



Preparatory Phase for the pan-European  
Research Infrastructure DANUBIUS-RI  
“The International Centre for advanced  
studies on river-sea systems”

## Online Lectures

### Deliverable 10.4



European  
Commission

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	<b>Restricted to a group specified by the consortium (RE)</b>	
	<b>Confidential, only for members of the consortium (CO)</b>	

## **Executive summary / abstract**

Short lectures with dynamic visual components were produced by DANUBIUS-PP and made available online. They cover the following themes: Functioning of, Ecosystem Services of, and Anthropogenic Impacts on, River-Sea Systems. The lectures will be widely communicated to relevant stakeholders, from all categories, helping to raise awareness and interest on DANUBIUS-RI and the importance of RS systems in general.

The three online lectures are hosted on <https://vimeo.com/showcase/6089247>, with public access.

For the beta-version they are filmed sequences in three Supersites of DANUBIUS-RI: the Danube Delta, in Romania, the Po Delta – Adriatic Lagoons, in Italy and the Tay Catchment, in the United Kingdom.

Each film comprises sequences grouped in the three major themes of the lectures:

- Functioning of RS Systems (Fig. 1)

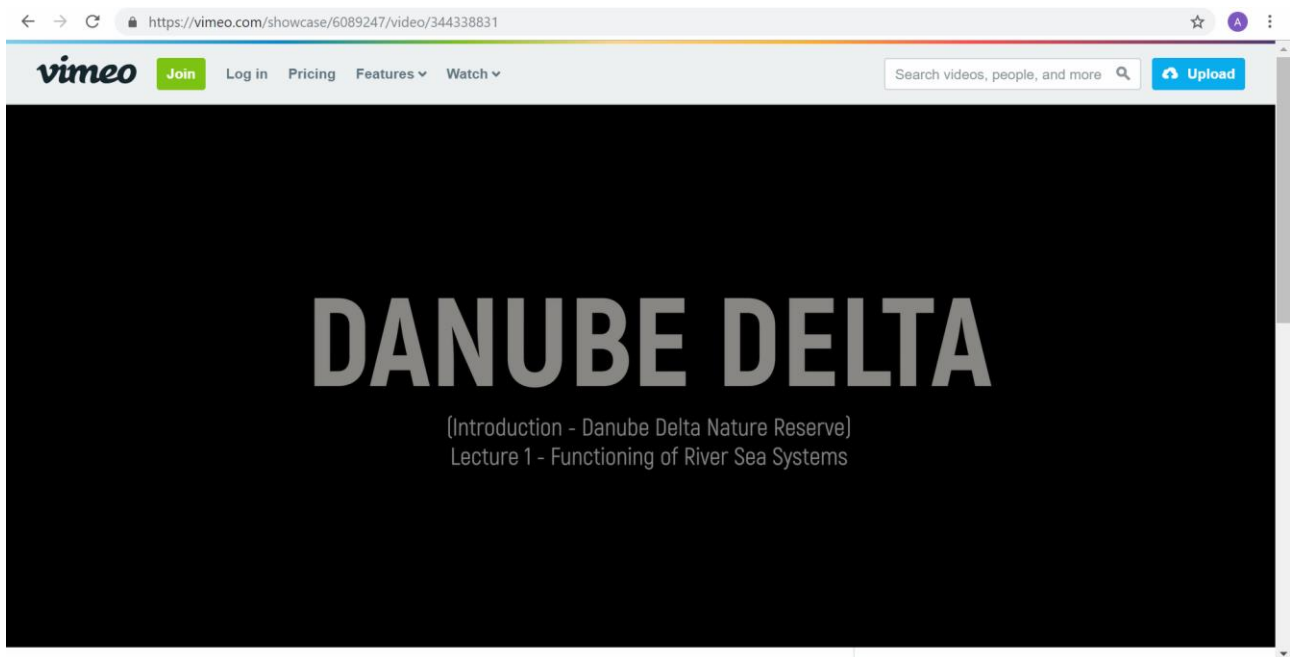


Fig. 1. Example from the Danube Delta Supersite movie

- Ecosystem Services of RS systems (Fig. 2)

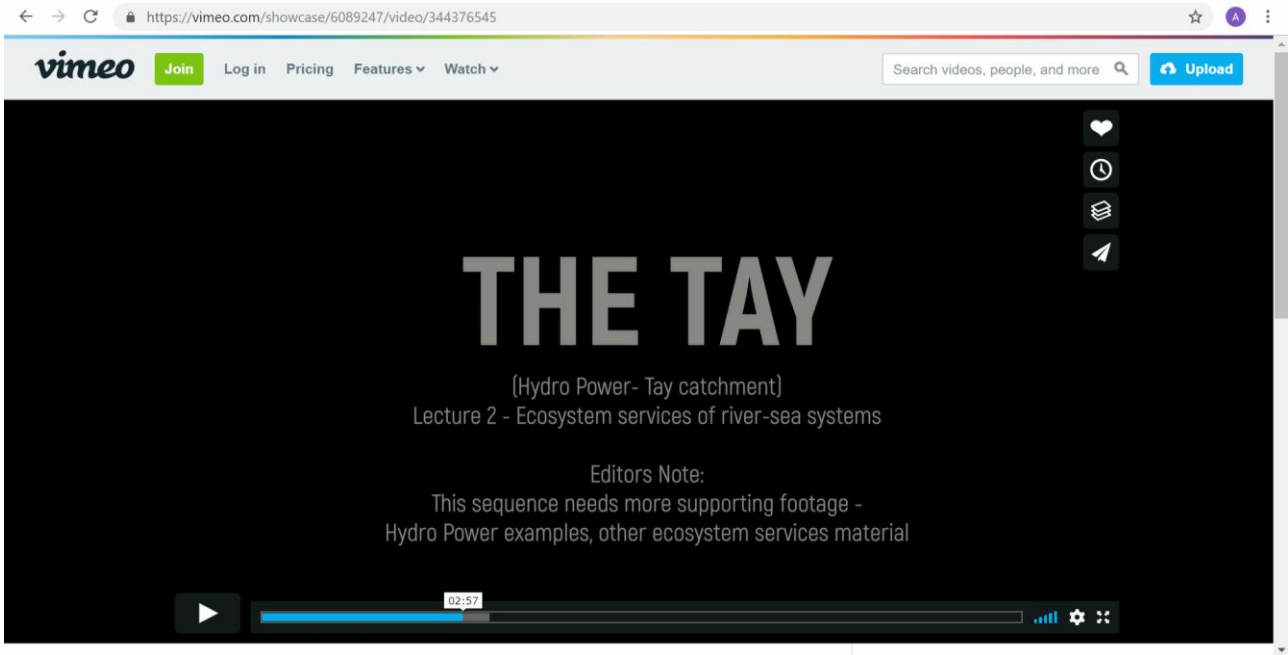


Fig. 2. Example from the Tay Catchment Supersite movie

- Antropogenic Impacts on Rs Systems (Fig. 3)

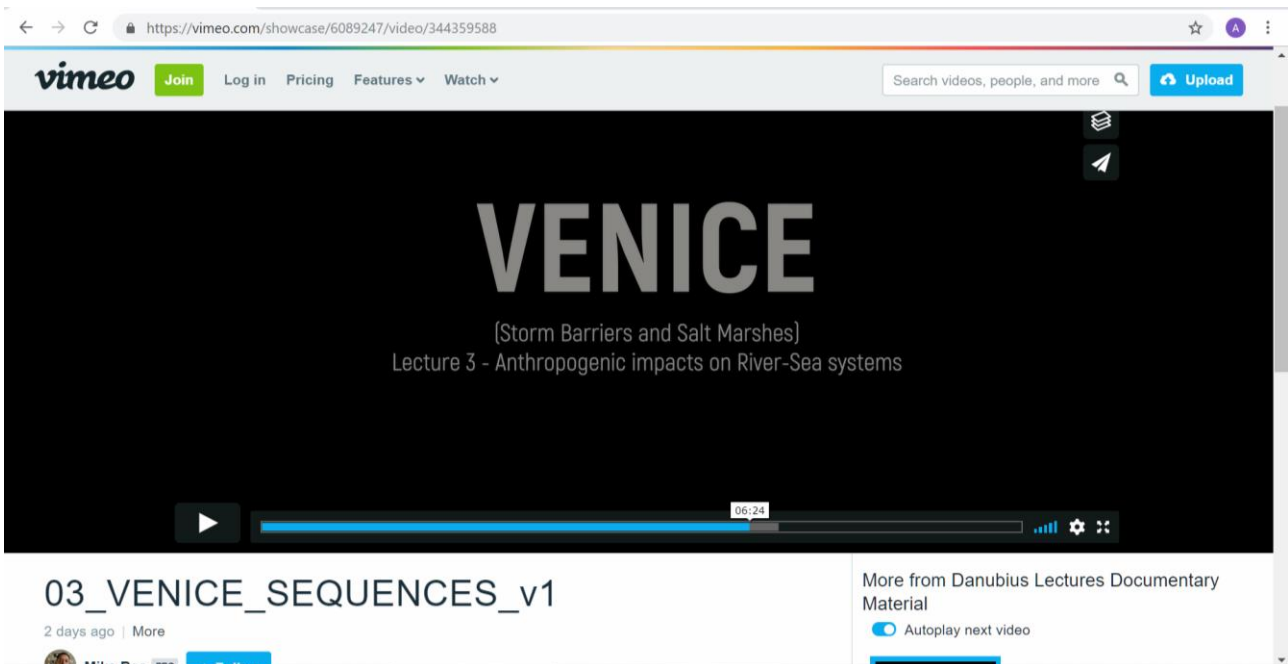


Fig. 3. Example from the Venice lagoon, part of the Po Delta – Adriatic lagoons Supersite movie

The beta-version of the lectures comprise interviews with the lead scientists from each Supersite and illustration of the scientific content described by the speakers, filmed in the three Supersites. (Fig. 4-6).

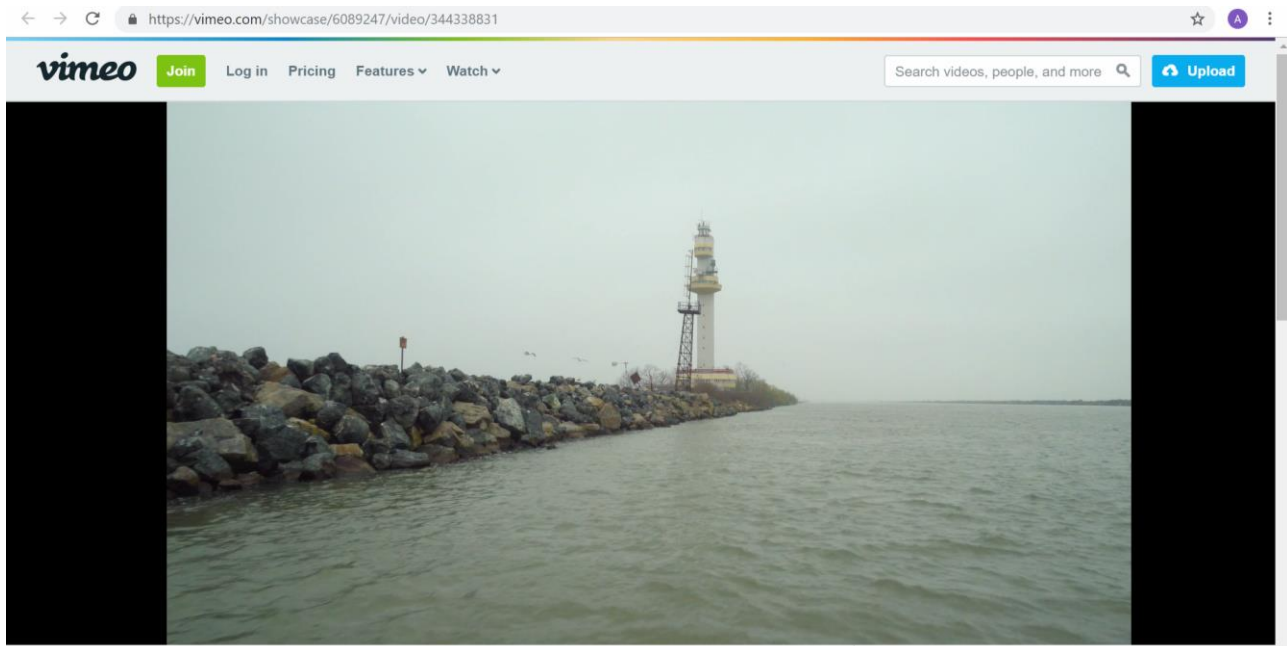
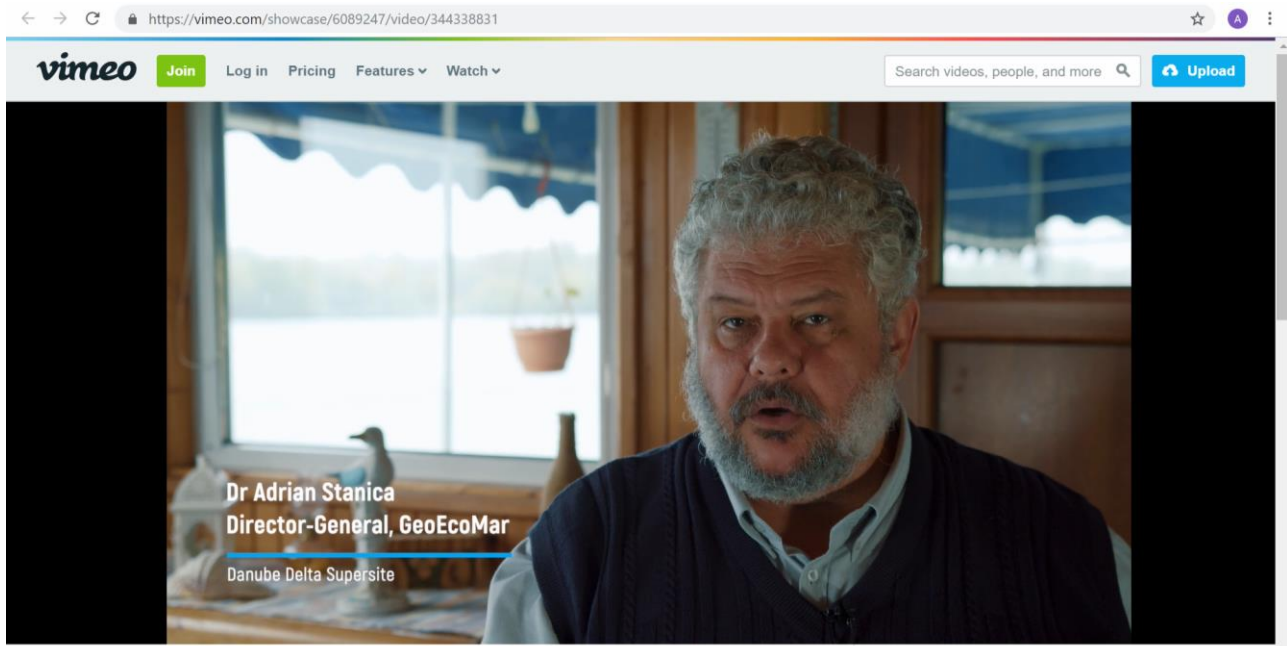


Fig. 4. Interview with Dr. Adrian Stanica and example illustration on the Sulina jetties, the Danube Delta Supersite

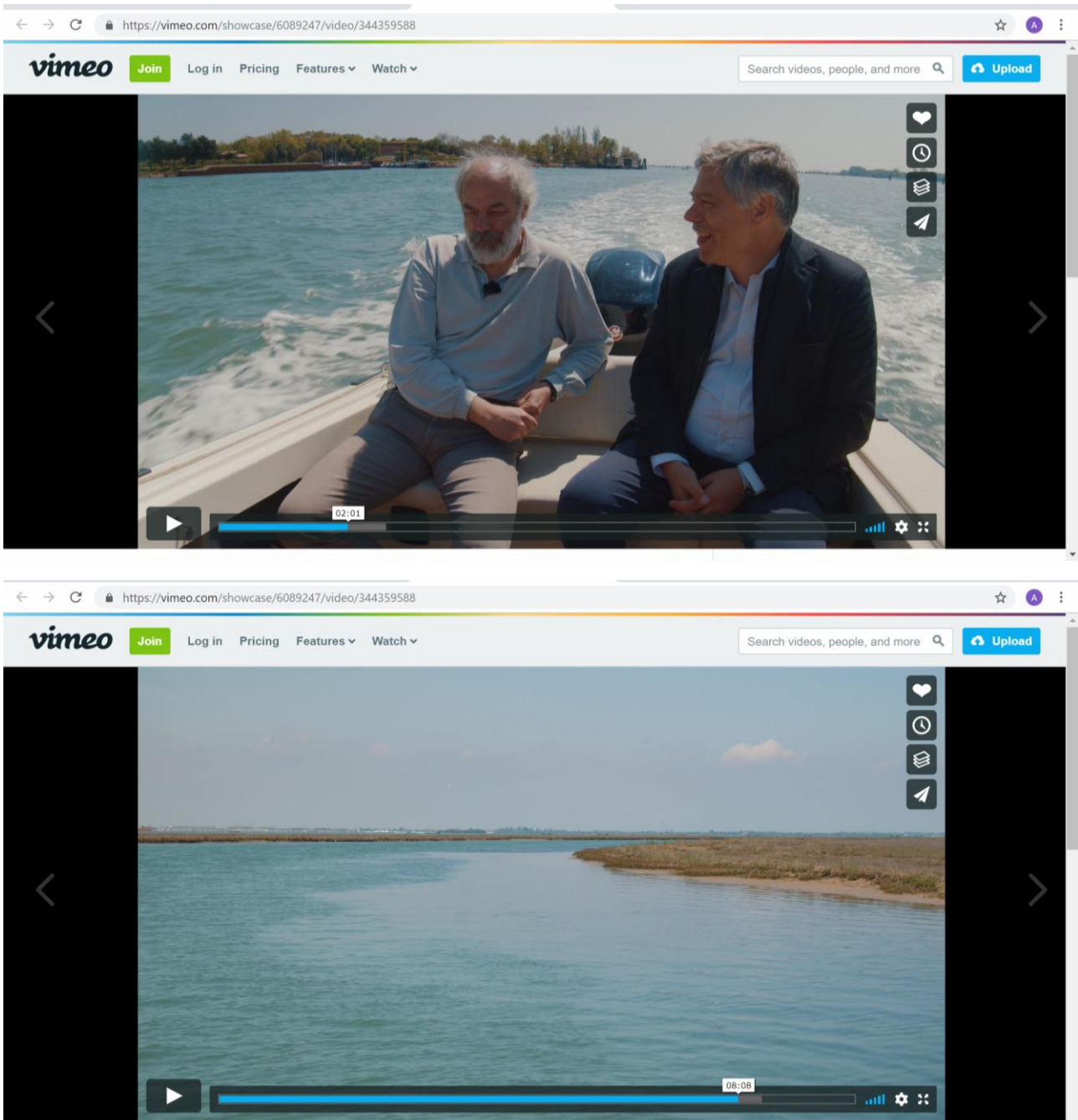


Fig. 5. Interview with Dr. Georg Umgiesser and Dr. Pierpaolo Campostrini while touring the Venice Lagoon, and the illustration of salt marshes in the lagoon, part of the Po Delta – Adriatic Lagoons Supersite



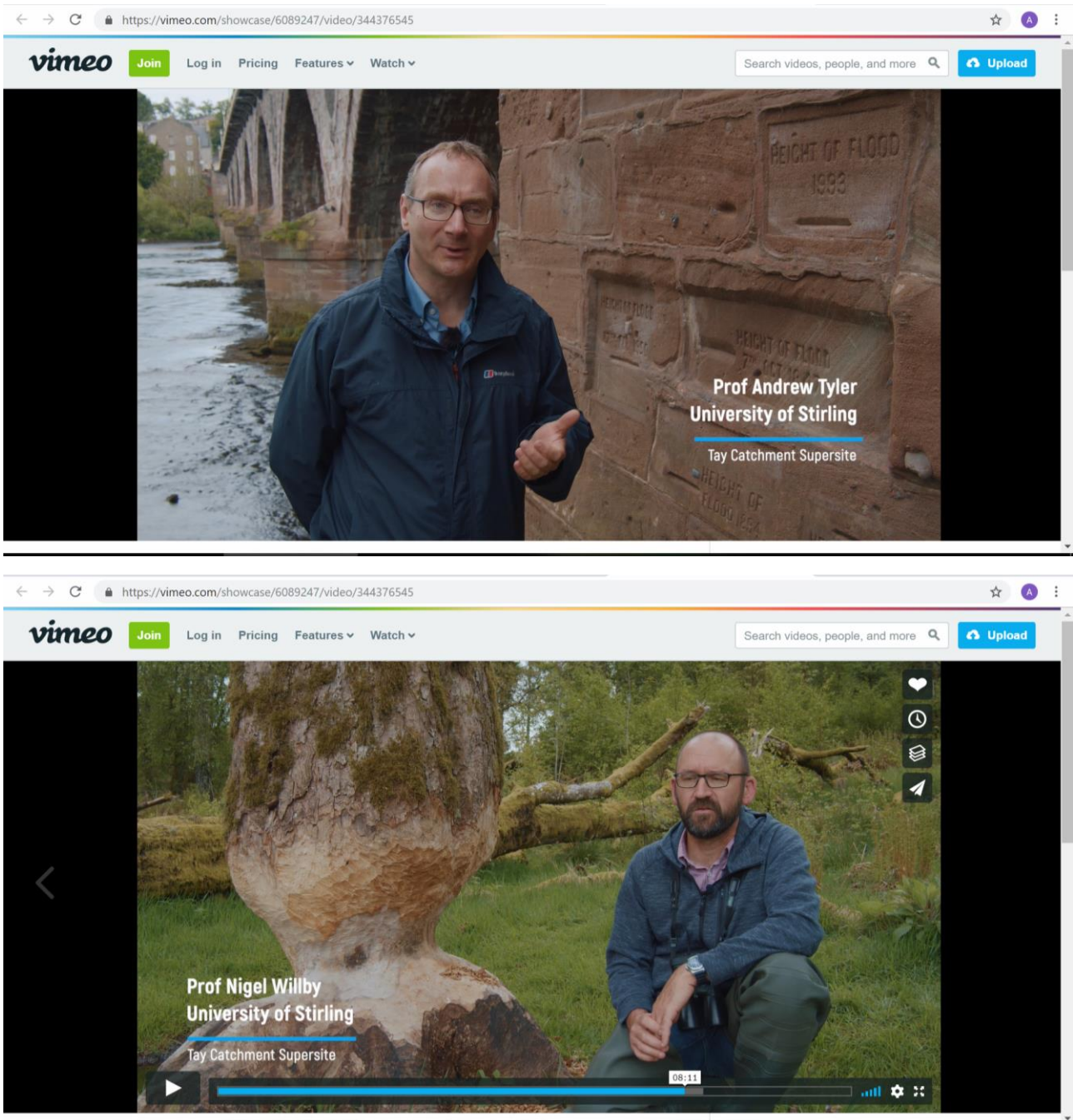


Fig. 6. Interview with Prof. Andrew Tyler at the Perth Bridge, and with Prof. Nigel Willby, illustrating the reintroduction of beavers, in the Tay Catchment Supersite

The final version of the online lectures will comprise an introduction to the main themes, Functioning of, Ecosystem Services of and Anthropogenic Impacts on River-Sea Systems and a series of sequences illustrating the main scientific issues, grouped around the three major themes. A more detailed plan is presented in Annexes 1-3.

Annex 1.

## Lecture 1: **Functioning of River-Sea Systems**

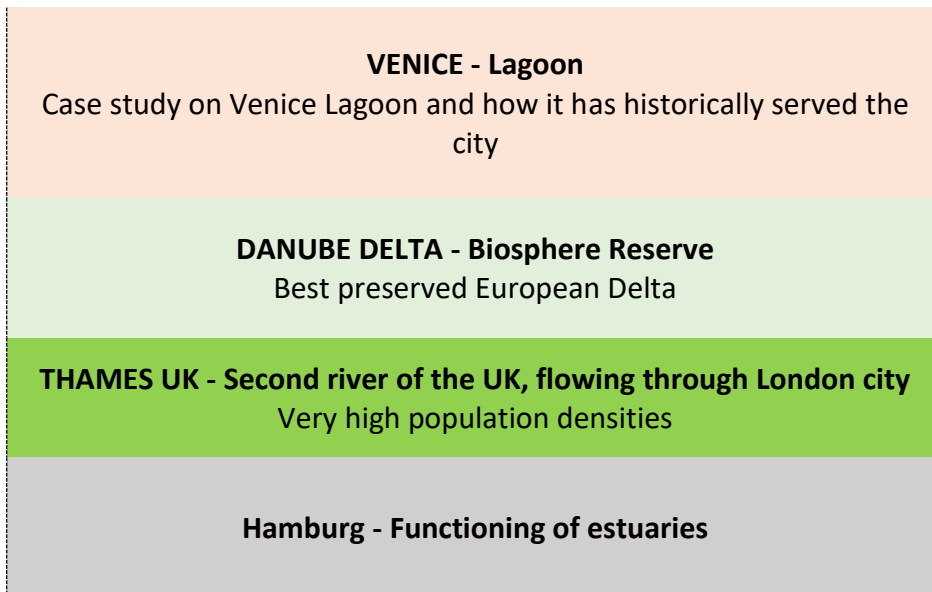
### **Introduction**

With their fertile plains and waters so rich in resources, rivers provided civilization with the essentials for a better and more secure life. In the lower parts of the rivers, ancient humans discovered the deltas and the estuaries, probably some of the richest habitats on this planet. Interacting environmental processes at the interface between land and ocean are the lifeblood of the river-sea system and circulation generated by the mixing of fresh and saline waters, river and groundwater discharge, tidal flooding, resuspension events, and exchange flow with adjacent marsh systems all play an important part in influencing the dynamics of estuarine and coastal zones. Nutrients and dissolved oxygen are continually resupplied from the ocean as well as the surrounding catchment, and wastes are expelled in the surface waters. This flushing action leads to some of the highest growth rates of aquatic plants in any water environment and provides a base for diverse and valuable food webs, fuelling the growth of some of our most prized fish, birds, and mammals.

From Alexandria to Rome, from London to Hamburg, from ancient Histria on the mouths of the Danube to Paris, humans from all ages of history tried to obtain the best of the resources provided both by the rivers and the seas. As well as regions rich in natural food provision, river-sea systems are exploited for drinking water extraction, agricultural irrigation, recreation and tourism, renewable energy resources for hydroelectric power plants and shipping transport pathways to the entire planet. Rivers, river mouths and the seas under their influence have been subject to dramatic abuses, nowadays being some of the most impacted environments.

### **Example Sites**

**TAY UK - relatively un-impacted river-sea system**  
Perspective on river basin



Annex 2.

## Lecture 2: **Ecosystem services of river-sea systems**

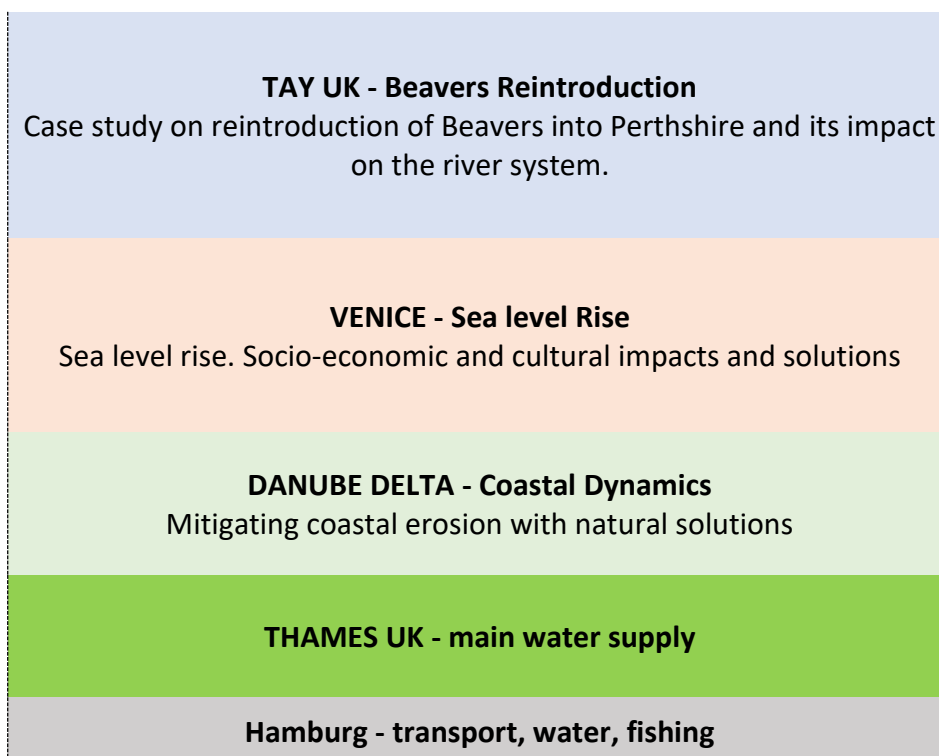
### **Introduction**

River-sea systems provide a wide range of benefits for society. These benefits, known collectively as 'ecosystem services', are derived from the natural and cultural attributes and processes contained within a catchment area. Ecosystem services relevant to rivers, deltas and estuaries, as well as adjacent coastal seas can be generally categorized as follows;

- Provisioning services
  - ✓ Food provision from aquaculture and commercial fishing,
  - ✓ Water availability for commercial, industrial and agricultural abstraction,
  - ✓ "Natural" waterways and harbours.
- Regulating services
  - ✓ Climate regulation from carbon storage,
  - ✓ Water quality regulation from the brackish and tidally mixed zones,
  - ✓ Coastal flooding and erosion regulation due to extensive and variable coastal habitats which provide an important natural defence against flooding by reducing the impact of wave action on the coastline and its defences.
- Cultural services

- ✓ Sense of place is provided by the river-sea environment,
- ✓ Sense of history from military and archaeological associations along the coastline,
- ✓ Tranquillity from vast areas of natural space,
- ✓ Recreation in the many social activities made possible from water sources,
- ✓ Biodiversity attained in the numerous species found in rich river-sea systems.

### Example Sites



Annex 3.

## Lecture 3: Anthropogenic impacts on River-Sea system

### Introduction

The development of towns and cities along the rivers, from the upper parts downstream to the coast, left little or no space for the constant and natural change and evolution of the watersheds. Discharges of polluted waters from industries and towns built along the riverbanks contributed to the overall degradation of water quality. Deforestation within river catchments led to accelerated erosion of soil leading to rivers being choked by sediment, reducing water quality and producing catastrophic floods

downstream. Increasing populations in towns and cities resulted in large areas of the alluvial plains transformed into agricultural lands, with fertilizers and pesticides leaking into rivers and washed down towards the seas. The demand for energy made people build dams for hydroelectric power plants. Besides their positive effects, these actions produced collateral damage, as dams drastically severed the continuity of the water flow, with everything it contains, from the mountains to the seas. Some fish and other species naturally moving between seas and upper parts of rivers had their migration corridors blocked. With no place to go and no space to move, rivers have started to react. Restrictions on the natural channels of rivers, due to hard embankments, dykes, and dams, together with abrupt changes of climate, have been the main causes of the catastrophic effects of the floods in rivers and river mouths over recent decades.

Another negative impact demonstrates the complexity of these natural systems. Sediments transported by the water remain in the barrage lakes upstream of the dams with lesser quantities transported towards the river mouths. But sands and muds are the materials deltas and beaches are made of. So when the river waters brought less sediments to the sea, deltas started to sink and beaches began to be washed away by the waves.

### Example Sites

<p><b>DANUBE DELTA - Coastal Erosion</b> Sediment supply and coastal erosion one of the main challenges to the Delta</p>
<p><b>Venice lagoon</b> Flood gates and salt marshes</p>
<p><b>THAMES UK - Heavily impacted by Pollution</b> Case study on role of River and impact of pollution</p>
<p><b>Hamburg - Port</b> The development of the Port and its impact on the economy and natural environment</p>

**Other examples from previous footage**  
Ex. Hydropower dams



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