CONSEJERÍA DE MEDIO AMBIENTE Y ORDENACIÓN DEL TERRITORIO

JUNTA DE ANDALUCIA

SIERRA NEVADA
PARQUE NACIONAL
PARQUE NATURAL

UNESCO
Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura

MaB 1971 2011 40
Programa sobre el Hombre y la Biosfera

Observatorio
Cambio Global
Sierra Nevada

EUROPARC
CONFERENCE 2014
28th SEPTEMBER – 1st OCTOBER
KILLARNEY - IRELAND

THE VALUE OF RESEARCH IN A PROTECTED AREA:

Sierra Nevada Global Change Observatory as a case study

Unión Europea
Fondo Europeo de Desarrollo Regional

EUROPARC FEDERATION

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Agencia de Medio Ambiente y Agua
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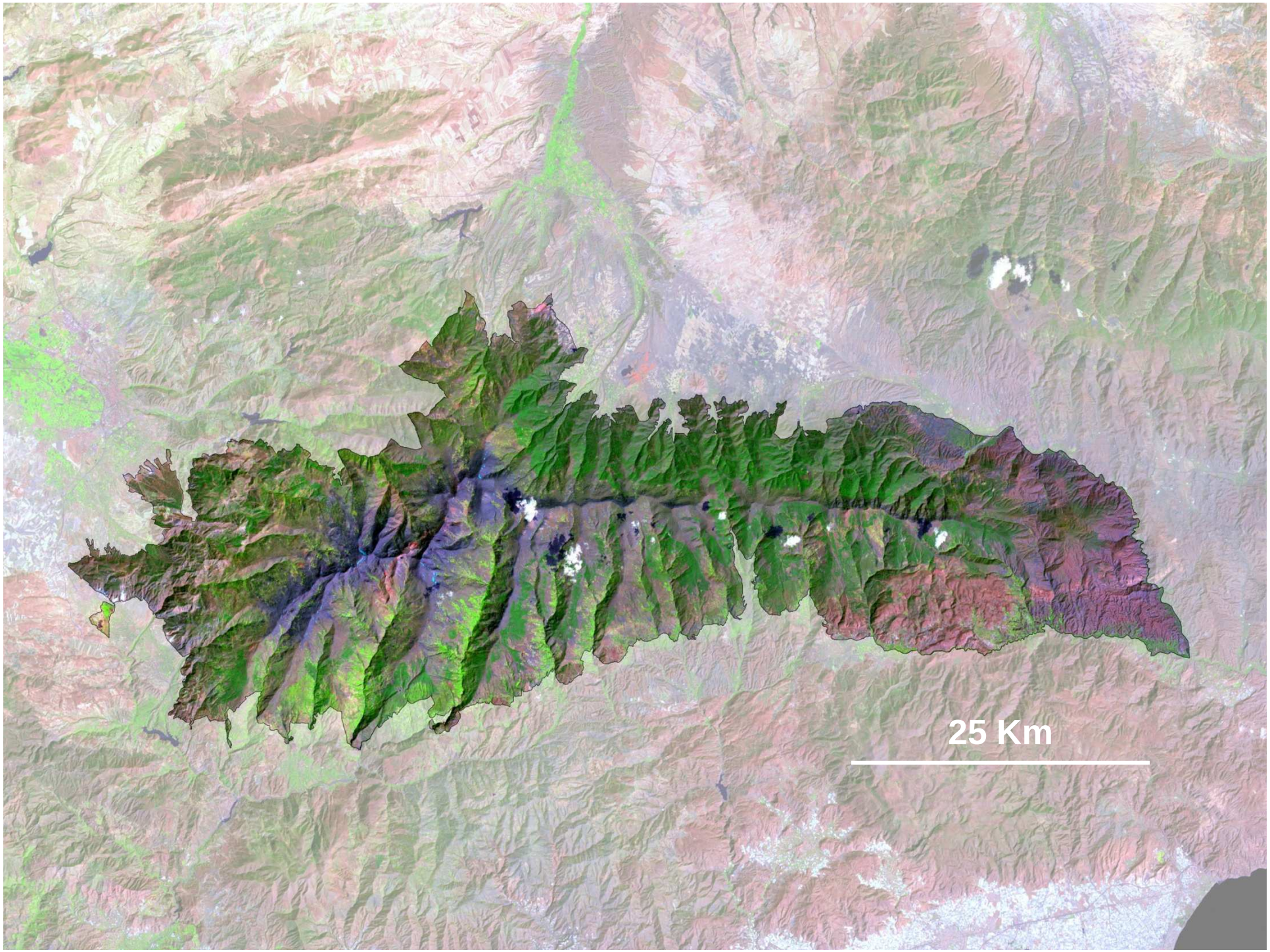
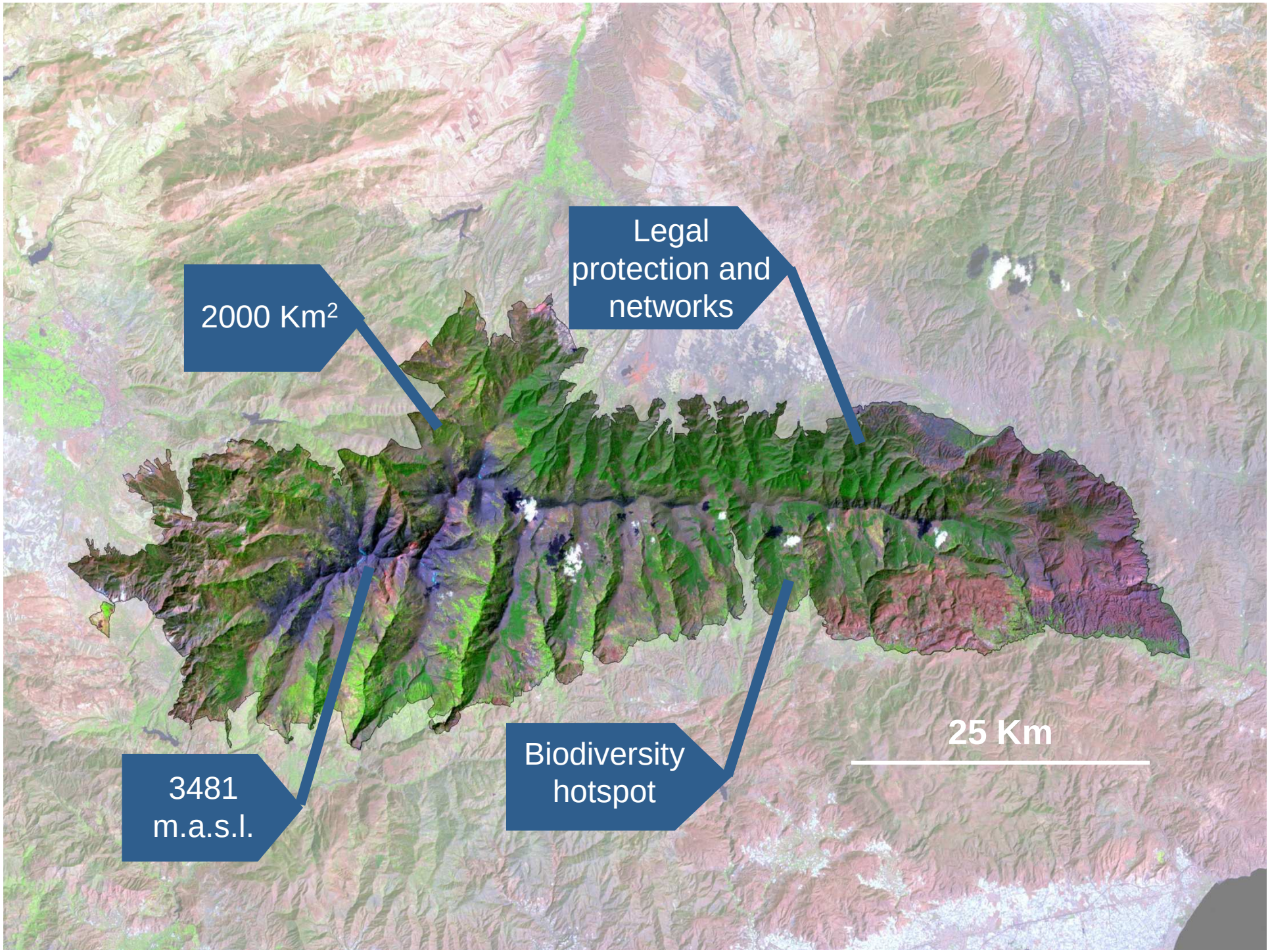
INDEX

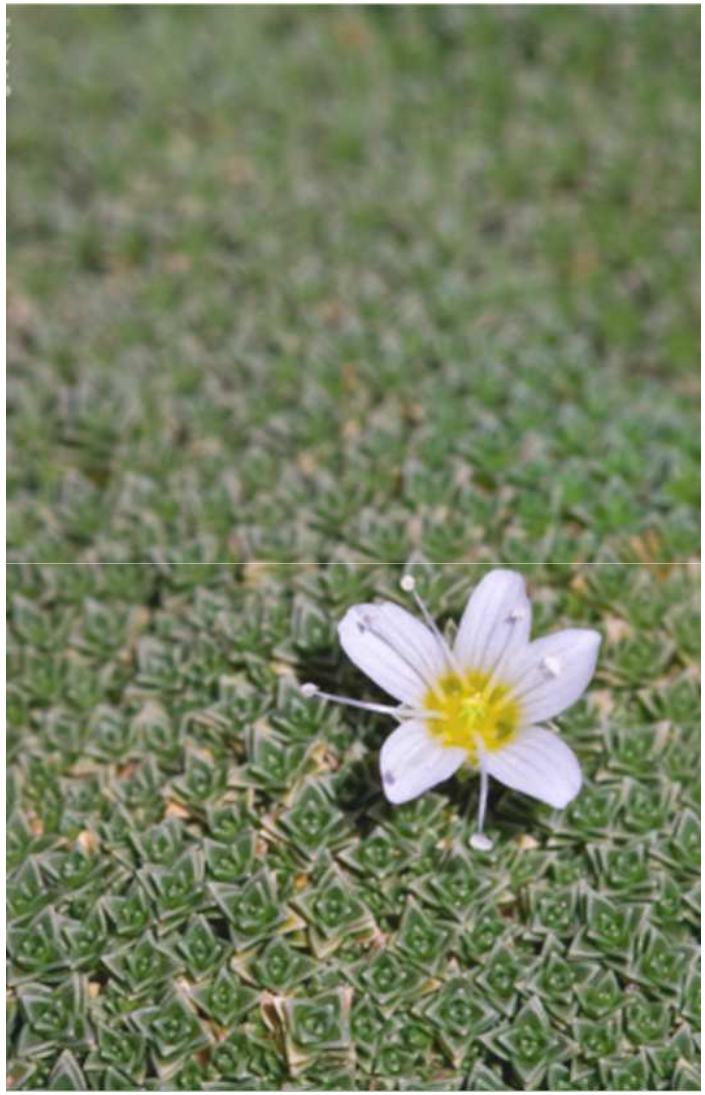
- **INTRODUCTION TO SIERRA NEVADA GLOBAL CHANGE OBSERVATORY**
- **IMPORTANCE AND BENEFITS OF SNGCO FOR THE MANAGEMENT OF SIERRA NEVADA BIOSPHERE RESERVE**
- **WHAT CAN BE DONE TO IMPROVE RESEARCH IN PROTECTED AREAS? FROM THEORY TO PRACTICE IN ACTIVE AND ADAPTIVE MANEGEMENT**
- **SOME PERSONAL REFLECTIONS: HOW IS TO WORK ON LONG TERM MONITORING IN A NATIONAL PARK?**


Andorra
Porto
Madrid
Lisboa
Cádiz
Gibraltar
Mar de Alborán


25 Km


2000 Km²
Legal protection and networks
3481 m.a.s.l.
Biodiversity hotspot
25 Km

Biodiversity hotspot



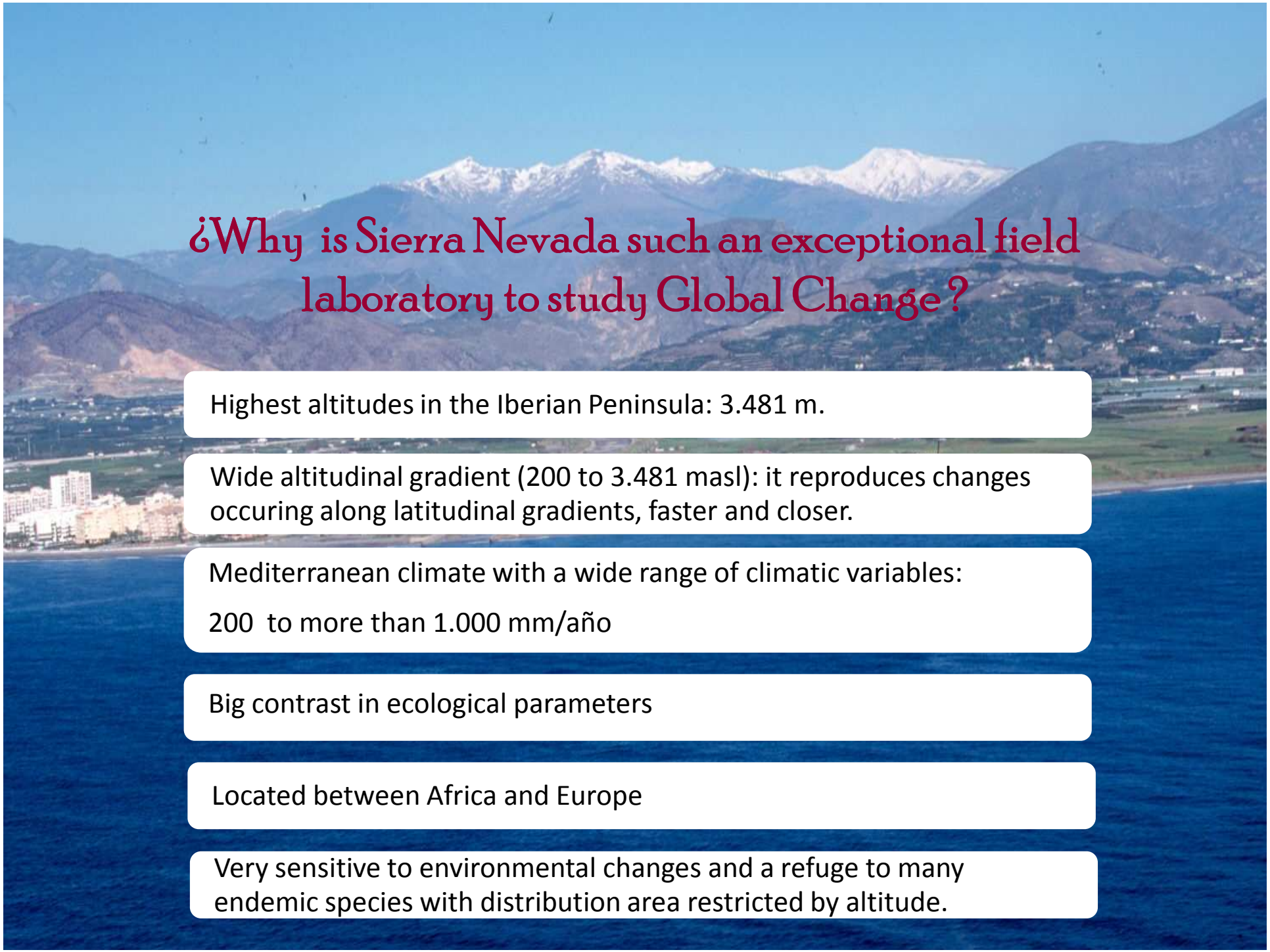
2100 species of vascular plants (21% of European flora) 66 exclusive endemisms (30-40% endemicity in summits), 80% of vegetal endemicity in local biotopes).
26 habitat types from the Habitats Directive

Biodiversity hotspot

Sierra Nevada hosts more than 10.000 species of invertebrates and 200 species of vertebrates

Legal protectioin and networks

- ✓ Biosphere Reserve
- ✓ Nature 2000 Area
- ✓ National Park
- ✓ LTER Site
- ✓ GLOCHAMORE
- ✓ GLORIA Site



¿Why is Sierra Nevada such an exceptional field laboratory to study Global Change?

Highest altitudes in the Iberian Peninsula: 3.481 m.

Wide altitudinal gradient (200 to 3.481 masl): it reproduces changes occuring along latitudinal gradients, faster and closer.

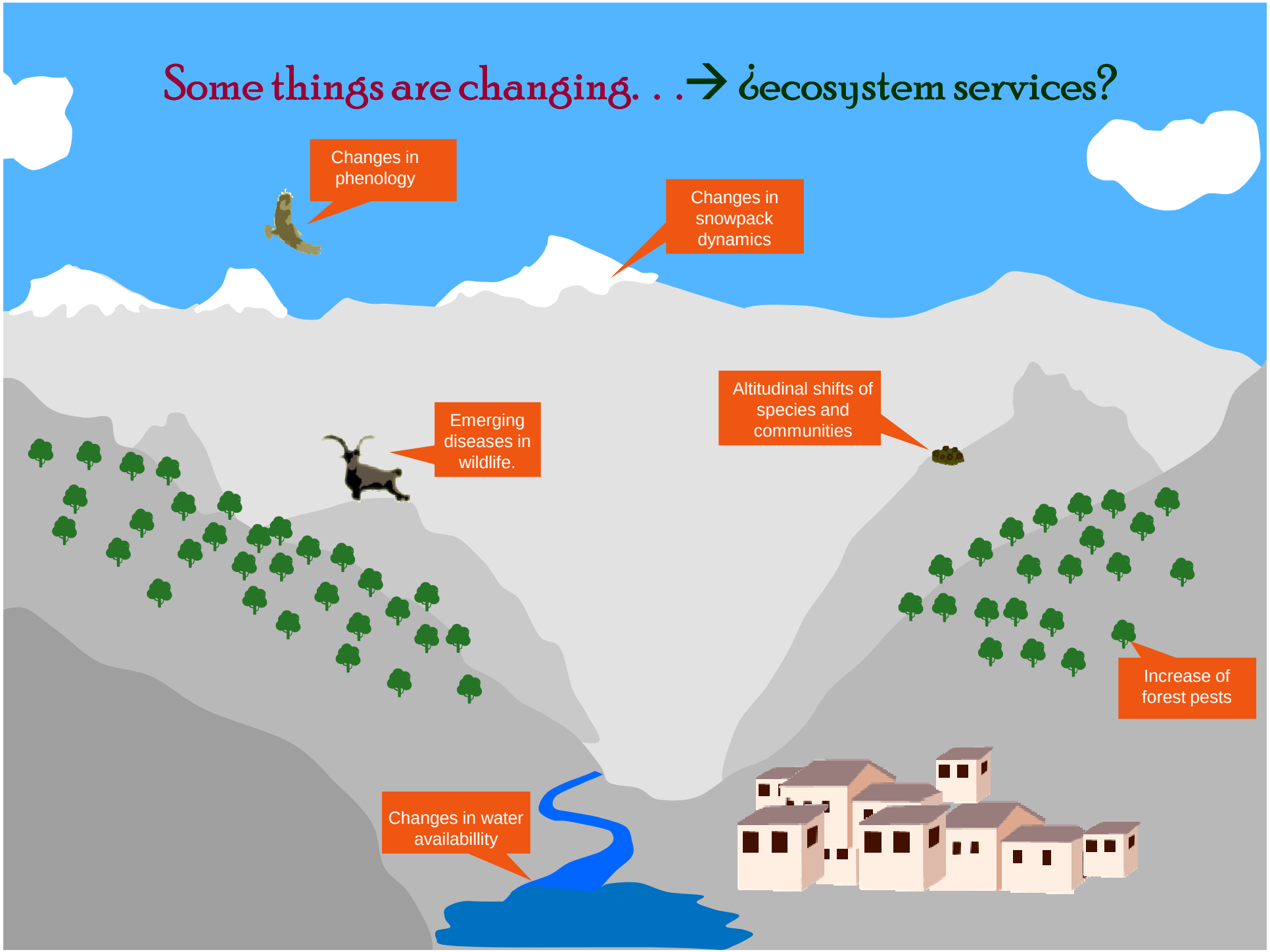
Mediterranean climate with a wide range of climatic variables:

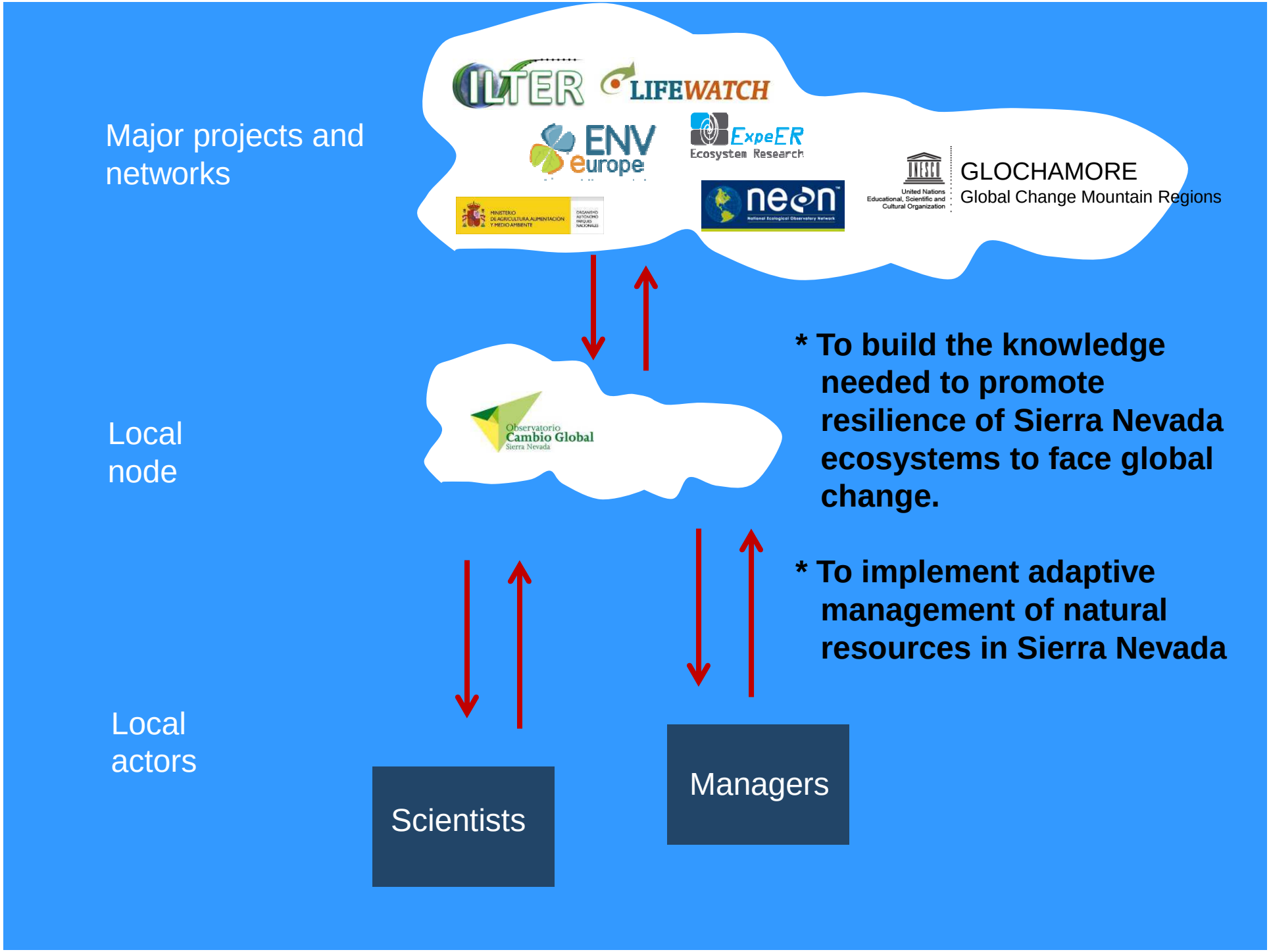
200 to more than 1.000 mm/año

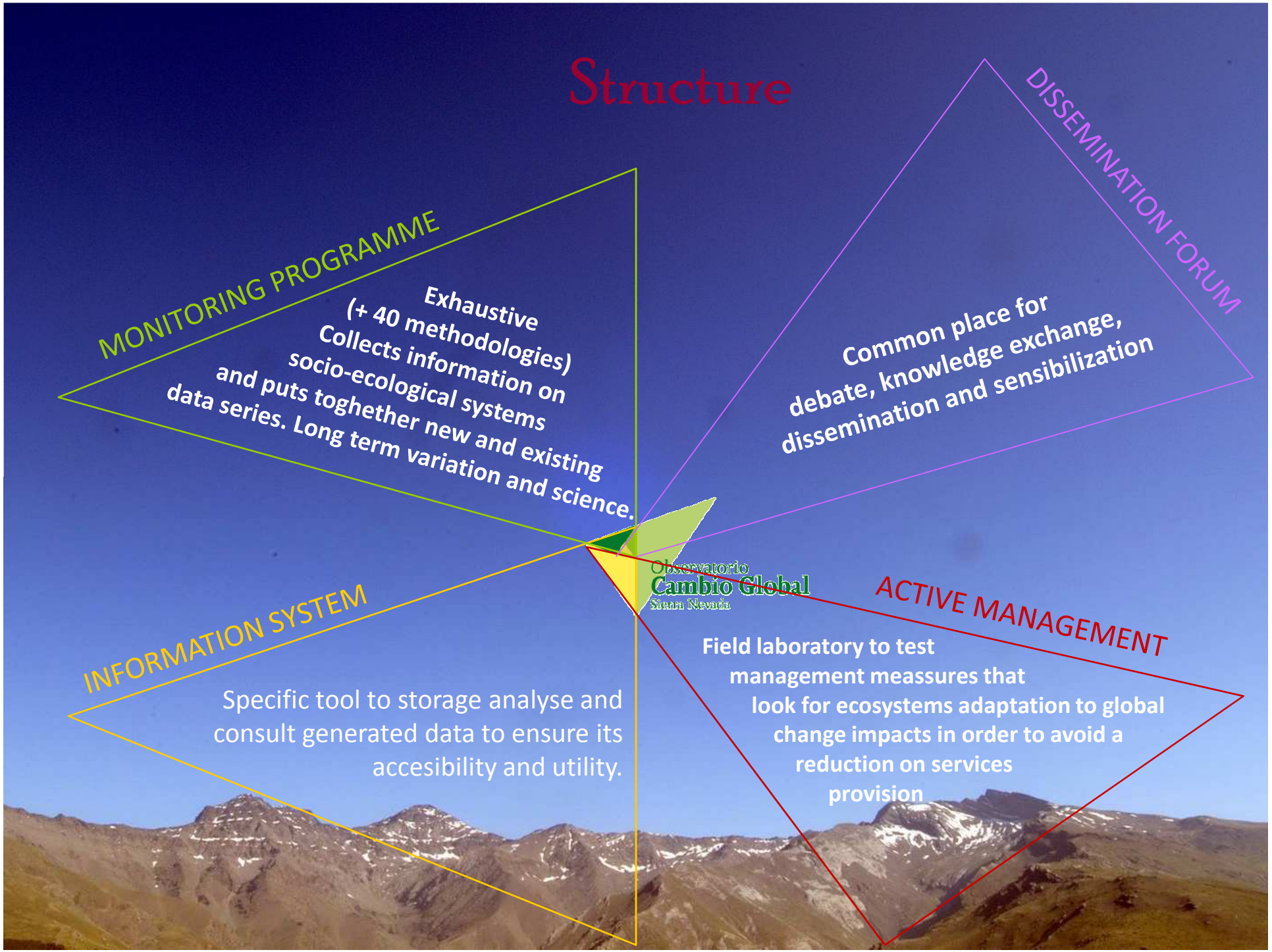
Big contrast in ecological parameters

Located between Africa and Europe

Very sensitive to environmental changes and a refuge to many endemic species with distribution area restricted by altitude.

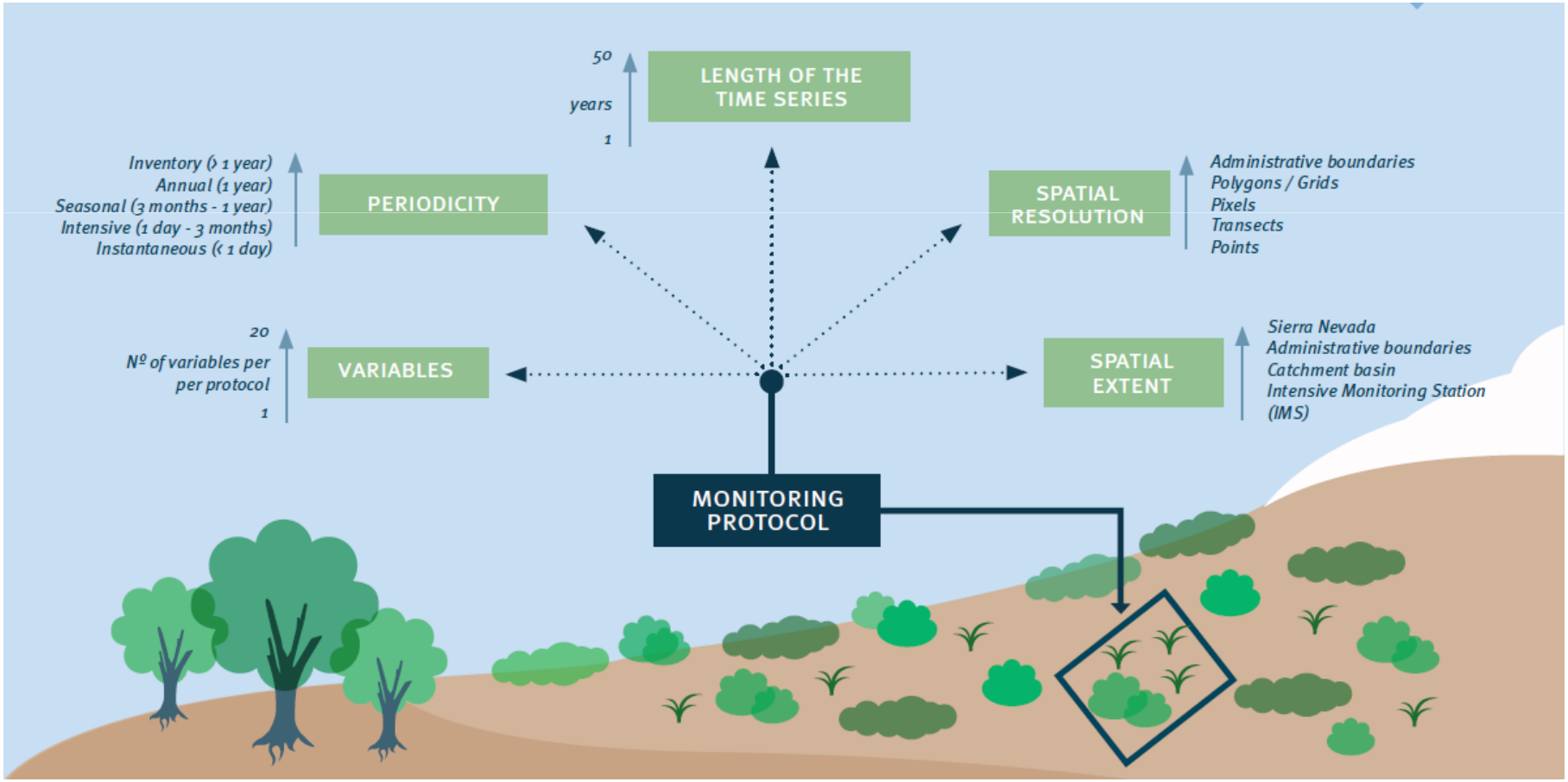

Some things are changing. . .→ ¿ecosystem services?
Changes in phenology
Changes in snowpack dynamics
Emerging diseases in wildlife.
Altitudinal shifts of species and communities
Increase of forest pests
Changes in water availabillity


Major projects and networks
ILTER
LIFEWATCH
ENV europe
ExpeER
Ecosystem Research
neon
National Ecological Observatory Network
United Nations Educational, Scientific and Cultural Organization
GLOCHAMORE
Global Change Mountain Regions
Local node
Observatorio Cambio Global Sierra Nevada
* To build the knowledge needed to promote resilience of Sierra Nevada ecosystems to face global change.
* To implement adaptive management of natural resources in Sierra Nevada
Local actors
Scientists
Managers


Structure
MONITORING PROGRAMME
Exhaustive
(+ 40 methodologies)
Collects information on
socio-ecological systems
and puts toghether new and existing
data series. Long term variation and science.
DISSEMINATION FORUM
Common place for
debate, knowledge exchange,
dissemination and sensibilization
Observatorio
Cambio Global
Sierra Nevada
INFORMATION SYSTEM
Specific tool to storage analyse and
consult generated data to ensure its
accesibility and utility.
ACTIVE MANAGEMENT
Field laboratory to test
management meassures that
look for ecosystems adaptation to global
change impacts in order to avoid a
reduction on services
provision

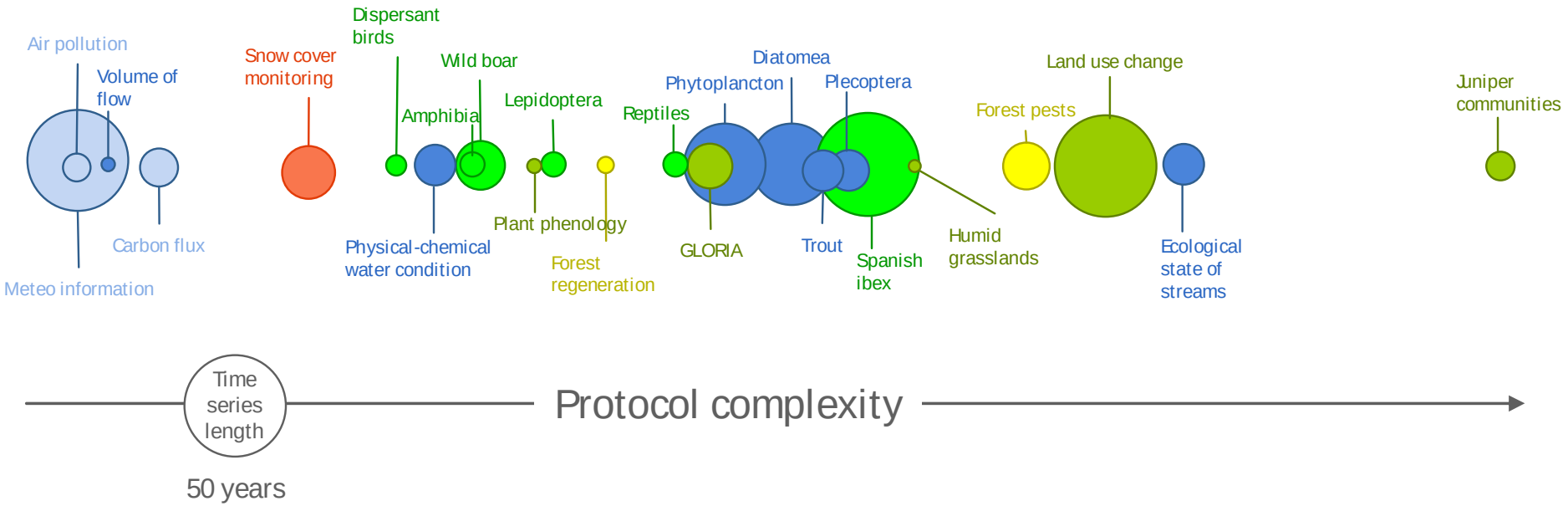
Monitoring Programme

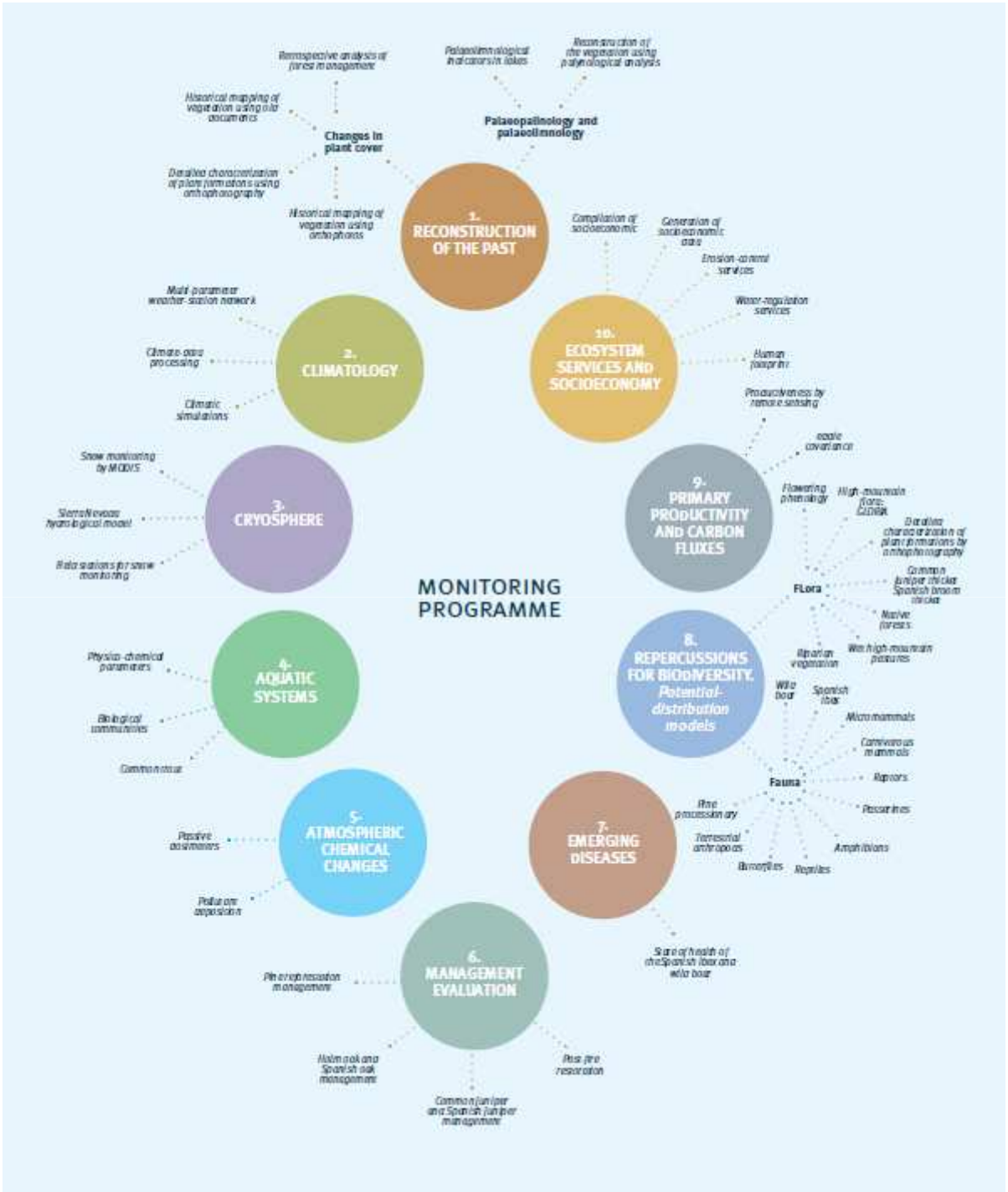
Schematic representation of the **five main attributes** used to characterize the 48 protocols comprising the Sierra Nevada Global-Change Monitoring Programme. Each attribute is defined using either continuous ranges of values (number of variables or series length) or discrete lists (period of data collection, resolution, and spatial extension).



- **The monitoring programme has aprox. 40 protocols scientifically validated**

- **They collect information for more than 100 environmental variables**



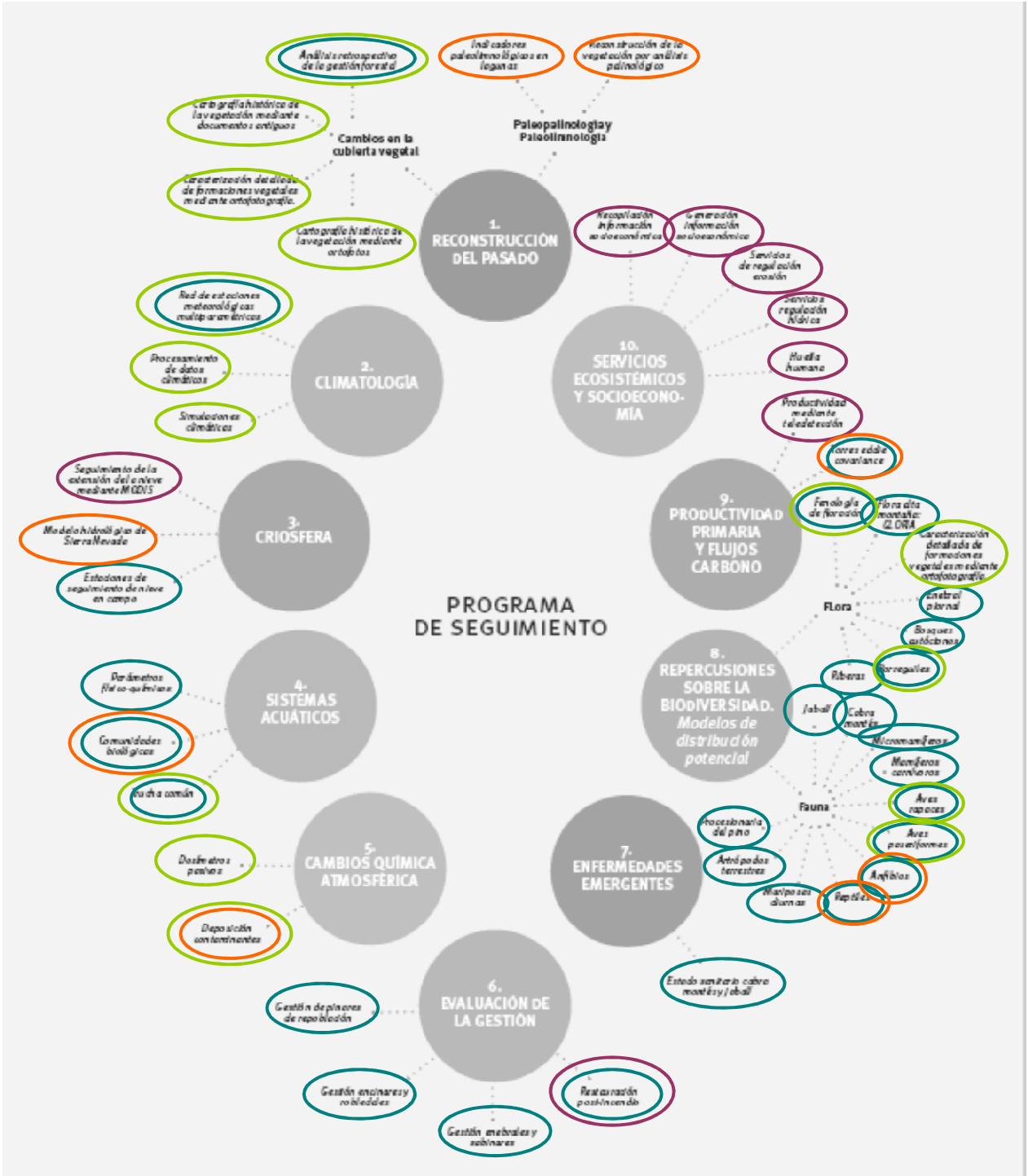

MONITORING PROGRAMME
1. RECONSTRUCTION OF THE PAST
Palaeopalinology and palaeolimnology
Changes in plant cover
Retrospective analysis of forest management
Historical mapping of vegetation using old documents
Detailed characterisation of plant formations using orthophotography
Historical mapping of vegetation using orthophotos
Palaeolimnological indicators in lakes
Reconstruction of the vegetation using palynological analysis
2. CLIMATOLOGY
Multi-parameter weather-station network
Climate-data processing
Climatic simulations
3. CRYOSPHERE
Snow monitoring by MODIS
SierraNevada hydrological model
Installations for snow monitoring
4. AQUATIC SYSTEMS
Physico-chemical parameters
Biological communities
Common otter
5. ATMOSPHERIC CHEMICAL CHANGES
Passive dosimeters
Pollutant deposition
6. MANAGEMENT EVALUATION
Pine reforestation management
Holm oak and Spanish oak management
Common juniper and Spanish juniper management
Pine fire restoration
7. EMERGING DISEASES
State of health of the Spanish ibex and wild boar
Pine processionary
Terrestrial arthropods
Birds
Mammalians
Reptiles
Amphibians
8. REPERCUSSIONS FOR BIODIVERSITY. Potential-distribution models
Flora
Common juniper thicket
Spanish broom thicket
Native forests
Riparian vegetation
Wild boar
Spanish ibex
Fauna
Micromammals
Carnivorous mammals
Raptors
Passerines
9. PRIMARY PRODUCTIVITY AND CARBON FLUXES
eddy covariance
Flowering phenology
High-mountain flora: CLIMER
Detailed characterisation of plant formations by orthophotography
Productiveness by remote sensing
10. ECOSYSTEM SERVICES AND SOCIOECONOMY
Compilation of socioeconomic
Generation of socioeconomic data
Erosion-control services
Water-regulation services
Human footprint

AMAs SN

AMAyA

iEcoLab

Otros grupos investigación



Observatorio Cambio Global Sierra Nevada

Team

CMAyOT – Sierra Nevada

CEAMA – UGR (iecoLAB)

Regino Zamora (Scientific coordination)

+

4 people from his research group. (Scientific and information management commetee)

Javier Sánchez (Dir. E.N.S.N), **Ignacio Henares** (Conservador), **Blanca Ramos** (Project Director) **Antonio Gómez** (Rangers Coordination), Jesús Vallejo y M.A. Mesa (Second Rangers coordinators)

8 rangers | 8 rangers | 8 rangers | 8 rangers

Climate & atmospheric pollution

Plants & forests

Animals

Rivers & lakes

Ignacio Maldonado (Economical responsible)

11 tecnicians, 8 field workers

AMAyA (public Agency)

Other research Groups

Dpto. Física de la Atmósfera – UGR,

Grupo Puertos y Costas CEAMA

Dto. Ecología (UGR),

Univ. RJC-Madrid,

Instituto Pirenaico de Ecología,

U. A. Barcelona,

Univ. Insbruk (Austria)

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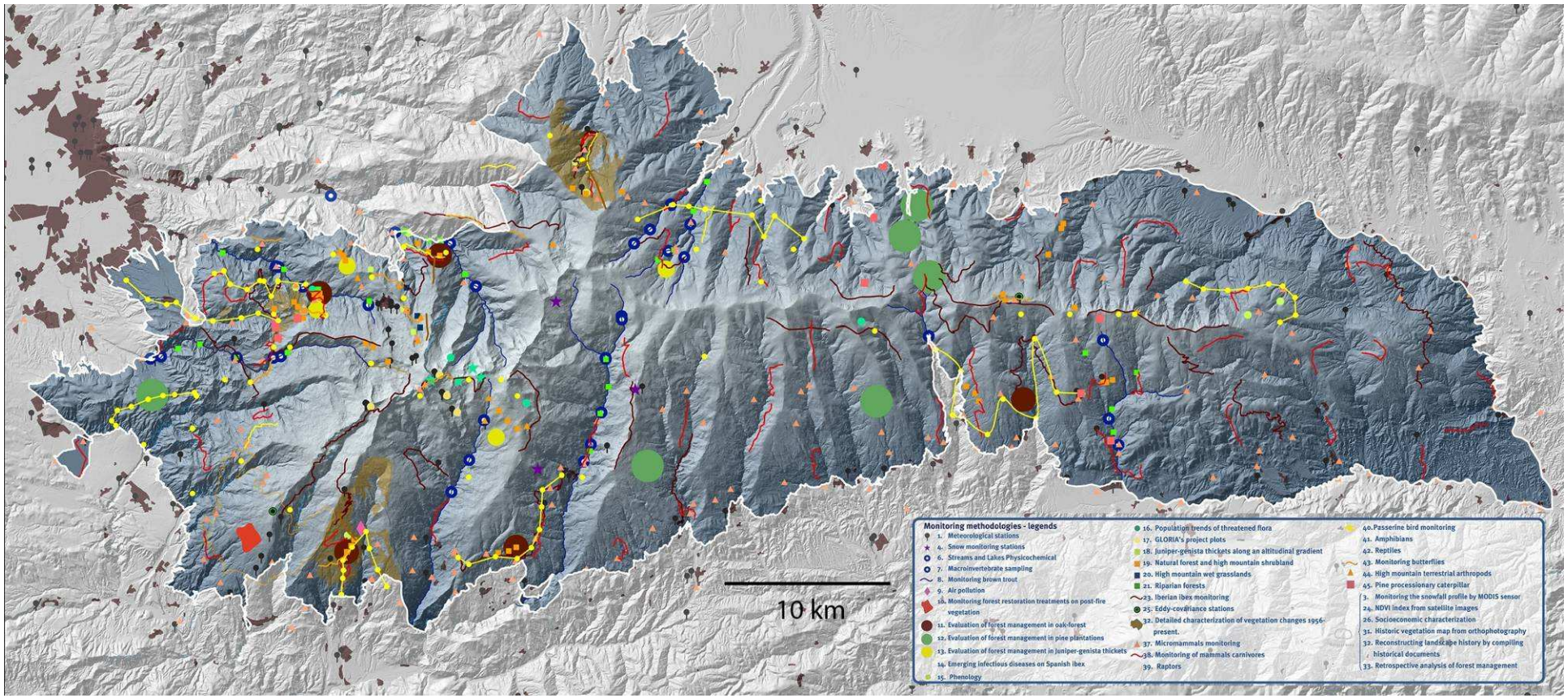
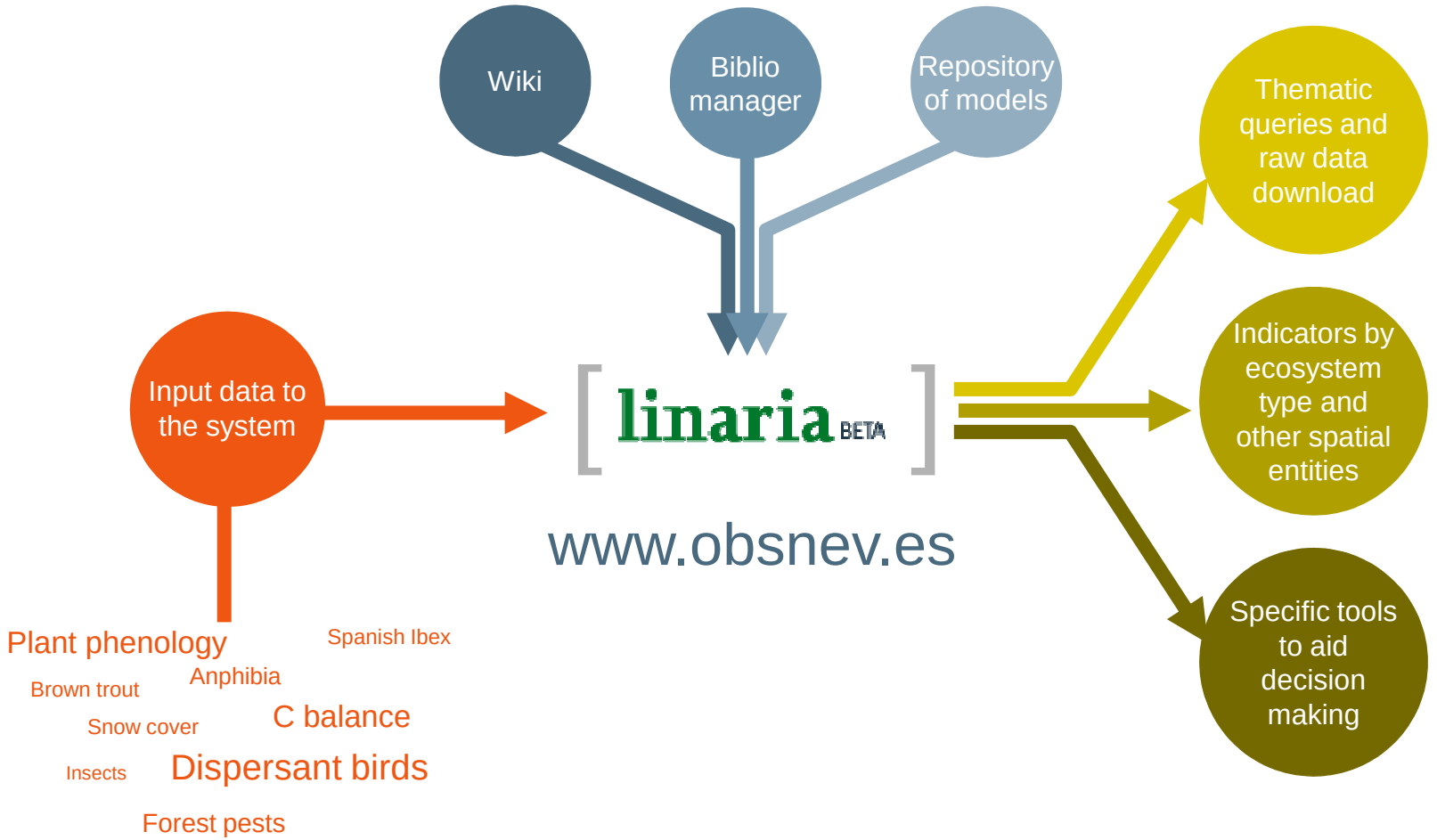
Methodologies of Sierra Nevada Global Change Observatory



Information System



Ecosistemas > **Enebrales-piornales**

Distribución | Indicadores | Servicios ecosistémicos | Gestión adaptativa

DISTRIBUCIÓN ESPACIAL

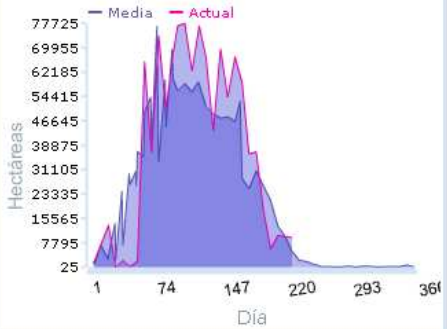
Ocultar

- Se localizan en la franja altitudinal 1800-3100 m.
- Formación vegetal mas extensa de Sierra Nevada.
- Caracterizada por las formas almohadilladas (pulvinulares) semiesféricas de sus componentes como respuesta a las condiciones ambientales.
- Su dinámica está condicionada por el patrón de innivación.
- Ha sufrido una escasa presión antrópica por lo que se ha mantenido su área de ocupación estable.
- Las proyecciones a futuro indican un declive potencial acusado con pérdida de área potencial.

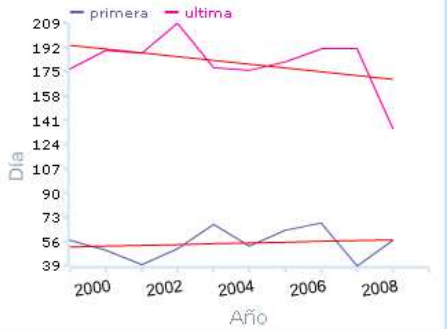
INDICADORES

Ocultar

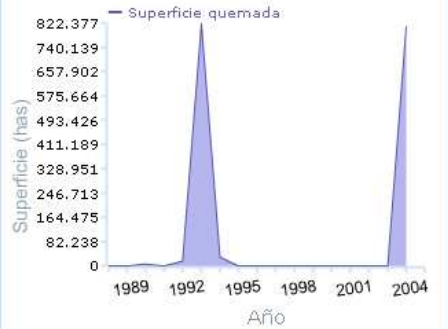
Perfil innivación CSV PNG METADATOS



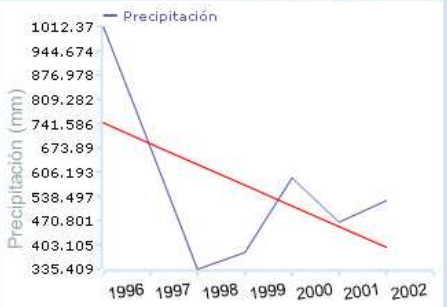
Primera - Última fecha con nieve CSV PNG METADATOS



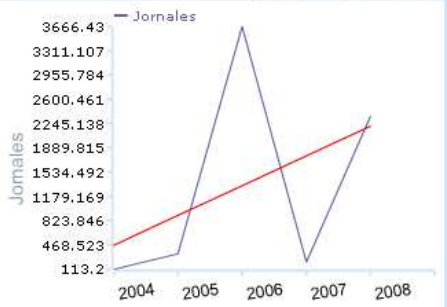
Area quemada por año CSV PNG METADATOS



Precipitación anual CSV PNG METADATOS



Inversión Forestal CSV PNG METADATOS



Índice de Actividad Rural CSV PNG METADATOS

- **INTRODUCTION TO SIERRA NEVADA GLOBAL CHANGE OBSERVATORY**
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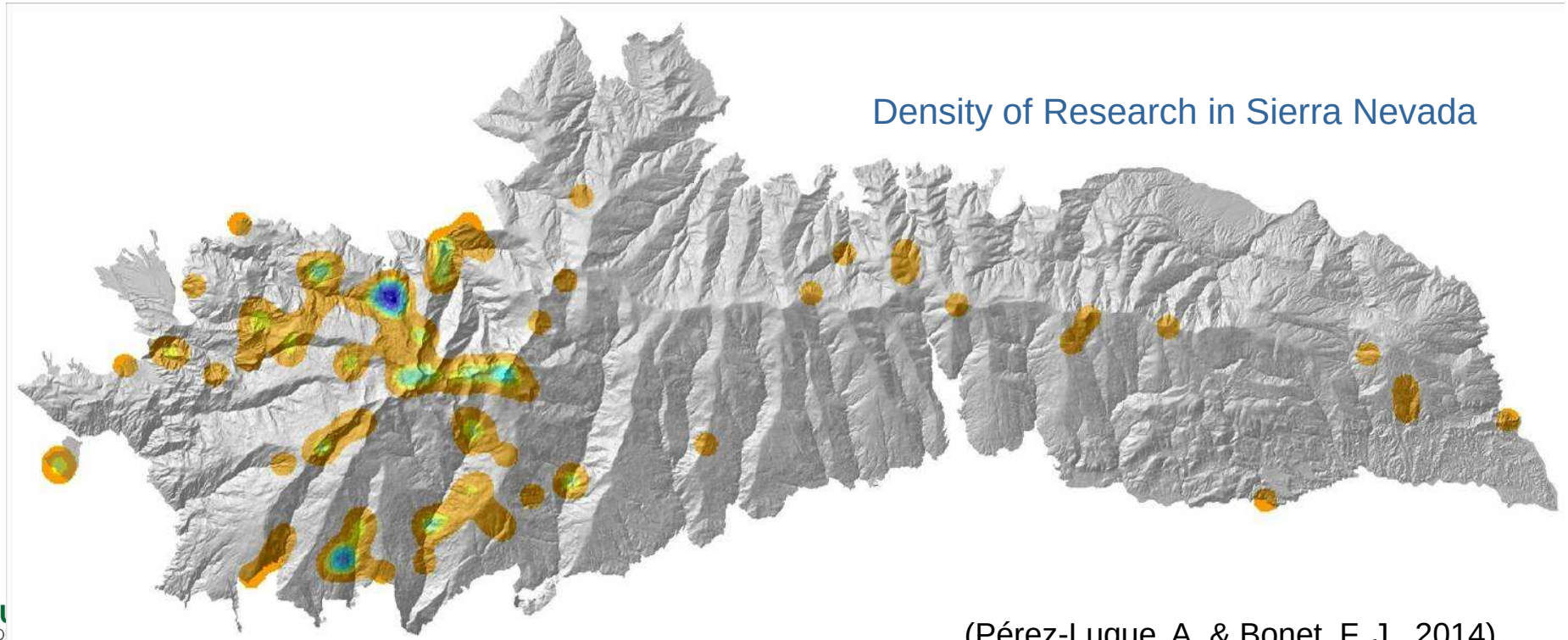
Scientific coordination of research in Sierra Nevada:

- **Exchange of existing information (sharing databases of existing information that can be useful to scientists)**
- **Coordination of research to avoid overlaps and promote sinergies**



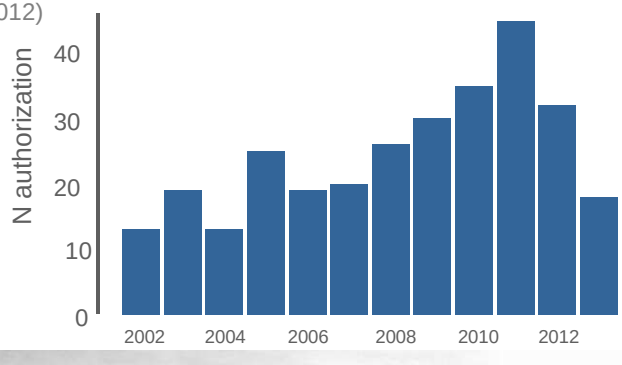
(Pérez-Luque, A. & Bonet, F. J., 2014)

Demand for Research today in Sierra Nevada

1700 1800 1900 2000

Research projects authorized in Sierra Nevada Natural Area

(Ramos-Losada 2012)



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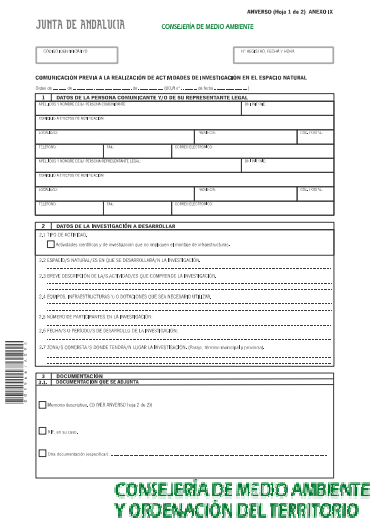
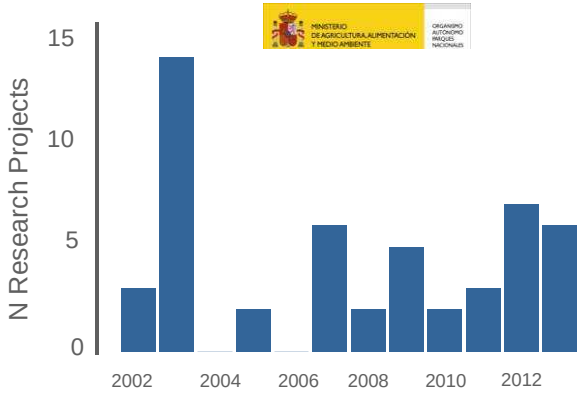
Research Projects in Sierra Nevada. National Parks Network



RED DE PARQUES NACIONALES



Observatorio
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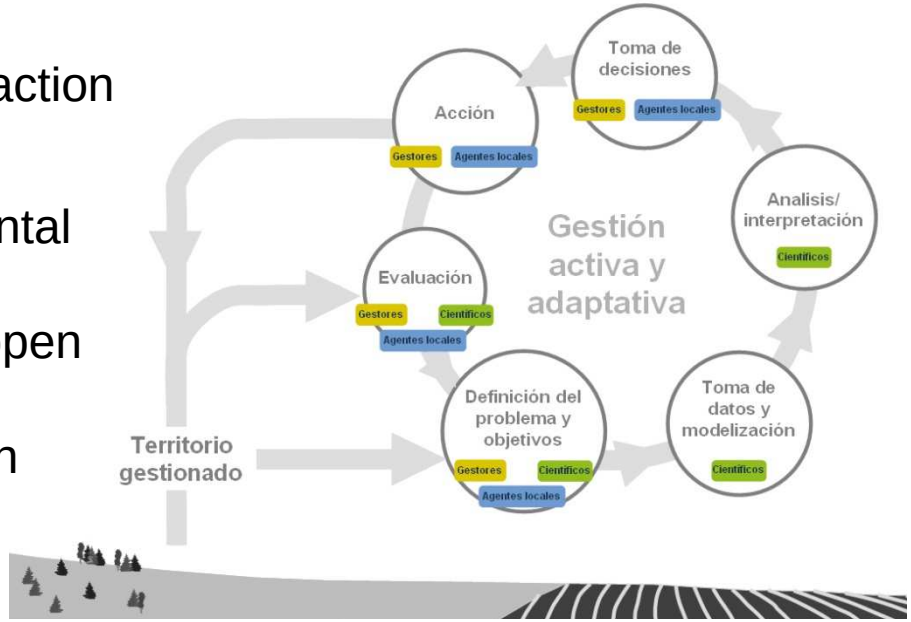
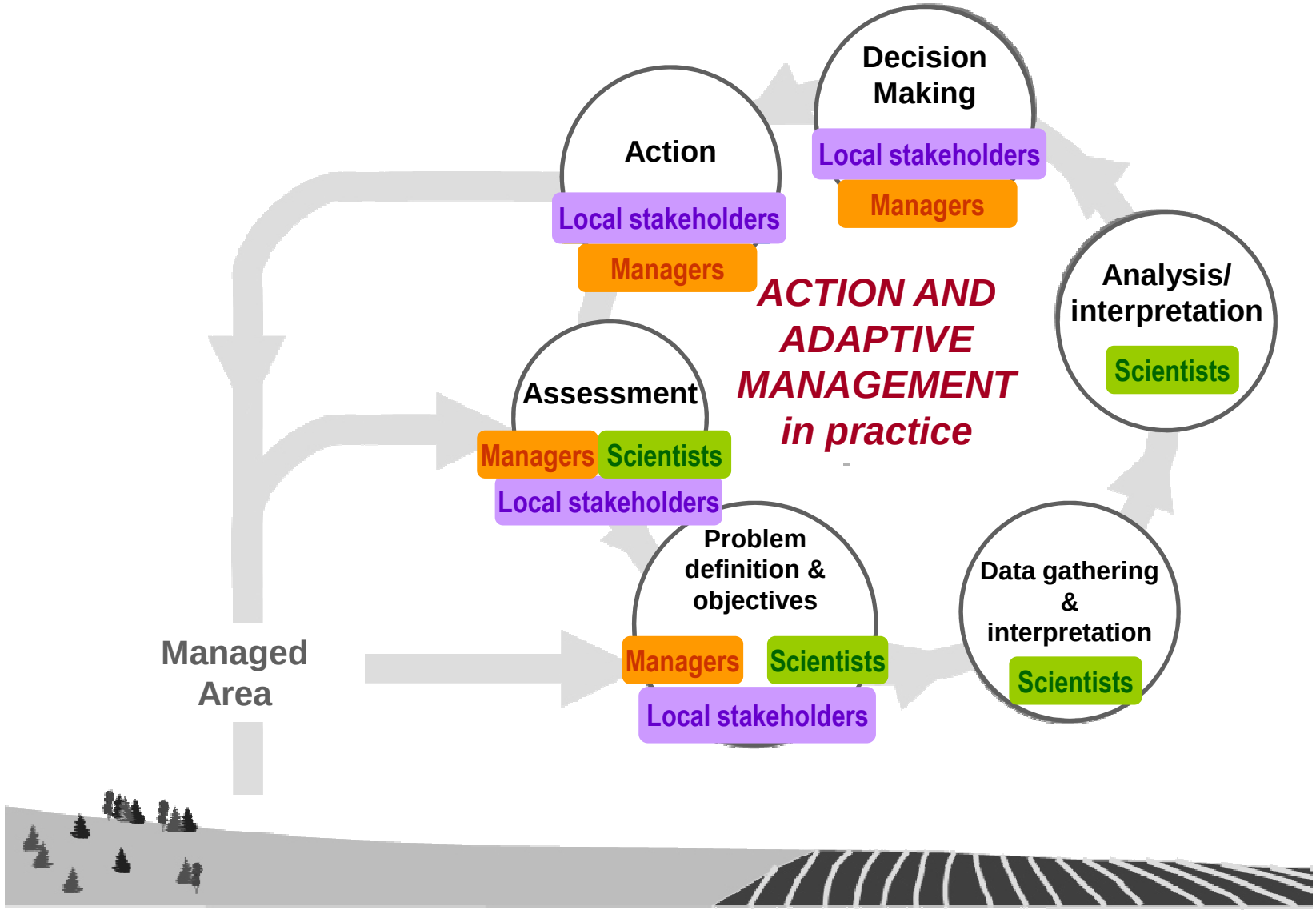
Sierra Nevada

From theory to practice in active and adaptive management

Turning information into useful knowledge for ecosystems management. Assesing the effects to learn from the experience

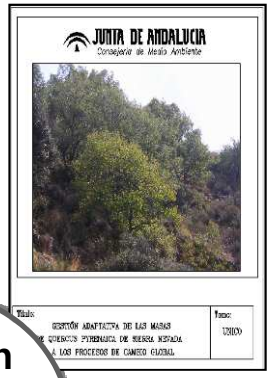
- It combines **scientific knowledge** on ecosystems functioning with **practical experience**.
- Assessing, almost **in real time**, the effects of management experimental practices to apply the newly acquired knowledge to the following decision making step
- **Uncertainty** is assumed in our interaction with live systems
- From problem definition to experimental design, data collection, analysis & interpretation → **Iterative process** open to continuous revision, leading to progressively more accurate decision making.




Decision Making
Local stakeholders
Managers
Action
Local stakeholders
Managers
ACTION AND ADAPTIVE MANAGEMENT in practice
Analysis/ interpretation
Scientists
Assessment
Managers
Scientists
Local stakeholders
Problem definition & objectives
Managers
Scientists
Local stakeholders
Data gathering & interpretation
Scientists
Managed Area

Example:

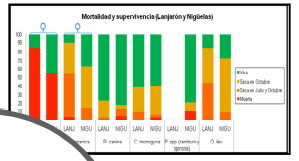
management of oak woods (*Quercus pyrenaica*) to enhance its resilience to CC



Decision Making

Local stakeholders

Managers



Action

Local stakeholders

Managers

ACTION AND ADAPTIVE MANAGEMENT in practice

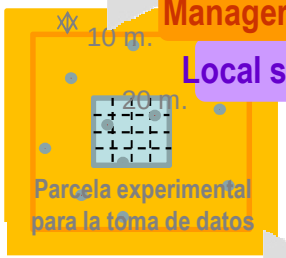
Analysis/ interpretation

Scientists

Assessment

Managers Scientists

Local stakeholders



Problem definition & objectives

Managers Scientists

Local stakeholders

Data gathering & interpretation

Scientists

Managed Area

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1. From theory to practice in Active Adaptive Management. What do we need?

→ A change in management policy: include uncertainty into the equation to work with, not against

→ A change in the way we work: closer communication between scientists and managers to:

- Allow the latest scientific knowledge being applied to management actions

- Designing and implementing mechanisms to continuously feed management decisions through the analysis of results

2. Long term monitoring is needed to study changes caused by CC over time and see the effects of management over time under a GC scenario.

3. For 1 & 2 become a widely applied reality some changes are needed…

→ Changes in scientific scoring: applied science should be valued through different creteria

→ Changes in financial instruments to facilitate/promote long term monitoring

4. Integrated research is needed: more coordination among scientific groups

→ Transdisciplinary teams (study multiple causes and effects of CG)

→ Strengthen coordination to optimize efforts locally

→ *All the mentioned needs could be incorporated into some kind of "**European Standards Commitment of applied research in P.A.**"*
Science would be valued according to:

i. The definition of a **main common problem** (resulting from a participation process managers & scientists together).

ii. The **direct applicability** of the results in the management of the P.A. (scored by managers)

iii. The **coordination with other scientific groups** (= topic ≠ area & ≠ topic = area)

iv. The generation of **knowledge from management** practices

v. The generation and use of **long time series**

vi. **Information return** to managers of P.A. not only in scientific format

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+ Great challenge to have the opportunity to:

* Studying processes I can see on the field:
* Working with people from ≠ backgrounds: biologists, forestry engineers, environmental scientists, sociologists, computer programmers,…
* Working with people from ≠ occupational contexts: public (managers), university, rangers, private and public companies…

+ Specialized: I can focus my energy in the topics I like most

- Uncertainty: difficulties for financing long term monitoring

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Thank you very much for your attention !

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MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO

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