State of the art of ecological restoration in the Mediterranean (challenges and opportunities)

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STATE OF THE ART OF ECOLOGICAL RESTORATION IN THE MEDITERRANEAN

1. DEVELOP AND USE KNOWLEDGE

2. ENGAGE SOCIETY

3. INTEGRATE ECOLOGICAL RESTORATION INTO LAND PLANNING
Sierra Espuña Regional Park, Murcia, SE Spain
LONG HISTORY OF ECOLOGICAL RESTORATION


- Morocco 20th century – 508,000 ha (Sabir, 2003)

- Total afforested/reforested Magreb – 2,000,000 ha (Le Houérou, 2000)
RESTORING THE RESTORED AREAS

Palaciosmil (León), NE Spain

High fuel accumulation

Orihuela (Alicante), SE Spain

Vulnerability to drought
WHAT WENT WRONG?

- LIMITED ECOLOGICAL KNOWLEDGE
- DEFICIENT INVESTMENT IN POST-PLANTATION MANAGEMENT
- UNEXPECTED CHANGES (CLIMATE CHANGE, EUTROPHICATION)

HOW TO AVOID PAST MISTAKES

- ALLOCATE FUNDS FOR EVALUATION AND MONITORING
- DIFFUSE AND USE THIS INFORMATION - ADAPTIVE MANAGEMENT
- IMPLEMENT PROJECTS AT ECOLOGICAL AND SOCIAL TIME SCALES
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Spanish strategy Green Infrastructure, Connectivity and Ecological Restoration
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FINANCIAL INSTRUMENTS

- Include ER in National Program for Rural Development (European Agricultural Fund for Rural Development)
- Use European Regional Development Funds (2014-2020) for ER.
- Use resources allocated to adaptation to climate change (Plan PIMA Adapta and later), and other lines of funding at the State level.
- Conditioned funding for projects from the Autonomous Regions fitting this strategy and following good practices.
BÉNI BOUFRAH VALLEY, RIF, N MOROCCO

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Superficie</td>
<td>186 km²</td>
</tr>
<tr>
<td>Longueur</td>
<td>21 km</td>
</tr>
<tr>
<td>Altitude</td>
<td>0 – 1750 m</td>
</tr>
<tr>
<td>Relief</td>
<td>Accidenté</td>
</tr>
<tr>
<td>Climat</td>
<td>Semi-aride  Méditerranéen</td>
</tr>
<tr>
<td>P°</td>
<td>298 mm</td>
</tr>
<tr>
<td>T°</td>
<td>17,6 °C</td>
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</tbody>
</table>

Aleppo pine plantations, B Boufrah, Morocco
Society acceptance?
Landscape units, B Boufrah, Morocco

Crops

Shrublands

Arar

Pine plantations

Cactus

M. Derak, 2017
Integrated participative evaluation of ESS
Integrated participative evaluation of ESS

\[ \chi^2 = 181.16; \, N=67; \, p<0.0001 \]
Participative restoration, Torres, B. Boufrah valley
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Participative restoration, Torres, B. Boufrah valley
Participative restoration, Torres, B. Boufrah valley
Fondó NP, Elx, SE Spain, Agricultural Reservoir
Sand dunes in Catalonia, NE Spain
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PINE PLANTATIONS?

WETLANDS?

METRICS?

NATURE-SOCIETY?

ACTIVE-PASSIVE?

COST-BENEFIT?

CROPLANDS?
TERECOVA – *Tools for integrating ecological restoration into land planning in the Region of Valencia, Spain*

**Map priority areas for restoration**

- Province of Alicante, SE Spain
- High risk of desertification and flooding
- Dry sub-humid to semiarid
- 225,000 Ha
INTEGRATING PEOPLE VALUES AND ASPIRATIONS

STAKEHOLDER PLATFORM

IDENTIFICATION-WEIGHT CRITERIA

CRITERIOS
1. 
2. 
3. 
4. 
5. 
6. 
7.

IDENTIFICATION-WEIGHT ESS

GIS ESS

VALUATION, TRANSFER, DIFFUSION

SOCIO-ECO SCENARIOS

GIS CRITERIA
Ownership
Protection status
Flood risk
Connectivity...

PRIORITY AREAS WHERE COST-BENEFIT MINIMIZES

RESTORATION SCENARIOS

PRIORITY MAP

INTEGRATING PEOPLE VALUES AND ASPIRATIONS
PRIORITIZATION CRITERIA

LANDSCAPE FEATURES
- Corridors
- Periurban areas
- Protected areas
- Vicinity of protected areas
- Areas with rare, endemic, threaten flora, fauna
- Traffic infrastructures

SOCIO-ECONOMIC
- Unemployed and vulnerable communities
- Vicinity of residencial áreas
- Touristic areas
- Areas with touristic potential
- Public areas
- Recreation areas

NATURAL AREAS
- Wetlands
- Coastal areas
- Shrublands and steppes
- Forest in dry sub-humid areas
- Forest in semi-arid areas
- North facing slopes
- Dead pine plantations

HIGHLY ANTHROPIC AREAS
- Rainfed crops
- Irrigated crops
- Quarries
- Dumping sites and debris
- Rivers

FUNCTIONS AND RISKS
- Erosion and desertification
- Carbon fixation
- Water retention and storage
- Salinization
- Water pollution
- Wildfires
- Flooding
- Invasive species
<table>
<thead>
<tr>
<th>PROVISION</th>
<th>SOCIAL-CULTURAL</th>
<th>OTHER</th>
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</thead>
<tbody>
<tr>
<td>Hunting</td>
<td>Landscape aesthetics</td>
<td>Sand dune fixation</td>
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<tr>
<td>Fishing</td>
<td>Leisure activities</td>
<td>Carbon fixation</td>
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<tr>
<td>Fish farms</td>
<td>Cultural heritage, identity</td>
<td>Flood control</td>
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<tr>
<td>Minerals, salt</td>
<td>Residential tourism</td>
<td>Erosion control</td>
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<tr>
<td>Aromatic medicinal plants</td>
<td>Conventional tourism</td>
<td>Increased soil fertility</td>
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<tr>
<td>Fruits</td>
<td>Ecotourism</td>
<td>Improved water quality</td>
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<tr>
<td>Agri production</td>
<td>Sports</td>
<td>Pest control</td>
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<td>Snails</td>
<td>Employment</td>
<td>Fuel breaks</td>
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<td>Honey</td>
<td>Environmental education</td>
<td>Climate regulation</td>
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<tr>
<td>Grazing</td>
<td>Research</td>
<td>Fauna</td>
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<tr>
<td>Aquifer recharge</td>
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<td>Corridors</td>
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<tr>
<td>Surface water collection</td>
<td></td>
<td>Biomass accumulation</td>
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<tr>
<td></td>
<td></td>
<td>Birdwatching</td>
</tr>
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EXPLORATORY MODEL
High to Very High Priority: 13.687 Ha

Economic cost of restoring Increase integrated provision of ESS

PRIORITY AREAS WITH LOWER COST: BENEFIT
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SOCIO-ECOLOGICAL RESTORATION

Environmental management which aims at protecting biodiversity, increase the provision of ecosystem services and contribute to human welfare.
THANK YOU!!

TERECOVA – Tools for integrating ecological restoration into land planning in the Region of Valencia (CGL2014-52714-C2-1-R)
Batlle i Roig, +2001
Barcelona Dumping site Vall de Joan, Garraf, Spain
Racó de Tudela Culip, Club Méditerranée, Girona, Spain - Estudi Martí Franch, +2005