ENVISIONING A CLIMATE CHANGE-PROOF FUTURE

Adaptations of local communities

In response to reduced water availability and rising temperatures, certain communities in Sierra Nevada have replaced irrigated areas with rainfed crops, introduced new crop varieties and extended growing seasons in the highlands. Furthermore, lack of profitability has reduced the number of herders and livestock, meaning that more resources are available to those who continue with this activity. Despite this, animals cannot survive the summer in the mountains without extra feed and water.

Traditional water management as a backbone for biodiversity conservation

Overuse of water resources by surrounding areas and certain conservation and agricultural policies have negatively impacted the social-ecological system in Sierra Nevada. The network of irrigation channels, which has shaped the landscape and preserved biodiversity for centuries, now operates on only 700 kilometers out of the original 3,000.

Ensuring the generational renewal

Although traditional mountain agriculture and livestock systems struggle to compete in global markets, they are essential for the sustainability of the social-ecological system in the Sierra Nevada. International and national policies should protect these systems by promoting generational replacement while also promoting their transformation for better economic profitability and social recognition.

LOCAL COMMUNITIES ARE PART AND PARCEL OF A BIODIVERSE FUTURE

Traditional irrigation channels in Sierra Nevada enable the rich biodiversity of this Mediterranean hotspot and the preservation of its symbolic cultural landscape. Local communities' ecological knowledge grasps the intricacies of the present global change scenario. Thus, it is crucial to engage them in the design and management of adaptation plans aiming at biodiversity conservation and the wellbeing of the population.

PROTECTING LOCAL COMMUNITIES TO BROADEN OUR ECOLOGICAL KNOWLEDGE

The communities of Sierra Nevada are the last holders of an ancestral knowledge preserved for millennia that is essential for their prosperity and that of the wider social-ecological system. The survival of these communities relies on the recognition and economic appreciation of their knowledge and activities, which in turn leads to environmental benefits and positive social-cultural impacts.

LEARN MORE

LICCI is a European Research Council (ERC) funded project aiming to bring Indigenous and local knowledge to climate change research. Visit the project website for more details and research results.
www.licci.eu

Fieldwork conducted by: David García-del-Amo; Laura Levy

Credit: David García-del-Amo

Project hosted by: UAB Universitat Autònoma de Barcelona

Research led by: laseg Social-Ecological Systems Research Group; ICTA-UAB; Excelencia María de Maeztu

Funded by: erc

LICCI | Local Indicators of Climate Change Impacts

Mountain communities, Sierra Nevada
Andalucía, Spain

Drier and warmer climate has nearly eliminated perpetual snow from Sierra Nevada's summits. Local communities report reduced river flows, vanishing springs and wildlife, and increased pests and diseases. Impacts are aggravated by the synergistic effects of land use change due to conservation and agricultural policies, technological changes in primary sectors, and market pressures.

Credit: Laura Levy

MOUNTAIN COMMUNITIES

With a population of over 90,000 people, local communities are endangered actors of the Sierra Nevada UNESCO Biosphere reserve, where the economy is turning towards tourism.

Traditional livelihoods maintain a network of irrigation channels providing water to humans as well as wild fauna and flora.

ACTIVITIES

Rainfed olives, almonds, and vineyards. Fruits and vegetables in irrigated lands and homegardens.

Goats, sheeps and cows. Transhumance, once common, is disappearing.

Beekeeping yields honey and serves as a pollinator for ecological crops.

TERRITORY AND CLIMATE

Credit: David García-del-Amo

Semi-arid

CLIMATE*

Changes in the climate

0°C to 12°C avg. >2000 masl
0°C to 25°C avg. <2000 masl

Since the 1960s, the territory has shown an average increase of 0.1-0.3°C per decade and longer heat waves.

200 - 700 mm avg.

Since the 1970s, rainfall and snow extent and persistence have decreased. The relict permafrost is rapidly disappearing.

*With large seasonal & geographical variations.

ACCESS TO NATURAL RESOURCES

Changes in the territory

Ditches provide snowmelt, rain and ground water to people, crops, and pastures.

Terraced mountain slopes foster fertile fields, while highlands host communal pastures. Forests supply wood. Local stone is used for irrigation channels and construction.

A ski resort and nearby greenhouses place high demands on groundwater for artificial snow and irrigation.
Depopulation. Declaration of the Natural and National Park and EU farming regulations. Reforestation and loss of local agrobiodiversity. Fertilizers and pesticides cause soil and water pollution.

VOICES OF LOCAL KNOWLEDGE

Communities in Sierra Nevada possess a profound local ecological knowledge of the area, rooted in their traditional water management system. However, climate change, conservation and agricultural policies, and technological changes in the primary sector threaten the foundations of their social-ecological system.

Drivers of change

Credit: David García-del-Amo

"The increase in wild boars and mountain goats greatly reduces my production of olive and almond trees."

"The landscape used to be green. Today, there are fewer people in the fields and the water channels are dry!"

Credit: Laura Levy

" I have a peach tree which my grandmother planted 50 years ago. The new fruit tree varieties do no last more than10 years due to pests and temperatures."

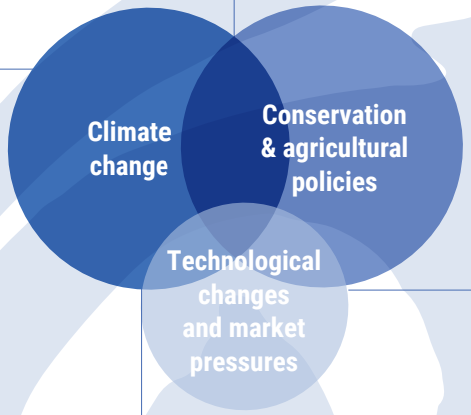
"When we joined the European Economic Community, decisions on milk and cereal quotas changed the agriculture of the whole region."

"The atmosphere has changed. It is no longer always raining with a westerly wind."

"In the old days, the ground would freeze over during the winters and the fields were dewormed."

"Heat waves are more frequent and intense, some of my hives have melted."

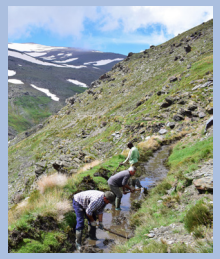
Credit: David García-del-Amo



"My brothers used to spend the summer watering under the sun. Today, the computer does it."

Credit: David García-del-Amo

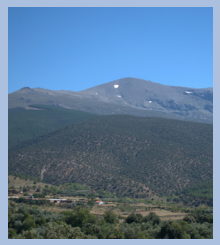
IMPACTS ON LIVELIHOODS AND CULTURE



Credit: David García-del-Amo

Abandonment of the traditional irrigation system

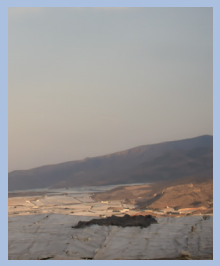
The network of irrigation channels of Sierra Nevada is threatened by reduced water availability due to climate change. The restricted use of large areas of the mountains and the decrease in farming contribute to its abandonment.



Credit: David García-del-Amo

A clash between new policies and traditional livelihoods

Conservation and farming policies further deplete traditional livelihoods impacted by climate change. The adoption of non-native crop varieties and livestock breeds combined with rising temperatures have increased pests and diseases.



Credit: David García-del-Amo

Endangered mountain livelihoods and landscapes

Global markets and climate change threaten traditional livelihoods in Sierra Nevada and endanger the iconic snow-capped peaks and green landscape, which are paradoxically a symbol of local identity and tourist attraction.