URBAN STREAM REHABILITATION IN MADRID (SPAIN)

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URBAN STREAMS IN MEDITERRANEAN AREAS

- Natural high variability of flow regime
  - Big canals without water

URBAN STREAMS IN MEDITERRANEAN AREAS

- Natural high variability of flow regime
  - Flow regulation
  - Artifical functioning
  - Loss of river landscape experience
  - Bad aesthetics
  - Poor water quality
  - No flow/dilution
STREAM CONDITIONS IN MADRID MUNICIPALITY

Before 1985: Increase of water quality problems in big rivers
Disappearance of small streams for urban development

1875 - 2005

1985-1995: IPSIM (First Integral Waste Water Treatment Plan of Madrid)
Main objective: Water quality improvement in the Manzanares river (sewage treatment)

Manzanares River

- Dredging and Widening the channel
- Lateral revetments
STREAM CONDITIONS IN MADRID MUNICIPALITY

1985-1995: I PSIM (First Integral Waste Water Treatment Plan of Madrid)
Main objective: Water quality improvement in the Manzanares river (sewage treatment plants, river regulation)

1995-2002: II PSIM to improve sewer system and treatment plants
Construction of bigger main sewers along the stream network to cope with expected urban development
Stream rehabilitation (Case studies)

2002-: Maintenance of previous works and facilities
New interventions in stream reaches linked to urban developing plans

Disappearance of small streams for urban development ended by 1995 (II PSIM)

Rehabilitation case studies:
- Arroyo Meaques
- Arroyo de Pozuelo
- Arroyo de Valdebebas
REHABILITATION WORKS IN THE ARROYO DE MEAQUES

- Total length: 10.5 km
- Rehabilitation works in the lower reach that runs within the Casa de Campo Park Area (8 km).

Main problems:  
- High Flood risk (last event in June 1995, affecting big roads)  
- Intensive public use (Casa de Campo Park), demanding visual biodiversity and gardening aesthetics  
- High sediment load transported by the stream to the Lake

Rehabilitation works:  
- Construction of a dam for flood defense upstream Casa de Campo Park  
- Hydraulic by-passes in critical points (Zoo)  
- Construction of four check-dams with associated pools and flow recirculation pumping systems, to promote visual aquatic fauna  
- Divertion system at Lake arrival to avoid sediment entrance during floods
REHABILITATION WORKS IN THE ARROYO DE MEAQUES

Rehabilitation works:

Present conditions:
- Macrophyte invasion in the artificial ponds
- Concrete structures seem out of place in the natural environment

Recent Discharge of groundwater pumped from the Madrid underground network, that improves water quality and quantity flowing in the channel during dry season
REHABILITATION WORKS IN THE ARROYO DE POZUELO

- Total length: 9.2 km
- Rehabilitation works done in 2 km of the lower reach, in urban areas
- Upper parts of the catchment belong to another municipality and have been urbanized and the stream has been buried.

1995-2002: II PSIM. CASE STUDIES

Main problems:

- Small, channelized ditch-type channel, normally dry
- Very poor riparian vegetation, dominated by weeds
- Presence of debris and obstacles, unwanted aesthetic
REHABILITATION WORKS IN THE ARROYO DE POZUELO

Rehabilitation works
- Construction of a new main sewer with environmental constraints

Present conditions:
- Polluted effluents in the channel and macrophyte invasion reducing flooding capacity
- Disappearance of many planted species but improving the previous woody vegetation
- Conservation of the fluvial space for recreational activities, as an open public urban park
- Minimum maintenance costs
REHABILITATION WORKS IN THE ARROYO DE VALDEBEBAS

General characteristics:

- Total length: 11.8 km
- Rehabilitation works done in the middle reaches crossing an agricultural area, along 2 km
- Upper parts of the catchment urbanized, and lower part of the channel hardly channelized crossing the Madrid airport

Main problems:

- Physical occupation of the stream by marginal constructions, debris disposals, etc.
Rehabilitation works: • Channel morphology improvement and widening
• Riparian plantations
• Improvement of the existing local track, providing bollard defense against building debris disposal

Present conditions: • Dissapearance of riparian plantations
• Riparian space free of debris disposal
• Conservation of the fluvial space with very reduced use
• Minimum maintenance costs
• Severe degradation of the lower reach by new impacts
In Mediterranean areas, urban development increases the dryness of the urban streams, making difficult their ecological recovery.

The presence of humidity from effluents exacerbates the macrophyte growth inside the channel, increasing the flooding risk.

Artificialization of the streams with hard engineering devices follows design criteria that get old-fashioned in time, requiring high maintenance costs.

A more natural, dynamic and self-designed river morphology allows fluvial processes, improving the landscape aesthetics with minimum maintenance.

Rehabilitation works should attend the recovery or improvement of the flowing water regime, as the main factor allowing self-maintenance fluvial structure (fauna and flora).

Rehabilitation projects made at local scale should be included in restoration programs at catchment scale, where urban landscape planning and future infrastructure construction are mutually coordinated.
New urban development undertaken in big parcels, fragmentating the streams. Channel design according to the different urbanization criteria of each parcel.
STREAM REHABILITATION IN MADRID
PRESENT TRENDS

Consideration of the green water ways as an alternative very appropriate for maintaining the urban fluvial space in mediterranean dry conditions, where there is not water most of the time.

THANK YOU FOR YOUR ATTENTION!