

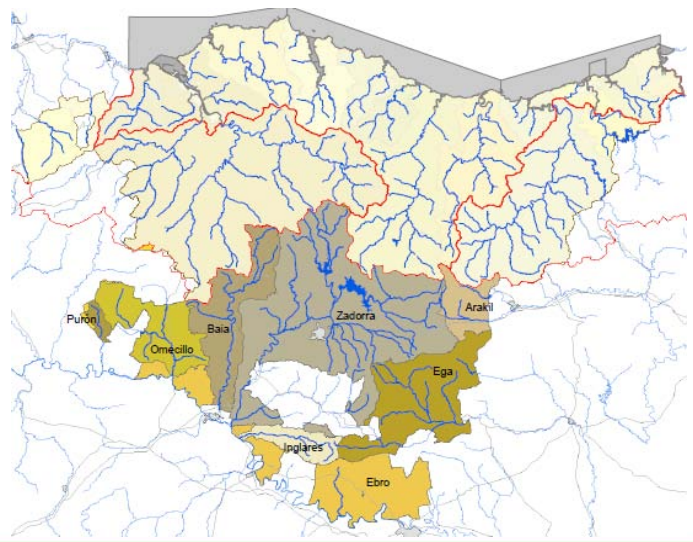
# Water to Adapt in the Basque Autonomous Country of the Ebro River Basin

*Resilience enhancement and water demand management  
for climate change adaptation*

# Outline

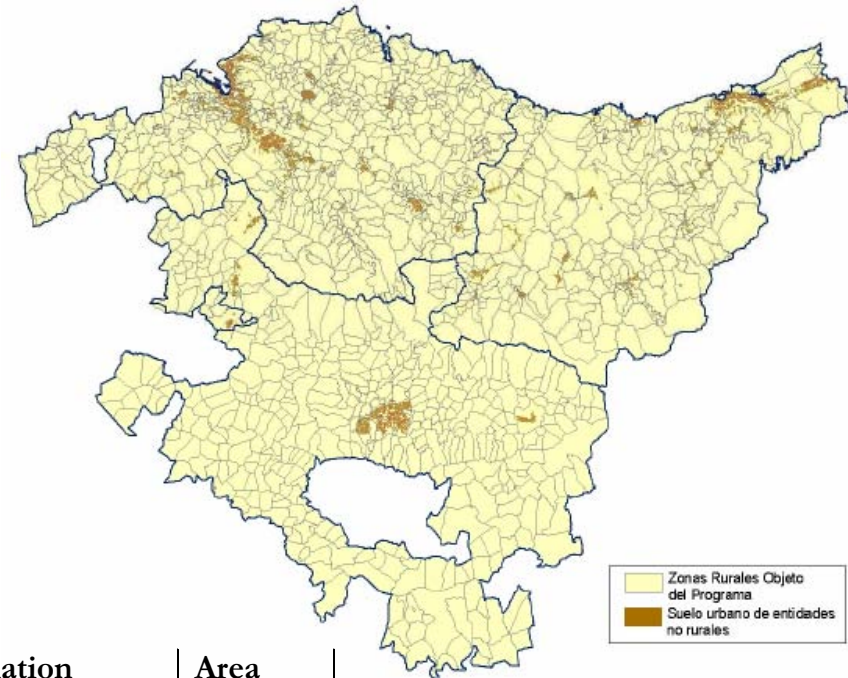
- The Case study area
- The 1988-1990 drought
- Toward resilience in the system
- Adaptation to a changing environment: recommendations

# The Case Study Area



# Rural and urban worlds

- A rural world with 3 basins of attraction

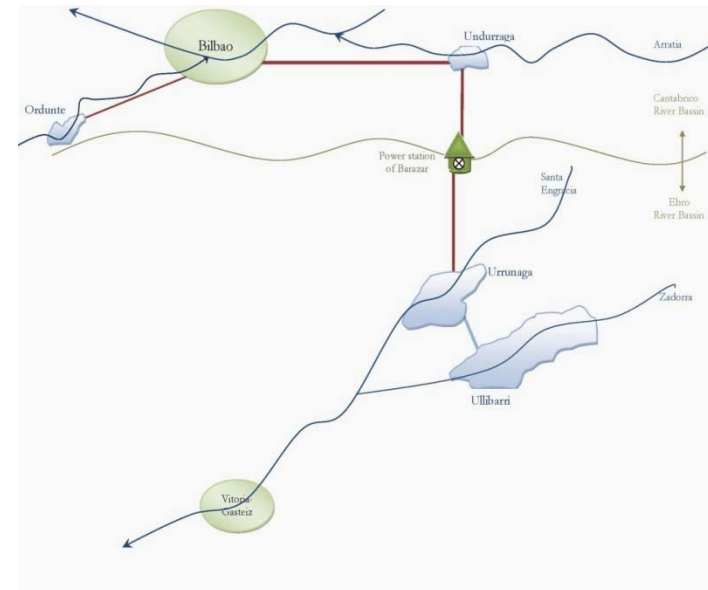
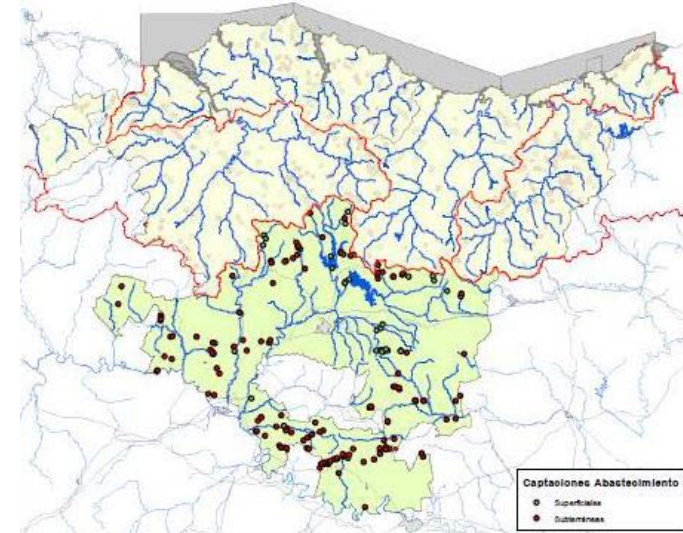


Rural world	Territorial units		Population		Area
	Number	%	Number	%	
<b>Alava</b>	419	98%	40 246	14%	95%
<b>Gipuzkoa</b>	241	81%	68 149	10%	77%
<b>Bizkaia</b>	490	86%	88 763	8%	86%
<b>Basque Country</b>	1 150	88%	197 158	9%	87%

Source: Basque government 2010

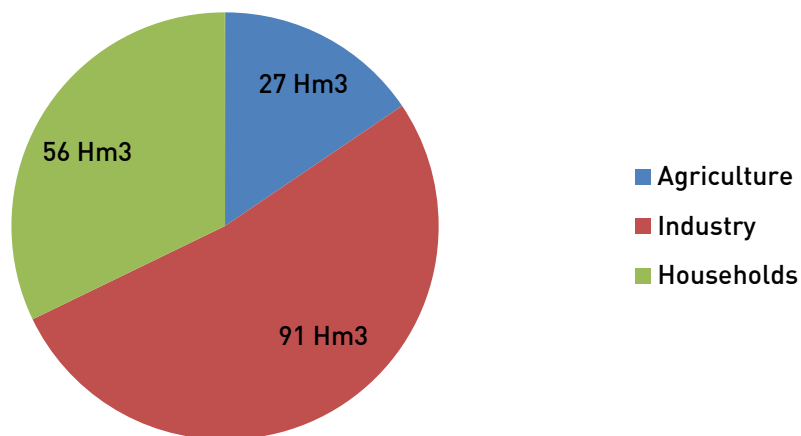
# Water bodies – water supply

- The main source (in volume) of water is a superficial water source.
- Source: Zadorra reservoirs (Ullibarri and Urrunaga).
- Capacity: 180 Hm<sup>3</sup>/year
  
- Characteristic: multiple users with water inter basins transfers
- Users: 2 water utilities, 1 energy company



# Water demands

Distribution and annual volume of water consumption

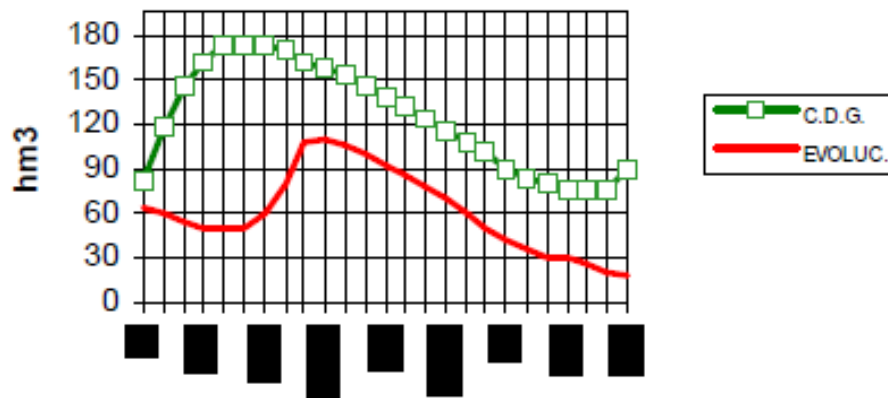


- Industry: 1/3 is supplied by water utilities, 2/3 have own pumping system.
- Agriculture: supplied water is negligible, most is own pumped
- Households: 80% of consumed water originated from a transfer

# The 1988-1990 drought

- Duration: 28 months
- Stock in Zadorra (red curve):

Evolucion embalses del Sistema Zadorra en 1989

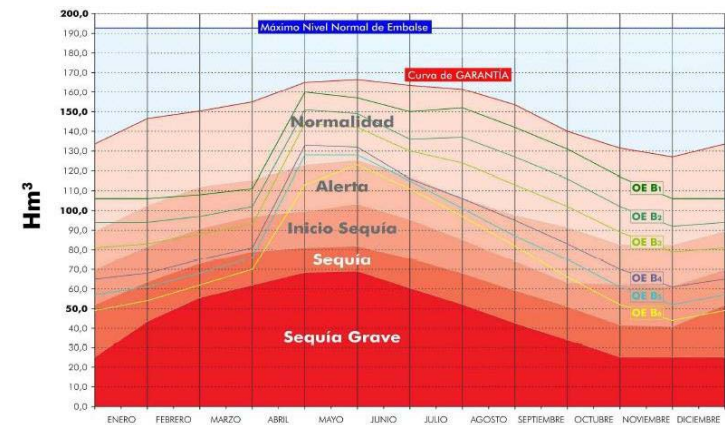


- Severe restrictions between October 1989 and July 1990: from 6 to 12 hours/day
- Estimation of welfare loss: 80 millions € (for residential uses)

**Failure of the water supply system**  
**Structural changes after this drought**

# Toward a resilient system: Institutions and planning

- Institutional
  - Hydrological National Plan (10/2001): water utilities must design an **Emergency Plan** in cities > 20.000 hab.
  - Special drought management plan (2007): monitoring and alert system in the Ebro river basin
- Risk-sharing and optimal management of multiple users reservoir
  - New agreement on **warranty curves** in the reservoir, between energy company, water utilities, municipalities.
- **Substitution** of water sources (1992 protocol)
  - Strategic and emergency sources (groundwater uses)





# Toward a resilient system: economic instruments

## ■ Water quality improvement

- Agrienvironmental measures of CAP
  - Payment for strips of grassland (run-off reduction)
    - Non cultivated plot: 39.54€/ha, Cultivated plots: 256.05€/ha

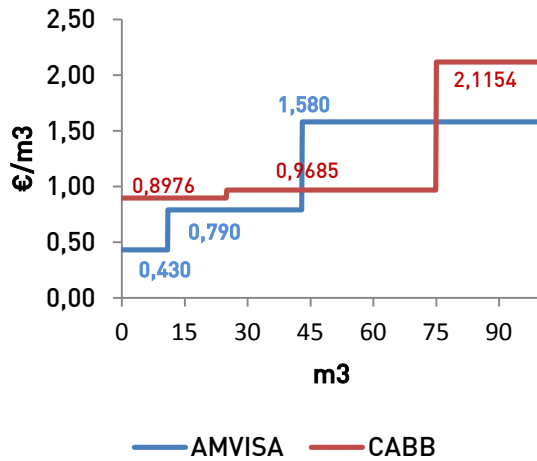
## ■ Efficiency gains towards changes of practices and technology

- LEADER program and measures of the Rural Development Plan
  - Funds actions dedicated to :
    - water management (14% of budget in BAC), biodiversity (25%), dairy sector organization (35%)
- Awareness programs: water utilities promote water reduction in residential uses (PIAA 2002, Plan Futura 2009)

# Toward a resilient system: economic instruments

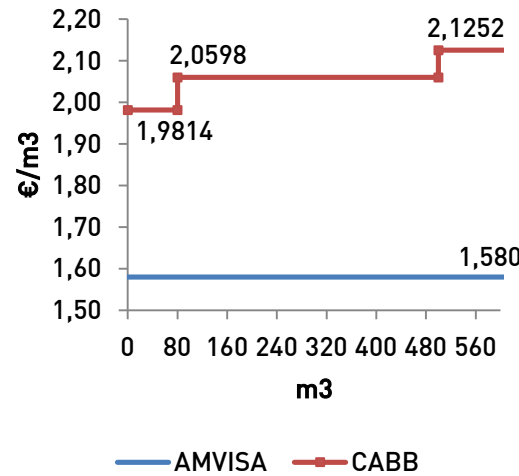
- Efficiency gains via tariffs

Domestic



Fixed part + volumetric

Industrial



Fixed part + volumetric

Agricultural

	€/Ha
Operation and Maintenance	6,37
Administration	0,72
Depreciation	0,42
<b>Total</b>	<b>7,51</b>

Fixed part + surface

- ...but cost recovery first (Water Framework Directive)

# Adaption to a changing environment

Instrument	Sector	Strategy	Advantages - Objectives	Remarks
Technology	Water/Public	Control for the “uncontrolled” water	Efficiency gains	Check potential institutional barriers
	Domestic	Education/Information programs on more efficient tools	Promote public awareness, efficiency gains	Financial incentives boost adoption of technology
	Agricultural	Efficient system of irrigation	Efficiency gains	Potential perverse land expansion effect.
Prices/Tariffs	Agricultural	Metering system and study efficient water tariffs for cost recovery and efficiency gains	Efficiency	Potential land expansion effect. Gains depend upon elasticity of demand
	Industry	Increasing block rate tariffs for AMVISA	Efficiency/Equity	Institutional barrier to regulate prices. Gains depend upon elasticity of demand
	Domestic	Equity in the block rate tariffs of CABB	Equity/Efficiency	Institutional barrier to regulate prices. Gains depend upon elasticity of demand

## Adaption to a changing environment (Cont'd)

Instrument	Sector	Strategy	Advantages-Objectives	Remarks
Water transfers	Water users	Update the warranty curves of reservoirs with climate evolution. Introduce flexibility in the curves	Risk mitigation to climate variability	Negotiation between multiple users and multiple risks are complex.
Insurances	Agriculture	Study the possibility to promote financial insurance	Risk management	To be studied jointly land uses plan policies
		Land use plans: adoption of less water demanding land use	Reduce exposure/vulnerability to drought	Cost of transition to such land uses.
Coalition	Water/Public	Regrouping of water management entities in Alava	Financial risk sharing	Possible geographical and institutional barriers

