



IBERIAN MEDITERRANEAN RIVERS CHALLENGES FOR RESTORATION

REstoring rivers FOR effective catchment Management



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IBERIAN MEDITERRANEAN RIVERS CHALLENGES FOR THEIR ECOLOGICAL RESTORATION

1. WATER as a natural limited resource
2. SEDIMENTS as surplus supply for high erodible soils
3. HUMAN ACTIVITIES
 - High pressure on water resources
 - Strong restrictions to the room of rivers
4. What has been done until now
5. What is needed

WATER AS A NATURAL LIMITED RESOURCE

- Relatively small amount of runoff

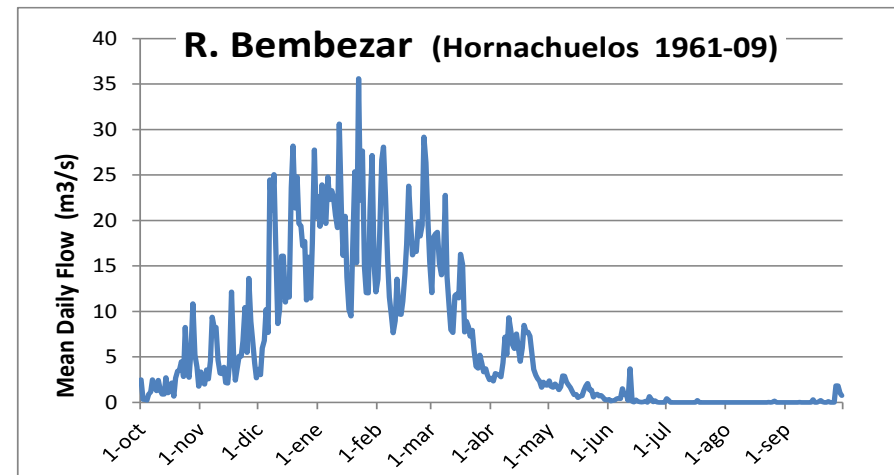
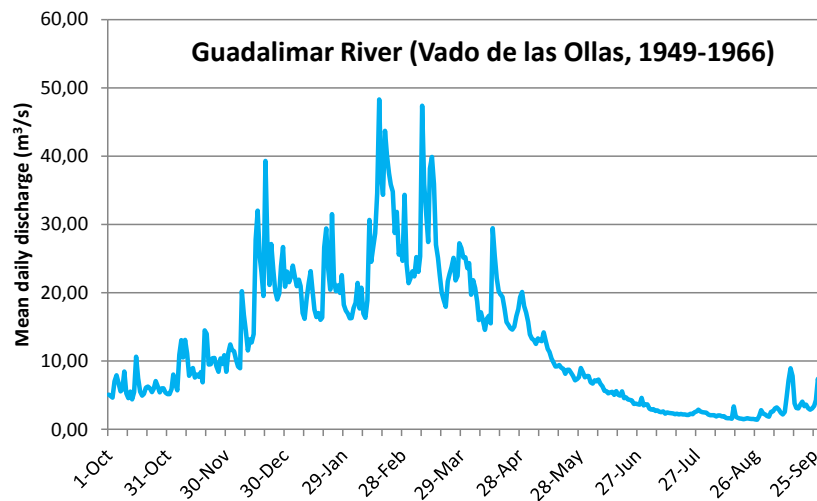
Mean annual runoff coefficients of main Spanish Water Districts (*Libro Blanco del Agua en España, MMA, 1998*)

Miño-Sil	Cantábrico	Ebro	Tajo	Duero	Andalucía Oriental	Cataluña	Guadalquivir	Guadiana	Júcar	Segura
0.56	0.57	0.31	0.3	0.28	0.25	0.23	0.23	0.16	0.16	0.11

- Natural Flow Regime:

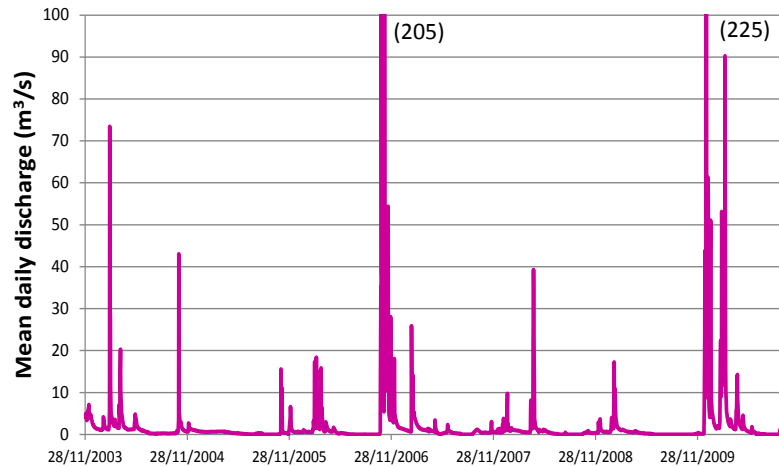
- Relatively low specific discharge ($\text{m}^3\text{s}^{-1}\text{km}^{-2}$)
- Strong seasonality: Reduced summer flows

	specific discharge ($\text{m}^3\text{s}^{-1}\text{km}^{-2}$)
Humid Spain	> 0.0165
Guadalquivir at Seville	0.0041
Guadalquivir at Baeza	0.0033

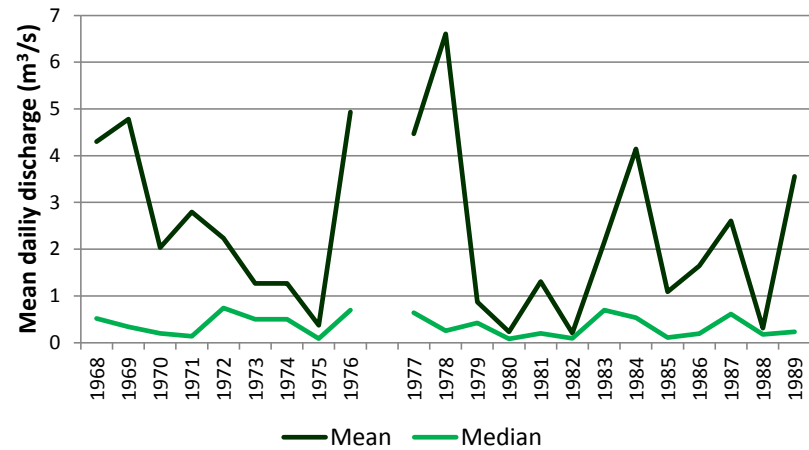


WATER AS A NATURAL LIMITED RESOURCE

- High **temporal variability**
 - Frequent flash floods
 - High inter and intra-annual fluctuations

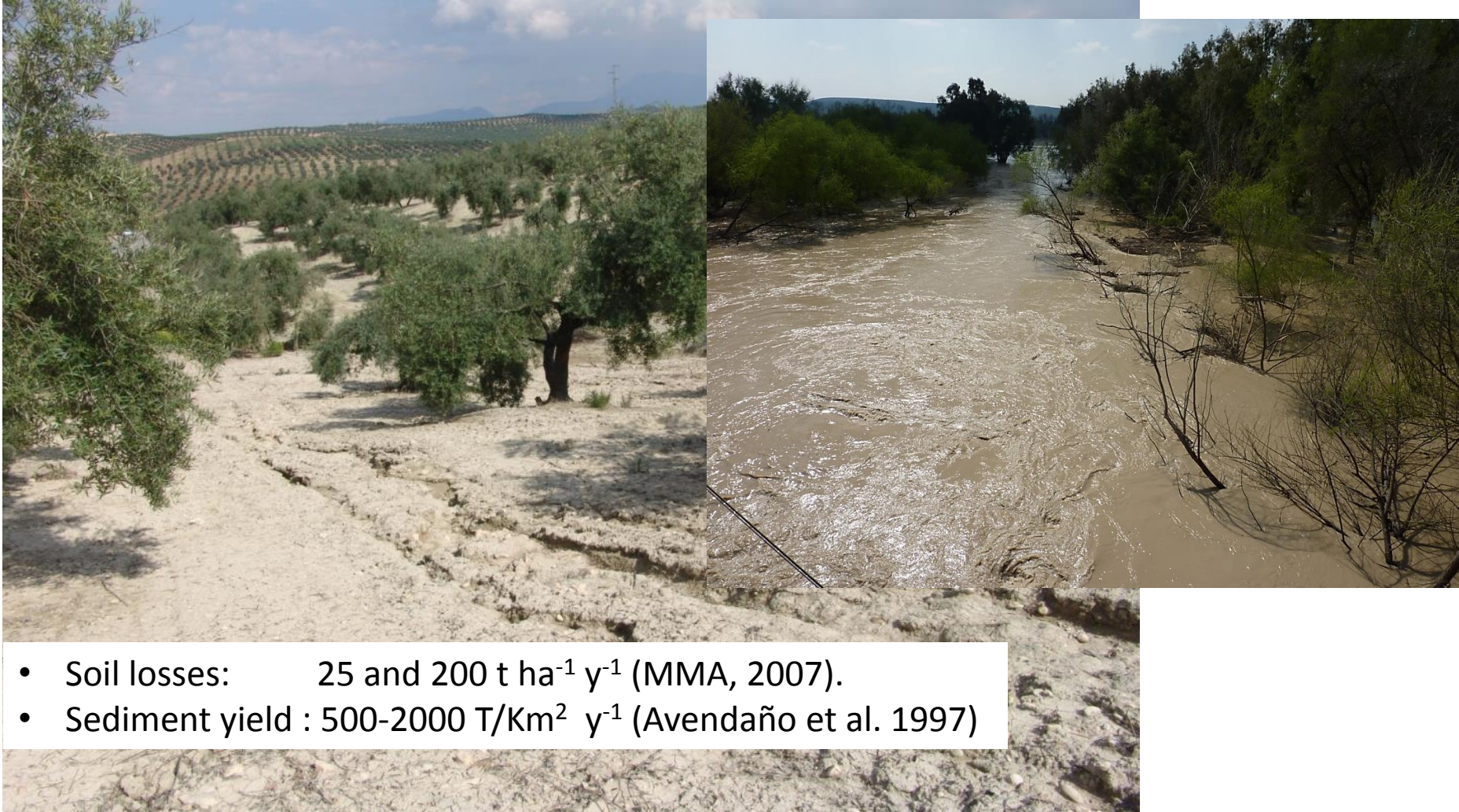


River Guadarranque (Guadiana Basin)



SEDIMENTS as surplus supply from highly erodible soils

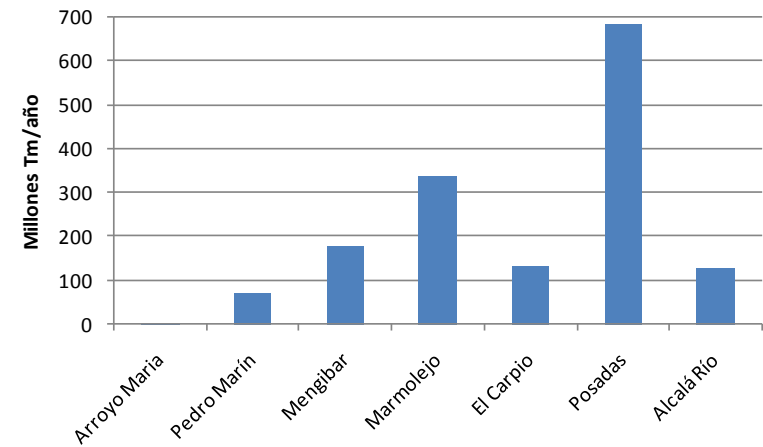
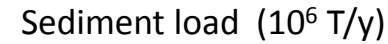
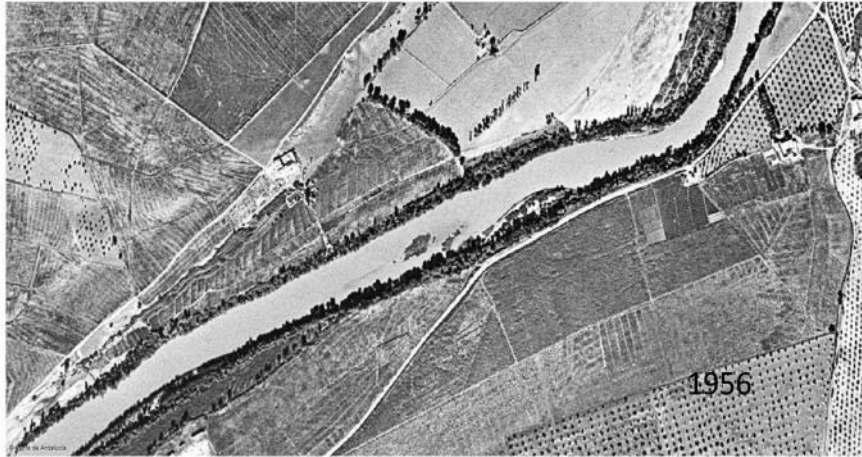
- High **water turbidity**, big impacts on aquatic communities.
- Massive deposition along channel bed and banks, river **morphological changes**



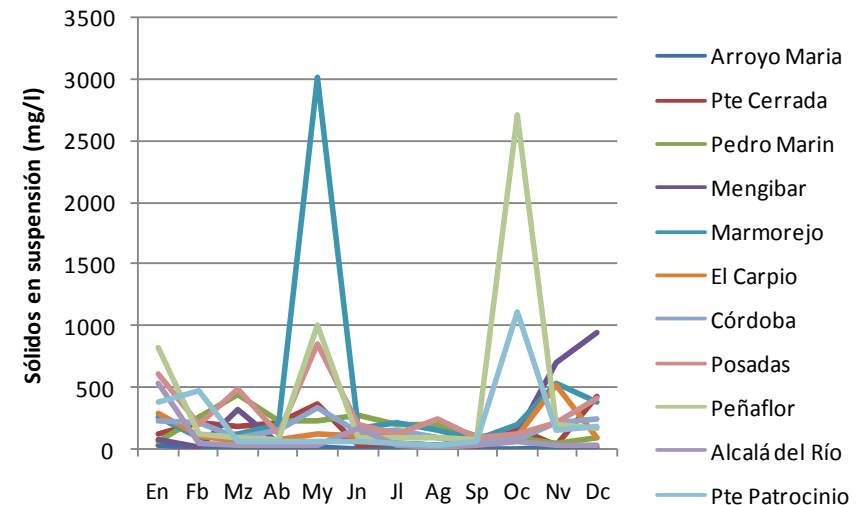
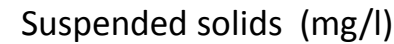
- Soil losses: 25 and 200 t ha⁻¹ y⁻¹ (MMA, 2007).
- Sediment yield : 500-2000 T/Km² y⁻¹ (Avendaño et al. 1997)

SEDIMENTS as surplus supply from highly erodible soils

- High **water turbidity**, big impacts on aquatic communities.
- Massive deposition along channel bed and banks, river **morphological changes**
- **Vegetation overgrowth**



The Guadalquivir River, Villa del Río



HUMAN ACTIVITIES: *AGRICULTURE*

-HIGH PRESSURE ON WATER RESOURCES

- **Irrigation** as main user of stored water (>80% natural runoff)
- Intensive **flow regulation** schemes (>1200 large dams)
- Difficulties for **environmental flows** allocation, due to Socio-economic pressure

Water District	Natur. Runoff Hm ³ /y	Storage in reservoirs		Water Demands (Hm ³)					Agricuilt. / Natural Runoff %	Agricuilt. / Water Storage %
		Reservoir Capacity Hm ³	Regulation Intensity %	Urban	Agriculture	Industry	Other	Total		
Duero	13660	7667	56	329	4501	46	8	4884	33	58,7
Tajo	10883	11135	102	599	1712	284	0	2595	16	15,4
Guadiana	4414	8843	200	222	2907	24	0	3153	66	32,9
Guadalquivir	8601	8867	103	444	3490	83	0	4017	41	39,4
Ebro	17967	7702	43	506	6310	250	0	7066	35	81,9
Catalunya	2787	772	28	592	388	150	8	1138	14	50,3
Jucar	3432	3349	98	721	2789	147	0	3657	82	83,3
Segura	803	1223	152	143	1662	46	30	1881	207	135,9
Sur	2351	1319	56	390	1159	72	0	1621	49	87,9
TOTAL	91468	54476		4320	25278	1621	50	31269		

HUMAN ACTIVITIES: *AGRICULTURE*

FLOW REGULATION EFFECTS:

✓ **Hydrologic alteration of:**

- Seasonality
- Flood magnitude, frequency, timing
- Transport capacity

✓ **River responses:**

- Fine sediment storage
- Vegetation overgrowth
- Increased flood risk

✓ **Ecological consequences:**

- Aquatic habitat degradation
- Fish community losses
- Ecosystem services depletion



-HIGH OCCUPATION OF RIVER LAND

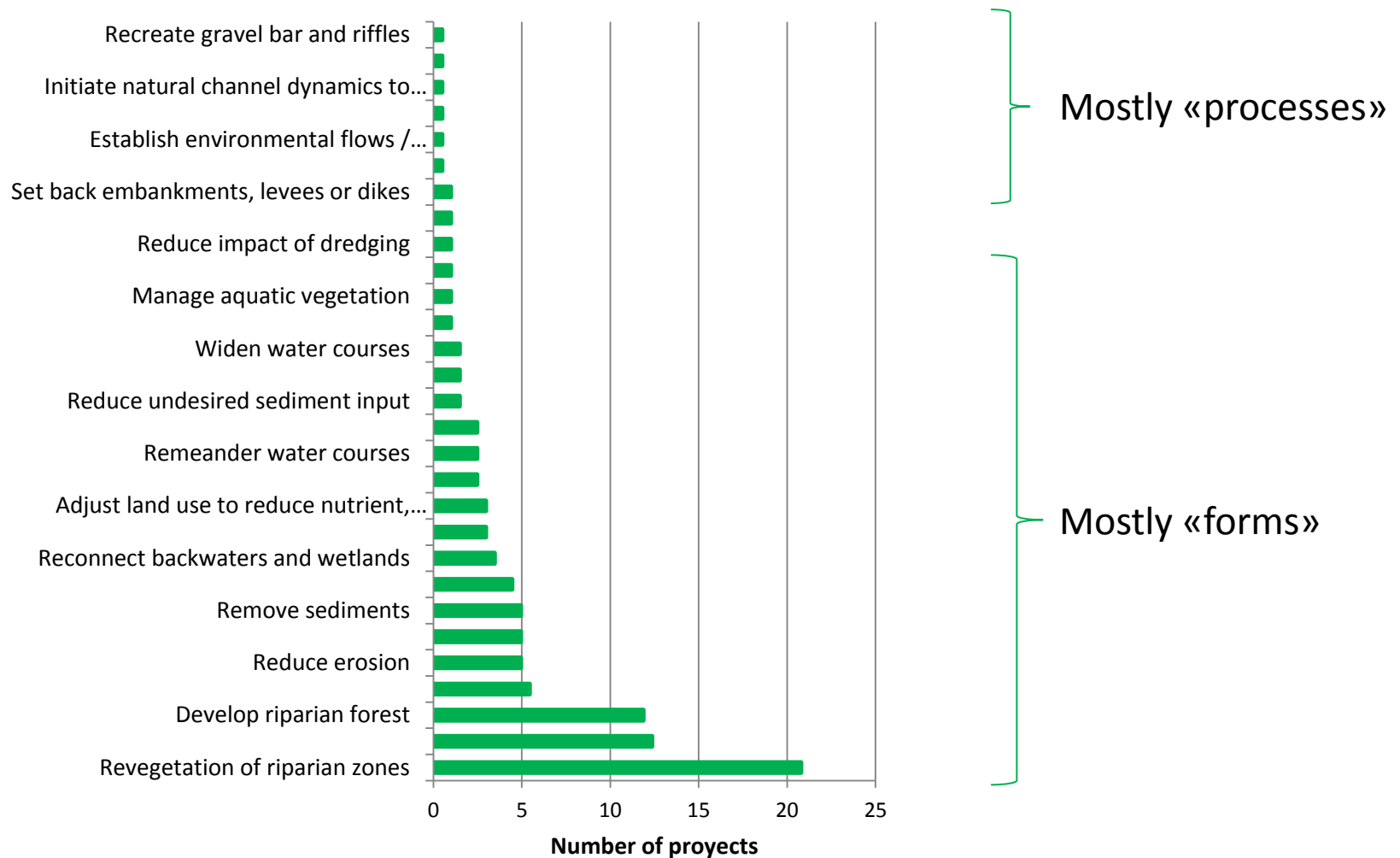
- High urban density on floodplains
- Still a big confidence on traditional river engineering (channelization works)
- Dryland rivers promoting culverting and piping, increasing hydrologic risk



River Segura (Orihuela)

RESTORING IBERIAN MEDITERRANEAN RIVERS: *WHAT HAS BEEN DONE*

- Big effort on water pollution control
- Important investments on longitudinal continuity and fish passes



RESTORING IBERIAN MEDITERRANEAN RIVERS: *WHAT HAS BEEN DONE*

- Big effort on water pollution control
- Important investments on longitudinal continuity and fish passes
- **Very little effort on improving regulated flow regimes**

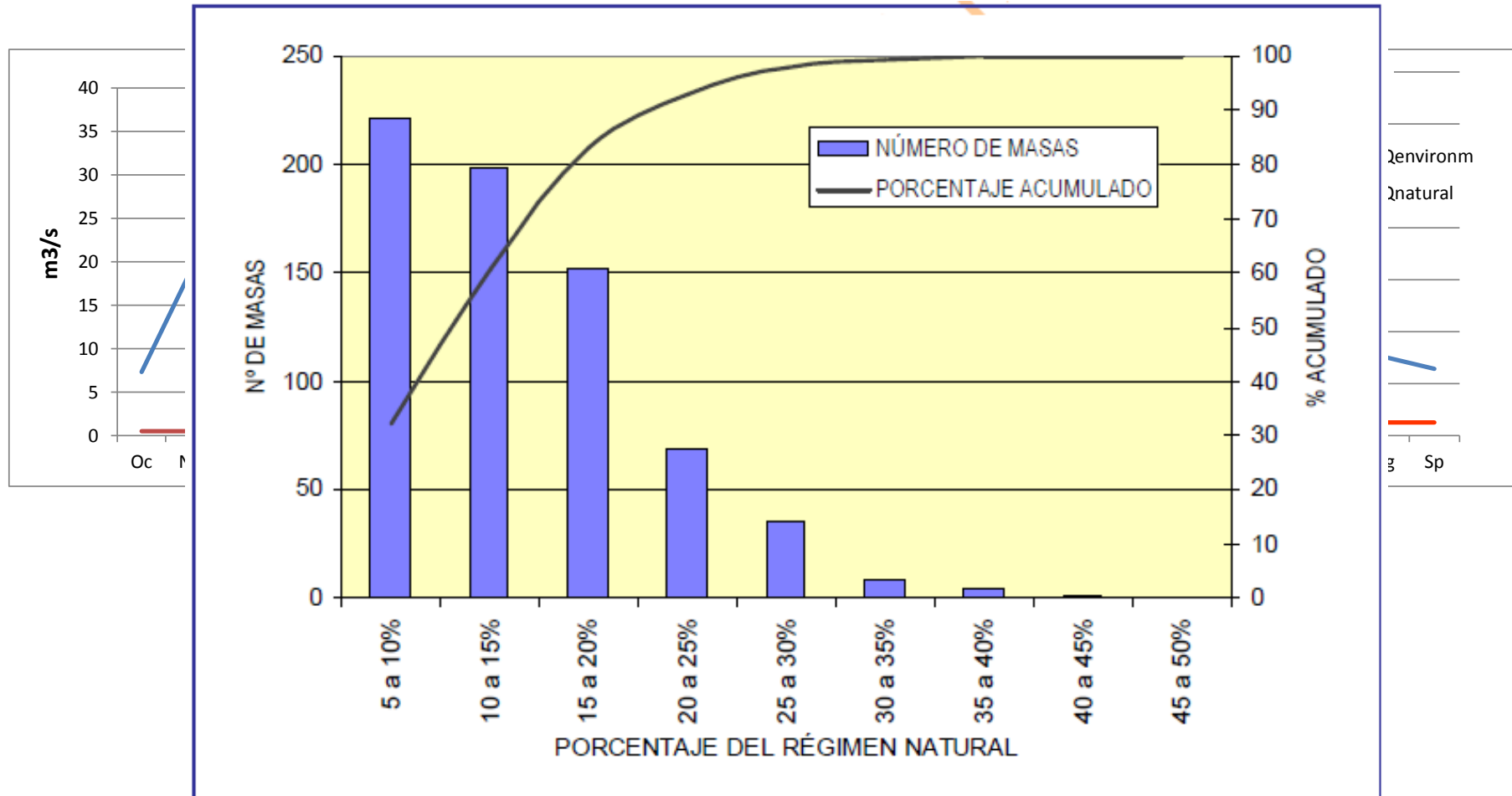


Figura 107. Histograma que representa los porcentajes de la aportación natural total fijados como caudales ecológicos en relación al número de masas de agua superficial.

RESTORING IBERIAN MEDITERRANEAN RIVERS: **WHAT IS NEEDED**

✓ MULTIDISCIPLINARITY AND TRANSPARENCY ON RIVER MANAGEMENT

- Reducing the prevalence of '*civil works*' in restoration measures
- Use ecologic, economic and social criteria in decision making
- Transparency in concessions and constrains (fees, duration, conditions, ..)

✓ PUBLIC PARTICIPATION AND SOCIAL LEARNING ON RIVER RESTORATION

- Give **time** for citizen participation from project starting, implementation and monitoring. Include educational purposes

✓ ALLOCATING FLOWS FOR RIVER ECOSYSTEM SUPPORT

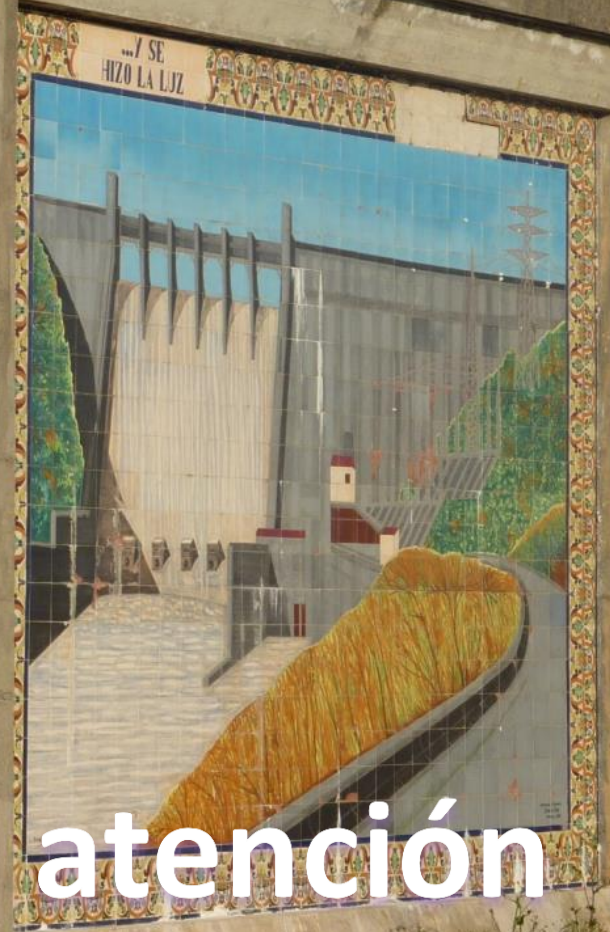
- **Environmental sediment flows**: asses the sediment balance downstream reservoirs and establish mitigation measures when needed
- **Environmental water flows**: Mirrow Mediterranean regime that means minimum instream flows during the warm season

✓ RECOVERING RIVERINE LANDSCAPE PROCESSES

- **Promote natural regeneration**, Revegetate only when strictly necessary.
- Allow **bank erosion** to promote channel dynamism and vegetation succession

✓ IMPROVING COMMUNICATION AND KNOWLEDGE TRANSFER

RESTORING IBERIAN MEDITERRANEAN RIVERS



Gracias por su atención

Monumento a la Obra Hidráulica (Peñaflor)