

Fishing valleys in the Venetian Lagoon

A traditional extensive aquaculture system, still functioning and spread along the border of the Venetian Lagoon.

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Figure 1 Fishing valley in Lio Piccolo, northern Venetian Lagoon.
Fishing valleys of the Venetian Lagoon

Context.

Location: Venetian Lagoon, Veneto region, Italy.
Period: 11th Century A.D.
Function: Aquaculture system.
Type: Extensive fish cultivation system.
Area: 8500 ha.
Components: The main elements are the fishing ponds, the embankments separating the valleys from the lagoon, the mansions, and the waterworks able to calibrate the amount of fresh water and salt water to introduce in the valleys.
Status: In use.



Figure 2 Continental scale Europe and Italy



Figure 3 Country scale Italy and Veneto region

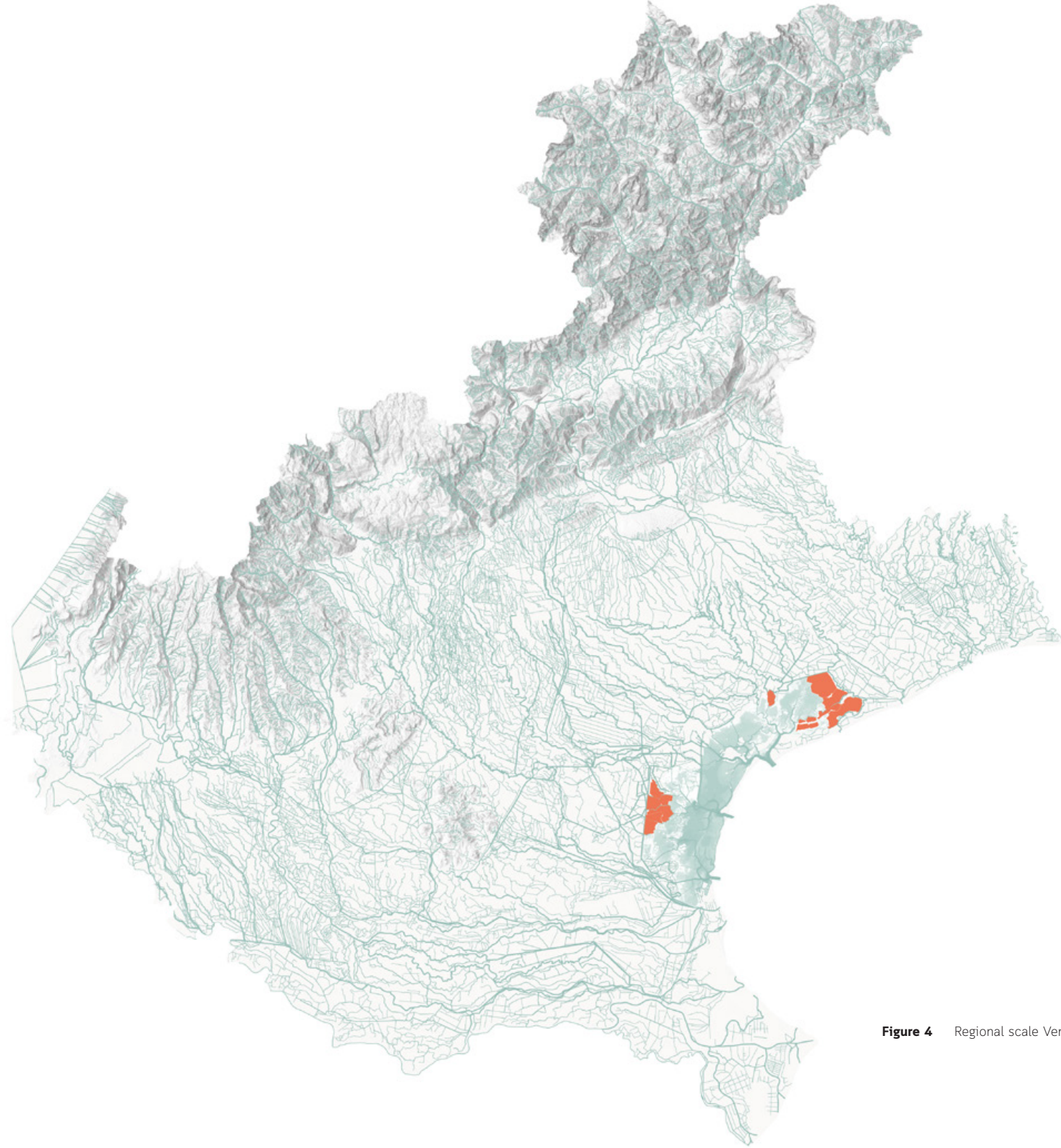


Figure 4 Regional scale Veneto region and Venetian lagoon

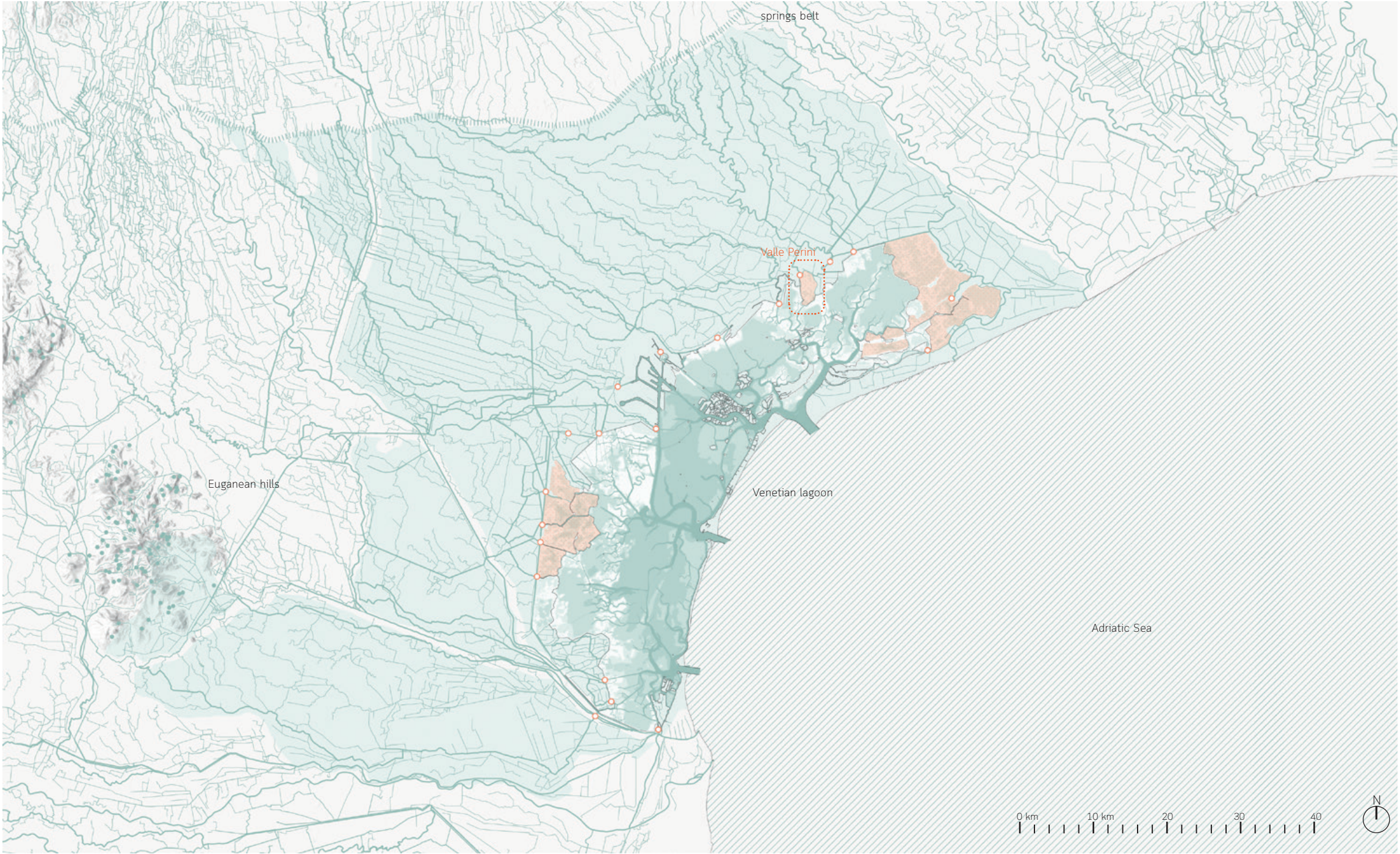
Catchment Area.

The freshwater catchment area discharges directly in the Venetian Lagoon, and therefore it provides with freshwater the fishing valleys. It originates from two different sources: the so-called *springs belt* formed by those waters, which accumulated in the underground aquifers, resurface; and the Euganean Hills, a group of hills of volcanic origin that rise to heights of 300 to 600 m from the Paduan-Venetian Plain a few km south of Padua.

During the past centuries, because of the innumerable interventions conducted by the Republic of Venice to ensure the survival of the city of Venice and to avoid the silting of the whole Venetian Lagoon, many of rivers naturally discharging in it (as Brenta, Bacchiglione, Tagliamento, Sile and Piave) got diverted. This engineering decision had a tremendous negative effect on both the amount of sediments and the amount of freshwater discharged inside the lagoon, reducing them and altering the hydromorphological balance in act.

The orange elements highlighted in the map are the areas occupied nowadays by the fishing valleys, in total 23, completely limited by embankments along the border of the Venetian Lagoon.

Figure 5 Venetian Lagoon watershed. With an orange dotted line is marked Valle Perini, the fishing valley which will be further analyzed in the research.



Fishing valleys of the Venetian Lagoon

Human Interactions.

The fishing valley master, *capovalle*, the fishing valley workers and the guardian are the three fundamental figures for the fishing valley management in the Venetian Lagoon. The *capovalle* is the chief of the fishing valleys, regulating the water regime and employing of seasonal workers; the workers are in charge of different managing activities; the guardian monitors the valley daily.



Spring.
From March to May, in the open lagoon, *pescenovellanti* know where to flush the juvenile fishes out. They are there, nearby the inlets where the water is constantly fresh and flowing, all hidden in the shallow waters populated by tall and impenetrable seaweeds. Then, it is time for seasonal workers to sow the larvae in the *seragio per il novellame*, an impervious labyrinth where the fry acclimatize with the valley's conditions.



Summer.
From June to the end of September, inside the fishing valley, the *capovalle* is the main director of the scene. He is in charge of controlling the whole system, from the water salinity to nutrients and oxygen levels regulation. In the summer humid air, it is time to take care, maintain, manage, adjust, fix and repair, small actions to ensure the valley its smooth procedure.



Autumn.
From October to the end of December, the *fraima* takes place. This natural migration instinct arises because of the progressive cooling of the waters and bring the shoals of fish populating the valley towards the *lavorièri*. In these traps, the fishes are captured by the workers and selected in relation to the species and the size: specimens suitable for marketing are sent directly to fish markets; small specimens, instead, are placed in *pesciere di sverno* where they will face the difficult winter season.



Winter.
From January until the beginning of March, takes place the most delicate phase regarding the fishing valleys management. During winter becomes extremely critical controlling living conditions and protecting the ponds from potential predators, as herons, cormorants, and seagulls.

Climate.

Climate zone: Temperate
Sub-climate: Mediterranean

Climate & Weather Averages	
High t°:	30°C
Low t°:	1.1°C
Mean t°:	14.5°C
Precipitation:	700.0 mm
Humidity:	75.3%
Wind:	9.36 km/h
Pressure:	1015,5 mbar
Hottest Months:	July and August (28°C avg)
Coldest Month:	January (4°C avg)
Wettest Months:	April and November (78 mm avg)
Windiest Months:	April and November (10.08 km/h avg)
Annual Rainfall:	748.0 mm per year

It is important to notice three tendencies, readable from the three drawings presented here: the first one, from the graph below, is the proportional relation between monthly highest and lowest temperatures; the second one, as well from the graph below, is the constant amount of monthly average precipitation, between 50 and 80 mm; the third one, from the comparison between average temperature and average rainfall, is the mitigating effect of the Adriatic Sea, allowing higher average temperatures and lower rainfall events in the Venetian lagoon.

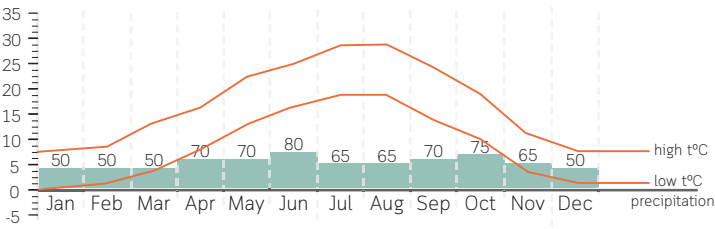


Figure 10 Venetian lagoon annual precipitation and temperature

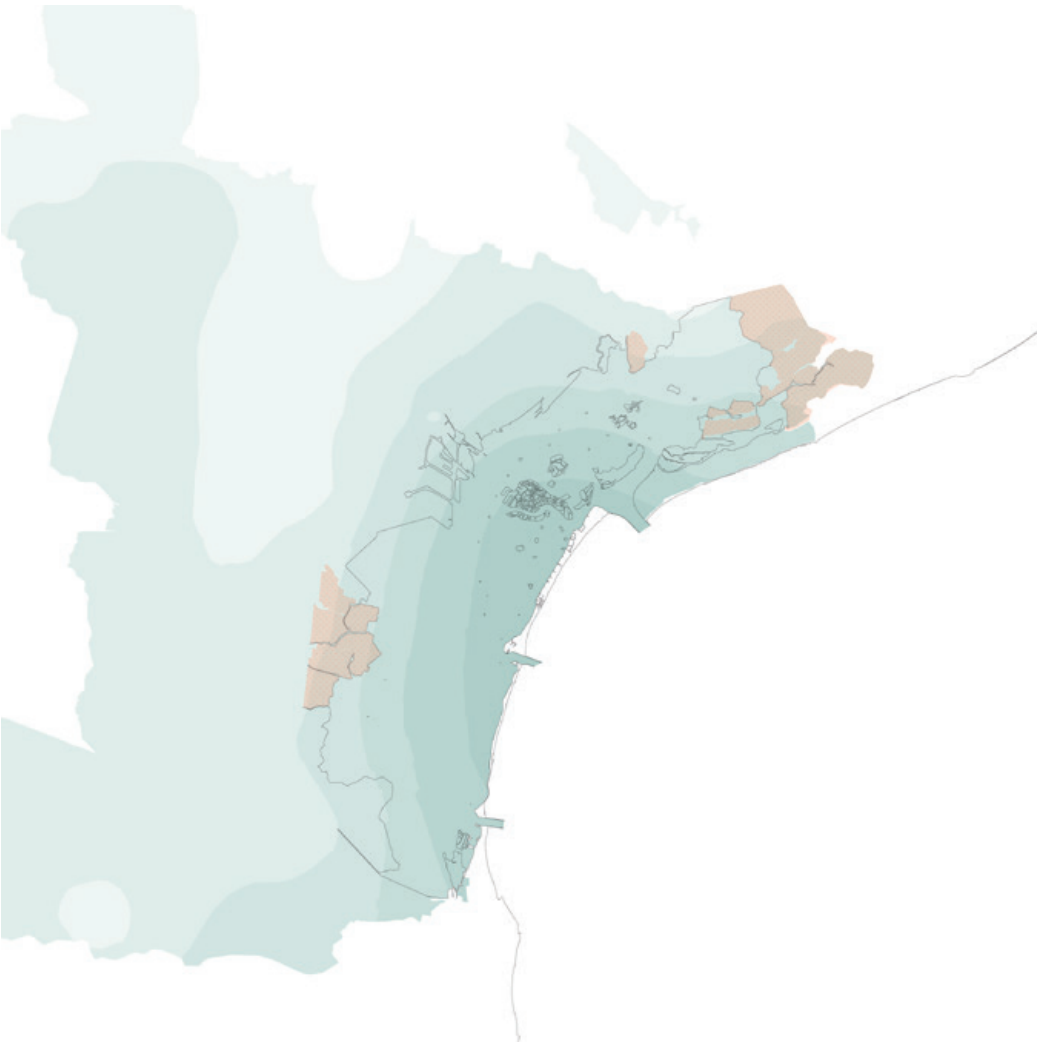


Figure 11 Average temperature (C)

- + 14.5
- 14.2 - 14.5
- 14 - 14.2
- 13.8 - 14
- 13.6 - 13.8
- 13.4 - 13.6

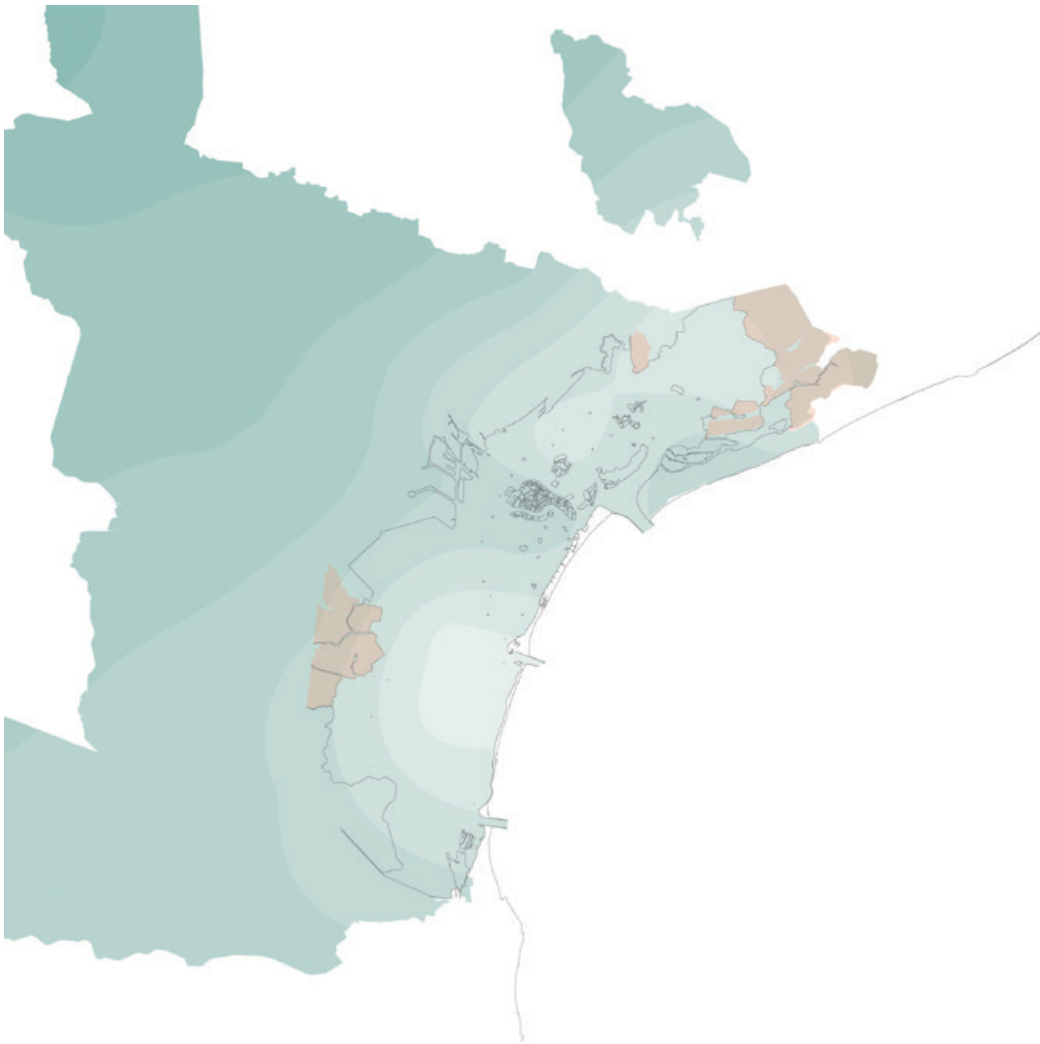


Figure 12 Average rainfall (mm)

- 1200
- 1100
- 1000
- 900
- 800
- 700
- 600
- 500
- 400



Origins and evolution.

The origins of the fishing valleys are lost in the remote antiquity. A legend narrates that the St. Mark Evangelist, sailing through the waters of the lagoon, forced by a storm docked his boat at the banks of a valley already in good conditions (Fortibuoni, 2009, p. 143).

In ancient times, fishing activities were carried out mainly in the shallow waters of the Venetian Lagoon. From Roman Empire until 15th century this system started to be implemented with nets and fixed structures, gaining the name of *enclosed waters* or *piscariae* (from Latin, *of or pertaining to fish or fishing*), evolving afterwards in *valleys* or *fishing valleys* (stage 0). These primitive open valleys were in direct communication with the lagoon, taking advantage of its tidal fluctuations and were located in shallow waters.

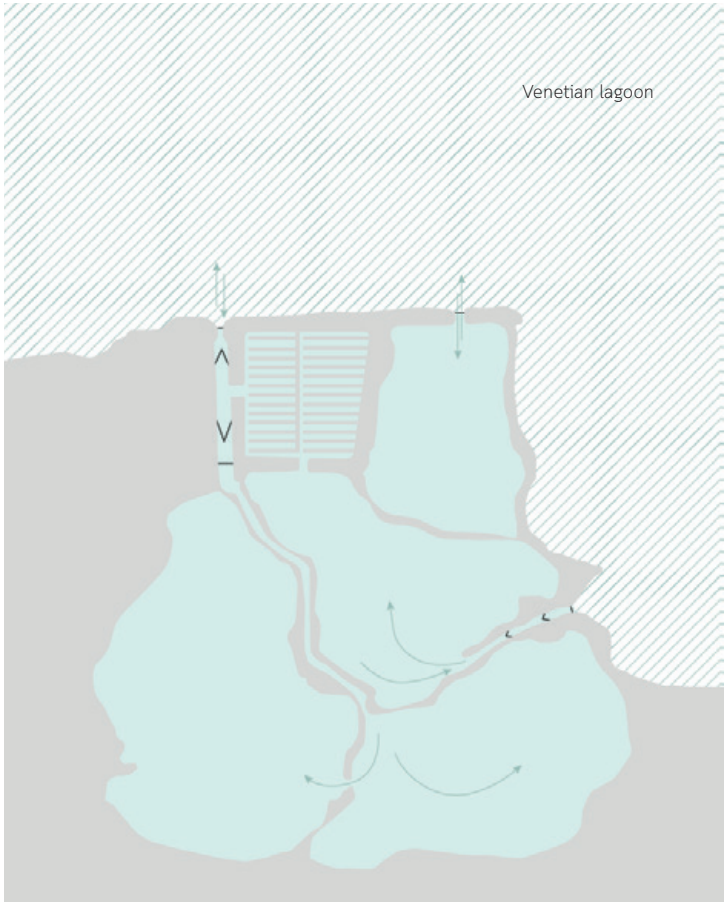
Subsequently, to tackle the problems caused by durability and perishability, Venetians anglers started to reinforce their valleys, until that moment nomadic and subject to tidal influence, with hard dikes (stage 1). These semi-embanked valleys, *valli semi-arginate*, had the part windward delimited by earth embankments. From this moment onwards, the fishing valleys were permanently transformed into managed systems, where, during winter, the undersized fishes were kept in winter fishponds, *peschiere di sverno*, instead of being sold anyway. In addition, the valleys no longer depended only on the fish natural migration, but also on fry's sowing, captured in the lagoon by the *pescenovellanti*, fishermen specialized in fishing juvenile larvae.

The final stage, still in function today, is represented by the embanked valleys (stage 2), *valli arginate*, completely enclosed by elevated embankments and communicating with surrounding water bodies through sluices. The valleys drew both brackish water from the open Venetian Lagoon and freshwater from streams discharging in their proximity.



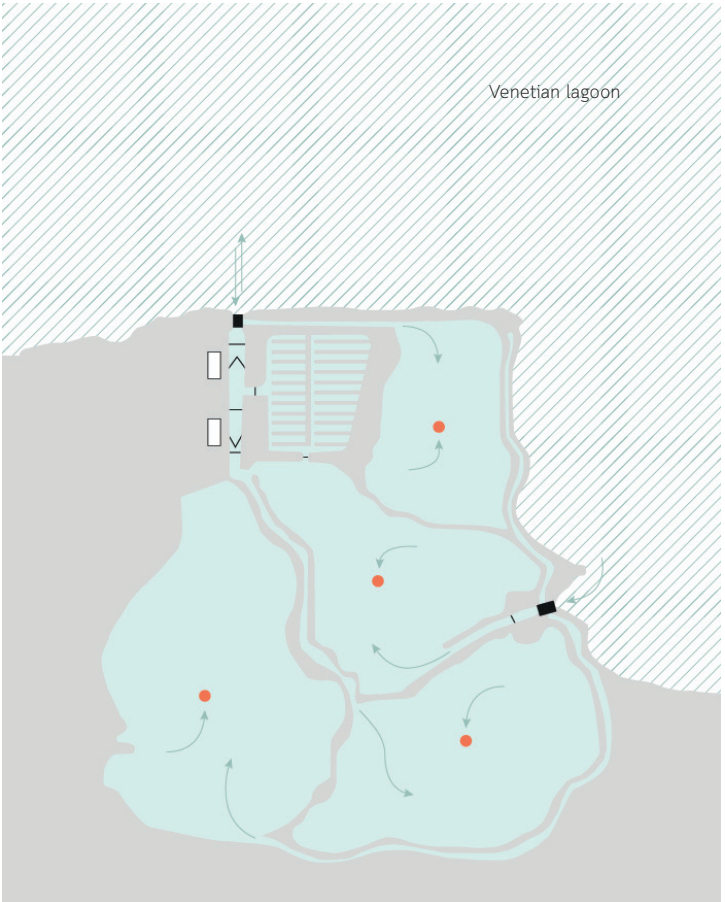
- Brackish marshlands
- Brackish water
- Land
- Removable and permeable barriers
- Water movement

Figure 13 Stage 1: semi-embanked valley, *valle semi-arginata*, schematic representation of plan. In use from 15th to 20th century, the fishing valley is still subject to tidal influence, in fact the barriers are made of weaved reeds, in the specific *Phragmites australis*.



- Brackish water
- Embankments
- Winter pond
- Fixed trap to capture fishes
- Water movement

Figure 14 Stage 2: embanked valley, *valle arginata*, schematic representation of plan. In use from 15th to 20th century, the fishing valley is completely enclosed and separated from the Venetian lagoon.



- Water pump
- Brackish water
- Embankments
- Winter pond
- Fishing valley mansion
- Water sluice
- Fixed trap to capture fishes
- Water movement

Figure 15 Stage 3: embanked valley with water pumping system, *valle arginata con sistema di pompaggio idrovoro*, schematic representation of plan. From mid 20th century to present, the fishing valley has been implemented technically with a water pumping system, to better regulate water flows and amounts.

Seasonality.

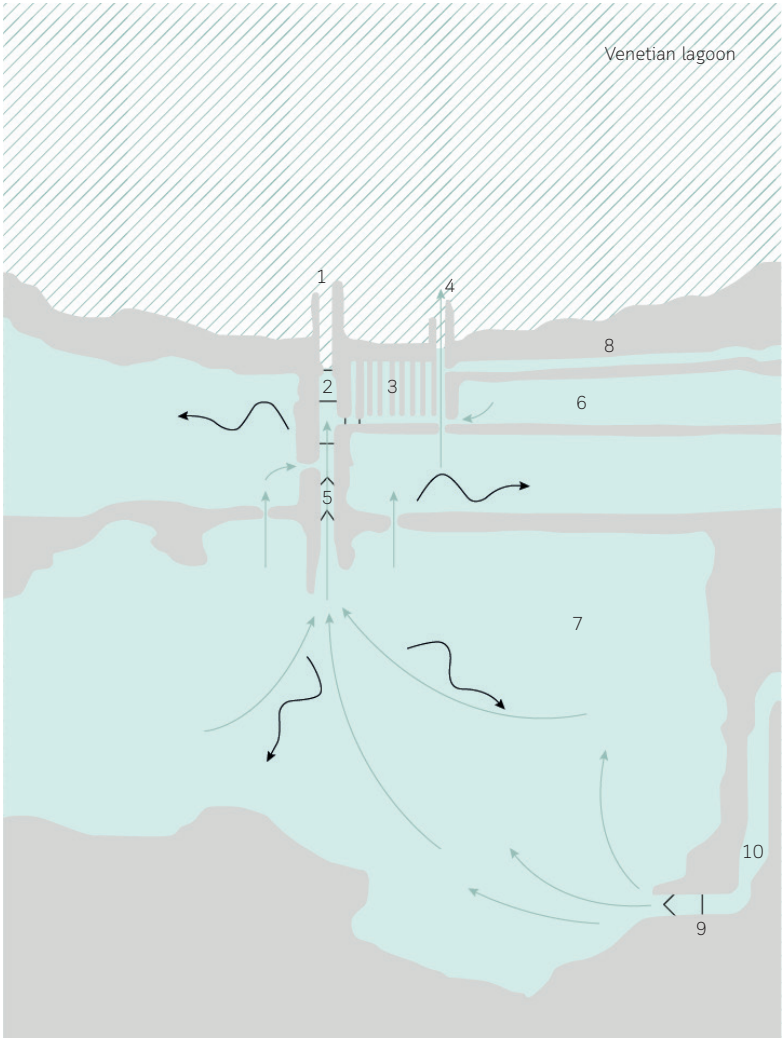
As in every aquaculture system, in the fishing valleys of the Venetian lagoon the most important variable is the seasonal succession, and the whole functioning is calibrated on this repetition.

The water temperature and nutrient composition, the salinity gradient, fluctuating from more salty, to more brackish, to more fresh, the fish natural migrating instinct from the Adriatic sea to the lagoon in spring and vice versa during autumn, and the human actions of capturing, sowing, breeding, and selling are extremely complex and interconnected, depending on seasonal variations.

The natural migrating instinct of fishes and the controlled movement of water are the fluxes which directly shape the fishing valleys functioning.

In spring, freshwater is pumped within the pasture basins where fishes are recalled after having wintered in the winter ponds.

In autumn, the temperature of shallow waters in the valley decrease. Cold brackish water from the lagoon is introduced inside the fishing valley, while the warmer water of the pasture basins is sucked by the water pumps. This combined procedure stimulates the fishes' natural impulse to migrate towards the sea. The fishes, following the source of the cold water, remain trapped in the *lavorièro*, where the collection takes place.



- 1 Salt water sluice
 - 2 Collection basin (*colaùro*)
 - 3 Winter ponds (*peschiere di sverno*)
 - 4 Salt water sluice for the winter ponds
 - 5 *Lavorièro*
 - 6 Breeding basin
 - 7 Pasture basin
 - 8 Fresh water canal
 - 9 Dewatering pump
 - 10 Discharging canal
- Lagoon
 - Fishing valley water
 - Embankments
 - Water flow direction
 - Fish flow direction

Figure 16 Scheme of the water flows of an extensive breeding in the post-winter phase of re-entry of the fish loads in the pasture basins. Spring: grazing and sowing.

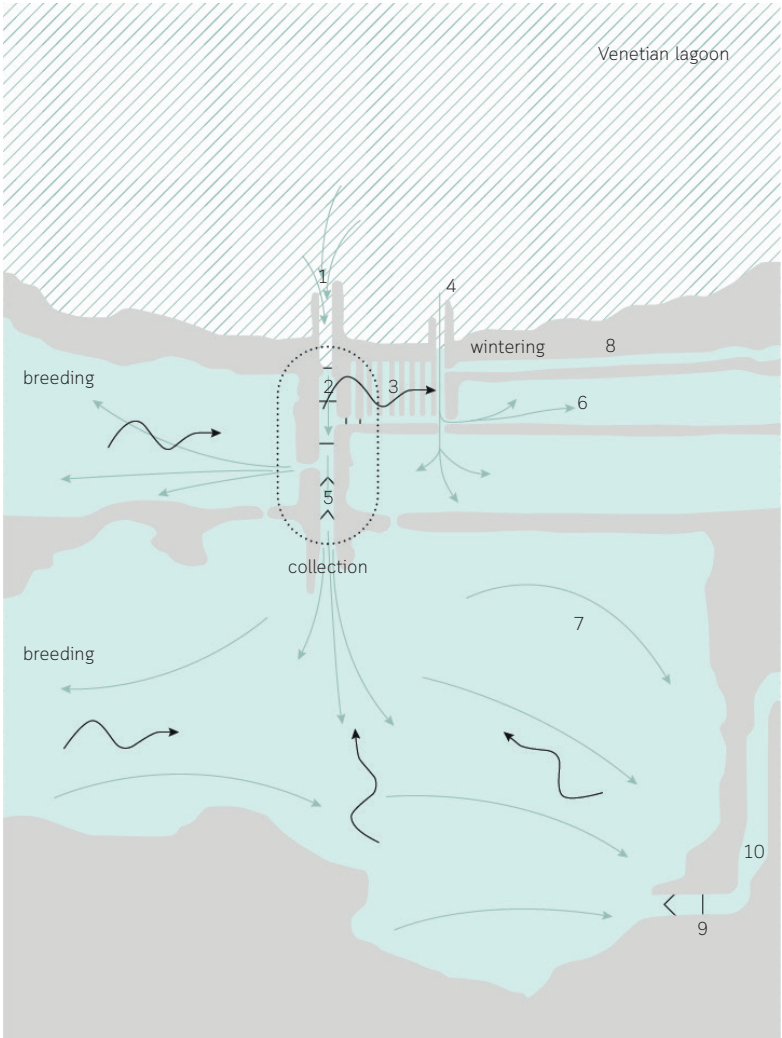


Figure 17 Scheme of water flows (drying and recall) in an extensive breeding in the autumn phase of collection, selection and capture of fish. Fall: fish collection, selection and wintering.

Water System: Valle Perini.

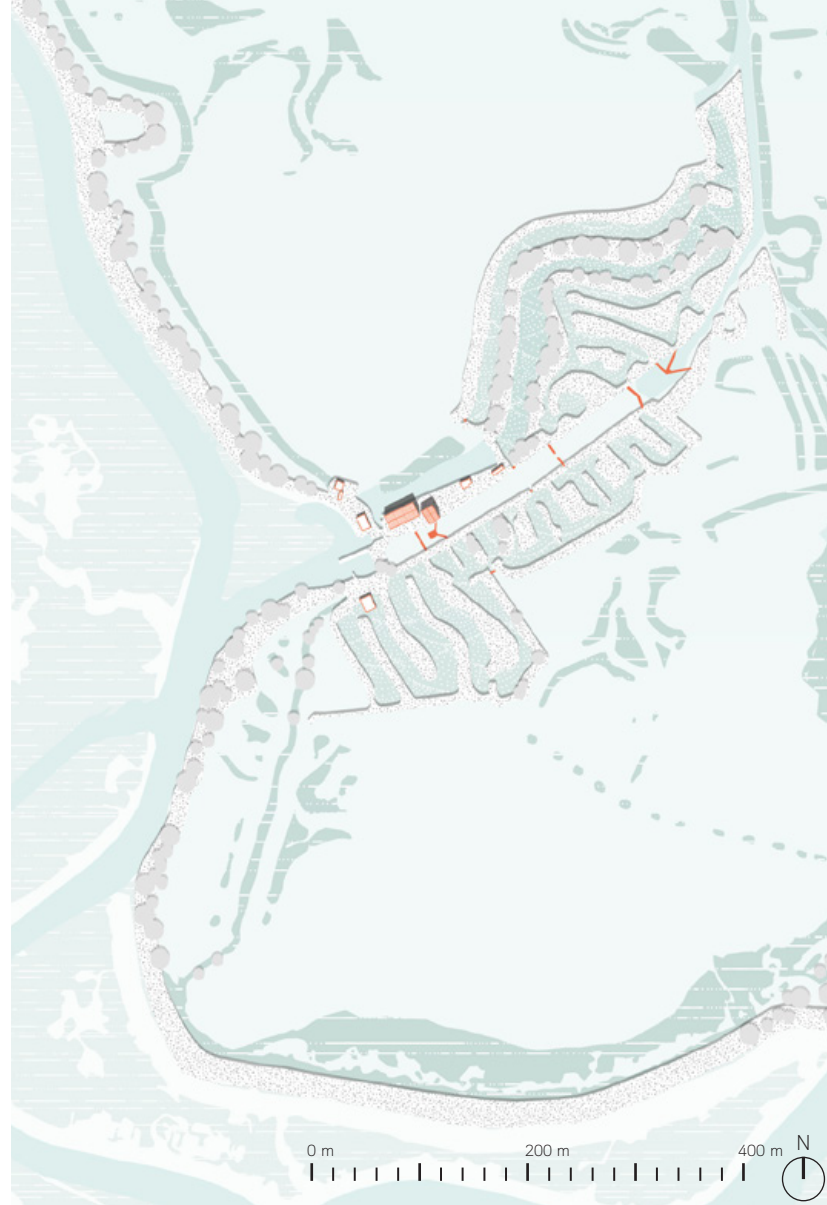
Valle Perini is located in the northern Venetian Lagoon. In past times, it was part of the Cà de Riva farm estate. It was part of a more complex system of valleys and, already before 19th century, was an embanked valley, *valle arginata*, internally subdivided: the subdivision by parallel and longitudinal channels is still recognizable today, and it underlines the original intended use for agricultural cultivation.

It is delimited to the north, east and west by freshwater courses: respectively from Taglietto Canal, Silone Canal and Lovigno Dolce Canal (an ancient lagoon branch of the Sile river) and Siloncello Canal. Along the southern border, facing directly the lagoon and therefore mainly characterized by brackish water, Valle Perini is tightened between Palude di Cona and Palude della Rosa.

Still accessible exclusively by water, the valley has changed very little over the centuries, maintaining a strong continuity with tradition, both in terms of equipment and management methods.

It is one of the less built fishing valleys; there is a unique settlement on the Venetian Lagoon front in front of the Palude di Cona. There, the fishing valley mansion, *casòn di valle*, and a warehouse, *cavana*, both artifacts from the 17th century, are built on the upper embankment of the fish collection basin, *colaùro*, which continues in the combs of the winter ponds; there are two other *cavane*, one on the access to the valley, the other in the winter ponds area. The fishing valley mansion-*colaùro*-winter fishponds-embankment is functionally integrated and morphologically continuous.





- Brackish marshland, *barene*
- Winter fishpond, *peschiere di sverno*
- Reinforced embankment
- Lavorièro*
- Water sluice
- Fishing valley mansion, *casòn di valle*
- Storage, *cavana*, of Valle Perini
- Freshwater sluice
- Saltwater sluice
- Reinforced embankment
- Valle Perini building
- Brackish marshland, *barene*
- Lagoon brackish marshland
- Valle Perini reed bed

Figure 18 Plan of Valle Perini (right).
Figure 19 Detail of Valle Perini fishing valley mansion, *casòn di valle*, winter ponds, *peschiere di sverno*, and fishing trap, *lavorièro* (top).



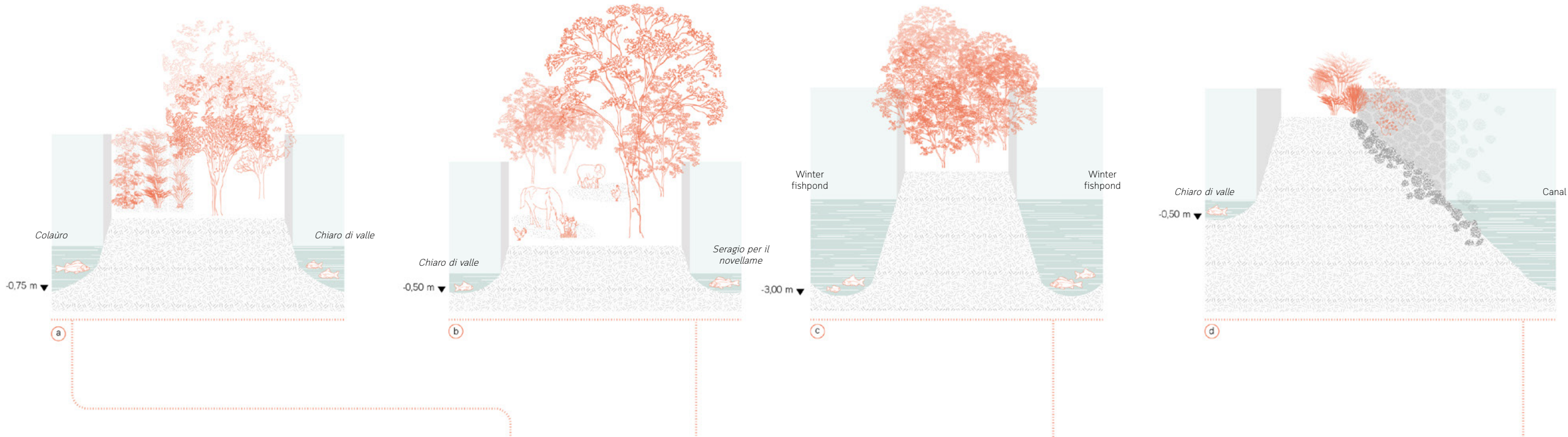
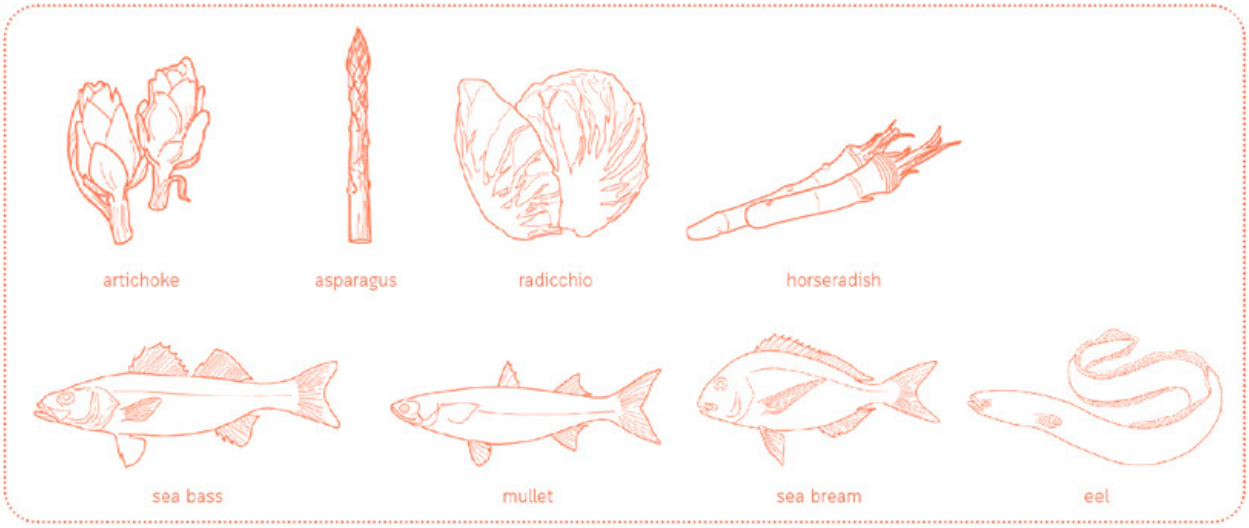
Water System: Circularity.

Since the first decades of the 20th century, the fishing valleys can be addressed as an extensive polyculture, where the main activity of fish farming has been juxtaposed by farm animals breeding (as horses, sheep, hens, goats, cows, etc.), vegetable gardens and orchards (cultivating horseradish, radicchio, asparagus, artichoke, etc.), reeds, mulch, fertilizer and hay production.

Despite its relatively low rates in terms of production, compared to other intensive aquacultures, this activity is

associated with reasonably low management costs: fishing valleys in the Venetian Lagoon are mainly family farms employing seasonal workers during the busiest seasons (spring and autumn). Recently, many of the fishing valleys have implemented their accommodation activity, providing a slower and lighter touristic alternative to discover the outer lagoon territory, in counter-trend to the mass tourism suffocating the historical center of Venice.

Main species cultivated in fishing valleys



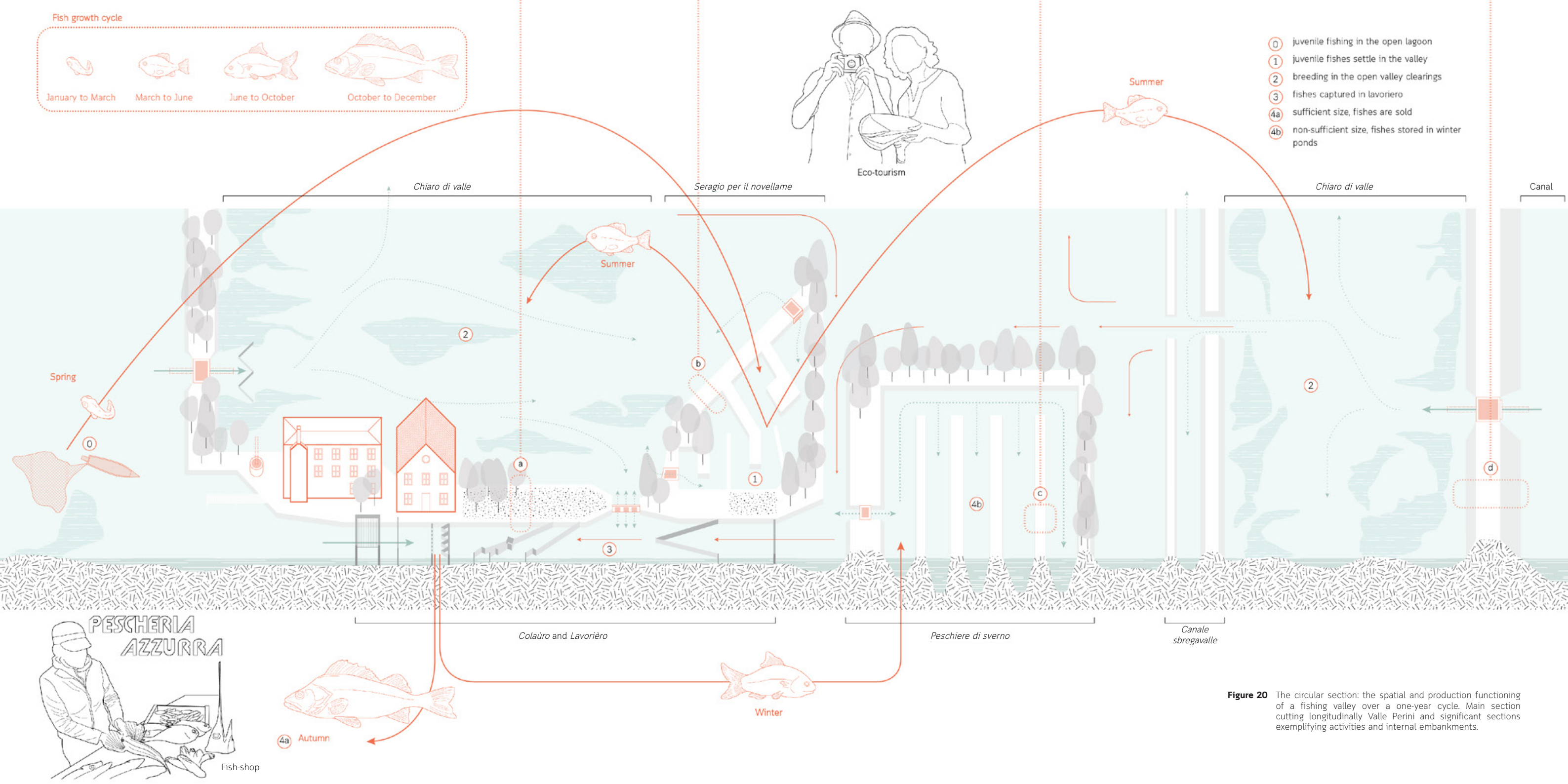


Figure 20 The circular section: the spatial and production functioning of a fishing valley over a one-year cycle. Main section cutting longitudinally Valle Perini and significant sections exemplifying activities and internal embankments.

Conclusion.

The complex and almost legendary origin, the highly evolutionary tendency, and the multi-layered functioning and productivity make the fishing valleys the most antique and characteristic aquaculture system of the Venetian Lagoon and of the whole Mediterranean Sea. Its long-standing performance has ensured the *Serenissima* Republic of Venice seafood and fishes until its collapse, but even in that moment of weakness, this structure has not downfallen on its turn. It can be ascribed as a strong identity catalyst for the people involved in its management and, undoubtedly, as the most peculiar element of the productive heritage of the Venetian lagoon.

Landscape values - Since the 20th century, despite having been embanked for productivity reasons to limit losses, the current fifteen fishing valleys located alongside the Venetian Lagoon contermination (border) have allowed the conservation of peculiar traits and elements of the Venetian Lagoon landscape. The brackish marshlands, *barene*, included within the valleys and at the same time protected by their embankments, have not suffered from erosion as the ones in the open lagoon, and have been able to perform their supportive ecological role within the ecosystem.

Architectural values - Fishing valley mansions, *casoni da pesca*, and anglers' storages, *cavane*, represent two of the earliest examples of Venetian Lagoon vernacular architecture. These elements of necessity were built from scratch by Venetian anglers in need for shelter for themselves, their boats and their working tools during the fishing season. Mainly constructed with very resistant wood, like chestnut or larch coming from Venetian Dolomites, the primitive examples were consolidated with clay and silt and their roofs were made with reeds and branches. As the time passed, the mansion became the symbol of power and wealth of the family owning the fishing valley.

Functionality values - Many of the elements characterizing the fishing valleys' structure and architecture, and their simple formal and constructive solutions, answer the vocation of pure functionalism. The winter ponds, the canals, the open pasture basins, derive from the organic forms already shaping the lagoon landscape along its extreme boundaries.

Sustainability values - The main natural forces determining the functioning and the performance of the Venetian Lagoon fishing valleys are fishes and water. Their seasonal movements are the crucial behaviours considered by the water workers to define their role to intervene and to profit from this interaction. With the passing of centuries, the fishing valleys have become more complex systems, not only made of aquaculture but also agro-production, agro-tourism and eco-environmental conservation (WWF site of Valle Averte, southern Venetian lagoon). In a succeeding manner, they have been implementing their scope of action, tending to perform as more circular systems rather than linear activities.

Ethnographic and identity values - Even before the foundation of the city of Venice, since 5th century A.D., those populations that occupied the swampy lagoon took advantage of its natural provisioning of raw material: the fishes. Fishing have always constituted the most important source of work and food, and traditionally it was handed down from one generation to another. However, this expertise combined with the natural characteristics of the lagoon landscape (extended surfaces of shallow and brackish waters), has opened the doors for the development of the fishing valleys' extensive aquaculture system as it is known nowadays.

Strategic values - The present geographic location of the fishing valleys results to be extremely strategic, even

if not directly chosen. In fact, after many bureaucratic vicissitudes, at the end the valleys have been placed along the Venetian Lagoon contermination (border). This current positioning ensure them the vicinity to freshwater outlets and the distance from the, sometimes extremely powerful, sea water currents entering in the lagoon.

Lessons to learn - The key aspects to be taken from the Venetian Lagoon fishing valleys example are the integration of the aquaculture extensive system with multiple parallel activities, as agricultural production and slow tourism enhancement and the respectful and sustainable coexistence with the natural landscape of the Venetian Lagoon, especially the brackish marshlands, which they have been actively preserving.

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Project 3 - Fishing valleys in the Venetian Lagoon

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