

## Benefits of Water Framework Directive implementation

### Evidence of river restoration measures improving ecological conditions

River restoration is an integral part of sustainable water management and directly supports the aims of the Water Framework and Floods Directives. The WFD and FD have acted as drivers for numerous river restoration projects aimed at the improvement of ecological status across Member States. The following eight case studies demonstrate positive results to meet the objectives of the WFD and FD and are excerpted from a full report.<sup>1</sup>

These improvements include the abundance, diversity and population structure of specific bioindicators and improvements of hydromorphological conditions or flow regimes. Some of the case studies highlight relevant improvements in river governance (i.e. Segura, Turia, Eddleston Water and Eau Blanche and Bocq) or the crucial role of public participation (i.e. Orbigo, Segura and Eddleston Water). These provisions of the WFD prove to be key elements for successful river restoration interventions.

#### 1. Rivers Bocq and Eau Blanche (Belgium) – LIFE project “Walphy”

<i>Catchment &amp; Lead organization</i>	Meuse, Service Public de Wallonie	
<i>Budget &amp; scope:</i>	€ 2,8 million, 20 obstacles on 46km removed, 22km lateral connectivity improved	
<i>Categories of restoration</i>	Morphological, Hydrological connectivity	
<i>Significant &amp; innovative elements</i>	Improved governance	
<i>Pressures</i>	<b>WFD measures</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>Channelization</li> <li>Floodplain disconnection</li> <li>Damming &amp; embankment</li> </ul>	<ul style="list-style-type: none"> <li>Habitat diversification</li> <li>Passability of barriers</li> <li>Barrier removal</li> <li>Re-meandering</li> <li>Reconnection of backwater</li> </ul>	<ul style="list-style-type: none"> <li>Enhanced habitat heterogeneity</li> <li>Improved fish mobility and population size</li> <li>Restored sediment transport</li> <li>Spawning places</li> </ul>

#### 2. River Drac (France)

<i>Catchment &amp; Lead organization</i>	Rhône - French Water Agency	
<i>Budget and scope</i>	€ 5 million, 4km, 450 000 m <sup>3</sup> gravel recovered to reconstruct altimetric profile, weir with fish passage built to fix riverbed height	
<i>Categories of restoration</i>	Morphological - braided channel morphology, improvement of sediments continuity and lateral reconnection	
<i>Significant &amp; innovative elements</i>	Integration with Floods Directive	
<i>Pressures</i>	<b>WFD measures</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>Riverbed incision due to gravel extraction</li> </ul>	<ul style="list-style-type: none"> <li>Restoration of morphological conditions</li> <li>Restoration of sediments continuity</li> <li>Reconnection of tributaries</li> <li>Innovative monitoring method</li> </ul>	<ul style="list-style-type: none"> <li>Improved physico-chemical quality</li> <li>Improved habitat conditions</li> <li>Increased presence and abundance of aquatic and flagship species</li> </ul>

<sup>1</sup> <https://europe.wetlands.org/publications/successes-eu-water-framework-directive-implementation/>

### 3. River Cofio (Spain)

<i>Catchment &amp; Lead organization</i>	Tagus - Tagus River Basin Authority	
<i>Budget and scope</i>	€ 280k, remove medium/large-sized dam, extract and relocate sediments, re-profile and reforest riverbanks	
<i>Categories of restoration</i>	Morphological, Hydrological connectivity, Flow regime	
<i>Significant &amp; innovative elements</i>	Monitoring of additional bioindicators and/or backwaters	
<i>Pressures</i> <ul style="list-style-type: none"> <li>• Damming</li> <li>• Water pollution</li> </ul>	<b>WFD measures</b> <ul style="list-style-type: none"> <li>• Dam removal</li> <li>• Sediment extraction</li> <li>• Reforestation</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>• Improved fluvial habitats and riparian forests</li> <li>• Recovery of riverine communities - improvement of fish populations of all species linked to the above result</li> </ul>

### 4. River Orbigo (Spain)

<i>Catchment &amp; Lead organization</i>	Duero - Ministry of Environment and Rural and Marine Affairs	
<i>Budget and scope</i>	€ 3 million, 24km river – rock armoring removed 13km, 5km embankment setback, 10km secondary arms restored, 7.2ha vegetation buffer	
<i>Categories of restoration</i>	Morphological, Hydrological connectivity	
<i>Significant &amp; innovative elements</i>	Public participation, Integration with Floods Directive	
<i>Pressures</i> <ul style="list-style-type: none"> <li>• Embankment and erosion control structures</li> <li>• In-channel obstacles</li> <li>• Channelization</li> </ul>	<b>WFD / FD measures</b> <ul style="list-style-type: none"> <li>• Removal and adjustment of weirs, embankments and rock armour</li> <li>• Reconnection of floodplains</li> <li>• Active public participation</li> <li>• Innovative monitoring method</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>• Improved flood risk mitigation</li> <li>• Habitat diversification</li> <li>• Quantitative assessment compared flooding - successfully contained within the new configuration, whereas old situation caused serious damages</li> <li>• Improved ecological status of water body</li> </ul>

### 5. River Segura (Spain)

<i>Catchment &amp; Lead organization</i>	Segura - Segura River Basin Authority	
<i>Budget and scope</i>	€ 3,4 million, 54km – 1 weir removed, 8 fish passages constructed	
<i>Categories of restoration</i>	Hydrological connectivity	
<i>Significant &amp; innovative elements</i>	Improvement in governance, Public participation, Monitoring of additional bioindicators and/or backwaters	
<i>Pressures</i> <ul style="list-style-type: none"> <li>• Damming</li> </ul>	<b>WFD measures</b> <ul style="list-style-type: none"> <li>• Weir removal</li> <li>• Fish passage construction</li> <li>• Vegetation management</li> <li>• Stakeholder and public participation</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>• Increased fish migration</li> <li>• Improved condition of riparian forest</li> <li>• Improved governance</li> </ul>

## 6. River Turia (Spain)

Project overview		
<i>Catchment &amp; Lead organization</i>	Júcar - Júcar River Basin Authority	
<i>Budget and scope</i>	Budget NA, 17km	
<i>Categories of restoration</i>	Flow regime	
<i>Significant &amp; innovative elements</i>	Improvement in governance	
<i>Pressures</i> <ul style="list-style-type: none"> <li>Damming</li> </ul>	<b>WFD measures</b> <ul style="list-style-type: none"> <li>Establishment of environmental flow</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>Restored spawning places and diversified habitats</li> <li>Recovery of aquatic species</li> <li>Improved riparian forest</li> </ul>

## 7. River Eddleston Water (United Kingdom)

<i>Catchment &amp; Lead organization</i>	Tweed - Tweed Forum	
<i>Budget and scope</i>	£1.4 million, 2km re-meandered, 2.9km flood embankments removed, 101 flow-restricting log-jams installed, 66ha planted, 22 stormwater ponds created	
<i>Categories of restoration</i>	Morphological	
<i>Significant &amp; innovative elements</i>	Improvement in governance, Public participation, Integration with Floods Directive, Monitoring of additional bioindicators and/or backwaters	
<i>Pressures</i> <ul style="list-style-type: none"> <li>River straightening</li> <li>Embankment</li> </ul>	<b>WFD / FD measures</b> <ul style="list-style-type: none"> <li>Re-meandering</li> <li>Removal of embankments</li> <li>Natural flood management measures</li> <li>Vegetation management</li> <li>Creation of water storage</li> <li>Public participation</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>Habitat creation</li> <li>Recovery of fish (salmon) and other species (otter)</li> <li>Improved flood risk management – delayed flood peaks, increased surface roughness and groundwater connectivity</li> </ul>

## 8. River Glaven (United Kingdom)

<i>Catchment &amp; Lead organization</i>	Glaven - Environment Agency	
<i>Budget and scope</i>	n/a, 400m embankments removed, channel re-meandered	
<i>Categories of restoration</i>	Morphological, Monitoring of additional bioindicators and/or backwaters	
<i>Significant &amp; innovative elements</i>	Integration with Floods Directive	
<i>Pressures</i> <ul style="list-style-type: none"> <li>Canalization</li> <li>Floodplain disconnection</li> <li>Damming and embankment</li> <li>Floodplain drainage</li> </ul>	<b>WFD / FD measures</b> <ul style="list-style-type: none"> <li>Floodplain reconnection</li> <li>Removal of embankment</li> <li>Restoration of channel morphology</li> </ul>	<b>Benefits</b> <ul style="list-style-type: none"> <li>Enhanced habitat connectivity and heterogeneity</li> <li>Increased vegetation richness</li> <li>Increased invertebrate diversity in backwaters</li> <li>Increased density of brown trout</li> </ul>