

**Restoration of urban rivers  
as a challenge towards  
sustainability.**

**Are ecologic and social  
concerns compatible?**

**Maria da Graça Amaral Saraiva**



river . ciudad . river . fiume . city . fleuve  
city . cité . fiume . stad . fluss . rio

## Summary

- **City- river relationships**
- **General overview on urban river rehabilitation constraints and opportunities**
- **Some experiences - the URBEM project**
- **Assessment and evaluation - indicators for post-implementation assessment**
- **Conclusions**

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Bilbao



Boston



Chicago



Moscow



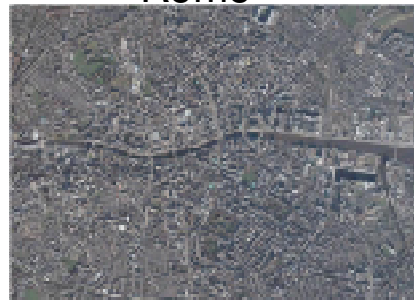
Rome



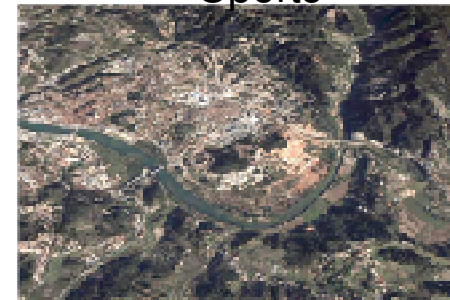
Oporto



S. Paulo



Dublin



Coimbra

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Pressures and impacts



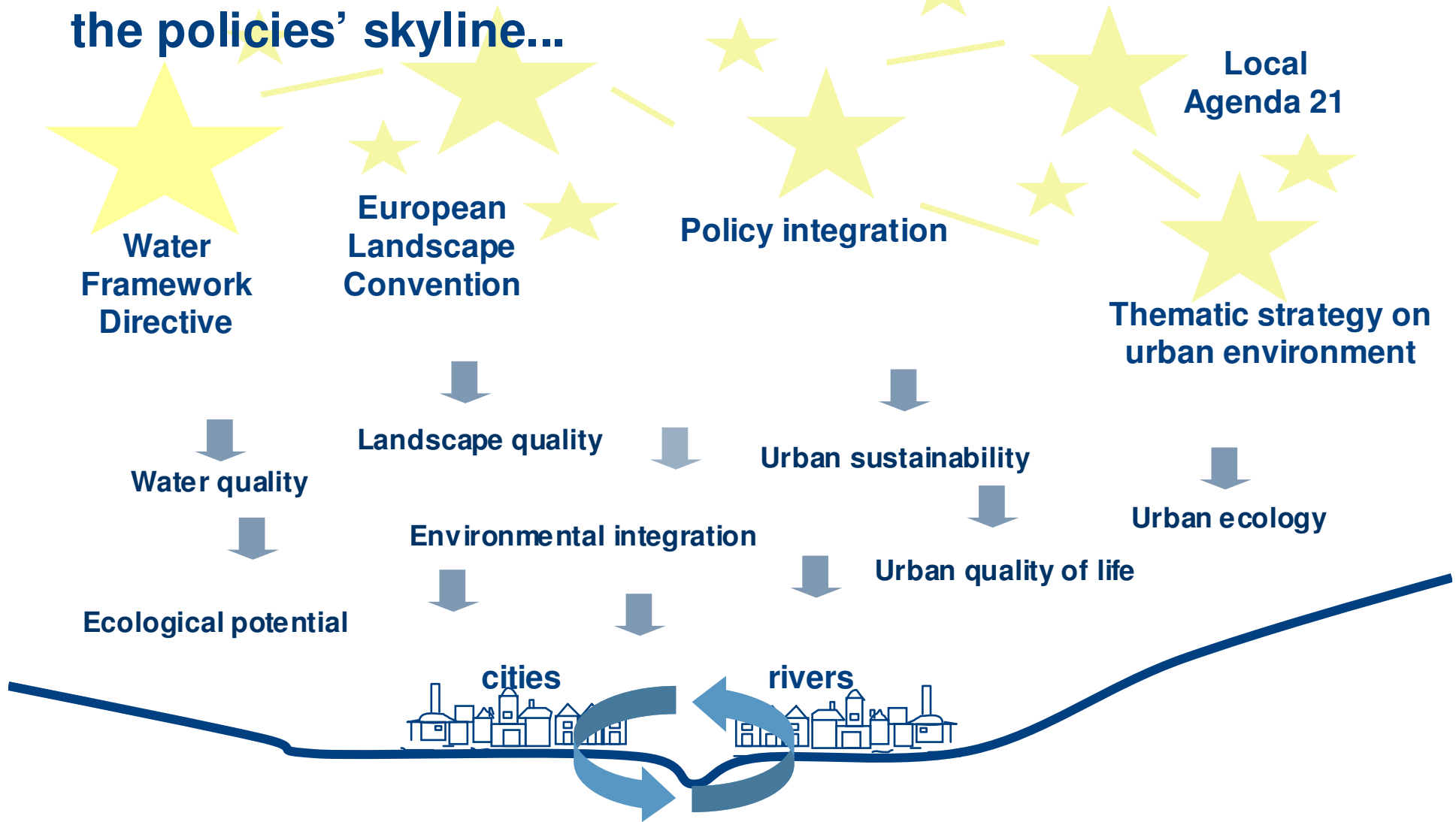
Opportunities - public interest and values

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cité, fiume, stad, riv, fluss, rio

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the policies' skyline...





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Examples of urban river rehabilitation and improvement



Stream daylighting in Leipzig, Germany



Santa Rosa Creek, CA, USA



Rehabilitation of Jardas creek, Cacém, Portugal



Rehabilitation of urban creeks, Gaia, Portugal

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Urban rivers

## Concepts

**Restoration** is directed towards *recreating the **pristine** physical, chemical and biological state* of rivers. In its purest sense it means a full structural and functional return to a pre-disturbance state (Wade et al. 1998, p. 2).

**Renaturalisation or naturalisation** describes the *naturalistic* way of bringing a (river-) ecosystem back to a **natural state** but without targeting the really pristine, pre-disturbance state (cp. Mendiondo 1999).

**Rehabilitation** indicates a process which can be defined as the *partial functional and/or structural return* to a former or pre-degradation condition of rivers or putting them **back to good working order** (Wade et al. 1998, p. 2). It is dedicated to the ecologic state (biological, hydromorphological and physico-chemical) by structural and partly non-structural measures.

**Enhancement** means an *improvement* of the current state of rivers and its surroundings. It aims at a general valorisation of the ecological, social, economic and aesthetic properties.

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- **artificialization of urban fluvial systems - “highly modified water bodies”**
- **restrictions imposed by urban uses**
- **pollution and decrease water quality**
- **high rate of imperviousness and runoff**
- **flood risks**
- **loss of biodiversity and landscape quality**
- **growing public interest on riverine and riverfront areas**
- **opportunities for rehabilitation associated to urban regeneration processes**

*“restoration in urban streams is both more expensive and more difficult than in less densely populated catchments” (Giller, 2005)*

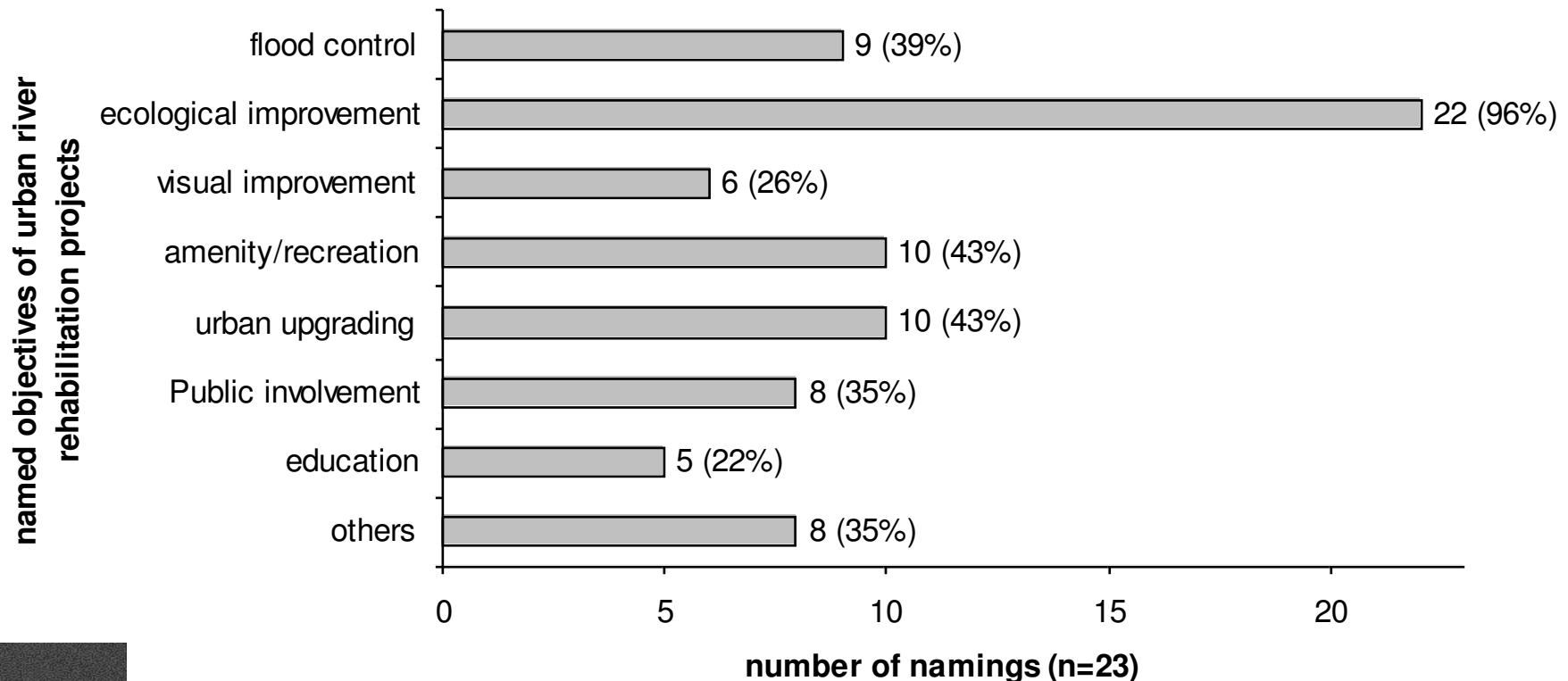


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URBEM WP2 Survey on existing Urban River Rehabilitation Schemes,  
Schanze *et al.*, 2004

**Objectives of urban river rehabilitation projects**

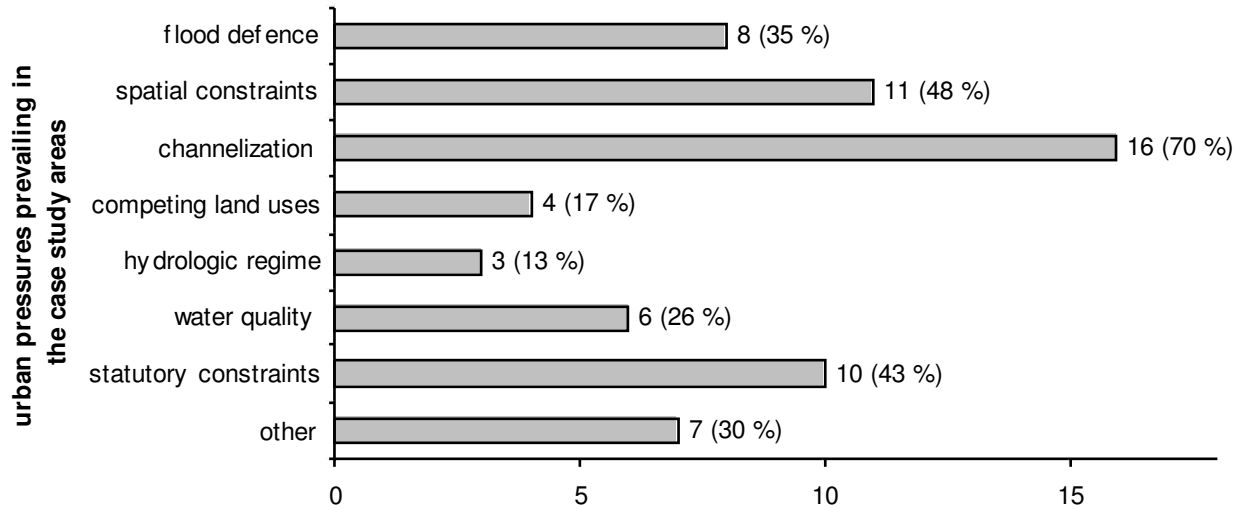


**Urban River Basin Enhancement Methods**  
2002-2005 [www.urbem.net](http://www.urbem.net)

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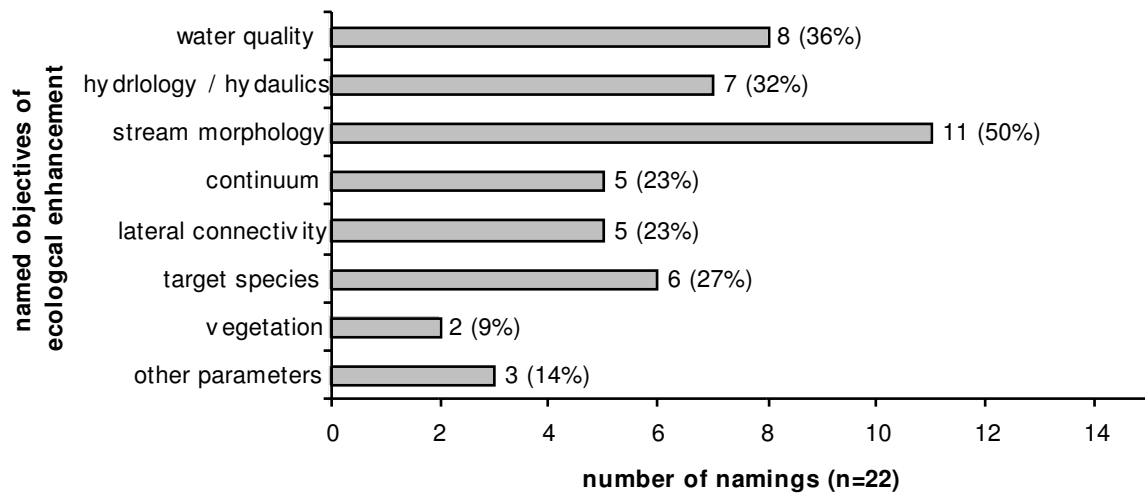


## Urban constraints and pressures in case study areas



\* as referred to in the enquiry process, not explicitly enquired **number of namings\***

## Objectives of ecological improvement in urban rehabilitation projects



Schanze *et al.*, 2004

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Indicators of Success, Tourbier et al., 2005

<b>Ecological Indicators</b>	<b>Social Indicators</b>	<b>Economic Indicators</b>
Biological water quality (WFD)	Parking lots	Activities to create income
River depth and width variation	Public transportation stops	Median property value
Acidification status	Access points for soft modes	Unemployment
Inundability	Water contact zones	
Percentage of stream length with riparian vegetation	Anchorage points	
Use of recycled water	River crossings	
Connection to groundwater bodies	Public utility of river sites	
River continuity	Landmarks / Viewpoints	
Presence of riparian vegetation	Recreational facilities	
Width of riparian fringe	Recreational paths	
Hydromorphological conditions (WFD)	Integration of cultural heritage and cultural assets	
Pollution by all priority substances identified as being discharged into the body of water	Cultural events	



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Case Study - Evaluation of the rehabilitation of river Fervença at Bragança, , POLIS Programme, Portugal

## ECOLOGIC

Qualidade da Água +  
Biodiversidade -  
Galeria rípicola -  
Estrutura Verde --  
Gestão de Riscos  
Conforto Bioclimático

## SOCIAL/URBAN

Qualidade de Vida  
Recreio e Lazer ++  
Identidade ++  
Satisfação ++  
Integração Cidade – Rio  
Mobilidade

## ECONOMIC

Oportunidade de negócio 0  
Auto-sustentação do espaço 0  
Serviços/Equipamentos +

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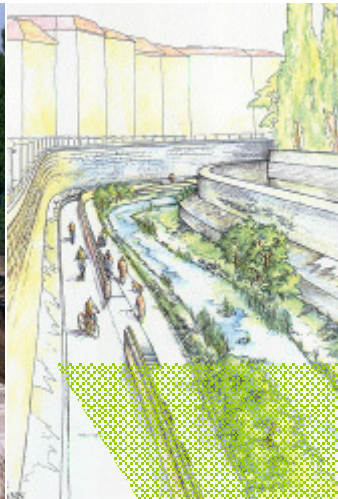


RiProCity Project

Rivers and cities: opportunities for urban sustainability

RIPROCITY INDICATORS	MEASURES
<b>1 Citizen satisfaction with the local riverfront</b>	Satisfaction Level of the citizens in relation to the intervention area.
<b>2 River contribution to local bioclimatic change</b>	Variables measurements of climate (temperature, relative humidity, wind speed (direction), solar radiation).
<b>3 Ecological quality of the river corridor</b>	Riparian corridor conservation status; Ecological status of water bodies.
<b>4 Flood risk</b>	<b>Risk</b> = Probability (probability of chain of events from origin to impact) x Exposure x Vulnerability (consequences/damages).
<b>5 Sustainable land use</b>	% of impervious surfaces in urban watersheds;
<b>6 Mobility and river accessibility</b>	River crossings for pedestrians; Accessibility to the river on public transports.
<b>7 Availability of local public spaces and services</b>	Social facilities area on the riverfront per inhabitant; Percentage of open public space on the riverfront; Area of restaurants, commerce and other services available for recreation over total surface area of the riverfront.
<b>8 Governance and sustainable management</b>	Stability of the land-use management system; Existence of projects or programmes with influence over the riverfront; Compatibility/conflicts between different management instruments. Public involvement and participation.

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**3rd generation  
Environmental  
and ecologic  
rehabilitation  
with social  
concerns?**

**2nd generation  
Public space**



**1st generation  
Riverfront development**

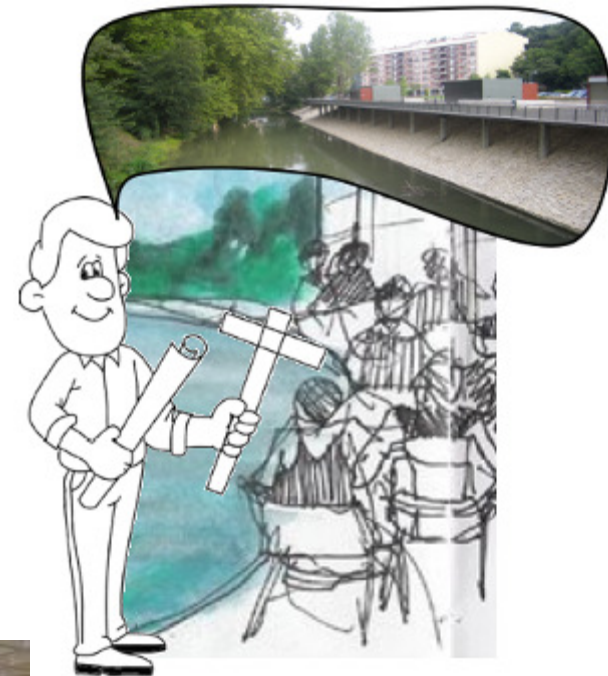
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Multidisciplinary....



and public  
involvement and  
participation.....

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