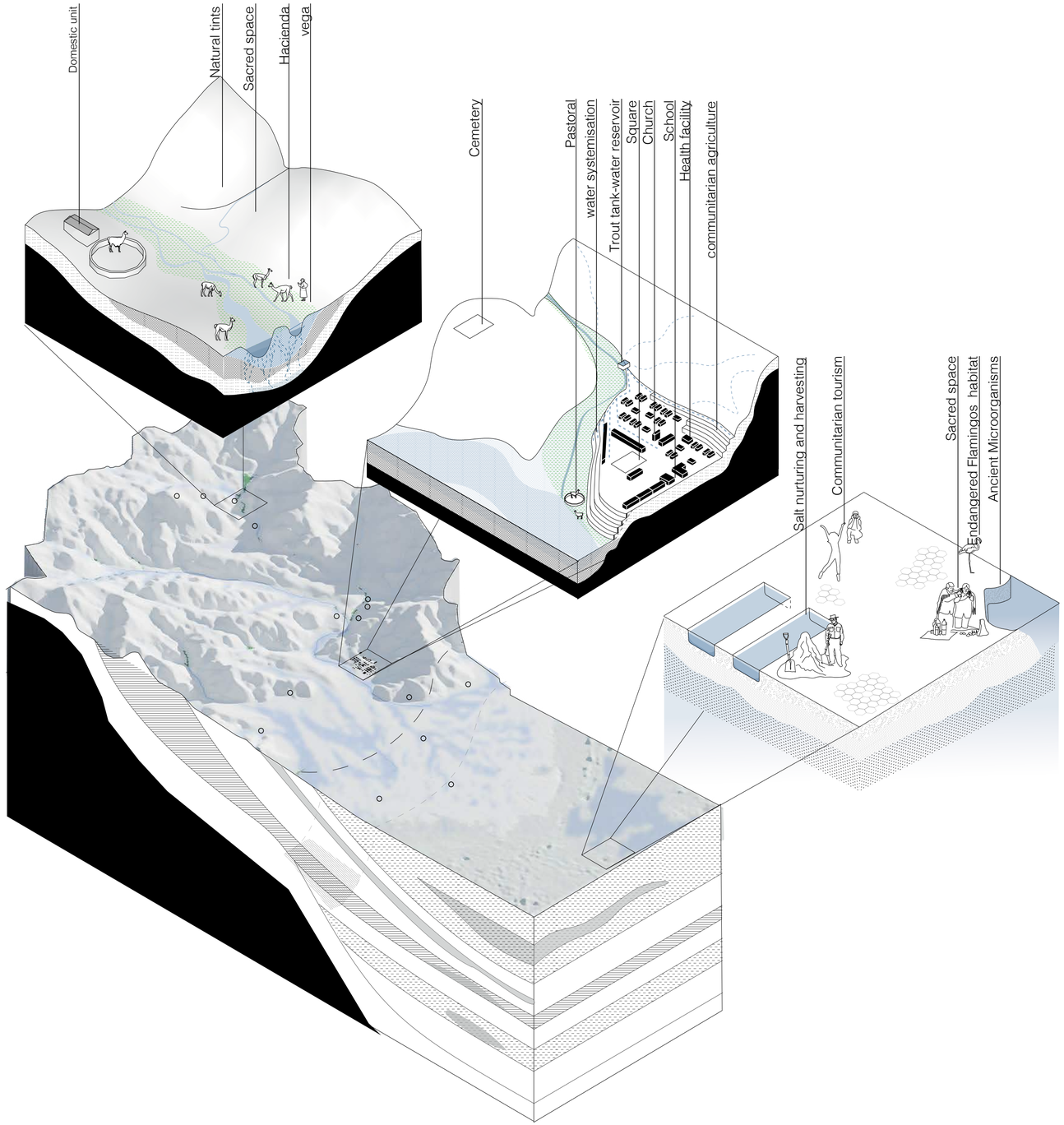
Geological, Hydrological and Topographic Wetness Index in relation with Andean Spatialities



Andean Spatialities

Salt Harvesting

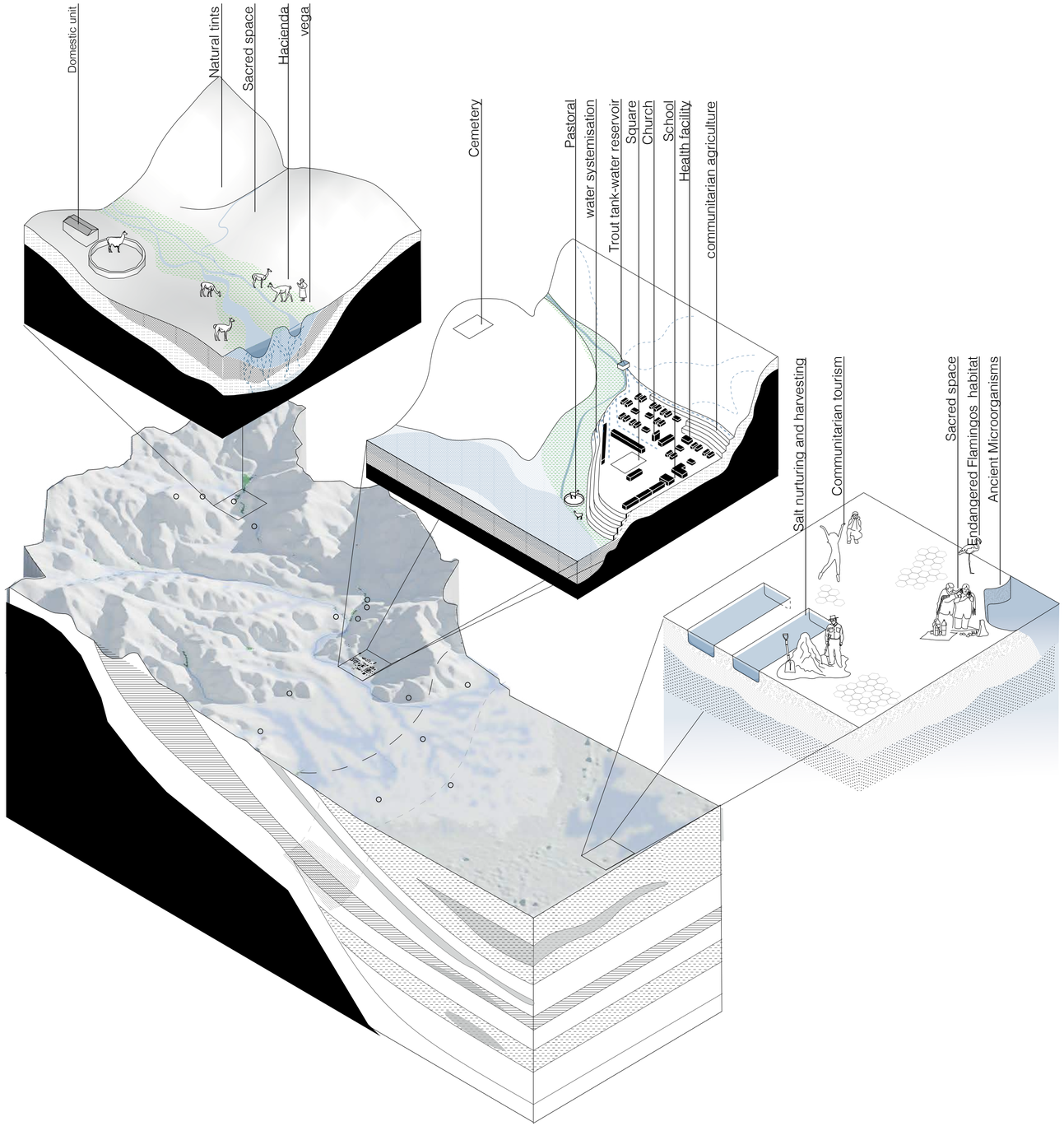
Salt Harvester
(Bajo la Sal, 2019)



Andean Spatialities

Semi nomad pastoral practices

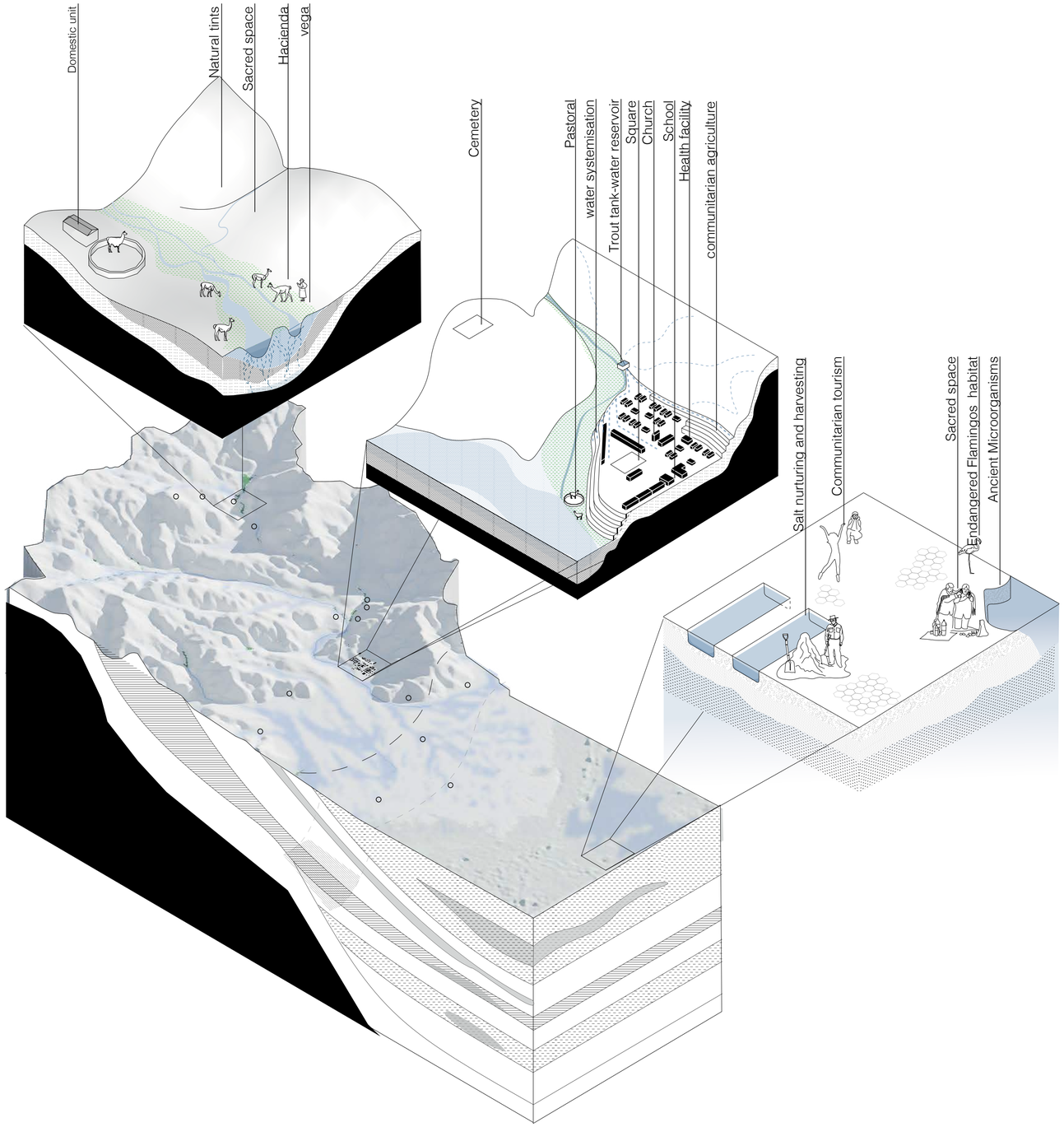
Grazing moving around a pastoral unit, El Moreno
(Bajo la Sal, 2019)



Andean Spatialities

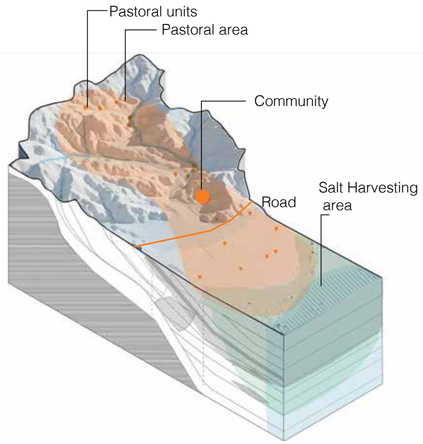
Agricultural practices

Agriculture terraces in San Francisco de Alfarcito.
Author, 2025



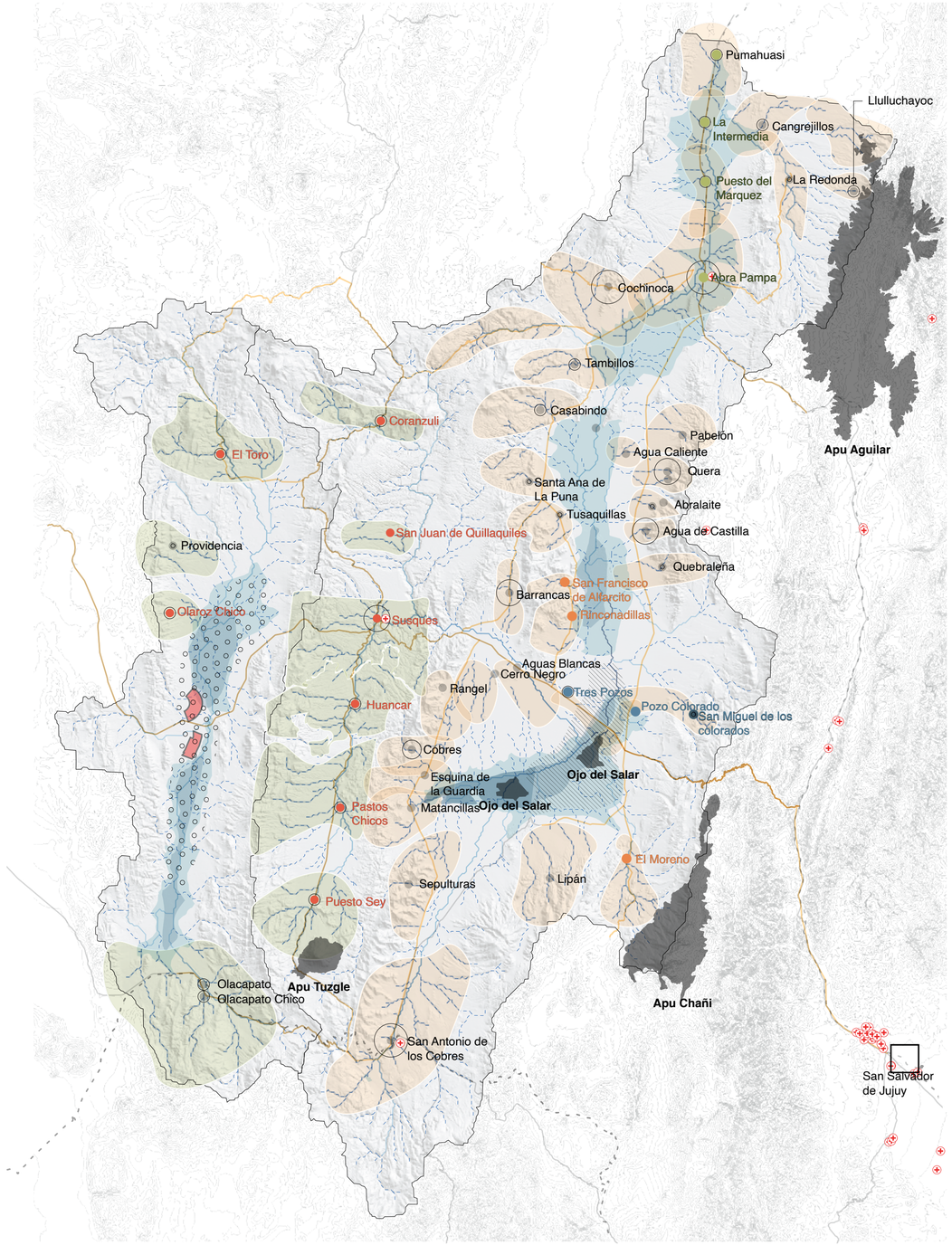
Re-Representation of Andean Spatialities

Representation of local processes and spatialities in Olaroz Cauchari and Salinas Grandes y Laguna de Guayatayoc Watersheds.



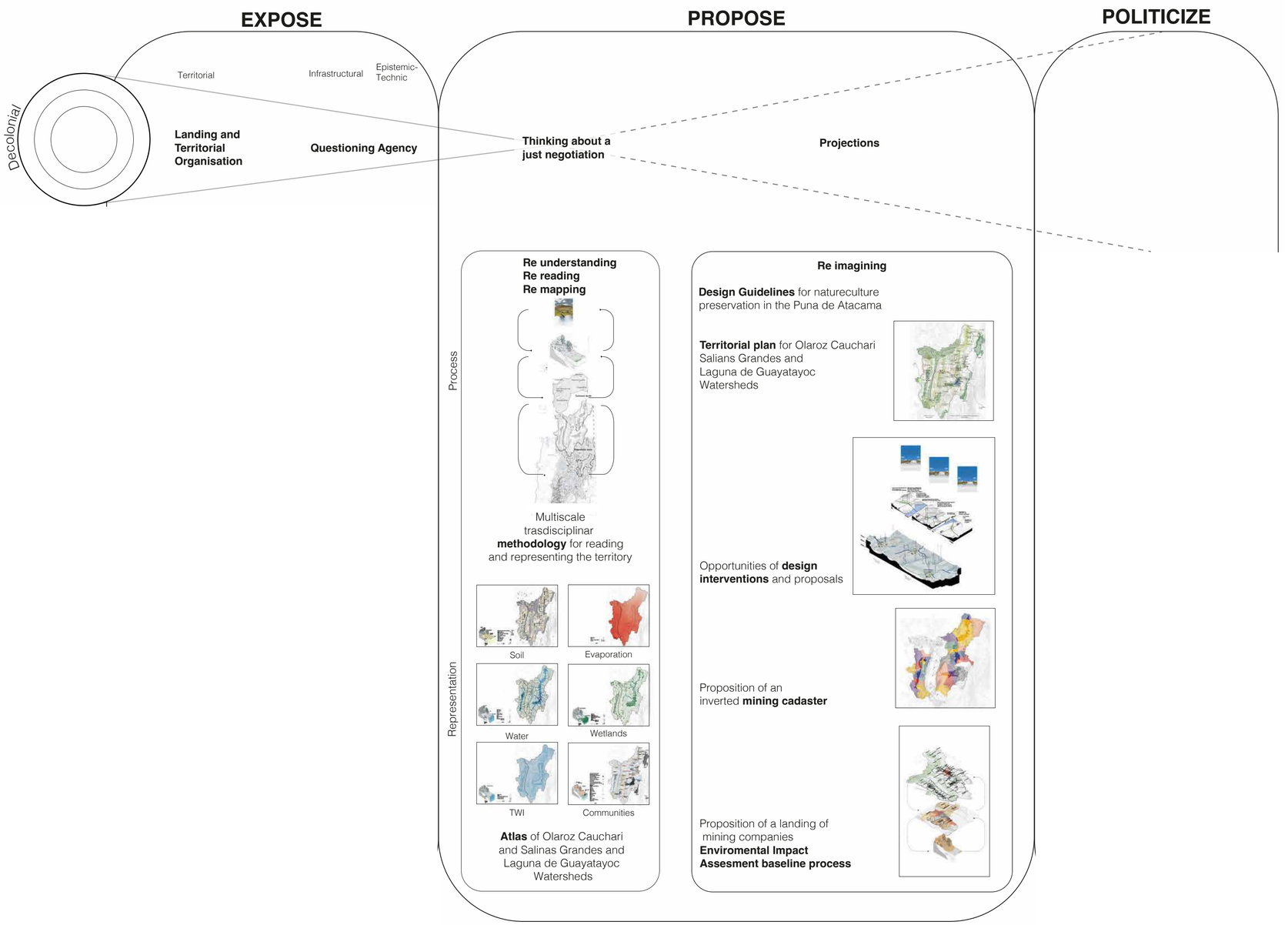
Communitarian Tourism
Agricultural practices
Salt harvesting cooperative
Salt Harvest area
Workers of Lithium mines
Lithium mining area
Lithium mining company
Community
Kolla Communities extension
Atacama Communities extension
Sacred area
Hospital
Registered Ihhabitants
0-100
100-500
500-1000
1000-5000
5000-150000
Road
Disused Railway
Watershed
Water stream
Creeks
Salar
Salar nucleus
San Salvador de Jujuy
Capital City

20km



Adressing the acceleration

Power lines on route between Atacama Salar extraction plants
and Mejillones Port, Weinberg 2023


EXPOSE
PROPOSE
POLITICIZE
Territorial
Infrastructural
Epistemic-Technic
Decolonial
Landing and Territorial Organisation
Questioning Agency
Thinking about a just negotiation
Projections
Process
Representation
Re understanding
Re reading
Re mapping
Multiscale trasdisciplinar **methodology** for reading and representing the territory
Soil
Evaporation
Water
Wetlands
TWI
Communities
Atlas of Olaroz Cauchari and Salinas Grandes and Laguna de Guayatayoc Watersheds
Re imagining
Design Guidelines for natureculture preservation in the Puna de Atacama
Territorial plan for Olaroz Cauchari Salians Grandes and Laguna de Guayatayoc Watersheds
Opportunities of **design interventions** and proposals
Proposition of an inverted **mining cadaster**
Proposition of a landing of mining companies
Enviromental Impact Assesment baseline process

Guidelines for territorial and natureculture preservation in Andean watersheds and salares for lithium mining.

1. Watershed as a Design Scale Element

Guideline: Consider the watershed as the fundamental element in territorial design, integrating and preserving recharge areas as essential components of the natural and cultural water system. Implement zoning, infrastructure, and impact assessments based on hydrological scales to ensure system sustainability.
Action: Establish high preservation areas to protect recharge zones and maintain the integrity of the natural and cultural system.

2. Recognising Salares Complex Natucultural Wetlands

Guideline: Understand salares not merely as physical bodies but as wetlands with integrated ecological and cultural complexity requiring a natucultural management approach.
Action: Establish medium preservation areas to conserve the ecological and cultural value of the sallares, promoting sustainable management.

3. Prioritising Spatial Autonomy of Communities (High Andean Spatialities)

Guideline: Recognise Andean communities as autonomous spatial entities linked to ecological, cultural, and hydrological systems, considering practices as semi-nomadism, beyond viewing them solely as urban settlements.
Action: Design territorial policies and plans that guarantee the spatial and cultural autonomy of communities.

4. Identification and Preservation of Sacred Areas

Guideline: Identify and preserve sacred areas as elements of high cultural and spiritual significance, granting them special protection.
Action: Establish high preservation areas for these sites, preventing any interventions that may affect their integrity.
Action: Promote local ecological and social rehabilitation practices to mitigate these impacts.

5. Promotion and Articulation of Local Activities and Practices

Guideline: Identify and strengthen traditional local activities for their development and preservation, valuing practices such as: salt harvesting,community-based tourism,local agriculture.
Action: Spatial Identification and articulation and Implementation of support programmes to revitalise and promote these practices, ensuring their cultural and environmental sustainability.

6. Delimitation and Rehabilitation of Socially and Environmentally Degraded Areas Due to Lithium Mining

Guideline: Recognise and delimit socially and environmentally degraded areas caused by lithium mining, including assessment of social impacts on communities and mine workers.

7. Promotion of Vertically Integrated Green Corridors

Guideline: Create green corridors connecting highlands, wetlands, and valleys to foster biodiversity, facilitate species movement, and maintain ecological and hydrological flows.
Actions: Connect fragmented ecosystems vertically across altitudes.
Integrate corridors with territorial and transport infrastructure, with special attention to critical crossings.

8. Identification of areas for specific mitigation- integration-articulation projects

Guideline: Identification of areas for specific projects that can foster integration and preservation of natural systems, enable community linkage, and mitigation of current and future mining activities.

9. Proposal for a New Mining Cadastre Based on Hydrological Delimitations

Guideline: Develop a mining cadastre considering hydrological divisions to restrict mining in sensitive areas, particularly salt flats as wetlands.
Recommendation: Avoid lithium mining in salt flats due to uncertainties about their hydraulic capacity and environmental impacts.
Alternative:
Delimit mining lots within hydrological sub-basins, establishing mining areas indivisible between concession holders.
Mark areas of direct influence to assess cumulative impacts within the same watershed.
-Incorporate these criteria for mining management and regulation, ensuring protection of water resources and associated ecosystems.

Applied Guidelines for territorial and natureculture preservation in Andean watersheds and salares for lithium mining.

1. Watershed as a Design Scale Element

2. Recognising Salares Complex Natucultural Wetlands

3. Prioritising Spatial Autonomy of Communities (High Andean Spatialities)

4. Identification and Preservation of Sacred Areas.

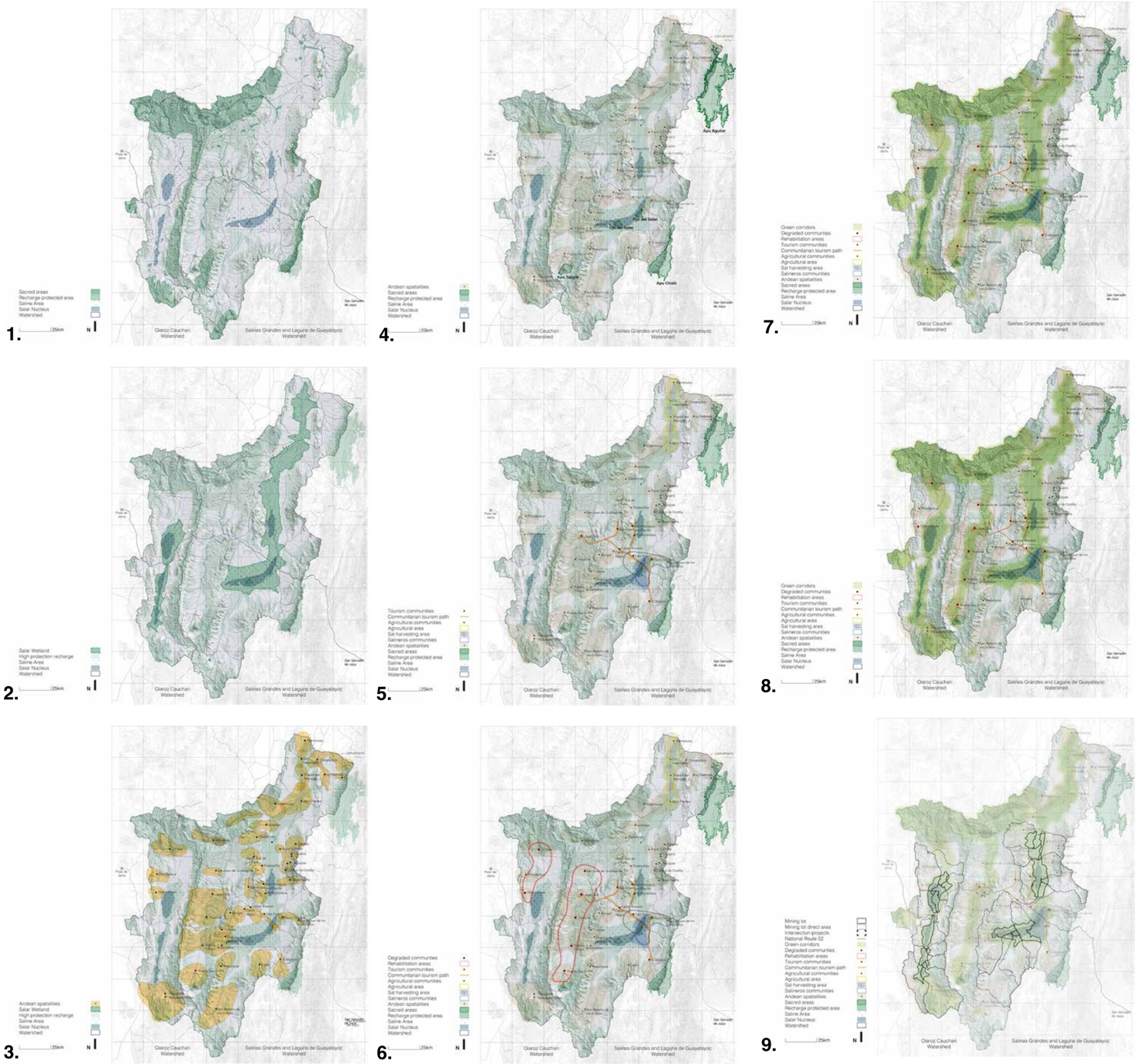
5. Promotion and Articulation of Local Activities and Practices

6. Delimitation and Rehabilitation of Socially and Environmentally Degraded Areas Due to Lithium Mining in Olaroz Cauchari

7. Promotion of Vertically Integrated Green Corridors

8. Identification of areas for specific mitigation- integration-articulation projects

9. Proposal for a New Mining Cadastre Based on Hydrological Delimitations



Applied Guidelines for territorial and natureculture preservation in Andean watersheds and salares for lithium mining.

1. Watershed as a Design Scale Element

2. Recognising Salares Complex Natucultural Wetlands

3. Prioritising Spatial Autonomy of Communities (High Andean Spatialities)

4. Identification and Preservation of Sacred Areas.

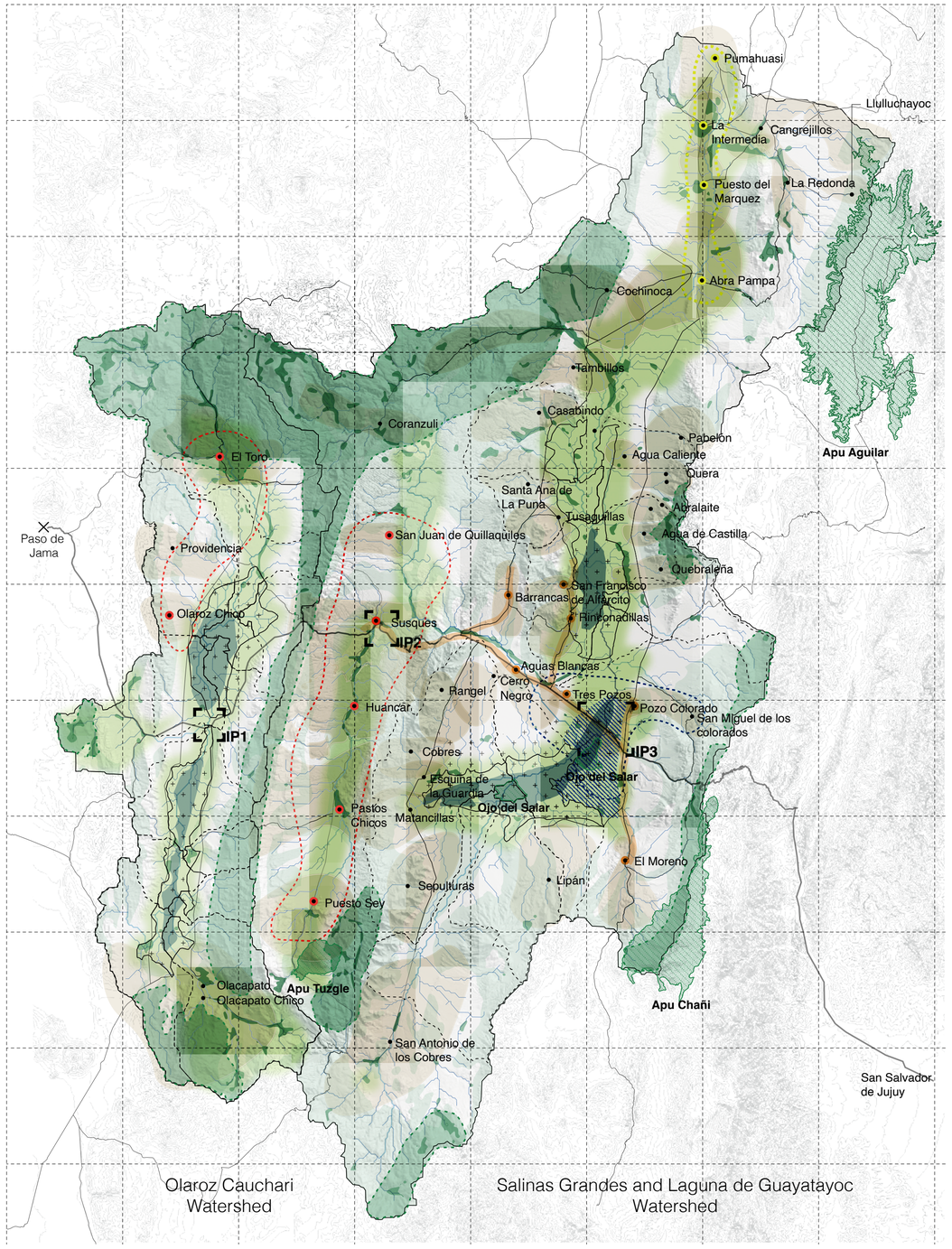
5. Promotion and Articulation of Local Activities and Practices

6. Delimitation and Rehabilitation of Socially and Environmentally Degraded Areas Due to Lithium Mining in Olaroz Cauchari

7. Promotion of Vertically Integrated Green Corridors

8. Identification of areas for specific mitigation- integration-articulation projects

9. Proposal for a New Mining Cadastre Based on Hydrological Delimitations

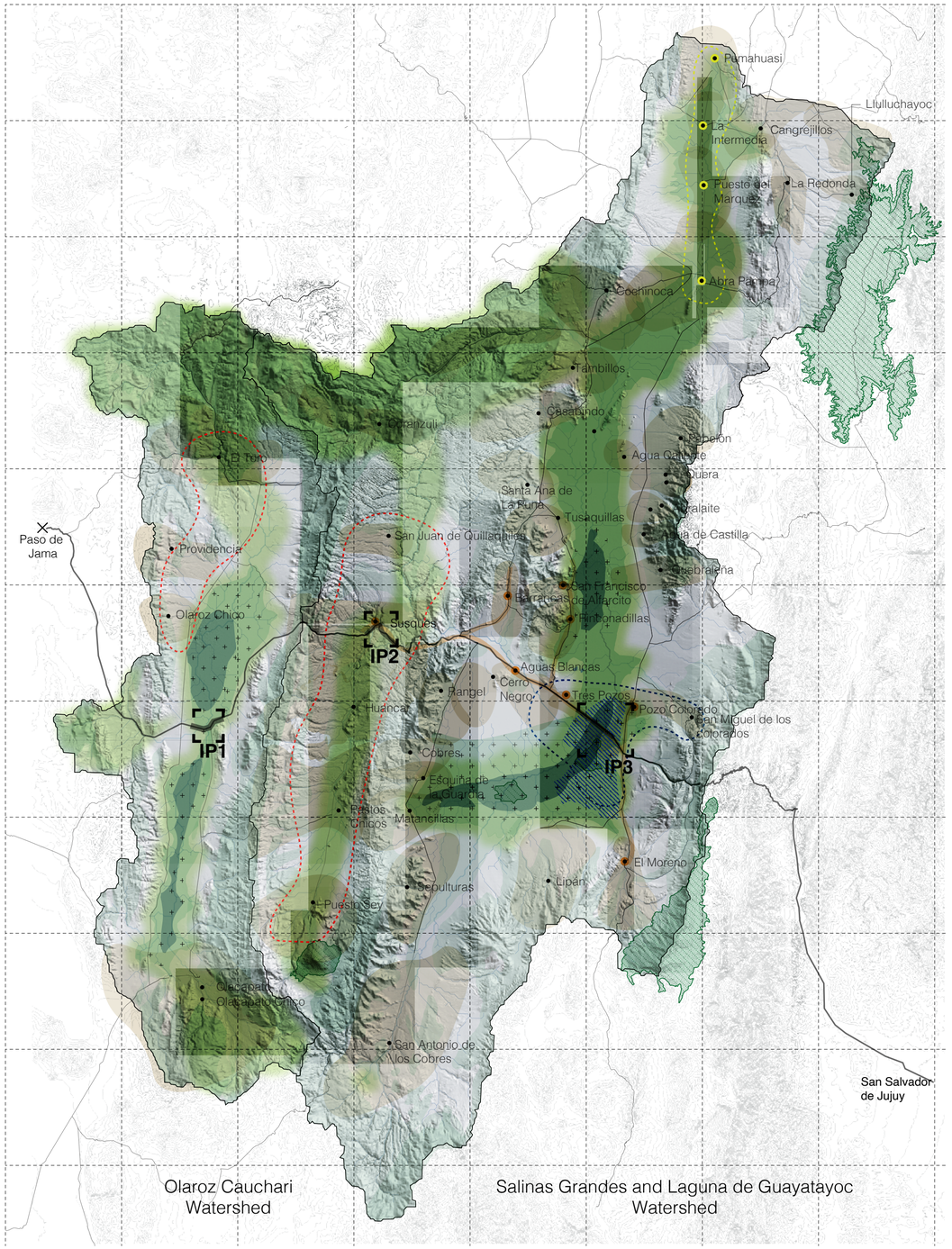


7. Promotion of integrated Green Corridors

Guideline: Create green corridors connecting highlands, wetlands, and valleys to foster biodiversity, facilitate species movement, and maintain ecological and hydrological flows.
Actions:
-Connect fragmented ecosystems vertically across altitudes.
-Integrate corridors with territorial and transport infrastructure, with special attention to critical crossings.

8. Identification of areas for specific mitigation- integration-articulation projects

Identification of areas for specific projects that can foster integration and preservation of natural systems, enable community linkage, and mitigation of current and future mining activities.



Route 52 Current Situation

Part of the Bioceanic corridor project in current development connecting Porto de Santos in Sao Pablo with thew Pacific Ocean.

1. Crossing Cuesta de Lipan to arrive to Salinas Grandes

2. Salar Transition area arriving to Salinas Grandes

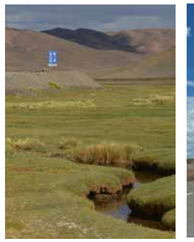
3. Crossing Salinas Grandes

4.Metering gas station built 2025

5. Electric line along the route

6. Several trucks along the route.

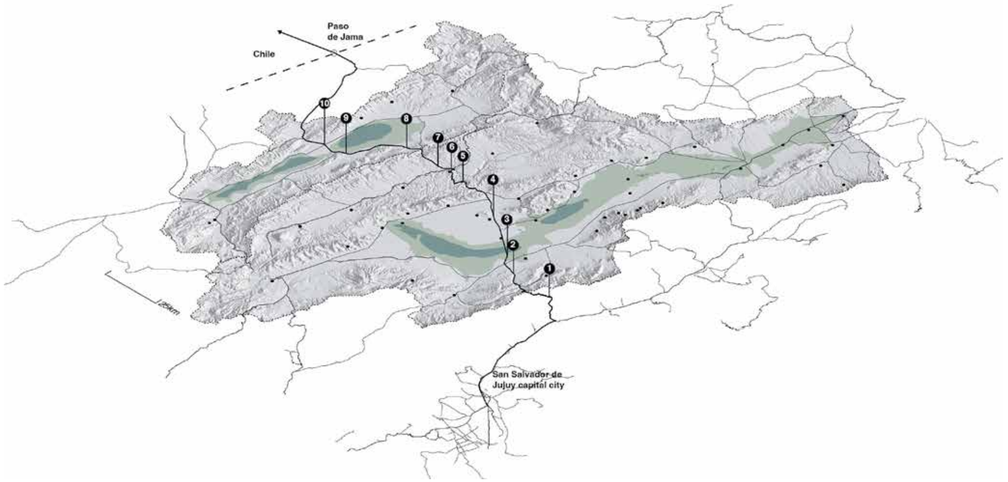
7. The Susques community is undertaking various new buildings and infrastructure.



8. High andean vega interrupted by road

9. Landscape fragmentation

10. EXAR mining facility entrance, with drainage infrastructure



Route 52

Current situation in Chile

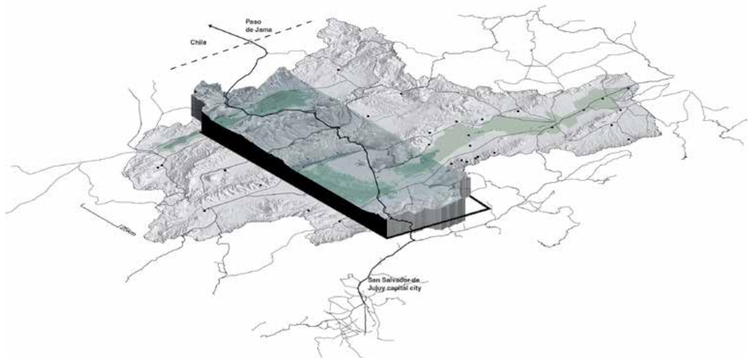
Industrial Sector La Negra ,
Weinberg 2023

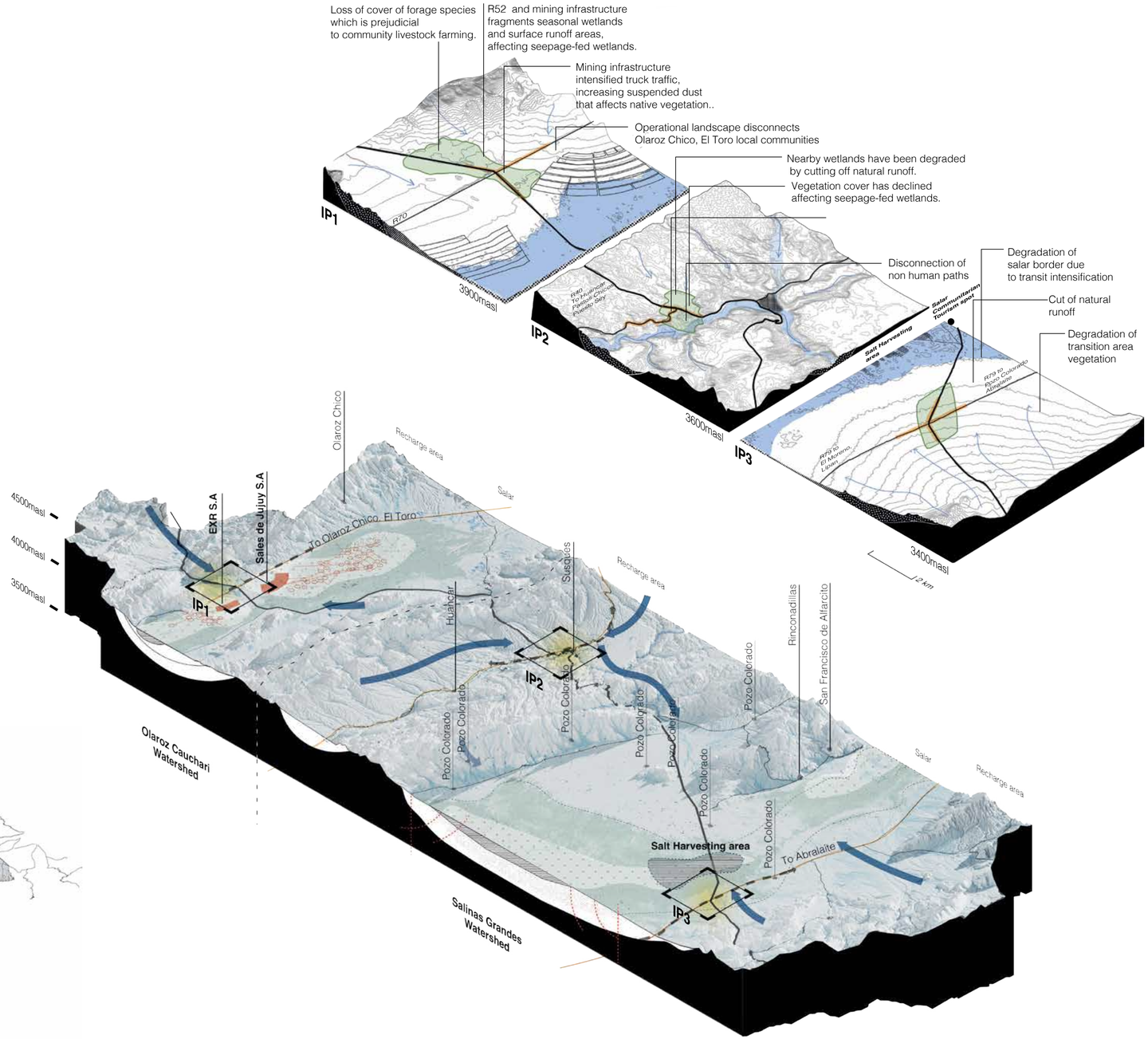
Hoses and power lines between the Salar extraction plants
and La Negra chemical plants, Weinberg 2023

Power lines on route between Salar extraction plants and
Mejillones, Weinberg 2023

Route 52 Current Situation

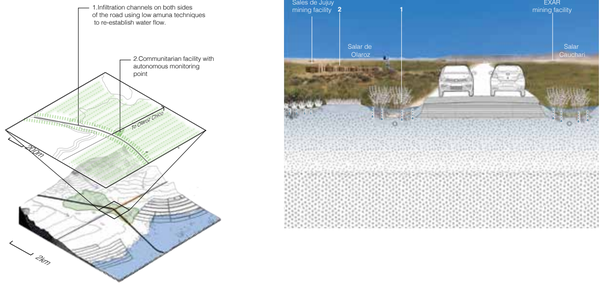
Areas for specific mitigation- integration-articulation projects

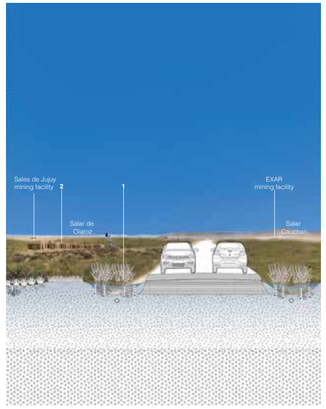




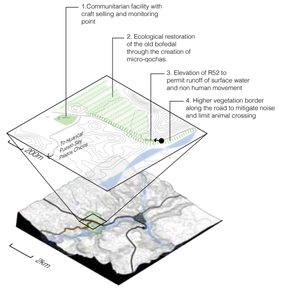
Intersection Projects

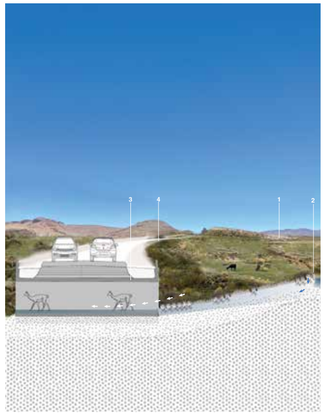
Intersection projects



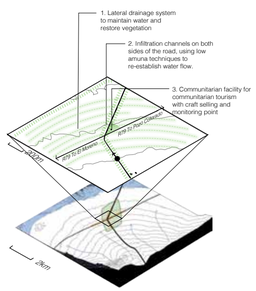


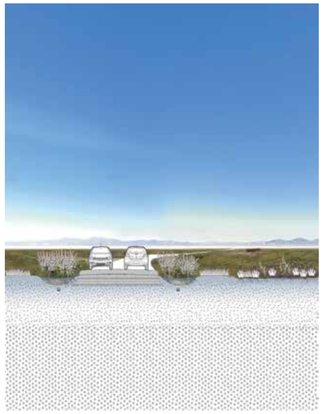
Intersection project 1: Salar de Olaroz Transition area.





Intersection project 2: Route 40 . Recharge area



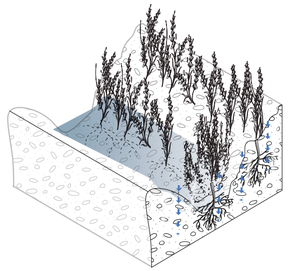


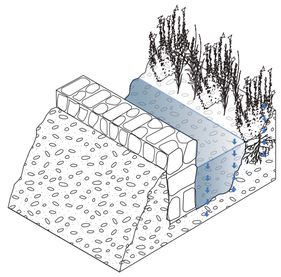
Intersection project 2: Route 79. Salinas Grandes transition area

Proposed interventions

Autonomous monitoring point

Communitarian facility

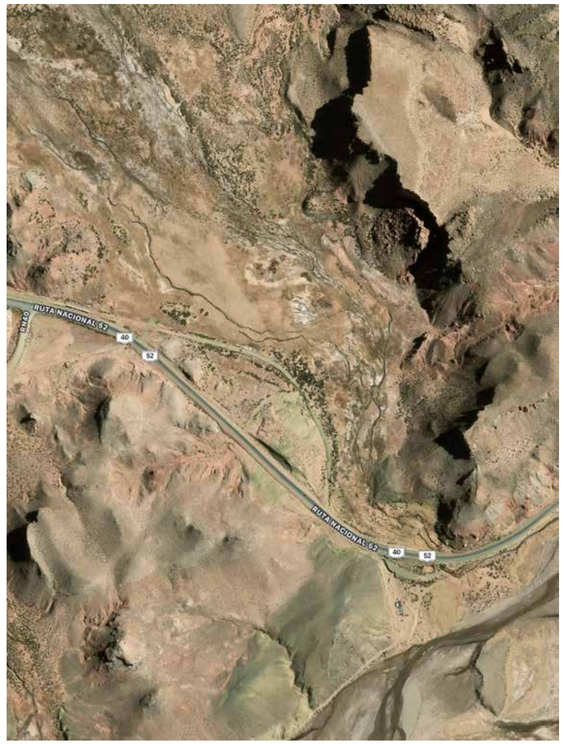


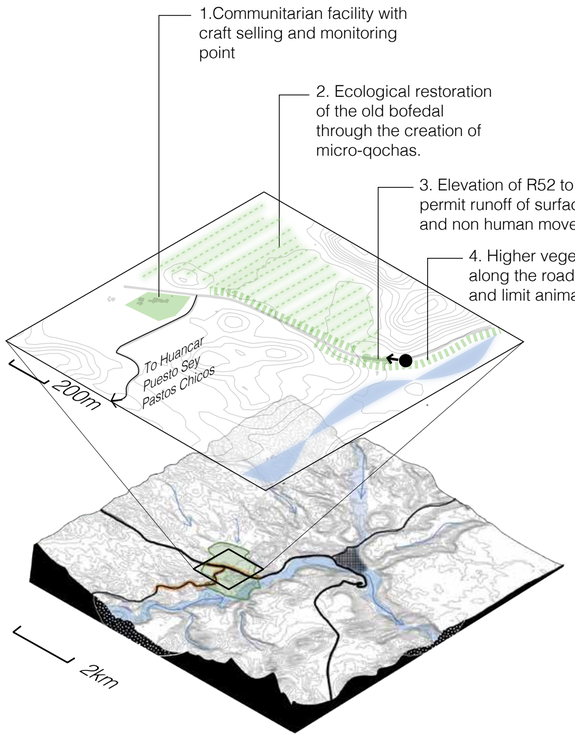


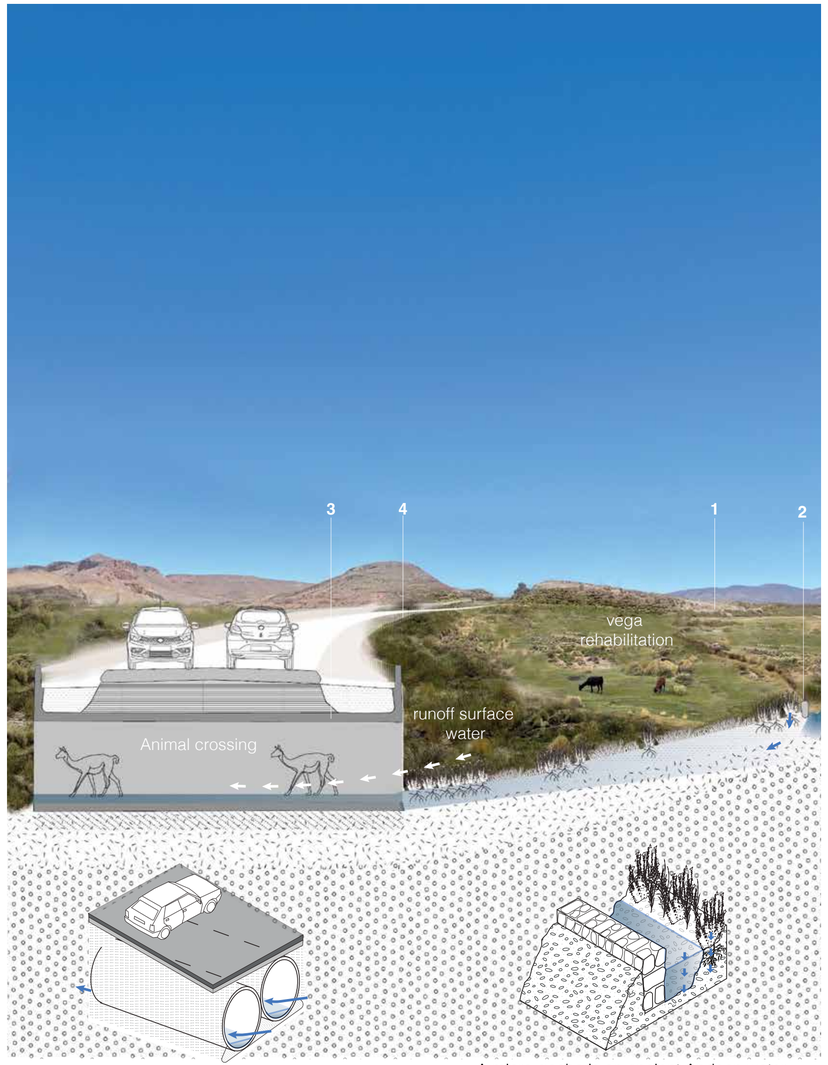
Ancient water infiltration management tecnhiques:

Intersection Project 2

Intersection with Route 40.
Salinas Grandes and Laguna de Guayatayoc Recharge area.

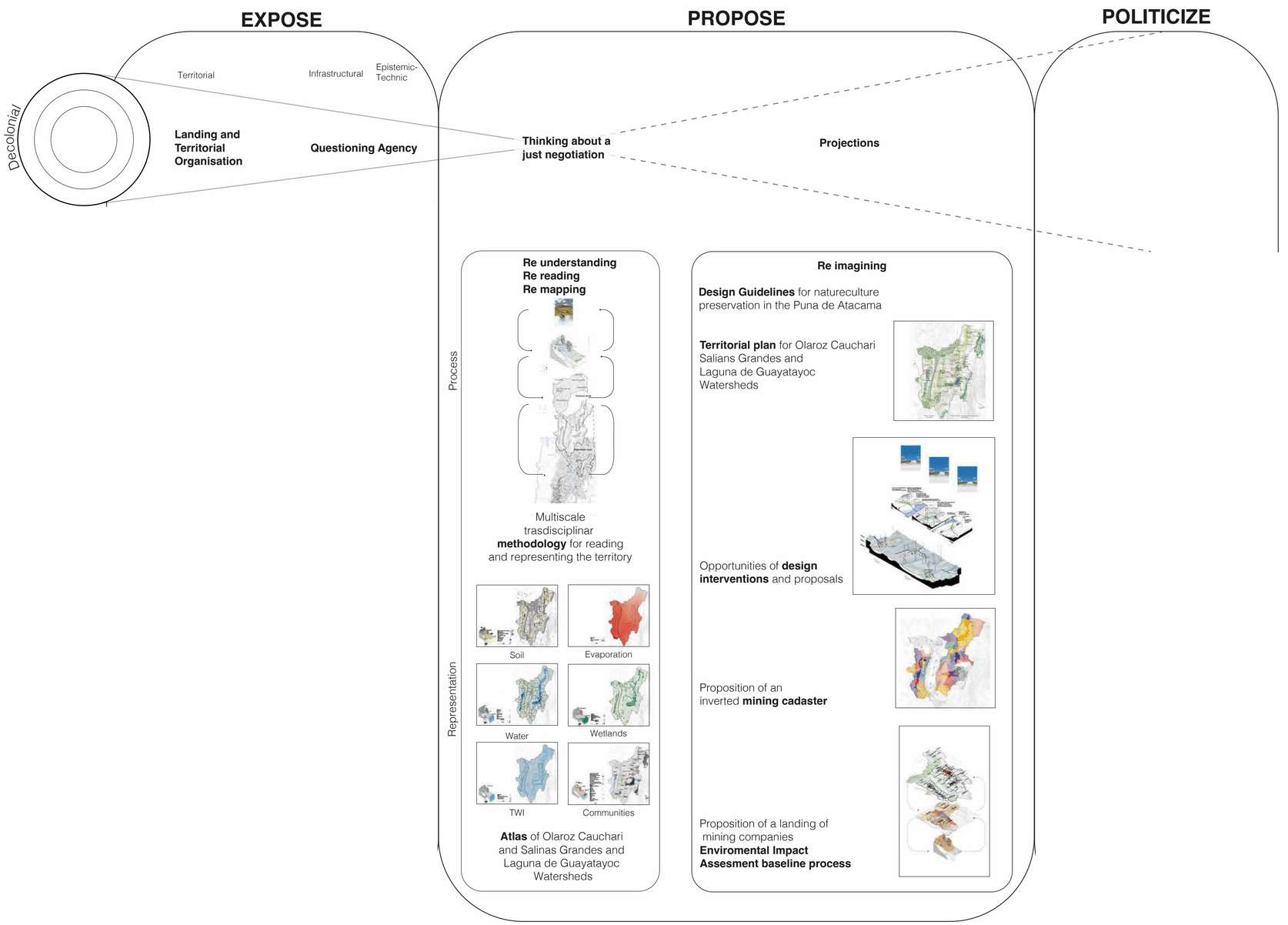






The proposed elevation of Route 52 incorporates durable precast concrete culverts, which offer benefits such as rapid installation, high structural strength, and long-term durability. These culverts help reduce habitat fragmentation by preserving the natural slope of the terrain.

A micro qocha is an ancient Andean water management technique that consists of a small, hand-built depression or pond designed to capture and retain rainwater or meltwater, promoting infiltration, soil regeneration, and sustaining life in high-altitude landscapes.


EXPOSE
PROPOSE
POLITICIZE
Territorial
Infrastructural
Epistemic-Technic
Decolonial
Landing and Territorial Organisation
Questioning Agency
Thinking about a just negotiation
Projections
Process
Representation
Re understanding
Re reading
Re mapping
Multiscale trasdisciplinar **methodology** for reading and representing the territory
Soil
Evaporation
Water
Wetlands
TWI
Communities
Atlas of Olaroz Cauchari and Salinas Grandes and Laguna de Guayatayoc Watersheds
Re imagining
Design Guidelines for natureculture preservation in the Puna de Atacama
Territorial plan for Olaroz Cauchari Salians Grandes and Laguna de Guayatayoc Watersheds
Opportunities of **design interventions** and proposals
Proposition of an inverted **mining cadaster**
Proposition of a landing of mining companies
Enviromental Impact Assesment baseline process

9. Proposal for a New Mining Cadastre Based on Hydrological Delimitations

Guideline: Develop a mining cadastre considering hydrological divisions to restrict mining in sensitive areas, particularly salares as wetlands.

Recommendation: Avoid lithium mining in salares due to uncertainties about their hydraulic capacity and environmental impacts.

Alternative:

Delimit mining lots within hydrological sub-basins, establishing mining areas indivisible between concession holders.

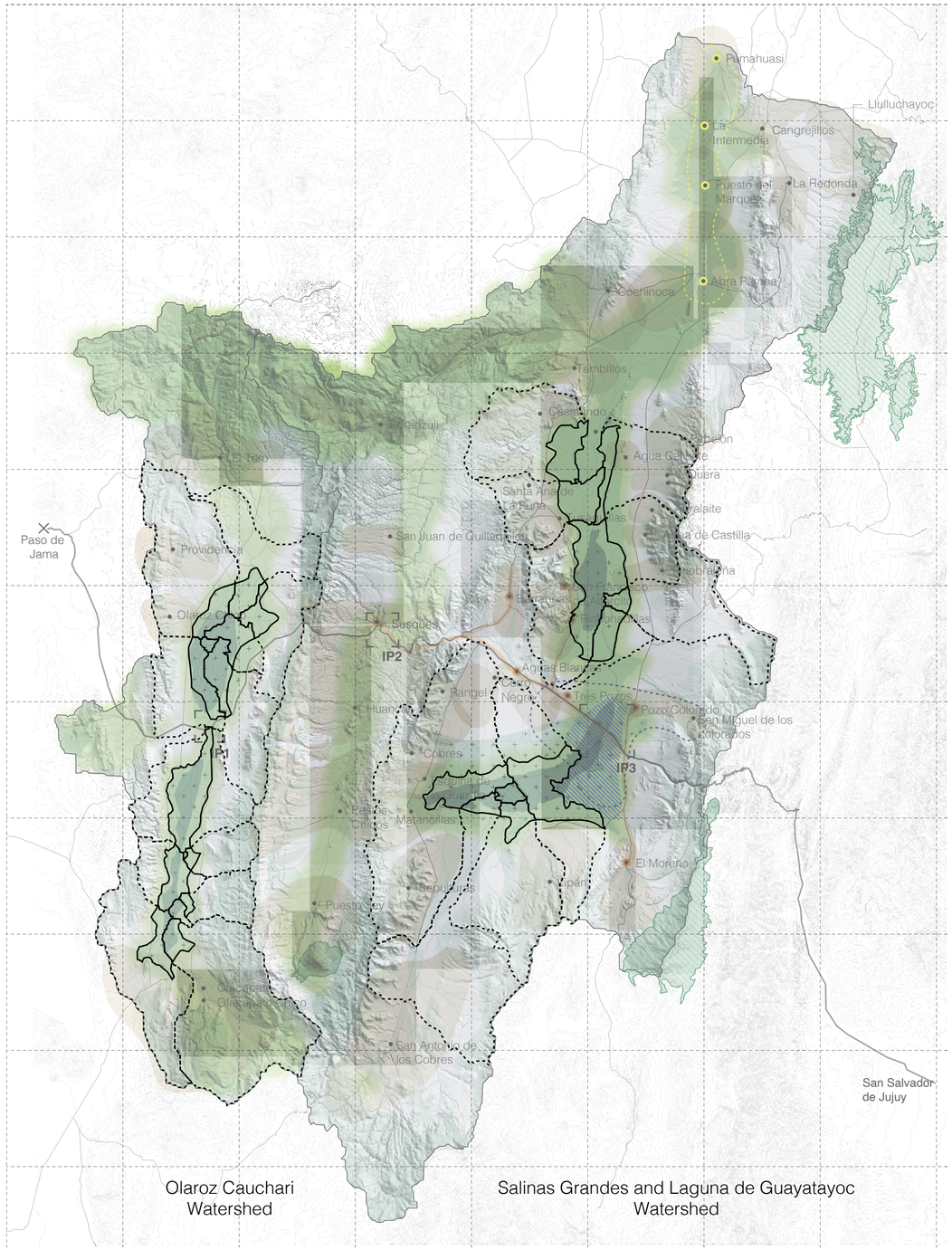
Mark areas of direct influence to assess cumulative impacts within the same watershed.

-Incorporate these criteria for mining management and regulation, ensuring protection of water resources and associated ecosystems.

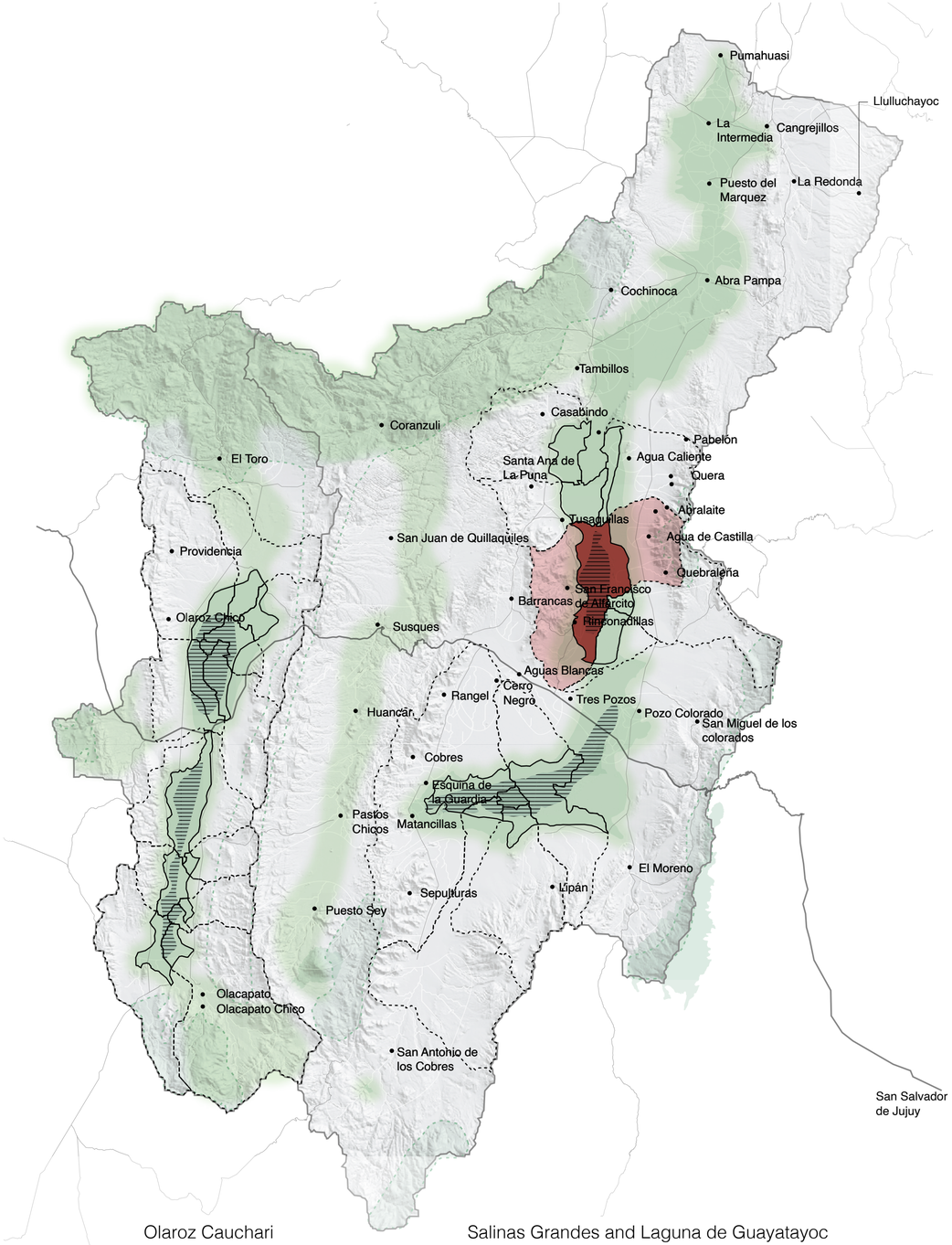
Mining lot
Mining lot direct area
Intersection projects
National Route 52
Green corridors
Degraded communties
Rehabilitation areas
Tourism communities
Communitarian tourism path
Agricultural communities
Agricultural area
Sal harvesting area
Salineros communities
Andean spatialities
Sacred areas
Recharge protected area
Saline Area
Salar Nucleus
Watershed

25km

N



Re-Landing


Pumahuasi
Llulluchayoc
La Intermedia
Cangrejillos
Puesto del Marquez
La Redonda
Abra Pampa
Cochinoca
Tambillos
Casabindo
Coranzuli
Pabelón
El Toro
Santa Ana de La Puna
Agua Caliente
Quera
Abralaite
Tusaquillas
San Juan de Quillaquiles
Agua de Castilla
Providencia
Quebraleña
San Francisco
Barrancas de Alfarcito
Olaroz Chico
Pircunadillas
Susques
Aguas Blancas
Cerro Negro
Rangel
Tres Pozos
Huancar
Pozo Colorado
San Miguel de los colorados
Cobres
Esquina de la Guardia
Pastos Chicos
Matancillas
El Moreno
Lipán
Sepulturas
Puesto Sey
Olacapato
Olacapato Chico
San Antonio de los Cobres
San Salvador de Jujuy
Local community
Proposed mining lot
Mining direct influence
Salar Nucleus
Watershed
25km
N
Olaroz Cauchari
Salinas Grandes and Laguna de Guayatayoc

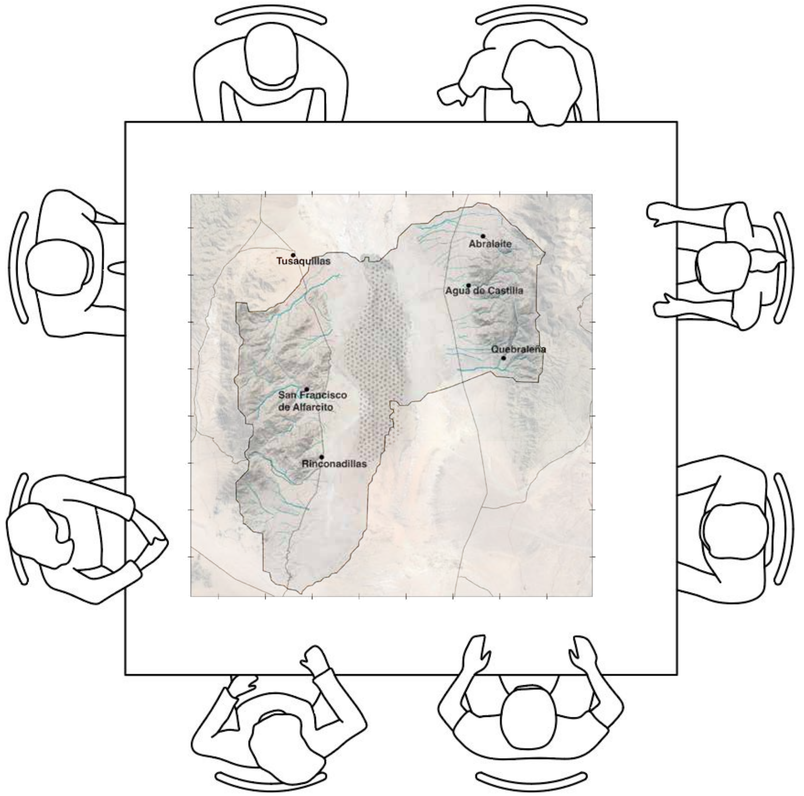
Re-Landing

Sub basin scale transdisciplinarity

Hydrologist
(recharge areas, water streams)

Spatial designer-planner

Biologist
(Wetlands, endangered species, Biodiversity corridors)



Geologists
(Soil type,soil structure, geomorphology)

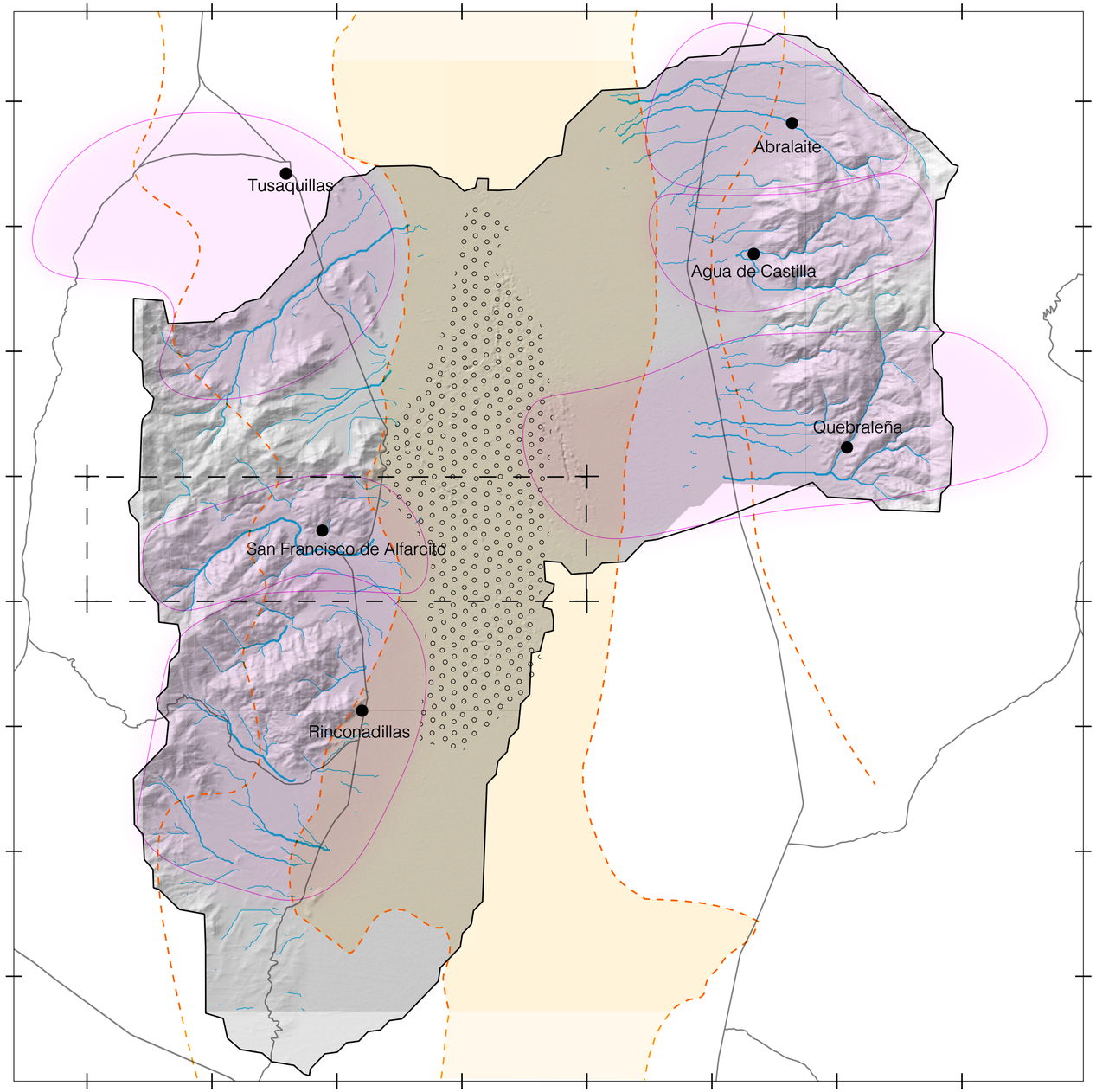
Hydrogeologist
(Saline ground, aquifers)

Lawyers
(spatial domains)

Local Communities
(SanFrancisco, Rinconadillas, Abralaite,Quebraleña, Agua de Castilla)

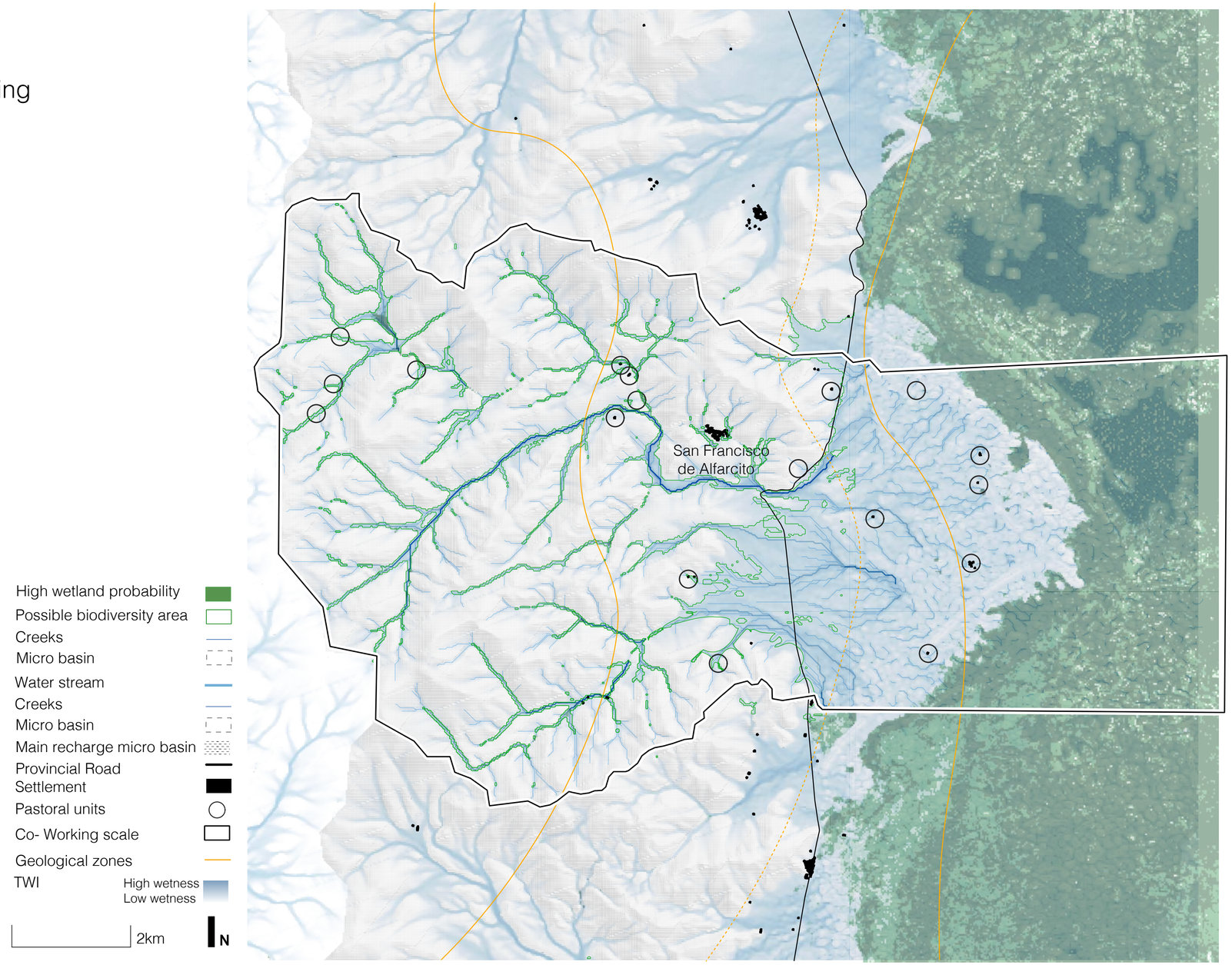
Re-Landing

Sub basin scale transdisciplinarity and definition of a Negotiated Scale



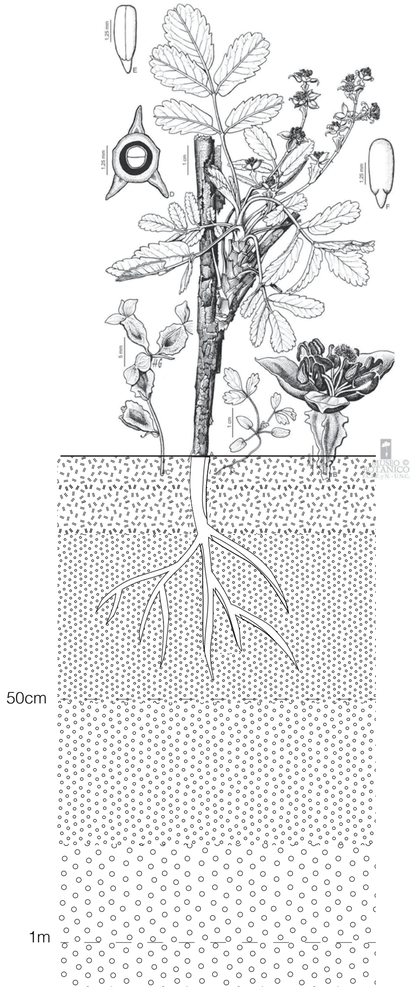
Re-Landing

Negotitated scale transdisciplinar re reading and re mapping

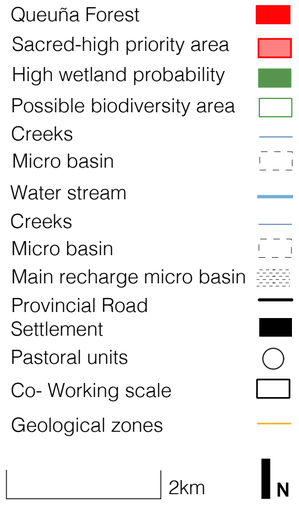


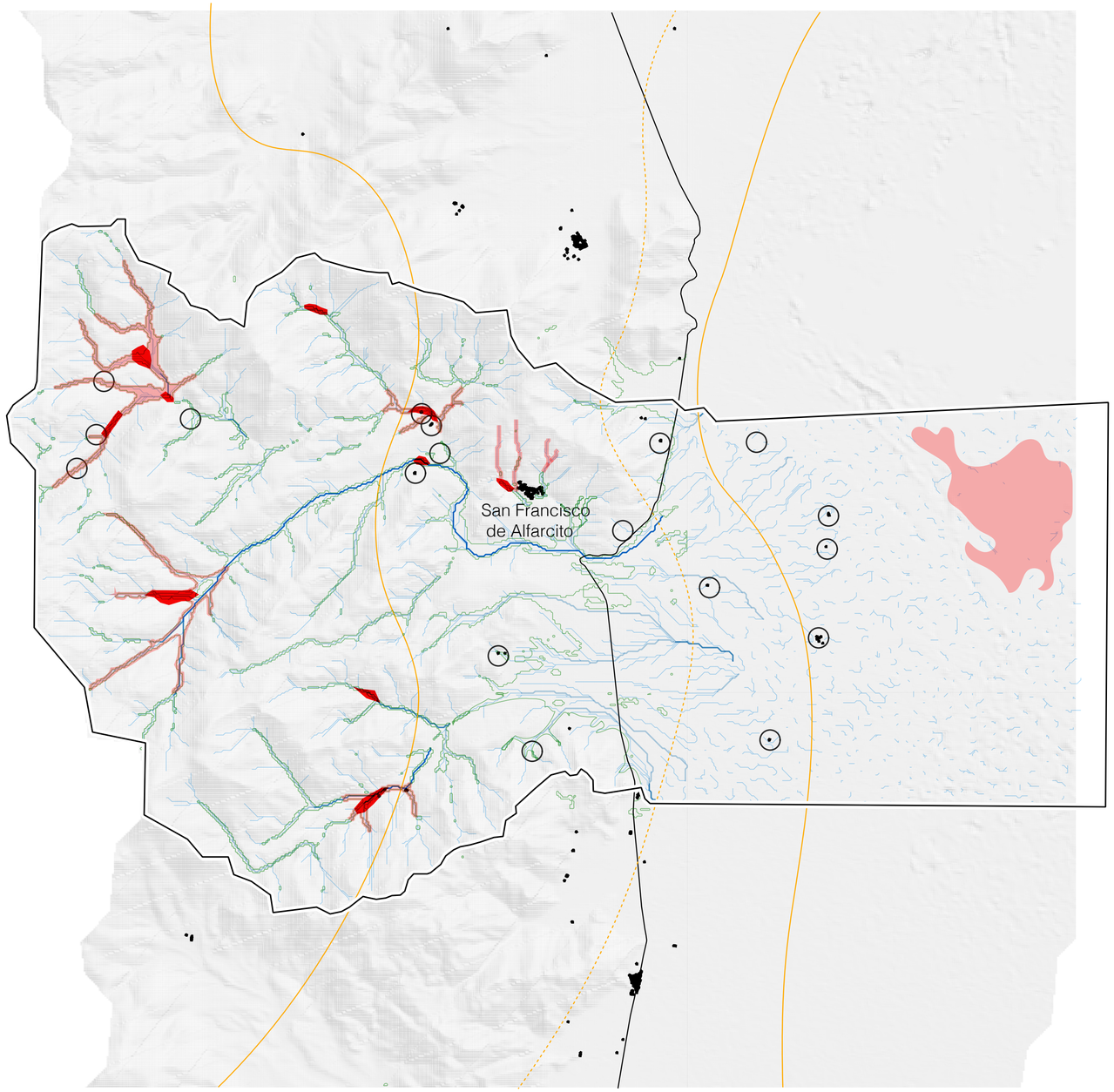
Re-Landing

Negotiated scale: identification of Vulnerable and important areas



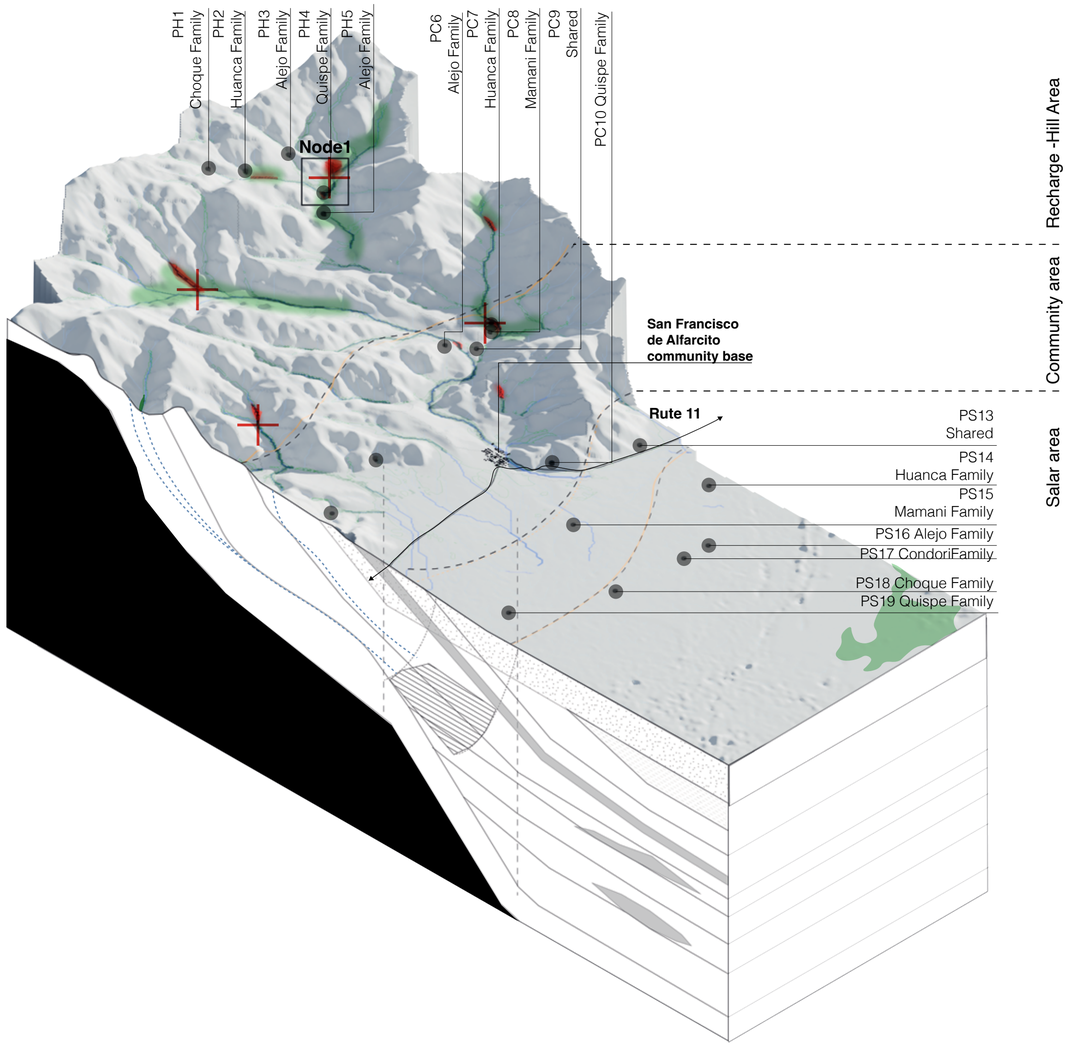
Polylepsis Queuña
img :Hunziker, A. T. edited with
soils by author.

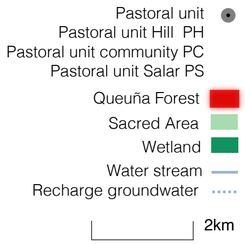




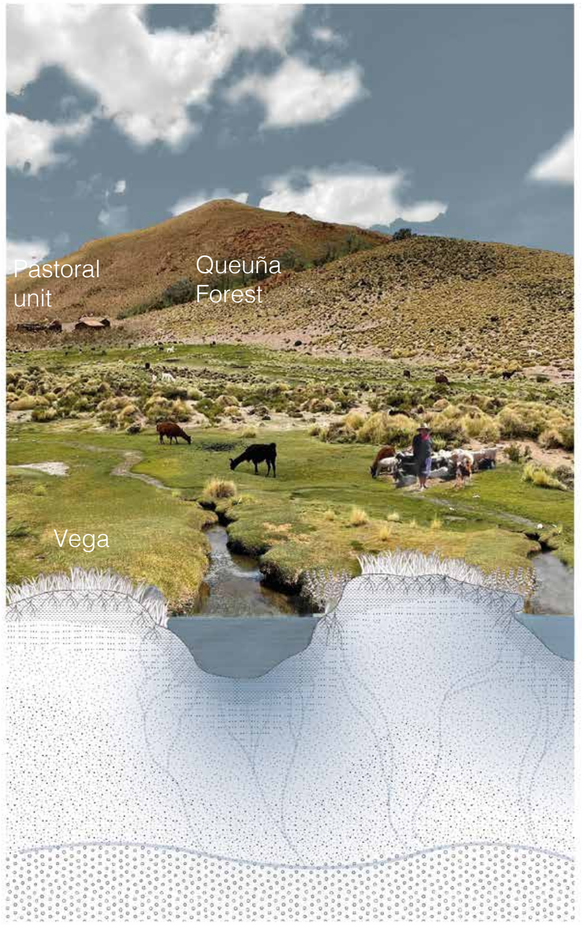
Re-Landing

Negotated scale: Co-Definition of relational nodes.





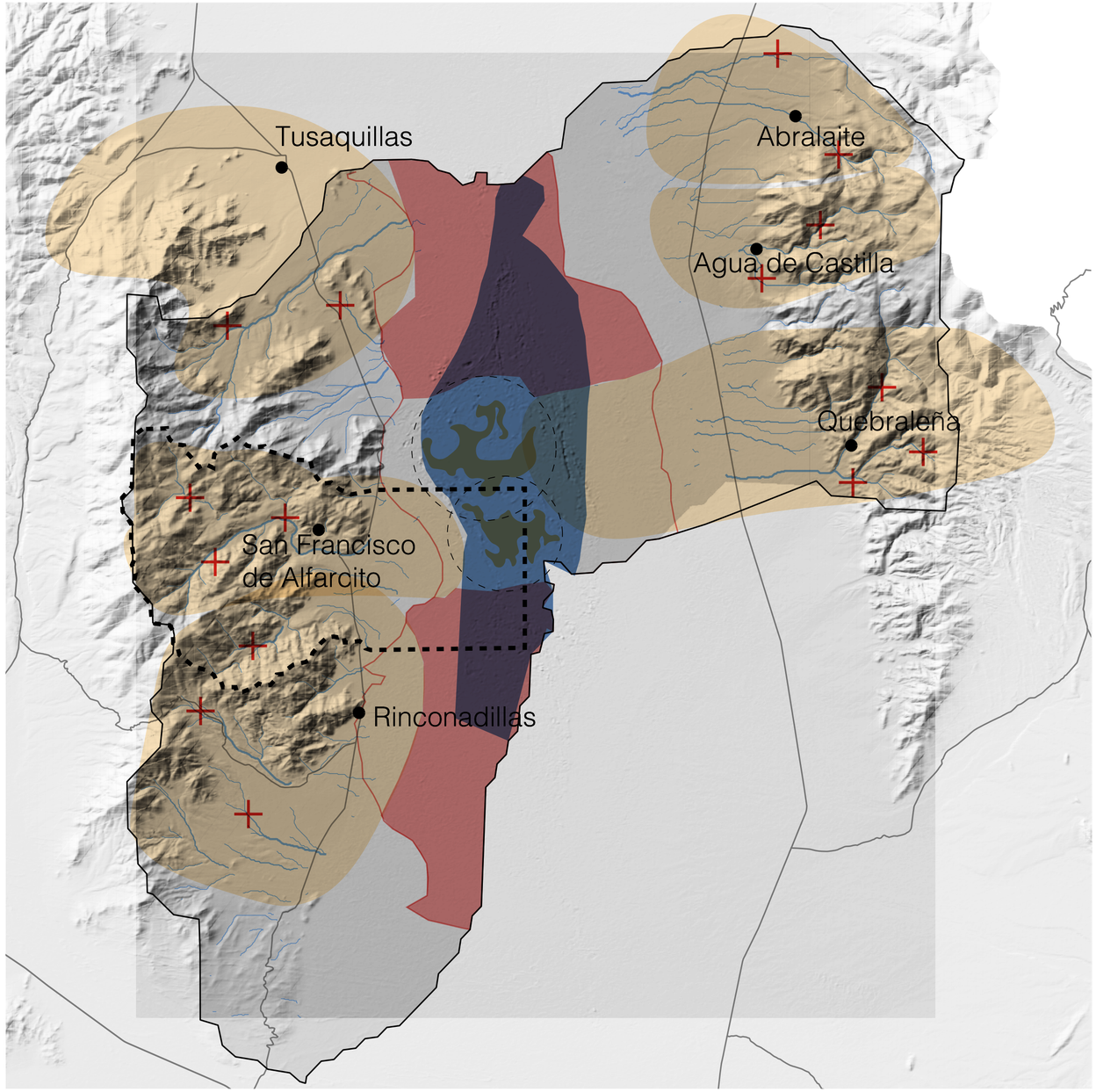
San Francisco de Alfarcito Negotiated scale



Relational Node 1

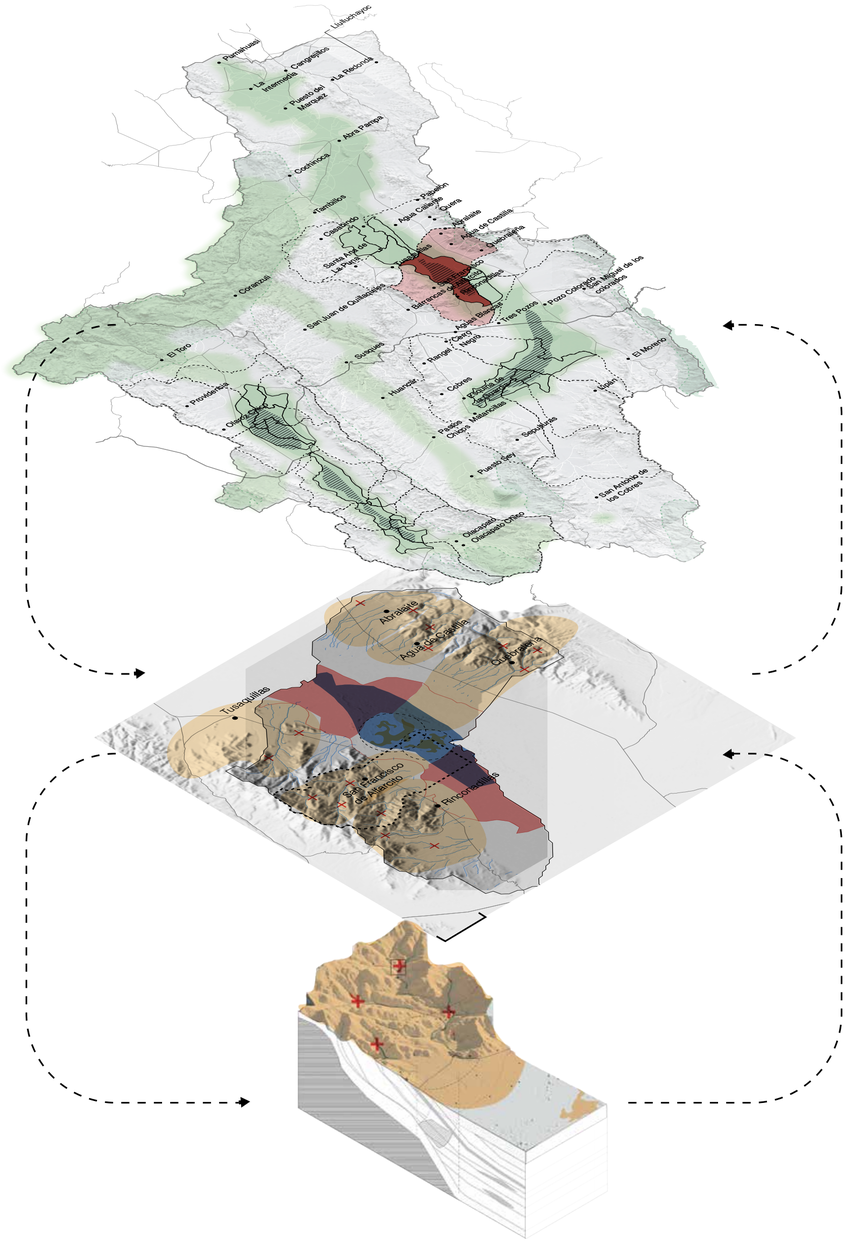
Re-Landing

Sub basin scale: informing from negotated scales.



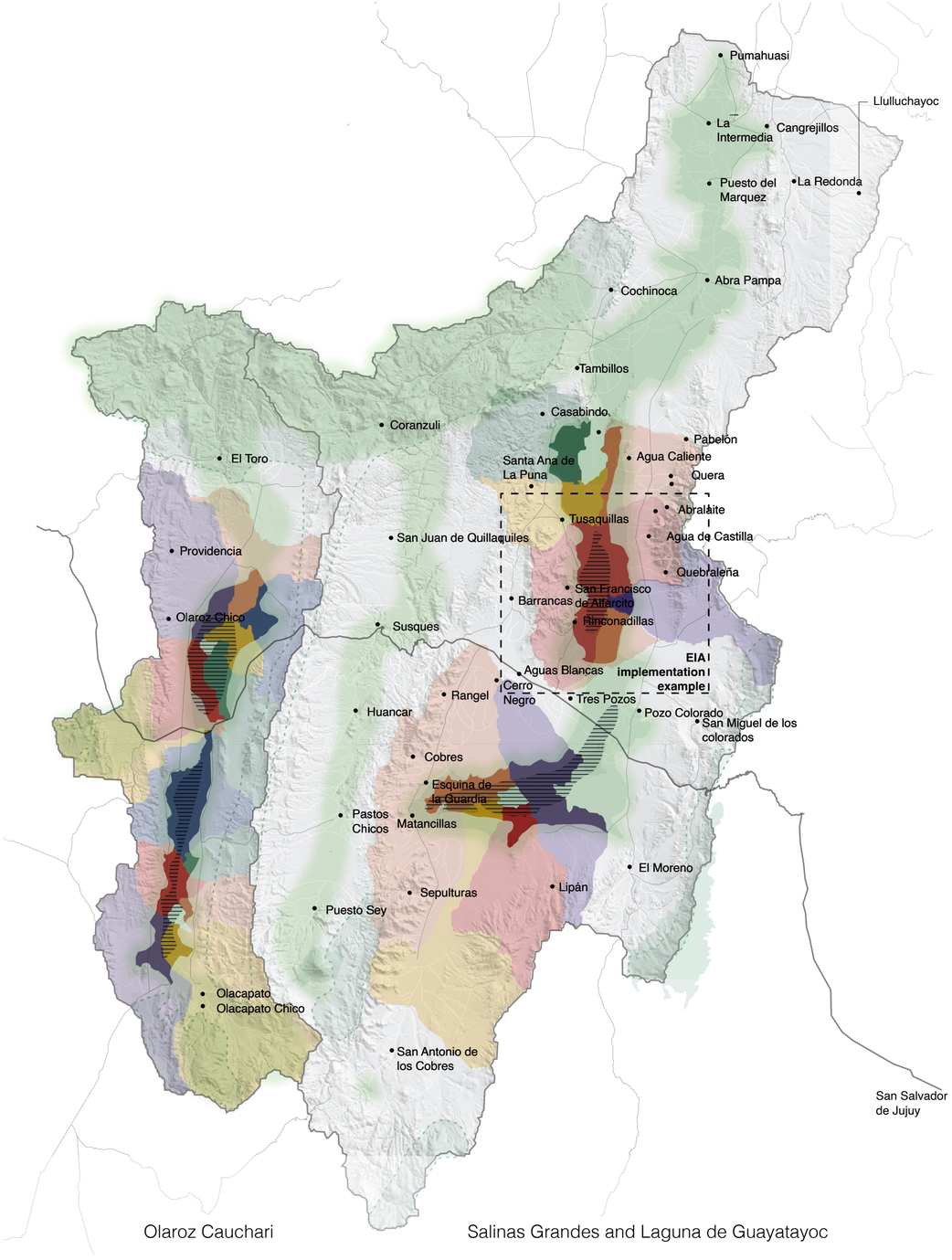
Re-Landing

Multiscale approach:
Traduction of local decisions to watershed scale



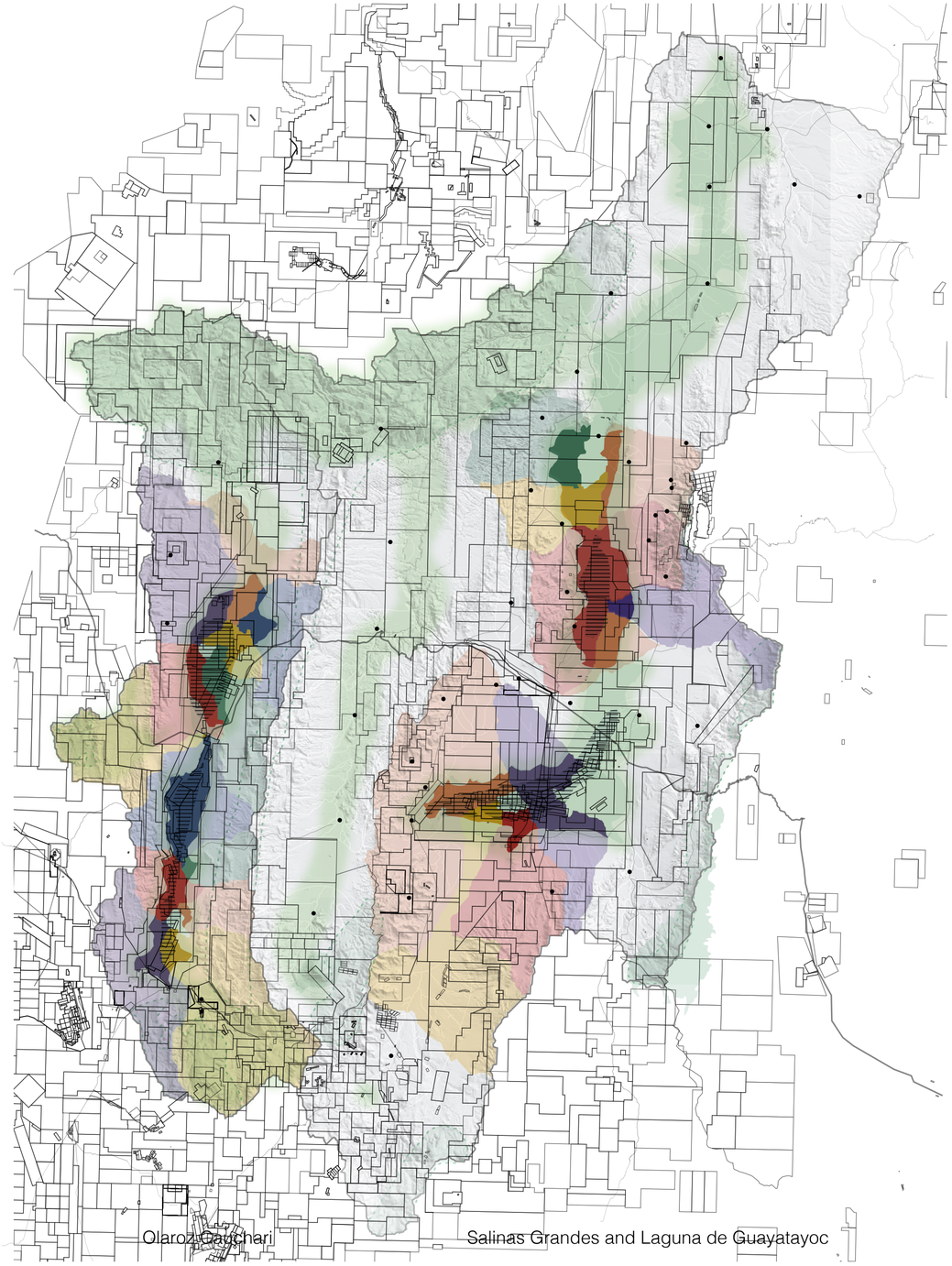
Re-Landing

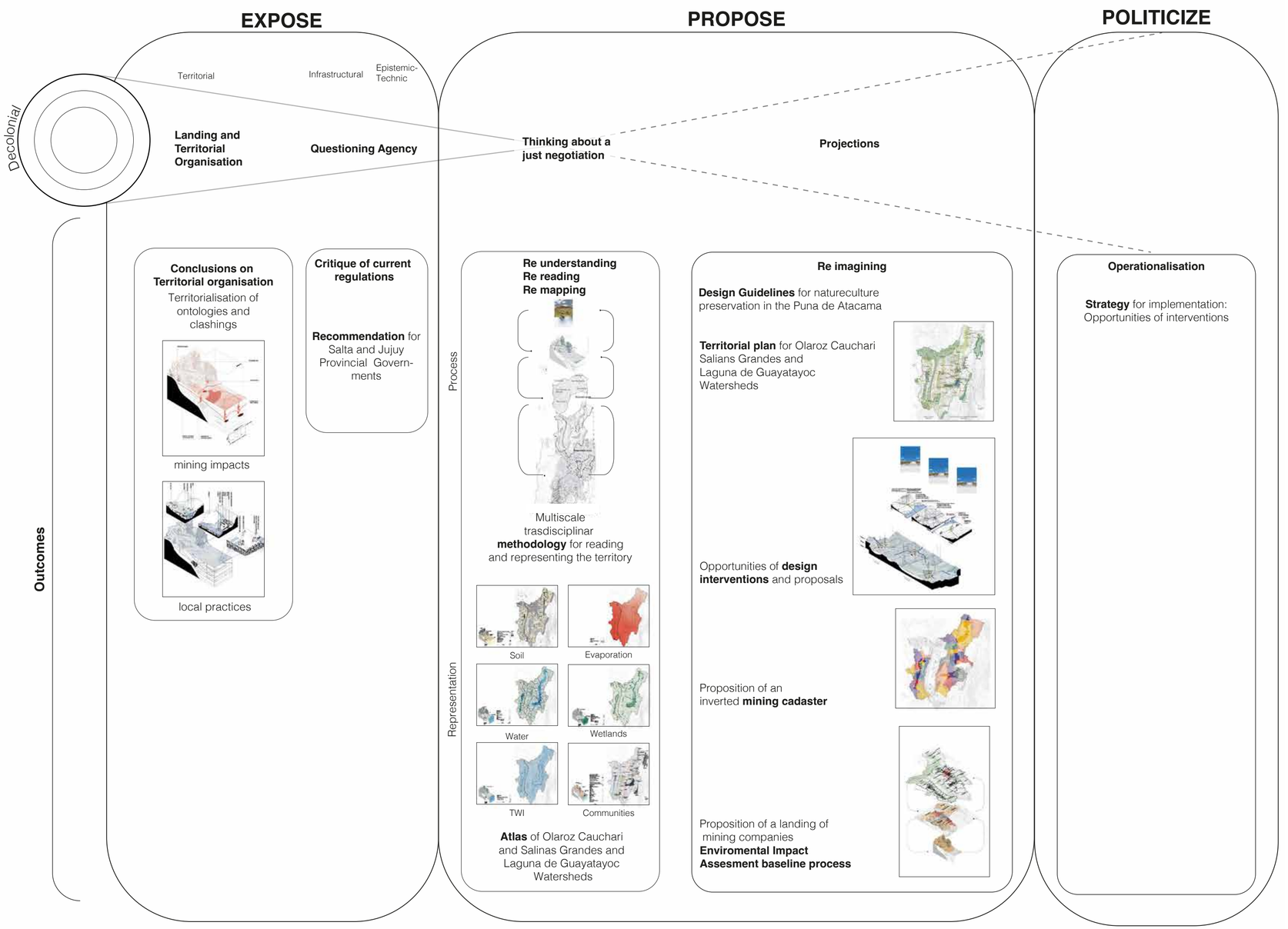
Proposed Mining cadaster



Contrasted mining cadasters

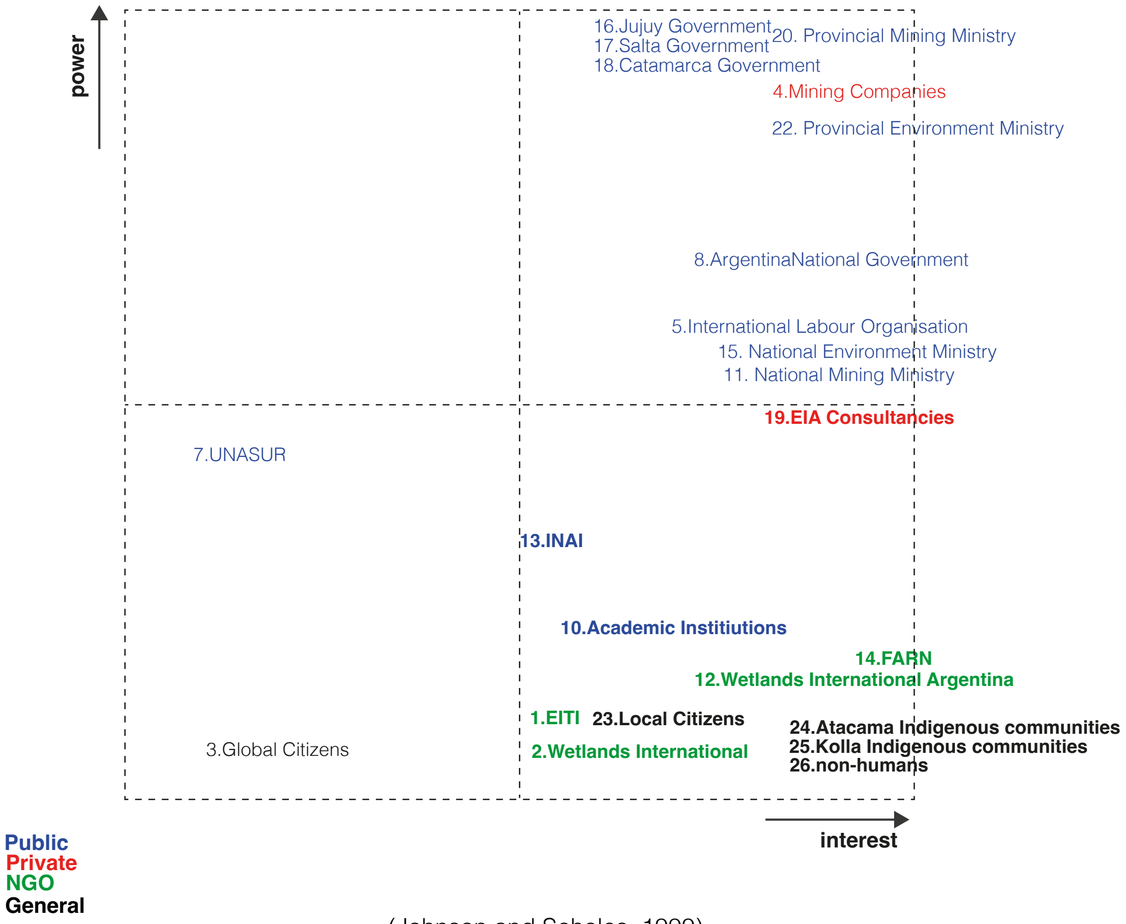
Contrasted cadasters




EXPOSE
PROPOSE
POLITICIZE
Decolonial
Territorial
Infrastructural
Epistemic-Technic
Landing and Territorial Organisation
Questioning Agency
Thinking about a just negotiation
Projections
Outcomes
Conclusions on Territorial organisation
Territorialisation of ontologies and clashings
mining impacts
local practices
Critique of current regulations
Recommendation for Salta and Jujuy Provincial Govern-ments
Process
Representation
Re understanding
Re reading
Re mapping
Multiscale trasdisciplinar methodology for reading and representing the territory
Soil
Evaporation
Water
Wetlands
TWI
Communities
Atlas of Olaroz Cauchari and Salinas Grandes and Laguna de Guayatayoc Watersheds
Re imagining
Design Guidelines for natureculture preservation in the Puna de Atacama
Territorial plan for Olaroz Cauchari Salians Grandes and Laguna de Guayatayoc Watersheds
Opportunities of design interventions and proposals
Proposition of an inverted mining cadaster
Proposition of a landing of mining companies
Enviromental Impact Assesment baseline process
Operationalisation
Strategy for implementation: Opportunities of interventions

Politicize

Stakeholder analysis



Global International
1.EITI
2.Wetlands International
3.Global Citizens
4.Mining Companies
5.International Labour Organisation

Latin America
6.CEPAL
7.UNASUR

National
8.ArgentinaNational Government
9.Environment Ministry
10.Academic Institiutions
11. National Mining Ministry
12.Wetlands International Argentina
13.INAI
14.FARN
15. National Environment Ministry

InterProvincial
16.Jujuy Government
17.Salta Government
18.Catamarca Government
19.EIA Consultancies

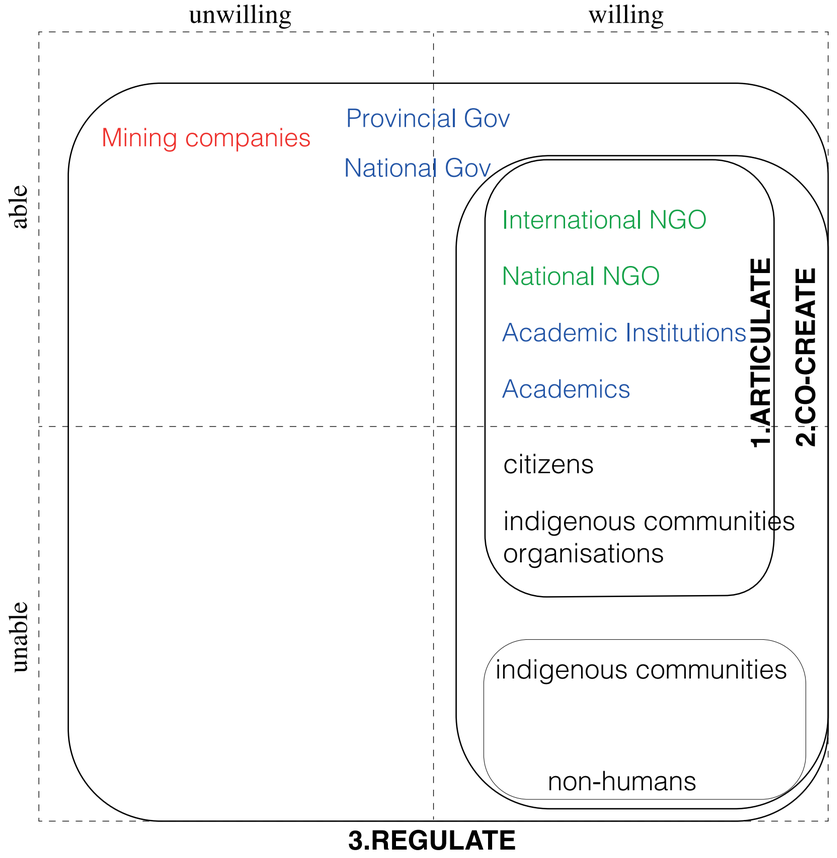
Provincial
20. Provincial Mining Ministry
21.Academic Institiutions
22. Provincial Environment Ministry
23.Local Citizens

Municipal
4.Mining Companies
24.Atacama Indigenous communities
25.Kolla Indigenous communities
26.non-humans

(Johnson and Scholes, 1999)

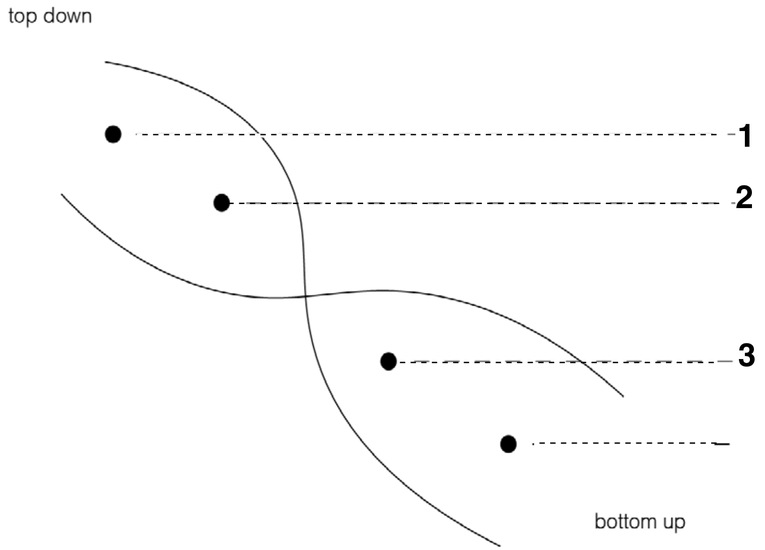
Politicize

Willing-Unwilling matrix and actions



Politicize

The Opportunities Project



1. Implementation of a nature culture protection plan.

-Specific objective: To identify and protect landscapes, practices and knowledge that integrate the ecological and cultural value of the territory.Institutionalising the relational approach through policies and plans.
-Instruments: Protected areas, areas to be rehabilitated, new mining cadastre, agricultural areas, community tourism areas, salt harvesting areas.

2. Relational EIA (Environmental Impact Assessment with Relational Approach)

Specific objective: To implement an assessment methodology that considers not only biophysical impacts, but also socio-ecological, affective and cultural relationships.
Changing the way the impact of projects on the territory is assessed and institutionalising a common language and process.

Approaches: Dialogue of knowledges, active participation, non-conventional indicators.

3. Mapping actions, co-creation of information and rehabilitation-protection of vulnerable areas through a network of actors.

-Specific objective: Restore degraded areas through participatory processes and sensitive to the territorial fabric.
-Actions: Co-definition of relevant areas, endemic species areas, cultural reactivation, community appropriation of spaces.

Politicize

The Opportunities Project Feasibility

Gustavo Saenz, Governor of Salta Province during inauguration of Mariana Project by Ganfeng Lithium, February 2025.
Source: www.salta.gob

Politicize

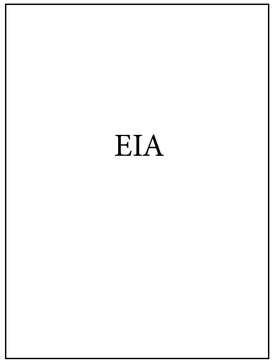
The Opportunities Project Feasibility

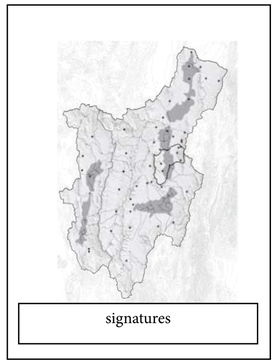
fixed and negotiated scales

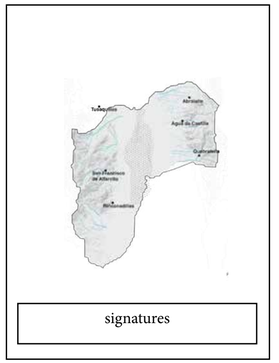
3. Relational EIA (Environmental Impact Assessment with Relational Approach)

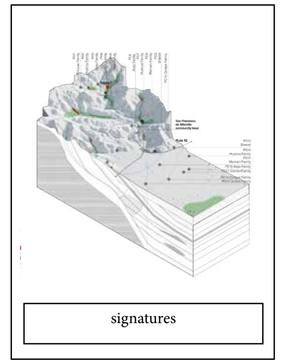
Specific objective: To implement an assessment methodology that considers not only biophysical impacts, but also socio-ecological, affective and cultural relationships.
Changing the way the impact of projects on the territory is assessed and institutionalising a common language and process.

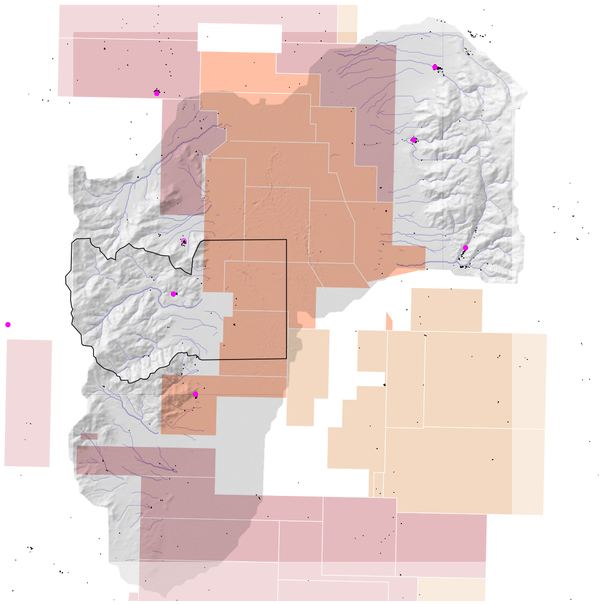
Approaches: Dialogue of knowledges, active participation, non-conventional indicators.

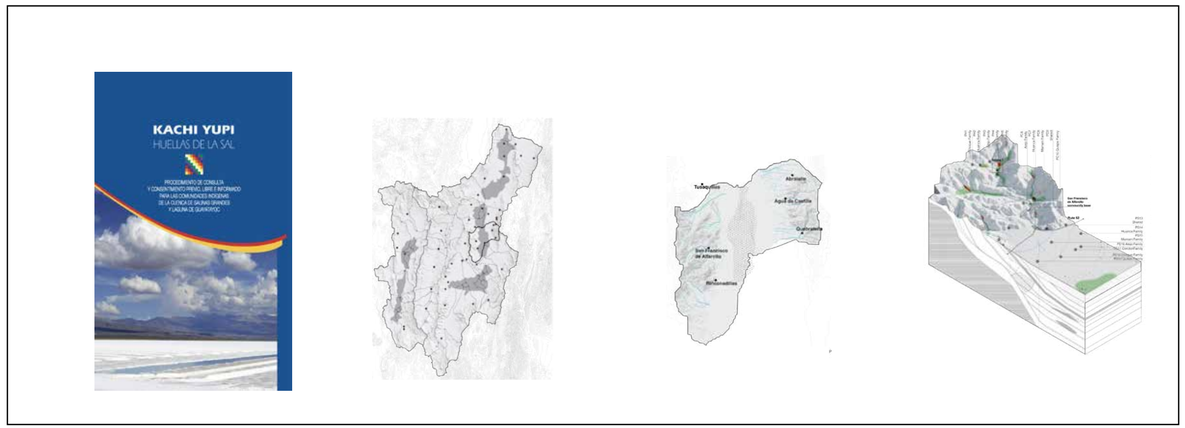










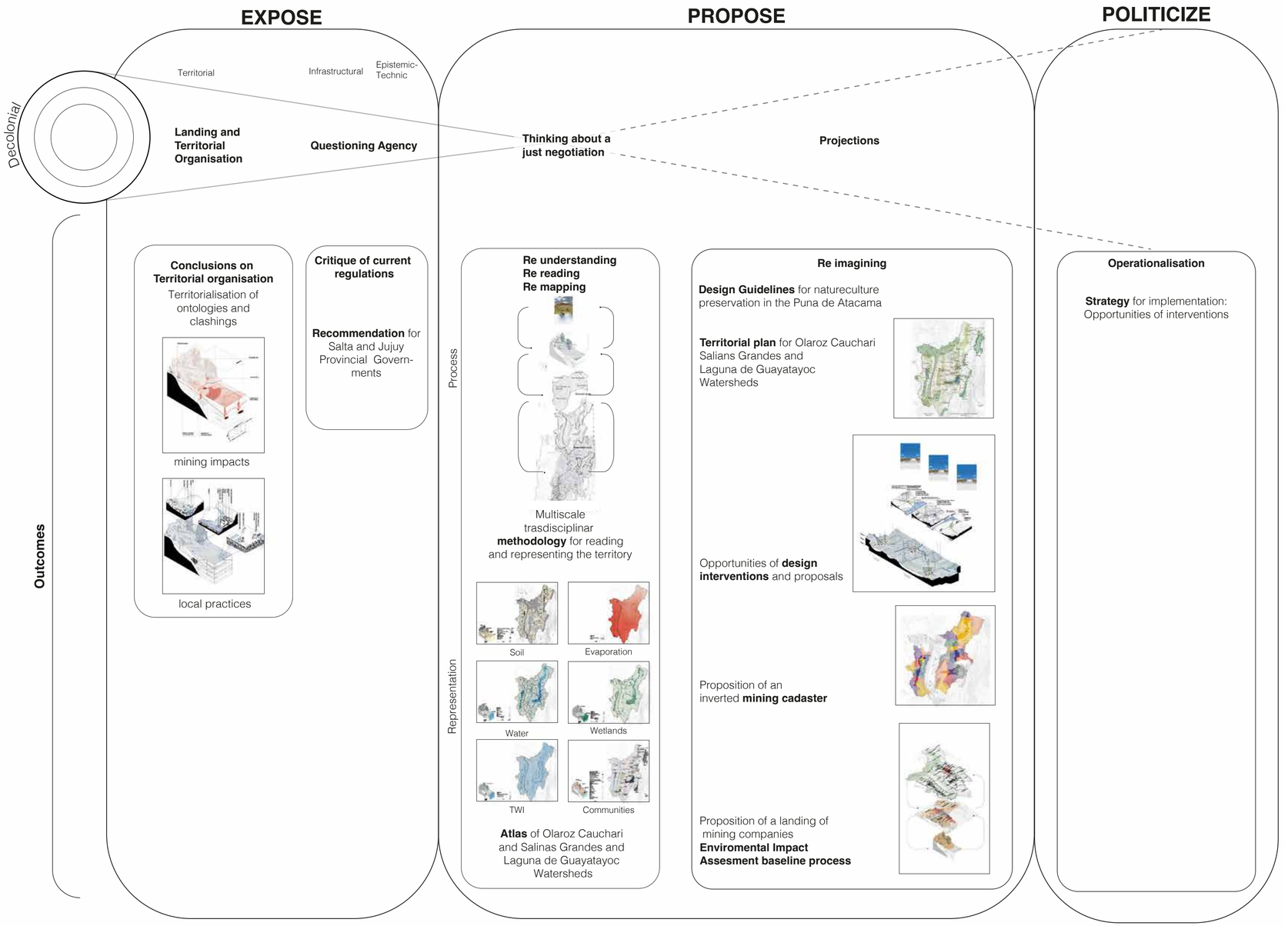


Conclusion

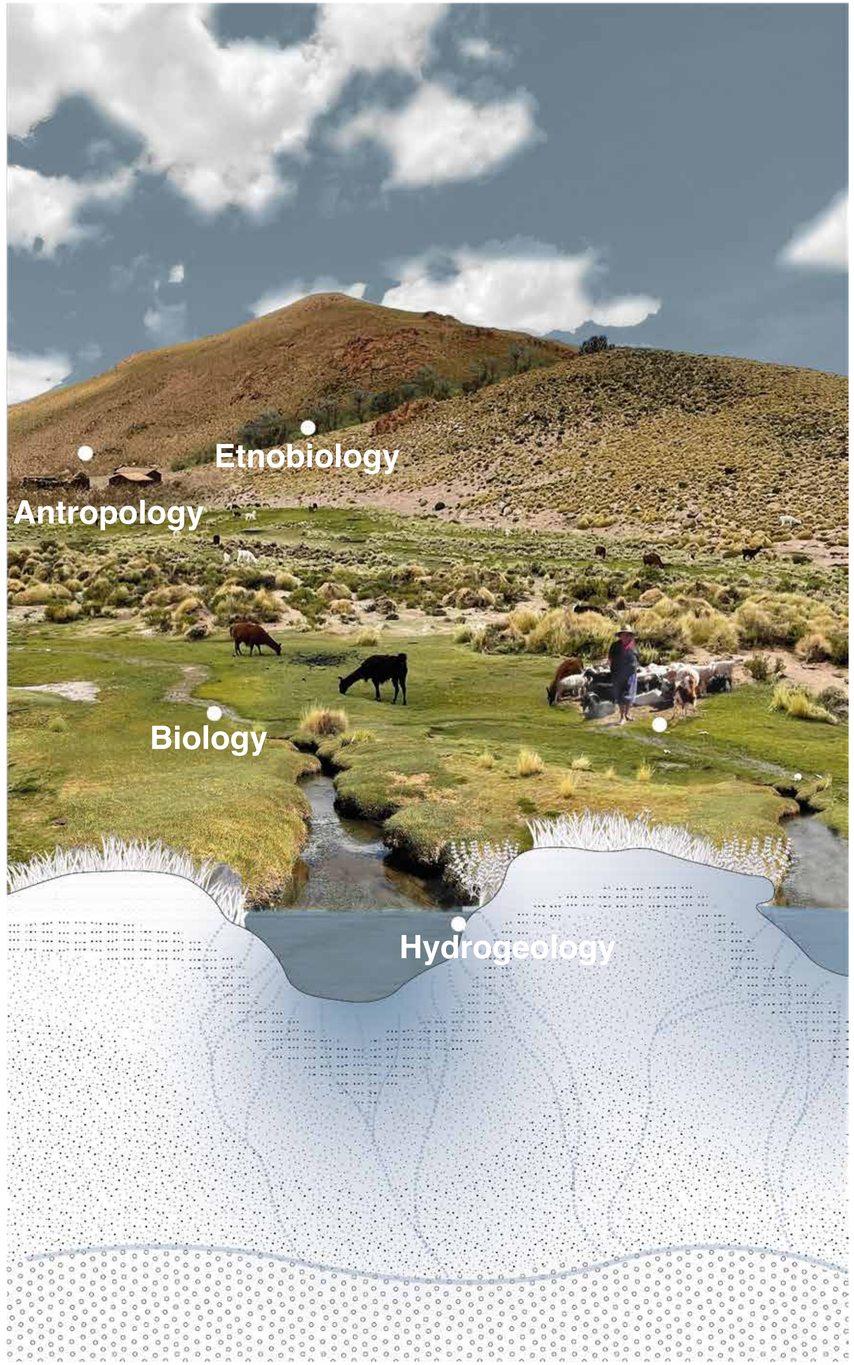
How can a territoriality of brine extractivism on the Puna de Atacama be achieved with a balance of power over the territory for a truly ecologically, politically and economically sustainable future?

Challenging colonial perspectives and tools,
while listening to the territory multiple voices
will create new opportunities for negotiation and collective construction.

Conclusion

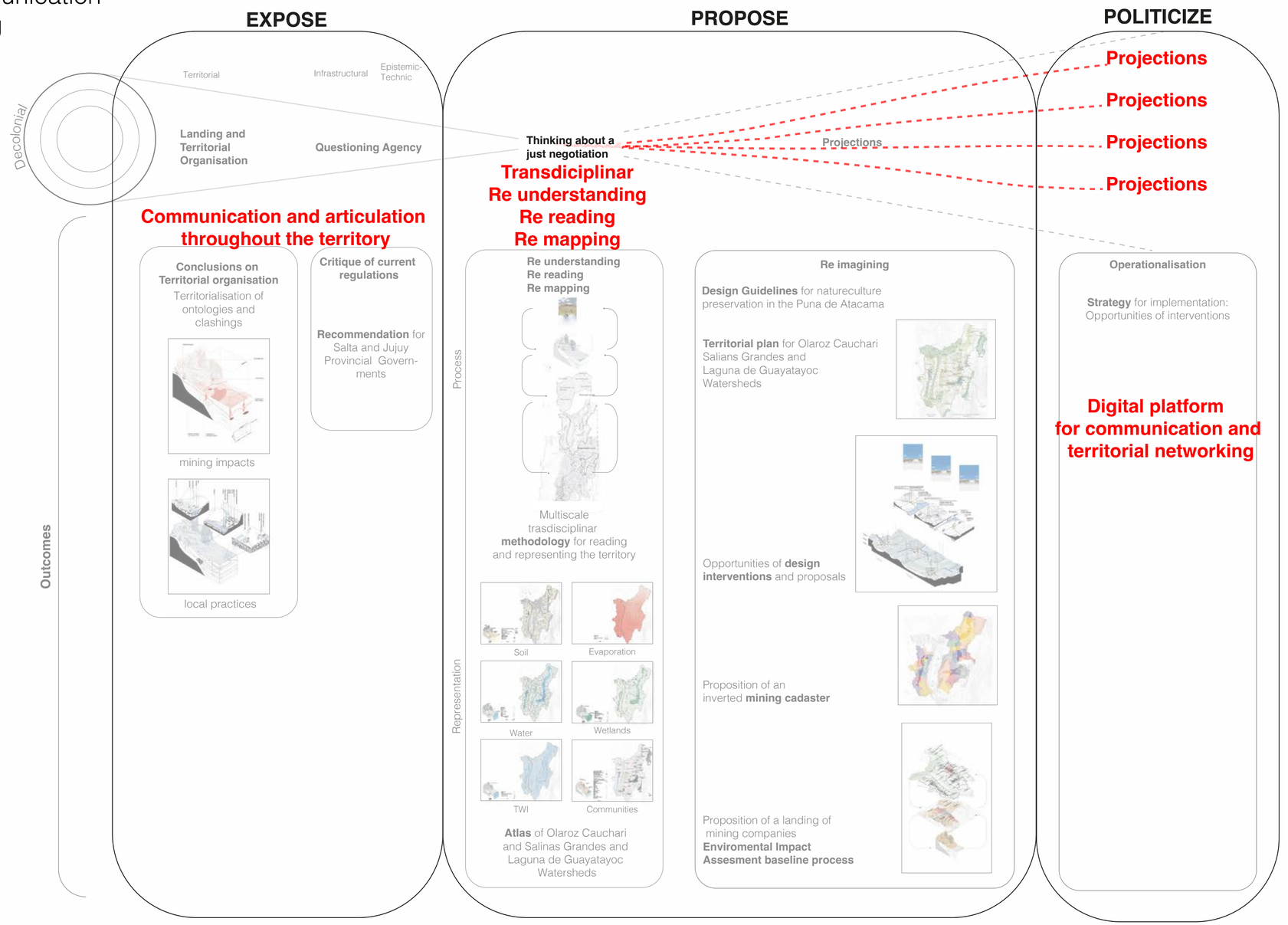

EXPOSE
PROPOSE
POLITICIZE
Decolonial
Territorial
Infrastructural
Epistemic-Technic
Landing and Territorial Organisation
Questioning Agency
Thinking about a just negotiation
Projections
Outcomes
Conclusions on Territorial organisation
Territorialisation of ontologies and clashings
mining impacts
local practices
Critique of current regulations
Recommendation for Salta and Jujuy Provincial Govern-ments
Process
Representation
Re understanding
Re reading
Re mapping
Multiscale trasdisciplinar methodology for reading and representing the territory
Soil
Evaporation
Water
Wetlands
TWI
Communities
Atlas of Olaroz Cauchari and Salinas Grandes and Laguna de Guayatayoc Watersheds
Re imagining
Design Guidelines for natureculture preservation in the Puna de Atacama
Territorial plan for Olaroz Cauchari Salians Grandes and Laguna de Guayatayoc Watersheds
Opportunities of design interventions and proposals
Proposition of an inverted mining cadaster
Proposition of a landing of mining companies
Enviromental Impact Assesment baseline process
Operationalisation
Strategy for implementation: Opportunities of interventions

Reflection

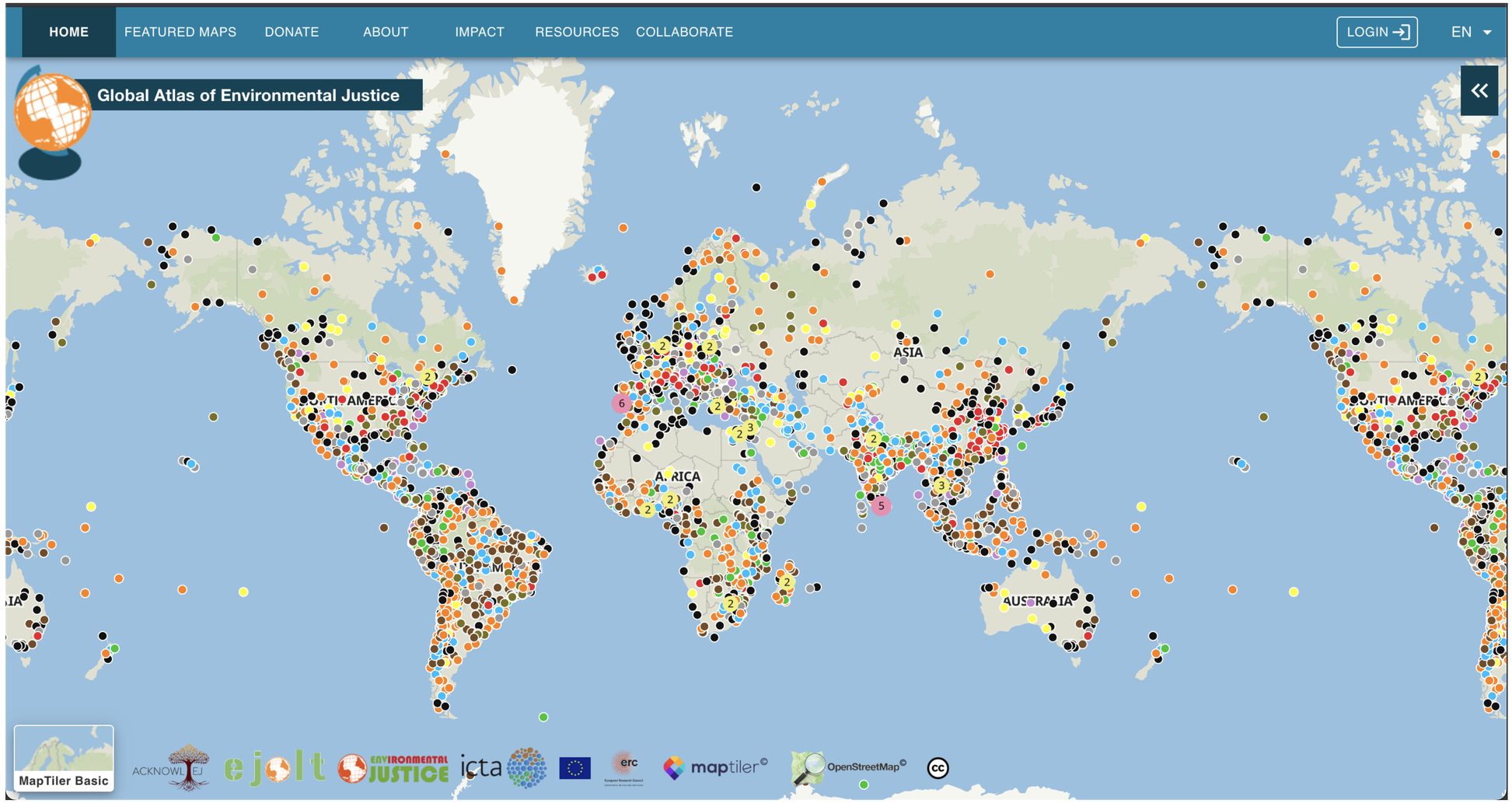


Politicize the Reflection

Digital platform for communication and territorial networking



https://eltriangulodelitio.com/


HOME
FEATURED MAPS
DONATE
ABOUT
IMPACT
RESOURCES
COLLABORATE
LOGIN
EN
Global Atlas of Environmental Justice
ASIA
MapTiler Basic
ACKNOWLEJ
ejolt
ENVIRONMENTAL JUSTICE
icta
erc
maptiler©
OpenStreetMap©

Thank you
Gracias