N. 1 comprehensive study by P6, P7 and P10 on the possibilities of Croatian aquaculture development and innovation of farming processes, biodiversity conservation due to setting of fish aggregating devices and necessary changes in spatial planning for fishery and aquaculture areas

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ABBREVIATIONS

ID PP	Amendments to the spatial plan
IUOP	Integrated coastal zone management
IC	Istria County
JLS	Local governments
PP	Spatial plan
PPUO/G	Spatial plan of the Municipality / City
PGC	Primorsko-Goranska County
SDC	Splitsko-dalmatinska County
Sl.gl.	Official Herald
ZOP	Protected coastal area

1 INTRODUCTION

The subject study is a summary of three completed studies that specifically processed spatial plans for three counties (Istria, Primorsko-Goranska and Split-Dalmatia) in an identical manner down to the level of the detailed plan of each place. Considering the large graphic coverage, an insight into them can be obtained by a parallel review of the original studies in the Croatian language.

The Istarska, Splitsko-dalmatinska and the Primorsko-Goranska Counties, as project partners, are participating in the implementation of the ARGOS project. The goal of the ARGOS project (ShARed GOvernance of Sustainable fisheries and aquaculture activities as leverage to protect marine resources in the Adriatic sea) is to promote a common integrated approach to the protection of fish and marine resources, while improving marine quality, organized and responsible development under the Cross-Border cooperation program, INTERREG V-A Italy - Croatia.

One of the expected results of work package 3 (Management Framework), which also includes this project task, is the adoption of new knowledge on various aspects of maritime spatial planning and their interaction, which is adapted to the Adriatic Partnership Area. Given the simultaneous and different needs in the use of marine space, the terms of reference of this work package should contribute to the implementation development of aquaculture production.

The project partners are:
Croatia: Istarska County, Primorsko-Goranska County, Zadar County, Development Agency of Šibenik - Knin County, RERA SD Development Agency of Split-Dalmatia County, Institute for Oceanography and Fisheries (Split), Dubrovnik-Neretva County.

Italy: Autonomous Region of Friuli-Venezia Giulia (Lead Partner), Veneto Region, Region Emilia Romagna, Marche Region, Molise Region, Puglia Region, National Council for research (Roma).

Associated partners: Ministry of Agriculture (Zagreb) and Ministry of Agriculture, food and forestry policy (Roma).

2 GOAL AND PURPOSE

The archipelago of Istarska, Splitsko-dalmatinska and Primorsko-Goranska counties and its indentation indicate why fishing has been an important economic activity for a long period of time, as well on all eastern Adriatic coasts. Mariculture does not currently have a significant gross effect of domestic product, but it can bring much more if it is placed in the systematic management and planning of complete contents. But even as it is, mariculture is a significant employer, one of the important carriers of gastronomic offer in tourism and can be even greater if compared to the logistics structure in neighboring Italy and other counties. Despite significant water resources, there is a significant difference in the result of mariculture, largely due to delays in the construction of primary infrastructure - landing sites, processing and storage facilities and the lack of such facilities leaves the sector to random selection.

All of the mentioned has conditioned a serious constraints on better efficiency and results across the Adriatic coast, but the things in management have improved in recent years.

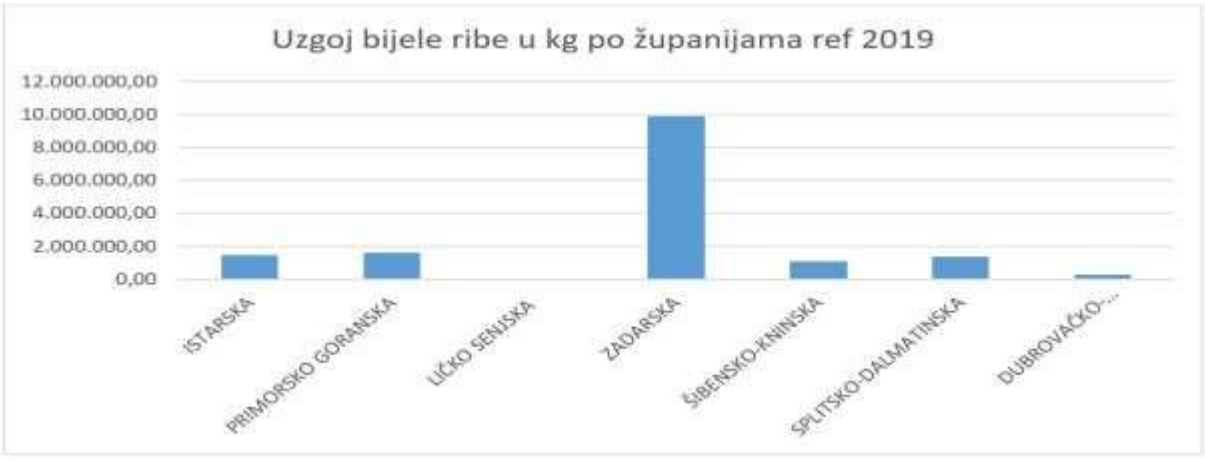
Implementation of the project "ARGOS" within the Cross-border Cooperation Program Italy Croatia 2014-2020, includes the development of guidelines for linking planned mariculture activities with the development logistical needs of mariculture in Istarska, Splitsko-dalmatinska and Primorsko-Goranska County. The main goal of the Study is to provide advice on the review of existing spatial plans within the purpose of mariculture with logistical infrastructure and suprastructural facilities at sea and on land.

Spatial planning at sea as a public process of analysis and determination of spatial and temporal distribution of human activities at sea includes the planning of aquaculture zones. The spatial distribution of aquaculture zones is only the first step in planning the development of aquaculture, followed by estimates of the capacity for each breeding technology.

In addition to the ecological and social capacity, everyone should also assess the production capacity of the zone. Production capacity is most often determined by assessing the technological capabilities of breeding equipment in the application and environmental conditions such as sea temperature and seawater exchange through the breeding system. The conducted assessments often neglect the cost of availability of the selected location, which is realized during the cultivation, and refers to the proximity of adequate coastal infrastructure and access to other logistical facilities.

Aquaculture at sea is also a maritime activity because it is used by various vessels that transport cargo on a daily basis and employees who also represent a limitation in production capacity. In addition, the production process carried out by the entrepreneur in aquaculture increasingly includes adding value to products through processing. In this sense, the dynamic capacity of infrastructure is a limiting factor, and the distance and capacity of coastal infrastructure also limit the production capacity itself. Therefore, the need for all targeted studies in larger productions prescribed by the regulation in the development of permissible capacity to include a broader understanding of infrastructure needs in addition to the location at sea.

Table 1-1: overview of farmed quantities of white sea fish in kg, Croatia (2019)



- This document was prepared for the preparation of three parts, ie it includes an overview of the current state of mariculture in the Istarska, Splitsko-dalmatinska and Primorsko-Goranska counties, including:
- - overview of current bases for the development of mariculture in the Istarska, Splitsko-dalmatinska and Primorsko-Goranska counties,
- - review of spatial planning bases for the development of mariculture activities in the area of Istarska, Splitsko-dalmatinska and Primorsko-Goranska County (implementing provisions and related graphic annexes of spatial plans at the regional and local level),
- - a review of possible differences in the differences between the last expert basis for the development of mariculture of the Spatial Plan

Table 1-2. Overview of concessioned areas for shellfish farming (m^2) in Croatia, (2019)

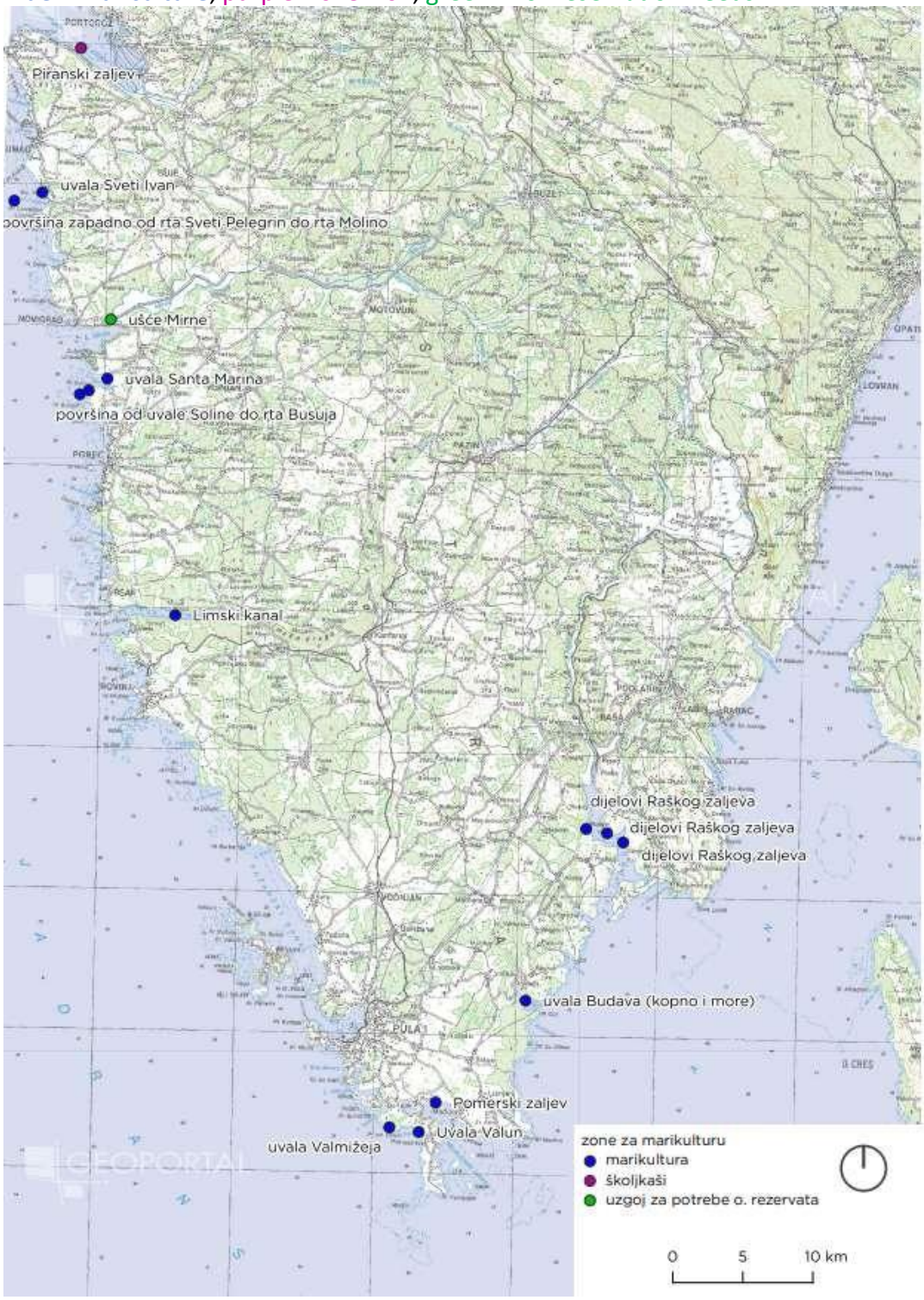
3CURRENT BASIS FOR THE DEVELOPMENT OF MARICULTURE IN ISTARSKA, SPLITSKO-DALMATINSKA AND PRIMORSKO GORANSKA COUNTIES)

The cultivation of sea fish and shellfish in IC ,SDC, and PGC does not have major oscillations, ie it has had stable production for years without significant increases or decreases in production. The main carrier of mariculture in white fish farming is Cromaris d.d. in IC Sardina d.o.o. in SDC and Orada Adriatic d.o.o. in PGC and a number of smaller shellfish farmers in IC. The activity has a positive effect on employment and the economy of these counties, and has a pronounced social component in terms of employment on the island near PGC and SDC. The development component is high and needs to be communicated properly. In the last two years, there has been a decrease in production in IC.

4 OVERVIEW MAPS OF MARICULTURE ZONES ACCORDING TO COUNTY SPATIAL PLANS

4.1 MAP . Mariculture zones according to valid IC spatial plan

Blue – mariculture, purple – shellfish, green – for reservation needs



4.2 MAP . Mariculture zones according to valid PGC spatial plan

Dark blue – fish, light blue – fish, shellfish, purple – shellfish, dark red - hatchery

4.3 MAP . Mariculture zones according to valid SDC spatial plan

Part 2. Mariculture infrastructure content planning needs in IC , SDC and PGC

5 NECESSARY LOGISTICS INFRASTRUCTURE AND SUPRASTRUCTURAL FACILITIES FOR MARICULTURE DEVELOPMENT CAPACITIES

Mariculture and its development, in IC, SDC and PGC mariculture mainly includes the cultivation of organisms in the marine part of the maritime domain. Traditional cage fish farm and traditional shellfish farming, in a broader sense, can be divided into marine and terrestrial. The sea part consists of installed anchor and breeding installations and a port pool used by the associated vessels. The land part of the farm is the land part of the port (port-landing place) with adequate coastal area.

The cultivation of organisms at sea is inextricably linked to maritime affairs and maritime skills. This means that it is completely dependent on the use of boats and / or ships. The following jobs are related to the use of boats and ships:

Fish farm
- Bring the juvenilles to the farm
-Delivery of food to the farm

-Feeding fish from the vessel
- Catching fish for sale
-Service shops (maintenance and cleaning of breeding installations)
-Transport of employees
-Transport of breeding material

Shellfish farm
- Bring the juvenilles to the farm
- Catch shellfish for sale
-Sorting and replanting on breeding installations
-Service shops (maintenance and cleaning of breeding installations)
-Transport of employees
-Transport of breeding units

In mariculture, it is often technologically important, especially on smaller farms, to use boats which are in use only for work on the farm. Then it is necessary to provide a place for them - secure mooring when not in use. Due to their size, it is desirable to be nearby the farms. An alternative is to use fast boats that also need a propulsion system for the slow navigation, which significantly increases the cost of their investment and maintenance. Mooring nearby farms are often based on minimal coastal superstructure (staff accomodation, handy warehouse and workshop).

Functional use of boats and ships in mariculture is possible only if there are adequate ports in which port operations of embarkation and disembarkation of people, equipment, organisms and consumables take place.

Coastal infrastructure is often the weakest logistical link in the development of aquaculture in a given area. The beginning of the development of aquaculture usually relies on the existing port capacities and already then induces competition on the coast. The growth of production is proportionally monitored by the number and / or size of vessels, which depends on the breeding technology used.

Smaller farms are most often set up in locations protected from large waves, while larger farms are usually set up in more exposed locations. Exposure of locations, size of breeding installations, cultivated species and distance of farms from coastal infrastructure determine the size of vessels in aquaculture, and the number of breeding units determines the number of vessels.

Large white fish farms also use larger quantities of dry food, which makes it possible to place a barge next to the fleet / fleet of cages, which significantly saves the number of vessels. On the other hand, tuna farming that feeds on fresh or thawed fish involves the arrival of fish on board daily and the arrival of vessels on the farm. Vessels involved in shellfish farming can be equipped for sorting, separating consumable and non-consumable shellfish and re-planting shellfish on breeding installations, so the size depends on the amount of equipment and work performed on the vessel.

Coastal infrastructure planning is therefore linked to the planned aquaculture sites, the production capacity of the sites, the expected number and size of vessels and the number and duration of port operations related to the use of vessels. It is also very important to keep in mind the connection of the coastal infrastructure with the possible construction of a superstructure and / or the connection with the transport infrastructure and its characteristics.

Accurate assessment of future needs is not easy a priori because investments in aquaculture depend on the interests and capabilities of entrepreneurs. On the other hand, there is a great interest of various users for port capacities in general. Therefore, the planning and construction of coastal infrastructure for aquaculture, in the absence of entrepreneurial interest, is likely to be used for other purposes.

We find two ways to plan coastal infrastructure for aquaculture:

1. Construction planning and construction prior to the entrepreneurial initiative for the construction of farms, where the coastal infrastructure is part of the coastal infrastructure within the port open to public traffic. In this variant, the efficiency depends on the quality of the port management.

2. Planning of construction before the entrepreneurial initiative and construction within the procedure of issuing a concession for aquaculture, where the coastal infrastructure would be in the category of a special purpose port.

Coastal superstructure for aquaculture and logistical facilities on land refer to all technological activities performed on land. These are:

-storage of equipment, food and consumables
-receipt of caught fish, sorting and packaging for sale
-service workshops for repair and maintenance of equipment and plants
-Ice production
-processing capacities (when the investor is a breeder)
-contents for temporary waste storage

If possible, it is desirable to place as many infrastructural facilities as possible along the coastal infrastructure or in industrial zones that are reasonably distant from the operational coast.

Figure 3: Demonstration of one complete port for large-scale mariculture
https://www.tridentseafoods.com/our-story/our-plants/

Figures 4,5,6 Demonstration of work on the farm and the necessary coastal facilities for larger capacities. The Norwegian Aquaculture Analysis 2019

6 SPATIAL PLANNING BASIS FOR THE DEVELOPMENT OF MARICULTURE ACTIVITIES

Defined in original studies on Croatian language

7 LOGISTIC FACILITIES ON LAND FOR MARICULTURE AND CONDITIONS FOR THEIR PLACEMENT ACCORDING TO THE IMPLEMENTING PROVISIONS OF IC,SPC AND PGC SPATIAL PLANS

In the following, the logistical infrastructural and suprastructural contents on land necessary for dealing with mariculture are singled out, as well as the conditions for their placement according to the implementing provisions of IC, SPC and PGC spatial plans.
All of the above is summarized in the following tables, which are also the basis for further analysis of the possibility of locating these logistics facilities on land for each zone of mariculture according to the spatial planning documentation.

Table 1-1 Overview of logistical infrastructural and suprastructural contents for mariculture activity on land and possibilities for their placement according to the implementing provisions of the IC

Logistic infrastructural and suprastructural facilities for onshore mariculture			Possibilities of placement of listed contents according to IC spatial plan	
Placement	Function	Type of infrastruction and suprastructure	Categories of use and purposes in which the placement of the listed contents is possible	Implementing Provisions of the IC plan that regulate the placement of the mentioned contents
Service area on the seafront next to the location of the farm	- mooring of the vessel - unloading-boarding (equipment, food, fish, etc.)	- dock	• construction area (IC plan Art. 53. Paragraph 1, Art. 159), (economic purposes) • outside the construction area (IC plan Art. 53. Paragraph 2) • sea traffic: - special purpose ports - fishing ports (Article 113) - ports open to public traffic - with landing places for fish reception (Art. 113)	Article 53 The spatial plans of municipalities and cities may also specify the construction area for mandatory facilities on land, such as: warehouses, sorting, processing and packaging facilities, shellfish dispatch center, shellfish purification center, administrative premises, employee premises, etc. Within the construction area, only buildings of basic purpose can be planned for mandatory facilities on land, without the possibility of using them for trade, catering or other activities that are not related to the cultivation itself. Outside the construction area, buildings intended for mooring vessels for the purpose of growing mariculture can be planned. Outside the construction area, buildings with a construction (gross) area of up to 30 m^2 can be planned for the needs of registered trades or legal entities registered for mariculture cultivation on a maritime domain that has a concession on a maritime domain for the use of at least 10,000 m^2. Article 113 For the needs of the fishing fleet, local level spatial plans determine landing places within ports open to public traffic or special purpose ports - fishing ports, in accordance with the Ordinance on conditions and manner of placing fish and other marine organisms on the market. fishing vessels performing commercial fishing at sea and the graphic part of the Program for the construction of fishing infrastructure in the County of Istria, as well as the conditions of unloading, transport and accompanying facilities on the coast. If not all the necessary facilities can be realized on the coastal part of the port, that space must be provided within the nearest production zone well connected with the port. The minimum number of permanent berths of fishing vessels must not be less than the existing registered vessels. Article 159 (…) Spatial development plans of municipalities and cities determine the mandatory planning of the construction area on land, which includes a functional unit with cultivation in the waters, namely unloading, sorting, dispatch centers, purification centers, purchase stations, handling space and other related facilities exclusively in the function of this activity.
	- performing operational activities: o plantations, feeding, catching… o storage o staff accommodation	- manipulative surfaces (operational shore), (eg surfaces for washing nets, etc.) - buildings (food and equipment warehouse, staff rooms, sorting and packaging		
	- transport - about the mainland to the service area - about the sea to the landing place for fish reception	- access road to the service zone of the farm on the coast - port - with landing places for fish reception	• road traffic • sea traffic: - special purpose ports - fishing ports (Article 113) - ports open to public traffic - with landing places for fish reception (Art. 113)	
Coastal infrastructure at a greater distance from the location of the farm	- mooring of the vessel - unloading (crew, fish, food, equipment and fuel in ships)	- port - with landing places for fish reception		
	- performing operational activities: o Receipt, processing and dispatch o storage o supply and repair of fishing vessels	- manipulative space - buildings o facilities for receiving and processing fish (maintenance, washing, cleaning, sorting, packaging) o warehouses (cold warehouses for fish, cold stores for storing frozen fish; warehouses for waste storage; warehouses for equipment, packaging) - facilities for the supply of fishing vessels - equipment for repairing fishing vessels	• sea traffic: - special purpose ports - fishing ports (Article 113) - ports open to public traffic - with landing places for fish reception (Art. 113)	

	- transport (to the point of sale)	- road connection between the port and the point of sale (fish markets, retail chains, catering facilities, factories)	• road traffic	*For road traffic /*

Table 1-2 Overview of logistical infrastructural and suprastructural contents for mariculture activity on land and possibilities for their placement according to the implementing provisions of PGC spatial plan

Logistic infrastructural and suprastructural facilities for onshore mariculture			Possibilities of accommodation of the listed contents according to PGC spatial plan	
Placement	Function	Type of infrastructure and suprastructure	Categories of use and purposes in which the placement of the listed contents is possible	Implementing Provisions of the PGC plan that regulate the placement of the mentioned contents
Service area on the seafront next to the location of the farm	- mooring of the vessel - unloading-boarding (equipment, food, fish, etc.) - performing operational activities: o plantations, feeding, catching… o storage o staff accommodation	- dock - manipulative surfaces (operational shore), (eg surfaces for washing nets, etc.) - buildings (food and equipment warehouse, staff rooms, sorting and packaging	• natural areas outside the construction area (PGC plan Art. 106, 107, 122, paragraph 2) • sea traffic: - special purpose ports - fishing ports (Article 152) • PGC plan does not mention the possibility of landing in ports of other purposes, ie ports open to public traffic, although the Decision on the list of landing sites for fishing vessels engaged in commercial fishing at sea (NN 10/20, 145/20), some of them as landing sites	Article 106 This plan determines the conditions for construction on natural areas, ie agricultural, forest, other agricultural and forest land and on water surfaces. On natural surfaces, buildings can be built exclusively in the function of primary activities performed on them or buildings in the function of certain activities based on the use of natural resources, such as: (...) buildings in the function of activities on water surfaces (...). Article 107 In natural areas, outbuildings can be built according to the following basic criteria: - the building must be in the function of using the space (agricultural, mountaineering, underwater, etc.); - the building must have, depending on the purpose and method of use, its own water supply (cistern, dug well up to 10 m deep), drainage (wastewater treatment) and energy system (gas tank, electric generator, or other); - buildings should be built in accordance with the criteria of space protection, evaluation of landscape values and autochthonous construction; - buildings must be away from the construction area, construction land and other buildings outside the construction area, except for line infrastructure buildings, at least: a) 500 m for plant cultivation; b) 2,000 m for livestock activities; c) 500 m for forestry and hunting; d) 2,000 m for sports and recreational purposes. Article 122. Buildings where fish are prepared for marketing may be outside the coastal area of the construction area. Provide a transport link from the building to the farm and vice versa. Immediately next to the location for fish and shellfish farming, buildings can be built outside the construction area in the function of primary activity with a total area of up to 400 m^2. These are moorings for ships, warehouses for storing,
	- transport - about the mainland to the service area o about the sea to the landing place for fish reception	- access road to the service zone of the farm on the coast - port - with landing places for fish reception	• road traffic • sea traffic: - special purpose ports - fishing ports (Article 152) - PGC plan does not mention the possibility of landing in ports of other purposes, ie ports open to public traffic, although the Decision on the list of landing sites for fishing vessels engaged in commercial fishing at sea (NN 10/20, 145/20), some of them as landing sites	
Coastal infrastructure at a greater distance from	- mooring of the vessel - unloading (crew, fish, food, equipment and fuel in ships)	- port - with landing places for fish reception	• sea traffic: - special purpose ports - fishing ports (Art. 152)	

the location of the farm	- performing operational activities: o Receipt, processing and dispatch o storage o o supply and repair of fishing vessels	- manipulative space - buildings o facilities for receiving and processing fish (maintenance, washing, cleaning, sorting, packaging) o warehouses (cold warehouses for fish, cold stores for storing frozen fish; warehouses for waste storage; warehouses for equipment, packaging) - facilities for the supply of fishing vessels - equipment for repairing fishing vessels	•PGC plan does not mention the possibility of landing in ports of other purposes, ie ports open to public traffic, although the Decision on the list of landing sites for fishing vessels engaged in commercial fishing at sea (NN 10/20, 145/20), some of them as landing sites • construction area outside the coastal area (PGC plan Art. 122, paragraph 1)	sorting and parking fish, dispatch center for shellfish, center for shellfish purification, administrative space, space for employees, etc. Article 152. The fishing port is used for receiving and accommodating fishing vessels, and is equipped with devices and equipment for loading / unloading fishing vessels, space for manipulating the catch and supply of fishing vessels. The fishing port, which has a coast length of over 50 m and a depth along the coast of more than 3 meters, is of national importance. The fishing port of national importance is Rijeka. Fishery ports of county importance are Klenovica (Novi Vinodolski) and Mišnjak (Rab).
	- transport (to the point of sale)	- road connection between the port and the point of sale (fish markets, retail chains, catering facilities, factories)	• Road traffic	*For road traffic /*

Tablica 1-3 Overview of logistical infrastructural and suprastructural contents for mariculture activity on land and possibilities for their placement according to the implementing provisions of SDC spatial plan

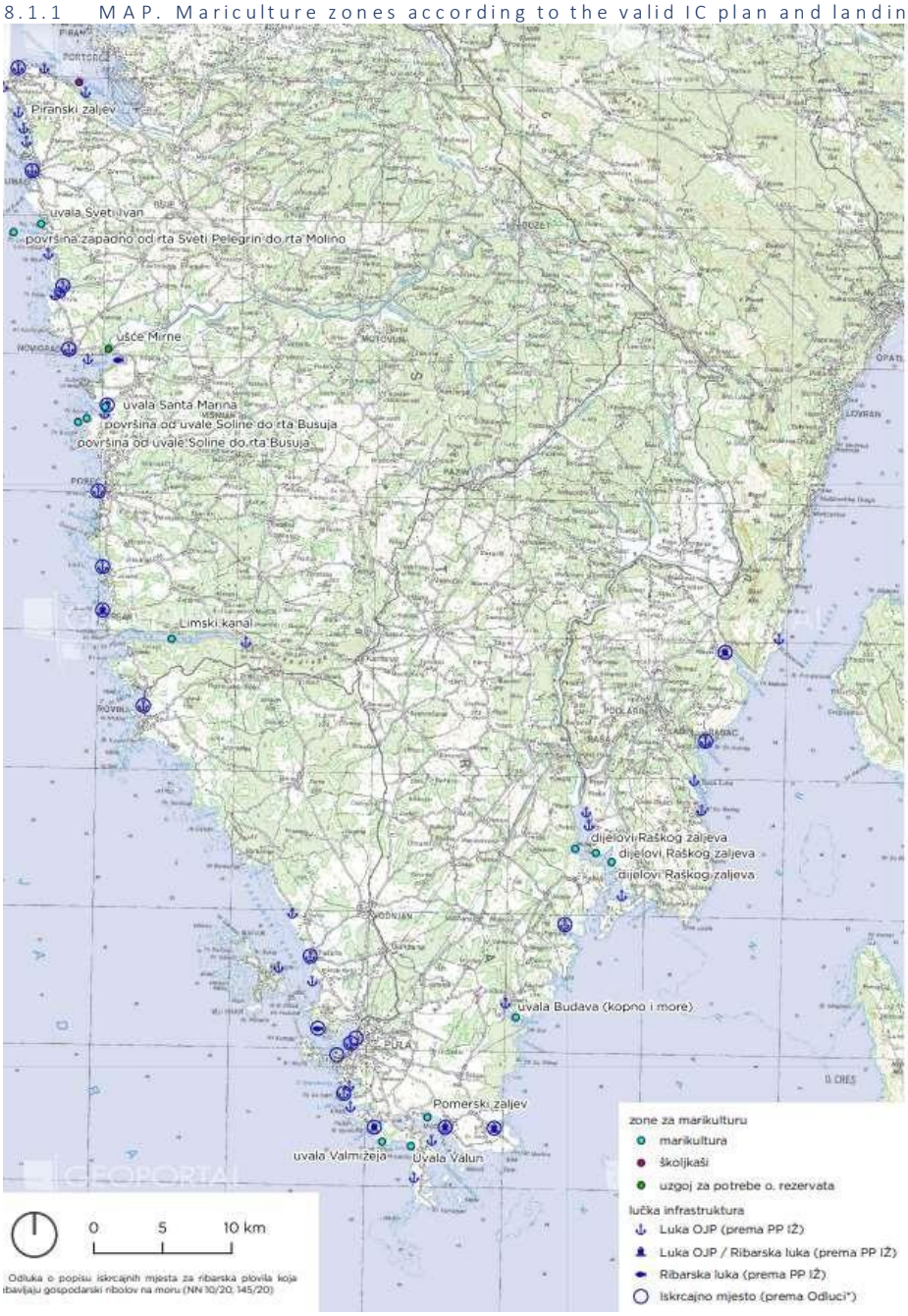
LOGISTIČKI INFRASTRUKTURNI I SUPRASTRUKTURNI SADRŽAJI ZA DJELATNOST MARIKULTURE NA KOPNU			MOGUĆNOSTI SMJEŠTAJA PREMA III. ID PP SDŽ	
Smještaj	Funkcije	Tip infrastrukture i suprastrukture	Kategorije korištenja i namjene u kojima je moguć smještaj navedenih sadržaja	Odredbe za provedbu koje reguliraju smještaj navedenih sadržaja
Servisna zona na morskoj obali uz lokaciju uzgajališta	- privez plovila - iskrcaj-ukrcaj (opreme, hrane, ribe i sl.)	- pristan	• građevinsko područje izvan naselja (čl.36., čl.63.) • predjeli izvan građevinskog područja (čl.110., uz izuzetak plave ribe / mrjestilišta u prostru ograničenja - stavak (4)) • pomorski promet: - luke posebne namjene - ribarske luke (čl. 130.) - luke otvorene za javni promet – s iskrcajnim mjestima za prihvat ribe (čl. 135, tablica 1.27c)	Članak 36. (3) Površine izdvojenih građevinskih područja izvan naselja određuju se za: - Gospodarsku namjenu, površine akvakulture H (zone mrjestilišta koje zahtijevaju smještaj na kopnu) Članak 63. (3) Prostornim planom županije, (…), utvrđuje se: (…) smjernice za utvrđivanje izdvojenih građevinskih područja izvan naselja za potrebe marikulture i pripadajuće ribarske infrastrukture. (4) Uz svaku od zona kategorije 1. i 2., u susjednom obalnom području kopna maksimalne površine 1000 m^2, na lokaciji s koje je vidljiva površina s uzgajalištem, dopušta se gradnja prizemnog objekta maksimalne površine do 200 m^2 zatvorenog prostora i 50 m^2 prostora pod nadstrešnicom, s namjenom
	- obavljanje operativnih djelatnosti: o nasad, hranidba, izlov … o skladištenje o smještaj osoblja	- manipulativne površine (operativna obala), (pr. površine za pranje mreža i sl.) - zgrade (skladište za hranu i opremu, prostorije za osoblje, sortiranje i pakiranje)		

	- transport ○ kopnom do servisne zone ○ morem do prekrcajnog mjesta za prihvat ribe	- pristupna cesta do servisne zone uzgajališta na obali - luka - s iskrcajnim mjestima za prihvat ribe	• cestovni promet • pomorski promet: - luke posebne namjene - ribarske luke (čl. 130) - luke otvorene za javni promet – s iskrcajnim mjestima za prihvat ribe (čl. 135, tablica 1.27c)	servisiranja djelatnosti uzgoja u zonama na moru. U zatvorenom dijelu prostora predviđa se prostor za smještaj čuvarske službe (sanitarni čvor, dnevni boravak, kuhinja), skladišni prostor (za hranu za ribu, repromaterijal, opremu), te priručna radionica. (5) Uz svaku od zona kategorije 3. i 4., u susjednom obalnom područja kopna maksimalne površine do 500 m^2, na lokaciji s koje je vidljiva površina sa uzgajalištem, dopušta se gradnja prizemnog objekta maksimalne površine 40 m^2, s funkcijom smještaja za čuvarsku službu na uzgajalištu. (7) Uz zone kategorije 1., 2., 3. i 4. nositelju koncesije dopušta se gradnja privremenog pristana maksimalne dužine 20 m na način da se ne mijenja obalna linija nasipavanjem. Pristan je potrebno ukloniti nakon prestanka aktivnog legalnog obavljanja djelatnosti, a područje gradnje rekultivirati. Članak 110. (1) Izvan građevinskog područja može se planirati izgradnja: (…) područja gospodarskog korištenja pomorskog dobra i uređenje plaža, (…) (2) Kriteriji građenja izvan građevinskog područja odnose se na gradnju ili uređenje pojedinačnih građevina i zahvata. Pojedinačne građevine ne mogu biti mješovite namjene, a određene su jednom građevinskom parcelom. Kriteriji kojima se određuje vrsta, veličina i namjena građevina i zahvata u prostoru su: - građevina mora biti u funkciji korištenja prostora (poljoprivredna, planinarska, stočarska, marikulturna, eksploatacijskog polja i sustava zbrinjavanja otpada), - građevina mora imati vlastitu vodoopskrbu (cisternom), odvodnju (pročišćavanje otpadnih voda) i energetski sustav (plinski spremnik, električni agregat, ili drugo), - građevine treba graditi sukladno kriterijima zaštite prostora, vrednovanja krajobraznih vrijednosti i autohtonog graditeljstva, - zahvat u prostoru ima isti tretman kao građenje. (4) U prostoru ograničenja izvan građevinskog područja, ne može se planirati niti se može graditi pojedinačna ili više građevina namijenjenih za: (…) uzgoj plave ribe, zone mrjestilišta - vrste uzgoja koje zahtijevaju samo smještaj na kopnu.(…) Članak 130. (5) Ribarska luka je luka koje služi za prihvat i smještaj ribarskih plovila s uređajima i opremom za ukrcaj/iskrcaj ribarskih plovila. Na obalnom dijelu luke potrebno je osigurati: manipulativni prostor i sadržaje za opskrbu i popravak ribarskih brodova, skladištenje i preradu ribe i djelatnosti prometovanja i trgovanja ribom. Članak 135. (8) Unutar luka otvorenih za javni promet državnog, županijskog i lokalnog značaja mogu se odrediti iskrcajna mjesta za prihvat ribe. Iskrcajno mjesto je određeni prostor u luci na kojem se u vremenski ograničenom razdoblju može osigurati iskrcaj i prihvat ribe, bez izgrađene infrastrukture za prihvat ribe. Iskrcajna mjesta se mogu odrediti u sljedećim lukama: tablica 1.27c.
Obalna infrastruktura na većoj udaljenosti od lokacije uzgajališta	- privez plovila - iskrcaj-ukrcaj (posade, ribe, hrane, opreme i goriva u brodove)	- luka - s iskrcajnim mjestima za prihvat ribe		
	- obavljanje operativnih djelatnosti: ○ prihvat, prerada i otprema ○ skladištenje ○ opskrba i popravak ribarskih brodova	- manipulativni prostor - zgrade ○ objekti za prihvat i preradu ribe (održavanje, pranje, čišćenje, sortiranje, pakiranje) ○ skladišta (hladna skladišta za ribu, hladnjače za čuvanje smrznute ribe; skladišta za čuvanje otpada; skladišta opreme, ambalaže) - sadržaji za opskrbu ribarskih brodova - oprema za popravak ribarskih brodova	• pomorski promet: - luke posebne namjene - ribarske luke (čl. 130) - luke otvorene za javni promet – s iskrcajnim mjestima za prihvat ribe (čl. 135, tablica 1.27c)	
	- transport (do mjesta prodaje)	- cestovna povezanost luke i mjesta prodaje (ribarnice, trgovački lanci, ugostiteljski objekti, tvornice)	• cestovni promet	

8 ANALYSIS OF SPATIAL POSSIBILITIES FOR LOCATION OF LOGISTICS ON LAND FOR CERTAIN MARICULTURE ZONES

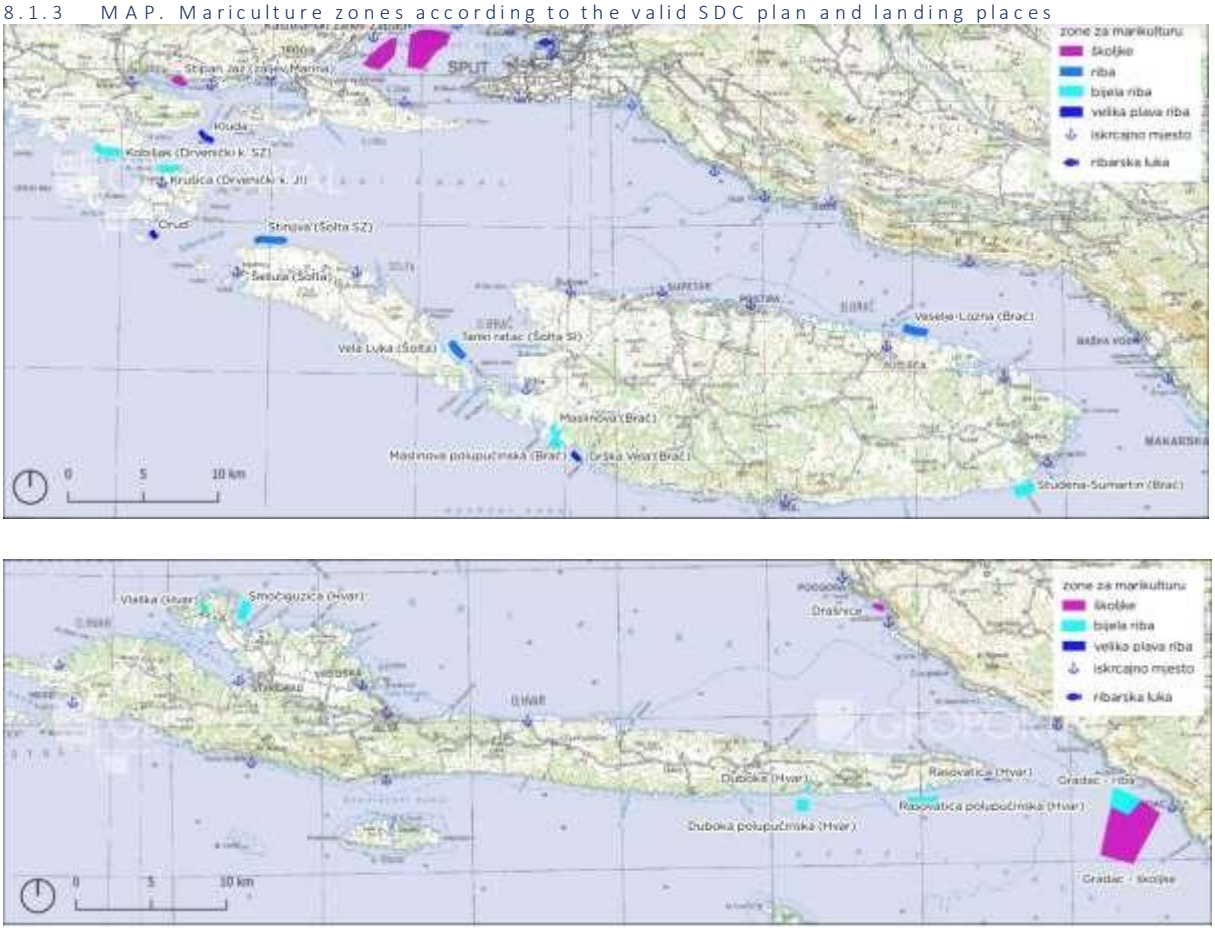
8.1 Overview maps of mariculture zones and landing sites

8.1.1 MAP. Mariculture zones according to the valid IC plan and landing places



8.1.2 MAP. Mariculture zones according to the valid PGC plan and landing places

8.1.3 MAP. Mariculture zones according to the valid SDC plan and landing places



Part 3.- Proposal for connecting logistics infrastructure for the needs of mariculture development in Istarska , Splitsko-dalmatinska and Primorsko-Goranska County

Final Part 3. refers to the proposal of the capacity and content of mariculture of Istarska, Splirtsko-dalmatinska and Primorsko-Goranska County based on the already conducted analyzes from the previous chapter. Through this concluding shorter chapter, it was necessary to consider and propose the capacities of the accompanying contents by locations where the necessity is seen. Individual locations have been covered in previous chapters, as have indications of the need to approximate coastal infrastructure. Examples of infrastructure and superstructure of such land support zones are presented, and through this chapter as a basis breeding is reduced to the existence of the necessary coastline for daily loading and unloading. Later, the capacities of other logistics are connected in terms of delivery of trucks with a capacity of over 40 tons, storage of food and other raw materials, sorting, processing and other important items, which would ideally be in close contact with the loading area due to reduced costs. and disembarkation. If this is not possible then such bound facilities must be

located directly in isolated construction areas or industrial zones or nearby ports of greater potential if we are considering mariculture of greater individual capacity.

The units mentioned so far, as well as the comprehensive study and accompanying analyzes, have a guiding character and their purpose is to serve as a basic guideline in structuring the Mariculture Plan, emphasizing that it requires significant logistics in the mainland as well as the coastline. Namely, there is a lack of definition of logistical needs in all previously performed contents, and it is necessary to define them and propose a place in space. These guidelines will primarily serve the Institute for Spatial Planning to fully understand all the links between mariculture and their connection in the Istarska Splitsko-dalmatinska and Primorsko-Goranska counties. It is necessary to develop and supplement the implementation of the Integrated Coastal Zone Management of Istarska, Splitsko-dalmatinska and Primorsko-Goranska County through the development of bases for the expansion of mariculture. A significant barrier to interest and investment in most of the proposed locations is the support in the mainland to monitor the logistics of the farm. Other possible forms and models of mariculture, which are mainly related to land-based cultivation, as well as funding categories in the past and future, were mentioned as separate chapters in this study making the development study in whole.

The cultivation of the main fish species in the mariculture of the Mediterranean - sea bass and sea bream, to this day has mostly taken place in cages, while other forms of farming include the use of land.

9 Criteria for determining logistical, infrastructural and superstructural contents and capacities for dealing with mariculture

9.1 Location and size of coastal infrastructure

The basic criteria for the accommodation of coastal infrastructure are the distance from the farm, the purpose, and the connection with the transport infrastructure. The size of the coastal aquaculture infrastructure can most easily be expressed in the length of the operational shore and the mooring for vessels. The length of the operational shore for aquaculture depends on the number and size of vessels, and the number and size of vessels depends on the number and size of farms served from a particular port.

Large farms (over 500 tons of annual production) can be set up in such a way that the coastal infrastructure is not within the breeding location (although this is better, and sometimes due

to the configuration of the coast and necessary because communication must be daily), while for smaller farms it is important provide coastal infrastructure in the immediate vicinity of the farm. When there is a regulated coast within smaller farms that is not connected to the transport infrastructure, it is necessary to ensure the possibility of using the part of the port open to public traffic that is located at a reasonable distance from the farm. In addition, it is necessary to take into account the exposure of the road that passes through the meteorological conditions of wind strength and wave height. For the area of PGC and SDC, the relief significantly influences the direction of wind change in certain locations.

Bearing in mind that the entrepreneurial interest and its choice of technology that determine the needs for coastal infrastructure cannot be prejudiced and that it is necessary to plan coastal infrastructure, a framework assessment based on previous experience and development trends will be approached.

In this sense, we divide the coastal infrastructure for mariculture into:

- operational coastal infrastructure that ensures the possibility of performing all tasks related to the use of vessels in aquaculture and unloading of juveniles, loading and unloading
- auxiliary shore for mooring boats

9.2 Criteria for the location of operational coastal infrastructure for mariculture

As already mentioned, different technologies may require different infrastructure capacities for different breeding capacities.

Since it is necessary to create at least some basic basis for the definition of the needs of the farm, the criterion of breeding in accordance with the capacities laid down in the regulation on environmental impact assessments will be taken.

Table 14 Criteria for the placement/location of operational coastal infrastructure for mariculture

Farm size	**> 700 tons**	**100-700 tons**	**< 100 tons**
Good distance from the farm	< 10 Nm	< 2 Nm	< 1 Nm
Medium distance from the farm	< 15 Nm	< 5 Nm	< 2 Nm
Connection with transport infrastructure	mandatory	mandatory	Mandatory
Availability (minimum limiting factor - unloading younger)	Access to trucks required	Access to trucks required	Access to trucks recommended

Table 15 Criteria for positioning of auxiliary coastal infrastructure, mooring

Farm size	> 700 tons	100-700 tons	< 100 tons
Position within the location	recommended – not neccessary	required	required
Mooring safety	High	high	high
Connection with transport infrastructure	Not neccessary	recommended	recommended

Table 16 Criteria for the dimensions of operational coastal infrastructure

Farm size	> 700 tons	100-700 tons	< 100 tons
Length of operational shore	Min. 20 m – plus 15 m on each 1000 t	15 – 25 m	Min. 10 m
Operating shore width (concrete, asphalt)	Min 10 m	Min 10 m	Min 10 m
Sea depth	Min 4 m	Min. 3 m	Min 2 m
Mooring length at the breeding site	Min 15 m	Min 10 m	Min 10 m

10 0 Other possible breeding models

Cage fish farming in the sea uses resources that can be used for tourism or other economic activities. At the level of sufficient saturation of the coast with mariculture cage activity, it is necessary to look for new resources for the development of this very important industry both in the direction of fish production and in the direction of breeding other marine organisms. Considering that the planned zones in IC and PGC for mariculture are not filled, it is necessary to consider the basic reason for the lack of interest, but also to mention possible other forms of mariculture-aquaculture for possible determinants of development. Capacity constraints without the possibility of conducting an environmental impact study for individual locations where it is possible to have higher production leads to a lack of investor interest.

Based on the search for the basis for significant development of mariculture in Croatia, and thus in IC and PGC, among other things, it is recommended to consider the possibilities of zoneI in the area of former industrial plants and unpromising military zones in general aquaculture

on land, but also in terms of current infrastructure. Territorial location, size of development areas, as well as current infrastructural equipment is of great importance for mariculture - especially as it meets the possibilities of raising aquaculture / mariculture due to the proximity of the sea and port, depth of waters, plateau area, protection and proximity breeding combinations. With regard to previous activities, it is necessary to conduct sediment tests in such zones as well as seawater quality.

In accordance with the possibilities of introducing innovation mariculture and defining the need for additional infrastructure, it is necessary to evaluate the possibilities that could be implemented with the provision of sufficient water resources and with possible favorable financial effects in accordance with today's advanced world practices.

Throughout the overall framework for the development of aquaculture-mariculture production in the Republic of Croatia, emphasis is placed on finding additional resources of water areas for insurance and raising production in the future for which the coastal parts of the sea will not be sufficient.

Today we are witnessing several upward trends:

- increased demand for quality and acceptable proteins for humans, fish and animals
- increased demand for Omega 3 essential fatty acids
- increased demand for processed fish and other marine organisms
-increased demand for sustainable production of IMTA Integrated Multitrophic Aquaculture (multi-trophic farming)
- increased need for a renewable energy supply chain
- increased need for active health foods and supplements
- increased need for diversification of the fish supply chain market and new ones more affordable products
-increased need for technological progress and education
-increased need to improve bio-waste management-circular economy
-increased need for the development of supporting equipment

Based on the above scenario of application of traditional cage and new breeding technologies, it is necessary to focus on the growing demand for certain types of products that would be sufficient, the use of raw materials and energy and development activities.

10.1 Planning activity

The activity of planning and selecting production directions of entrepreneurs was reduced to examining the course of industrial achievements, analyzing the latest production trends, following examples of good practices of relevant industries, and connecting several productions into one whole.

In addition to the definition of infrastructural equipment of marine supply zones, which is a project of high importance, it should be fragmented into risk categories and the entire project should include the categories of required reservoirs and pumping stations and desalination plants if we are also talking about the possibility of breeding.

Possible new activities in currently unpromising zones (innovative mariculture and possible related development activities)

- Aquaculture / mariculture - initial production - micro and macro algae / aquatic and marine plants (greenhouses), ponds and bio reactors
Land-based farming systems for the production of fish and other marine and freshwater organisms in RAS plants - initial hatcheries and overgrowth - especially for salmonids)
-Mini wind farms / solar panels / water tanks in cultivation combinations
-Integrated Hydro & Aquaponic plants for plant production-vegetables-supply
-Desalination plant
-Algal salt production plant
-Fish processing plants
-Bio waste processing plants
-Technology park for research and demonstrations
-Educational and faculty campus for marine technologies
-Production of equipment - logistics center for the spread of new technologies and equipment

The listed activities are not mandatory contents - depending on the entrepreneurial idea, all other investment projects can be proposed, but they are related to the use of marine / water resources with the obligatory bringing of infrastructure units primarily pipelines and additional energy. This category of planning is done for the whole of medium to large projects. The advantage is medium to large projects to give exclusivity in the management of zones, but also make its financial justification possible.

SELECTED POSSIBILITIES OF DEVELOPMENT PROJECT DIRECTIONS

Through the working basis of possible development directions of the zone, several integrated and non-contact projects have been proposed in the development of new breeding models with an emphasis on:

1. Aquaculture / Mariculture basic - micro / macro algae, zooplankton / ponds and bioreactors (possibility of rhombus breeding, possibility of breeding prey the needs of farms in the sea and on land. Breeding of diamonds, shrimps, other economically interesting species
2. Production facilities for fish and other marine organisms in land, closed or open system RAS-juvenile and consumable fish
3. Mini windmills / solar panels / reservoirs in cultivation combinations
4. Integrated Hydro & Aquaponic plants for fish and vegetable production
5. Plant for desalination or desalination by condensation
6. Algae salt production plants
7. Fish processing plants
8. Biowaste processing plants
9. Research and Demonstration Technology Park
10. Educational and faculty campus for marine technologies
11. Production of equipment - logistics center for the spread of new technologies and equipment
12. Infrastructure - more integrated connections to renewable sources

Based on the acceptance of the concept, it is possible to create a broader professional basis for the project task for individual zones of currently unpromising character.
The choice of such locations, which have several strategic points, can lead to an innovative approach to industrial production at an increased technological level. This is the framework for the preparation of a special study of innovative mariculture.

11 1 Economy planning

Mariculture is an activity that exploits common goods and thus enters into conflict with other interesting branches. User rights or concessions are granted within the framework of sustainable environmental and economic development, and in this way development capital is drawn in and enables long-term planning, especially in industrial zones.
In the following overview, we list some of the general positive social effects that this production would achieve:
Presentation of positive social effects

-Increase in the foreign trade balance is partly due to the export of the final product to the target market (in the case of increasing needs of the European market and the opening of exports is a realistic prerequisite for raising production)
-Increase in employment
-Return on basic investment 5-10 years (depending on the cultivation variant and choice of species)
-High profit rate when introducing new innovative species (new production allows production elasticity and reserve)
-Increases utility standards taxes, concessions
-Increases the individual standard of employment
-Economic development of the county high production
-It is not in conflict with alternative activities, there are no other interests for the narrower zone
-Develops and introduces new technologies "eco-friendly technology" and "best practice"
-Provides profits to other services of veterinary, transport, forwarding and other services
-Compliance with high standards in line with EU standards
-The project for the development of mariculture in marine locations has been accepted by acts of local self-government- it is necessary to conduct public calls
-The county area must be determined for the possibility of terrestrial breeding
-It is directly related to the tourism development program, socio-economic balance and stability
- Acceptable "inshore, semioffshore and offshore" technology
-Reducing competition with alternative activities

The main issues and goals related to environmental protection in the framework of cost-benefit analysis of the project (CBA (Cost Benefit Analysis)), relate to biodiversity conservation, conservation of fish stocks, protection of rare species, minimizing algal blooms, and maintaining existing quality water.

For optimal breeding and the correctness of fish and other marine organisms as food should have and maintain quality conditions of the breeding environment. Achieving this goal is enabled by proper zootechnological procedures and the implementation of continuous monitoring in production.

The new common policy of the European Union was completed on March 3, 2021, and the proposal of the Multiannual Common EU Policy for 2021-2027 was adopted. approach the outline of the strategic plan at the national level. By adopting all previous proposals, the Permanent Representatives of the Member States, together with Parliament, adopted the legislative provisions of the new Cohesion Policy, which will finance 330 billion euros of projects selected according to the guidelines of each Member State's National Strategic Plan.

New frameworks and programs for shared management have been identified through the following Structural Funds for Member States:
- Cohesion Fund
- Fund for Fair Transition
- European Maritime and Fisheries Fund
- European Agricultural Fund for Rural Development
- Asylum and Migration Fund
- Fund for Internal Security and Integrated Border Management

The National Strategy of the Republic of Croatia 2030 is a ten-year strategy designed according to EU guidelines, and refers to development in 4 directions:
- Sustainable economy and society
- Strengthening resilience to crises
- Green and digital transition
- Balanced regional development

Although it has been announced that funding for the fisheries sector will be reduced in the next budget period, it will remain sufficient to achieve all the objectives of the new Maritime and Fisheries Operational Plan 2021-2027.

Following the Commission's proposal on 13 June 2018 regarding the new Regulation on the European Maritime and Fisheries Fund (REGULATION (EU) No. 390/2018), planning for the financing of this sector for the forthcoming period 2021-2027 has begun. Within the Regulation, the Commission proposed a total
the ERDF budget of EUR 6,140,000,000, with EUR 5,311,000,000 allocated for shared management and EUR 829,000,000 as support in the form of direct and indirect management.

Aid under shared management relates to funds allocated to entrepreneurs in the fisheries and aquaculture sector, and direct and indirect management relates to several items: promoting sustainable fisheries through the implementation of the CFP guidelines, promotingsustainable aquaculture, processing and marketing, growth of blue economy, strengthening international ocean governance and keeping the seas and oceans clean and safe to navigate.

Furthermore, negotiations were held between the EU Council and Parliament, during which it was agreed that the current funding practice in this sector will be changed by investing in a more dynamic fisheries sector, generational renewal and a decent standard of living in coastal communities.

Before the challenges and new investments, it is important to look at the current financing of public infrastructure and large projects within fisheries and mariculture as a driver of the economy.
these branches and linking these projects with investment in roads and other superstructures needed to ensure that the sustainable development of all fisheries and mariculture efforts is focused and unhindered towards the goals that Europe promotes in this sector.

12.1 EU funding frameworks for the previous period and guidelines for the new perspective 2021-2027.

Countries within the European Union have developed their own system of allocating funds through common policies that define the framework for their co-financing when allocating EU funds. The most important direction according to which most of the projects designed in the Republic of Croatia were financed is the EU Regional / Cohesion Policy.

Regional policy was related to financing the environmentally friendly economy, strategic investment in roads, encouraging innovation, inclusive social development, improving education and employment systems, and over the course of 6 years all these objectives have been financed through several thousand projects implemented by the European Structural and Investment Funds (ESIF).

Funds from the ESI Fund were allocated to selected projects according to the strategic guidelines from these 3 main funds:
- European Regional Development Fund (ERDF)
- Cohesion Fund (CF)
- European Social Fund (ESF)

These two remaining, but no less significant:
- European Agricultural Fund for Rural Development (EAFRD)
- European Maritime and Fisheries Fund (EFF)

For the next budget period 2021-2027, funding will continue through the existing funds with the new European Agricultural Guarantee Fund.

Croatia's strategic goals expressed through the National Strategic Document 2030, as before, refer to man as the center of the development process, which with its identity and recognized culture through equality should achieve a more innovative, secure and competitive Croatia.

The objectives of the NRS (National Development Strategy) 2030 do not differ too much from the current regional policy funds and the 11 thematic objectives of cohesion policy for the period 2014-2020, but are better adapted to current EU priorities. In addition to development goals, strategic goals have been determined evenly distributed according to the needs of each development direction. Achieving development and strategic goals will be measured through set indicators.

Within the NRS 2030, fisheries and aquaculture are mostly moving through the strategic goal and related activities of Food Self-Sufficiency and Development of the Bio-Economy. The concept of bio-economy is based on the establishment of a circular economy that would be a logical ecological direction in aquaculture and fisheries to complete the production process. Aquaculture will also be further improved by connecting with domestic and international markets through an integrated approach to increase production and adapt to climate change. The emphasis will not only be on increasing production but on adding value to the product by certification and raising standards themselves
production. In order for the sector to adapt to production with climate change, it is necessary to conduct additional scientific research that would ensure further low-carbon development and adequate environmental protection. Significant support will be provided to small and medium-sized enterprises to ensure their stability, but also innovation, whose funds have so far been least used within the ERDF in the previous accounting period.

Competitiveness of the sector would be strengthened through innovation, association through producer organizations and vocational education. All these measures will be realized through a new integrated approach in order to allocate funds as efficiently as possible and actually direct them towards market demand.

Within the NRS, an interesting strategic goal for the fisheries sector is to improve the quality of life on the islands, where, among other things, through territorial development, investments will be made in starting the economy, especially the circular one. Through investments in transport infrastructure and the development of broadband, electronic communication networks, fishing infrastructure will be developed along with other economic branches of island communities.

Access roads and roads are necessary for the connectivity and functionality of fisheries on larger islands, and funding these activities will facilitate and justify the construction or reconstruction of new ports that will further emphasize the need to improve coastal liner shipping. In order to plan the development of islands and strengthen their economic component, it is necessary to systematically revise spatial plans in accordance with the directions of the National Island Development Plan 2021-2027. especially those related to the development of mariculture. The emphasis here is on PGC due to the larger islands in the waters.

Investments in fisheries and aquaculture have so far been exclusively financed by the ERDF, whose objectives and eligible results will be in the future financial perspective 2021-2027. be determined according to the synergy of guidelines from the Common Fisheries Policy (CFP), the EU Integrated Maritime Policy and the International Ocean Management Obligations.

According to the Regulation proposed by the Presidency of the European Union (2018) to the Parliament and the Council of the EU, ineligible investments through this fund with some exceptions will be the following:
- Vessel capacity increase or fishing effort operations
- Purchase of new vessels, import or replacement of engines for higher power engines
- Temporary or permanent cessation of fishing activities
- Transfer of ownership of the company
- Direct restocking
- Exploratory fishing (except scientific research)
- Construction of new ports or fish market
- Certain mechanisms of market intervention, etc.

12.2 Teritorial cooperation

A special set of programs are EU territorial cooperation measures designed to systematically and coordinatedly build partnerships at local, regional or national level with partners from other countries. This approach seeks to remove the border barrier through projects that will integrate different social or economic systems into one. Funds are provided for addressing common challenges identified through partnership communication. Challenges relate to IT connectivity and general technological development of regions, transport connectivity, business cooperation in various economic niches, through the private and public sectors, encouraging the increase of research and innovation projects, joint projects to reduce environmental pollution and cooperation of various educational and research institution.

Strengthening territorial cooperation reduces inequality among countries that are at different stages of development, but some less developed Croatian regions are also prospering.
In the previous period, the Republic of Croatia was able to fully participate in three areas of cooperation: interregional, cross-border and transnational cooperation.
Interregional cooperation refers to the following programs:
- ESPON - measures to assist in spatial planning and general cooperation of higher education and scientific institutions
- INTERACT III - a program that covers not only the EU but also the territory of Norway and Switzerland, and is based on the exchange of experiences and examples of good practice with an innovative approach to territorial cooperation
- INTERREG - a program co-financed by the European Regional Development Fund, which has also been extended to Norway and Switzerland, in addition to the EU. In addition to territorial innovative cooperation and exchange of experiences in the past period, it relied on 4 topics: research and development, SME competitiveness, low-carbon economy and environmental and resource efficiency
- URBACT - a program intended for the development of cities through the adaptation of strategic documents

Cross-border cooperation refers to the interaction of Member States with border regions and, accordingly, Croatia participates in these territorial programs:
- Cross-border cooperation program INTERREG V-A Italy - Croatia 2014-2020.
- Cross-border cooperation program INTERREG V-A Hungary - Croatia 2014-2020.
- Cross-border cooperation program INTERREG V-A Slovenia - Croatia 2014-2020.
- INTERREG IPA cross-border cooperation program Croatia - Bosnia and Herzegovina - Montenegro 2014-2020.
- INTERREG IPA Cross-border Cooperation Program Croatia - Serbia 2014-2020

Each program has different thematic priorities, and for projects related to fisheries and aquaculture the most favorable and interesting is the cooperation with Italy based on objectives related to blue innovation, maritime transport, security and resilience and the environment and cultural heritage.

INTERREG V-A Italy-Croatia projects in the past period related to fisheries and aquaculture are projects in which knowledge and experience were exchanged between relevant institutions of the two countries and possibly some necessary infrastructure was financed through the project. Some of the projects are:

- ADRI.SMARTFISH - strengthening small fishermen in the North Adriatic (boats smaller than 12 m) within the sector in order to gain opportunities for innovation within their activities. The project involves 10 partners and has a budget of 3,242,000 euros.
- ADRIAQUANET - a project in aquaculture related to innovations within the nutrition of cultivated species, their health and environmental protection around the breeding area. The project includes 11 partners and a total budget of 3,224,009.59 euros.
- ADRIGREEN - a project that connects coastal and air transport with other forms of transport to facilitate passenger transport and at the same time preserve the environment. The project involves 10 partners and the budget is 2,104,217 euros.
- PRIZEFISH-Management of eco-innovative supply chains in fisheries, in order to achieve added value of Adriatic fishery products. The project involves 14 partners and the budget is 3,117,680 euros.
- Like many others ...

Since the past period, Croatia has also entered 4 transnational cooperation programs:
- INTERREG V-B Mediterranean Transnational Cooperation Program 2014-2020.
- INTERREG V-B Danube Transnational Cooperation Program 2014-2020.
- INTERREG V-B Adriatic-Ionian Transnational Cooperation Program 2014-2020.
- INTERREG Central Europe Transnational Cooperation Program 2014-2020.

For the new budget period, territorial cooperation programs are in the phase of preparation of program content, which is decided by 29 partner countries. It is assumed that new priority axes will be announced by January 2022.

13 3 Benefits of construction or reconstruction of public infrastructu reand superstructure and their financing

13.1 Fishing ports and examples

According to Cetinić and associates, fish and other marine organisms delivered to the fishing port by fishing vessels are a special type of cargo that is subject to rapid spoilage and therefore requires a different and more complex procedure in the port than any other cargo that is not so sensitive. A fishing port can provide opportunities to upgrade a range of other activities within which it is possible to employ a significant number of people. In addition to service activities that include transhipment operations, supply and repair of fishing vessels in the fishing port, production processes of treatment of fish and other organisms can also take place.

The importance of ports for mariculture in part exceeds the needs of fishing ports because the need to use the operational coast is daily as it must be both continuous and constant.

Therefore, the basic operations should be considered, and these are the disembarkation of young people from trucks to a vessel or directly to the sea - direct access to the coast, loading and unloading of food, fish for consumption, breeding equipment, etc.
Processing will be within the needs of fishing pipes and landing sites, but within farms or nearby, there should be permanent moorings.

In 2020, the Government of the Republic of Croatia passed a Decision on the list of landing sites and ships that have the obligation to land their catch at 118 locations throughout the Republic of Croatia according to the tools they use. The decision was made on the basis of the European Regulation on Management Measures for Sustainable Exploitation fishery resources in the Mediterranean. Landing places are located within 7 coastal regions - Istria, Primorje-Gorski Kotar, Lika-Senj, Zadar, Šibenik-Knin, Split-Dalmatia, Dubrovnik-Neretva, but so far not all regions are covered by fishing ports as a necessary infrastructure to ensure the basis of production cycles in fisheries.

In Croatia, many ports on the Adriatic, under port jurisdiction, are registered as fishing, but most do not have the necessary infrastructure for quality fish landings. The basis that most ports have, such as a dock for mixed mooring, energy connection, plumbing and sanitation, is not a sufficient guarantee that fishery products can maintain sufficient quality during and after disembarkation. Minimum infrastructure required in fishing ports refers to:
- Port pools, docks, piers, operational shore with access to trucks, anchorage
- Breakwaters
- Port roads, water supply, sewerage, energy and telephone network, facilities related to safety of navigation (lighthouses)

Under the superstructure (suprastructure) it is enough to have:
- Administrative buildings, warehouses, transhipment facilities with the necessary packaging, cranes, etc.
Other facilities that can serve fishermen, their vessels and catches such as restaurants, accommodation or fish processing are not necessary, but can certainly add value to the port and the end products of fisheries and can serve as drivers of the local economy due to employment opportunities. profession.

The main task of the fishing port, but also the place of origin is to serve the fishing fleet and their catch, and further manipulation of seafood can be done in collection and distribution centers, processing plants or plants for processing fish products. Processing is possible

performed in facilities located in the fishing port or outside, and collection and distribution centers can be places for fish auctions, shipping centers, fish markets, etc.

In the Republic of Croatia, these facilities are usually located farther from fishing ports and the most important thing is to establish efficient transport connections between fishing ports, collection and distribution centers and centers for processing marine organisms by investing in roads or simply locating centers closer to fishing ports.

In order to establish control, quality and traceability of fishery products, the Ministry of Agriculture through Measure I on 23/24. Operational Program for Maritime Affairs and Fisheries 2014-2020 financed investments in public infrastructure. Through these measures, investment in fishing ports and accompanying infrastructure, labor exchanges, unloading points and waste disposal facilities in the fishing port was allowed. The tender and ordinance for the mentioned measure came out for the first time in 2018, and from then until 2020 the funds were used by 6 fishing ports in the Republic of Croatia - Gaženica, Vela Lamjana, Pumpurela pier, Brižine, Santa Marina, Umag pier.

Construction examples: The Zadar Port Authority, which has 2 fishing ports under its jurisdiction, Gaženica and Vela Lamjana, co-financed the reconstruction in 2018 and 2019 through its applications.Tthese two ports through EU funds from the total budget of HRK 32,852,102. (Source website of the Port Authority, Zadar)

Given the fact that landing sites in Zadar County are the places where the largest quantities of small blue fish are landed in Croatia (as much as 40% of the total landings in Croatia) and that in its waters the County has numerous farms of sea bass, gilthead sea bream and tuna, local the government recognized the need to establish a good port system and supporting infrastructure. In Vela Lamjana, work was done on the reconstruction and modernization of port resources. The works included:
-extension of the Nauta Lamjana breakwater extension of the port for the reception of domicile and fishing boats
-operational shore for landing or transhipping fish construction of a road between berths for fishing vessels and operational shores.
The port of Gaženica has several parts, an old cargo port, a new passenger terminal and a fishing port. Within the fishing port, the following is being renovated: operational shore,

construction of a warehouse, operational shore for repair of ships with a crane, arrangement of roads, parking lots, green areas, etc.

The fishing ports that have also been modernized and manipulatively planned to accept a larger quantity of landed seafood with accompanying facilities are Brižine in Split and Santa Marina in Poreč. The fishing port of Brižine in Split keeps pace with the needs of fishermen and builds within its infrastructure:
-collection and distribution center for temporary storage of fish and ice supply
-expansion and rehabilitation of the operational coast
-communal infrastructure and the road connected to the fishing port.

Santa Marina is a fishing port in the County of Istria, which has also been renovated according to the standards required for unloading:
-construction of breakwater and coastal wall
-restoration of berths and operating surfaces
-water supply and electricity (with lighting and video surveillance)
-expansion of marine waters
-ecological waste separation.

Name of beneficiary	Application year	Total eligible costs (including coofinancing-kn)	EU contribution (kn)
Zadar Port Authority	2018.	64.714734,50	29.520967,11
	2019.	4.441.513,00	3.331.135,00
Rab County Port Authority	2018.	19.169.775,19	285.937,50
	2019.	181.250,00	135.937,50
	2020.	19.169.775,19	173.437,50
Split Port Authority	2018.	37.226.000,00	27.762.443,76
Poreč Port Authority	2018.	10.495.927,59	7.365.643,68
	2019.	199.798,06	149.848,54
	2020.	10.495.927,59	4.603.699,03
Umag-Novigrad Port Authority	2018.	5.189.962,50	3.856.985,20
	2019.	123.982,50	92.986,88
	2020.	5.189.962,50	1.000.890,16

Table . Amounts of funds financed from the Operational Program for Maritime Affairs and Fisheries 2014-2020, measure I.23 Fishing ports, landing sites, fish exchanges and shelters - investments in

improving the infrastructure of fishing ports and fish exchanges or landing sites and shelters,investmentstoimprovesecurityfishermen(Ministry of Agriculture)

One of the most important port support infrastructures is the coastal port installations needed for the port terminal to function flawlessly. Fishermen need an electrical network when safely unloading and reloading fish, but also when loading various loads when sailing out to sea. Power propulsion is also needed by propulsion machines used by fishermen on the operational shore. Telecommunication and optical cables are nowadays an indispensable part of these installations due to communication when arriving at the port and going fishing, marketing, keeping electronic registers, etc. Water supply network is necessary for hygienic needs during storage and cooling of products, but also for hydraulic and fire device.

The sewerage network in the fishing port can be independent or connected to the city sewerage network, and in addition to the need for wastewater drainage, it can also be used to deal with rainwater so that it does not accumulate within the fishing port.

Although the reconstruction of these fishing ports was mostly financed from the Maritime and Fisheries Operational Program (2014-2020), the preparatory project-technical documentation required for the development of the projects themselves was mainly financed from other state funds and institutions responsible for such jobs such as the Ministry of Agriculture, the Ministry of Maritime Affairs, Transport and Infrastructure and the Ministry of Economy, Entrepreneurship and Crafts.
So far, it has also been possible to finance the mentioned additional infrastructure of the port substructure from the Cohesion Fund, which is supervised and implemented by the Ministry of Regional Development and European Union Funds responsible for sustainable coastal development. Proposals for solving the fishing infrastructure were also given in the sources of the program for building the fishing infrastructure of individual counties. Part of the fishing infrastructure to be used in the immediate vicinity of the farm and part of the mariculture infrastructure is therefore mentioned here.

13.2 The importance of transport in fisheries and aquaculture and its financing

Projects in the field of transport, which can be part of the port substructure, ie infrastructure in the Republic of Croatia, will still be able to be financed through the Cohesion Fund, within which for the period 2021-2027. provided funds in the amount of EUR 1.55 billion and through the European Regional Development Fund, which has been allocated funds in the amount of EUR 5.54 billion for this financial perspective in the Republic of Croatia.

Investments in transport infrastructure for the previous budget period (2014-2020) took place through measures from the Operational Program Competitiveness and Cohesion, which arose from the priority axis Connectivity and Mobility. The funds amounted to 1.3 billion euros and were drawn from two funds, the Cohesion Fund (910 million euros) and the European Regional Development Fund (400 million euros).
euros). The difference in funding is actually visible from the names of the funds, the funds of the Regional Development Fund are intended for regional projects that stimulate economic development within regions, employability of their population, environmental protection, and in a new perspective the adaptation of regions to climate change. adhere, be connected) actually encourages the connection of less developed member states through the financing of large infrastructure projects in the field of transport and the environment. Through the CF, funds were allocated for networks that connect land, air and maritime transport within the EU, or for transport in urban, rail or water transport that is designed in the service of environmental protection.

The funds that the Republic of Croatia has so far withdrawn from EU funds for the transport sector are distributed according to the objectives of the Transport Development Strategy defined for the period from 2014 until 2030, when all European member states are expected to be better connected by harmonized road, rail, maritime and air transport. This great vision would certainly facilitate the movement of people and goods and create a more market-competitive Europe by defining its transparent transport network. Each member state is obliged to invest in the infrastructure of the so-called TEN-T network, which represents not only transport but also energy and telecommunications development strategy. Croatia has the potential to develop its roads within the TEN-T network through the Mediterranean and Rhine-Danube corridors.

In addition to investing in the TEN-T road network, Croatia in the previous budget period 2014-2020 had a plan to invest in traffic safety, reconstruction of railway networks, urban mobility, connecting urban and rural settlements, improving accessibility of islands, reconstruction of Dubrovnik airport and finally, part of the funds was allocated for bypass projects
in Šibenik-Knin County (near Vodice), Split-Dalmatia County (LOT2) and the bridge near Čiovo. Croatia is well connected by traffic also due to the construction of the A1 motorway that connects the coast with the mainland and will certainly be even better connected with EU member states through the European Transport Network through continuous investment of EU funds in the TEN-T network.
According to the Roads Act (OG 84/11, 22/13, 54/13, 148/13, 92/14, 110/19), roads are divided into public and unclassified. In terms of planning the connection of economic entities

with important infrastructure in fisheries, unclassified roads are significant, which are defined as access roads to residential, commercial, commercial and other buildings. Unclassified roads are a public good in general use and are owned by the local self-government units in whose area they are located, and are determined by the Minister of the Sea, Transport and Infrastructure.

In the previous financial perspective, investments were made in unclassified roads through the Rural Fund through sub-measure 7.2. "Investments in the construction, improvement or expansion of all types of small-scale infrastructure, including investments in renewable energy sources and energy savings."

Exports of local products of marine organisms to other countries can also be done through air cargo transport. Connecting Croatia with the rest of the world by air depends on investing in airports, connected infrastructure in order to meet international standards and the directions of tourism development. Since becoming part of European air transport, Croatia has become more accessible to many market-important world destinations.

There are 7 airports in Croatia, located in the sea and continental part (Zagreb, Osijek, Rijeka, Pula, Zadar, Split, Dubrovnik) and two airports Brač and Mali Lošinj. In addition to investments in Dubrovnik Airport, the passenger terminal in Zagreb (not financed from EU funds but from credit funds) and in Split (financed mainly from own funds) was recently renovated, and the renovation of the seasonal airport in Pula is planned. When we talk about cargo transport that would allow the placement of some less perishable products of fisheries and aquaculture in Croatia, we can primarily rely on the airport in Zagreb because it has cargo warehouses through which passes 90% of this type of traffic in the country. In this part of the Zagreb Airport business, all types of cargo are shipped - special cargo, hazardous materials and perishable goods. In addition, it is important to note that the goods entry center is subject to phytopathological and veterinary control. Apart from courier services such as DHL and UPS, which deliver shipments from Germany, most cargo cargo comes from passenger planes of Turkish Airlines, Aeroflot, Emirates and third countries (Budić et al., 2019).

National trade in goods with this type of transport is currently negligible. Zagreb Airport has also prepared documentation for a project called "Zagreb airport cargo city", which plans to expand cargo transport by air, which is still awaiting funding.

In aquaculture or fish processing, closed facilities required for such activities are increasingly moving away from marine habitat to protect the environment due to anthropogenic pollution during the operation of these facilities. Although the evacuation of fisheries and aquaculture

processing or processing facilities outside the coastal zone may not be the best functional solution due to quality concerns, it is essential to ensure good transport links so that the operations necessary to obtain the final products run smoothly.

Sustainable development of islands and coastal areas in coastal communities largely depends on fisheries and underutilized potential of aquaculture on the islands, so it is important to connect the islands with coastal transport and communal connections meaningfully and structurally.

Fishing ports, as a starting point for fishing production, need to be quickly and efficiently connected to collection and distribution centers in order to maintain the freshness of products that are placed on the market.

Due to all the above, transport infrastructure is an important instrument of economic development, and fisheries and aquaculture are no exceptions to this rule. Constant efforts in transport investments are necessary regionally, but also nationally. The development of transport is thoroughly addressed through the specific objective of the NRS 2030. Sustainable mobility and funding will take place through investments in the modernization of railways, integrated urban connectivity, freight transport, then further development of transport and its processes, maritime and inland transport waters and air transport. This goal is part of the broader direction of Green and Digital Transition, which refers to supporting solutions for the transition to digital systems and energy that serves the purpose of preserving the environment and reduces the negative carbon footprint.

13.3 Infrastructure in aquaculture and processing by zones

Aquaculture, as one of the fastest growing branches of the blue economy in the world, needs to be paid attention to when drafting economic development plans in Croatia, given that the Adriatic Sea has a special potential for breeding in internal and external waters.

Aquaculture can be part of the recovery and support sector for the Croatian economy. When drafting the EU 2020 plan, the European Union paid special attention to the Blue Growth Plan, according to which mariculture is also in focus as a significant economic branch worthinvesting in. Spatial plans adopted at the local level define aquaculture zones, however, in addition to the spatial plans themselves, which determine the areas of setting up cultivation

fields, the accompanying infrastructure is very important, without which this activity cannot function. Supporting infrastructure applies
on the unloading of production goods on the operational shore, manipulation of equipment and preparation of products for storage or marketing. In terms of favorable management of this sector, the logical sequence is to expand production, which encourages the possibility of employing local people, establishing certain centers for shipping and purification of shellfish and better management of the entire breeding process.

In order for aquaculture and fishery products to achieve or maintain a certain market value, they must be well sorted, treated and stored or sent for further processing after capture. A certain part of the product is therefore processed in order to obtain a product that is more time-resistant and gourmet upgraded according to market needs. In the past, such forms of product processing facilities were usually planned and built on islands, but today such plants are increasingly being moved out of town, settlements or along the very edges of inhabited structures into business or entrepreneurial zones.

According to industry, business zones can be free and business, ie entrepreneurial and economic zones (Lončar, 2008). Business zones actually serve to encourage small and medium enterprises in favorable conditions of high technological and communal equipment with special financial and transport facilities. For similar purposes, business incubators are being set up to support start-ups or companies that are in the growth and development phase and do not have their own space. Entrepreneurial zones are projects of the Government of the Republic of Croatia that promote balanced regional development, so each county has a dozen or more entrepreneurial infrastructures formed according to the Law on Improvement of Entrepreneurial Infrastructure and it determines the establishment of the Unified Register of Entrepreneurial Infrastructure. The very establishment of zones depends on local and state authorities, and they can territorially provide many benefits of technological progress, modernization of business, additional employment and industrial connections with other regions. The most successful zones are those located in frequent places such as roads, river and sea ports or near airports. (Lončar, 2008)

Large business plants or business zones that are moving away from the coasts and islands in Croatia today are being built from 10 to 25 kilometers from the sea, and therefore a product that is fresh and of good quality is successfully delivered to them.

In addition to storage and processing within business zones, in adapted circumstances, cultivation can also be performed, as we have already stated. Such cultivation, although it

allows the treatment of effluents, requires large investment costs that largely depend on the mode of cultivation system - open (flow) or closed (recirculation).

With an open system, significant savings are achieved by terrains that bring water through the gravity system, which is sometimes a little harder to achieve on areas that are dislocated from the sea in spatial plans.
Closed system, ie recirculation of optimally tempered and conditioned water, is usually practiced in hatcheries and overgrowth of marine species. This aspect of cultivation is actually more economical than open flow, however, there is less ability to control the production process and there are large capital investments and operating costs.
Placing such plants in entrepreneurial zones has its advantages, but also disadvantages. The advantages are the dislocation of industrial activities in suitable zones that are covered by a quality utility, technological and transport network, they are economically more profitable in the long run, although capital investments are large. The great distance from the sea can be an additional cost either in the initial investment or through operating costs.

In the previous budget period, more precisely in 2017, the Ministry of the Economy, Entrepreneurship and Crafts financed the development of the infrastructure of entrepreneurial zones. Eligible beneficiaries were local and regional self-government units, and 46 projects were approved. Although the initial allocation of available grants was HRK 76,000,000.00 later - in 2019 the allocation was increased by HRK 198,651,418.00 and the total allocation then became HRK 274,651,418.00 (data according to the website of the Structural Funds)

Funding for the processing and related infrastructure activities is mainly allocated from the ERDF measure IV. which in the previous period published tenders with the aim of financing activities related to the improvement of processing, business, marketing and storage, and in the new financial perspective 2021-2027. it is planned to invest in the modernization of processing capacities.

Within the business, the introduction of innovative processes, improving product quality, adding value and just increasing the amount of production will be financed.
A survey conducted by the Institute of Oceanography and Fisheries in 2018 (Božanić) examined the impact of EU funds on companies engaged in processing in Croatia. According to this work in Croatia in 2014. 18 processing companies registered in the pre-accession period (2007-2013) 17 companies from this activity received IPARD grants (HRK 83,172,012) in order to be able to build or reconstruct and modernize their facilities and adequately prepare for the financial period 2014 - 2020

During the operational period 2014-2020, the Republic of Croatia invested in aquaculture through 9 measures determined within the Operational Program for Maritime Affairs and Fisheries.

Investment in infrastructure took place mostly through the measure Productive investments in aquaculture, and these funds were used to finance the construction or reconstruction of supporting infrastructure such as centers for shipping and purification of shellfish, hatcheries, warehouses and other necessary equipment for quality breeding.

According to the annual report on the implementation of the OPPR from 2019, 15 operations were approved for that year alone, funds of 1.7 million euros were allocated, and 24.9 million of public aid has been granted since the beginning of the implementation.

In the next period, according to the announcements, this measure will invest in the construction of new and modernization of existing farms, diversification of production, ecologically innovative aquaculture, improvement of healthy aquaculture that protects the environment and scientific approach and advice to help this sector.

Quality production with available infrastructure and transport connections enables better market placement and eventual export of marine organisms' products.

The total export of the fisheries sector, including fish products last year, according to data processed by the Croatian Chamber of Commerce, is worth 150.5 million euros, and imports slightly more than 90 million euros. Exports, which largely depend on the frequency of tuna sales, increased by 31 percent, while imports increased by 24 percent. Exports of salted fish were worth 16.7 million euros, and exports of canned fish and processed products 27.7 million euros last year. Prepared or canned fish is exported to more than 30 countries, mostly to the countries of the former Yugoslavia and to Spain and Italy. More than 1.3m euros were exported to each of these countries. Most in Serbia, about 6.1 million euros. It is followed by BiH with 3.5 million euros, Slovenia with 3.1 million, and Spain and Italy with about three million euros each.

Macedonia, Montenegro and Kosovo are also important markets, each importing between 1.3m and 1.5m euros. Exports of frozen fish, especially frozen fillets, are also growing.

14 4 Genesis of opening the interest

In order to manage the fishing infrastructure in general as well as mariculture, it is necessary to determine: the characteristics of the fishing fleet and breeding fleet, the size of the required shore, the dynamics of its use and the necessary upgrade (Par et al., 2007)

According to this logic, it is necessary to establish a comprehensive study of the current situation in the Republic of Croatia in fisheries in order to define a system of sustainable development of fisheries and aquaculture and in this regard further financing of related infrastructure and superstructure.

The results of such research could set the guidelines for a systematic fisheries and mariculture management plan. In order to implement the proposed strategy, the readiness of local units and communities to change spatial plans, which would have to adapt to the needs of the fisheries sector, remains questionable. Namely, in 2008 the Protocol on the Integrated Coastal Zone Management Plan (IPUOP) was signed in Madrid, which was ratified by the Croatian Parliament in 2013 and entered into force as a supra-law. An expert basis for its implementation has been developed, but local stakeholders have still not fully implemented these guidelines.

Some counties have made great strides towards strengthening the fisheries sector and, in addition to adopting planning documentation, have implemented most of the planned, so Zadar County, which in 2012 developed the Fisheries Infrastructure Development Program in Zadar County, in the coming years worked and continues to work on providing fishing infrastructure according to the needs of the sector, which is reflected in the efforts to complete the reconstruction of the previously mentioned fishing ports.

According to all information, Croatia continues to develop only basic infrastructure and superstructures in fisheries and aquaculture, although according to the European Commission's Blue Economy 2020 report, the business of these two industries has been developing in recent years to increase quality and innovation within the sector.

The EU is actually the world's 5th largest producer in fisheries and aquaculture, accounting for 3% of global production. Yet as EU citizens consume twice as much fish food as they produce, Europe is also the largest importer of seafood. With the proclamation of this Report, the European Commission has gone a step further by planning greater investments in adding value to aquaculture products, innovative production and adapting fisheries to the new

circumstances in which the fish stock has recovered after years of EU fishing effort sustainability measures.

According to STECF, primary production, ie fishing, is growing annually, especially in the Mediterranean, due to the increase in the mass of marine resources, while aquaculture is currently stagnating, increasing the quality of its products. Given that seafood consumption is growing in the EU, an increase in production is also expected. (The Blue economy report 2020, European commission)

In 2017, Croatia signed an agreement with the youngest EU investment organization, the European Bank for Reconstruction and Development (EBRD). Investments are carried out according to the Strategy defined by ERBD for Croatia. In the Strategy for Croatia, the EBRD identifies the following priorities:

1. Supporting private sector competitiveness by fostering innovation, business and resource efficiency, as well as improving the business climate and economic inclusion .;
2. Deepening financial markets for wider access to funds, with emphasis on capital market development; and
3. Promoting the commercialization of public enterprises, including improving corporate governance and supporting the privatization of some state-owned enterprises. (Source website of the Ministry of Finance)

As Croatian Fisheries and Aquaculture is led mainly by small, family companies with a few large players in the market, investments can be made not only with support from ESI funds but also through the Invest EU program which plans to mobilize investments in fisheries and aquaculture through the European Fund for Strategic Investments (EFSI). , risky financing for small businesses, research, innovation and education.

The economic picture in Croatia due to the crisis caused by the COVID 19 pandemic will lead to more serious thinking about the possibilities of better strategic and spatial planning for the progress of the blue economy, before subordinating the tourism sector, private and public investment will certainly continue.

Croatia needs to define and integrate investments in further infrastructure and superstructure as soon as possible in order to focus more on innovation, the introduction of modern technology in production processes and raising the competitiveness of Europe's products in terms of meeting growing food needs.

15 5 Biodiversity conservation due to setting of fish aggregating devices

Regarding the preservation of biodiversity, according to the interpretation of the title, we can refer to the categories of devices that form the basis for the aggregation and protection of fish. According to this principle, we can mention the most important:
- Artificial reefs-
- Marine farms
- Other marine structures

Artificial reefs will be deeply elaborated as places for collecting fish and other marine organisms are build by the project and placed on specific location or acidentaly happened and we will make focus on them.

While we plan the specific project task refers to the design proposal, conceptual solution and full design and technical documentation for the creation and installation of a pilot artificial reef. The idea concept should be designed, proposed and a framework of best practice should be created in the setting definition of adequate static devices or possible buildings - artificial reefs laid on the bottom of the sea.

Artificial reefs are designed as a step to preserve the increasingly endangered resources of demersal fish, shellfish and others marine benthic resources in the area of coastal counties. At the same time, such an operation introduces the first category of more significant management and contributes to the expansion of economic activities through possible recognizable forms of management in fishing, tourism and recreation, archaeology, scientific and professional education and dr.

A socially useful idea is based on the search for proposals and conceptual solutions for the construction of artificial reefs for the purpose of creating renewable and protected zones for marine organisms and includes a pilot project of creation project and technical documentation for the installation of one artificial reef. Installation location the artificial reef must be proposed and submitted in the processing by the project-technical contractor documentation, in accordance with the possibilities of spatial plans of municipalities and cities on the territory of counties.

In the framework of European legislation, these are static devices for the protection and strengthening of marine aquatics flora and fauna.

Through the management of the areas where the devices are installed, they don't have to, but they can later to be declared as an MPA (Marine protected area) in which the legal regulation prohibits certain activities with the aim of preserving marine habitats and biodiversity. Likewise, such zones can be recognized as a "No-take" zone or a zone exempted from fishing or where fishing is managed. The zone exempted from fishing is a marine protected area in which fishing, throwing waste and waste water, dredging the bottom, construction is strictly prohibited prohibited taking of natural living or non-living resources. Certain ones can also be carried out in the same zones other economic activities, but exclusively under the framework of management.

In terms of marine resources management, it should be taken into account that the deposition areas are static devices - artificial reefs are a type of public investment in nature protection and as such they should comply criteria of efficiency and equality as well as new added values without harmful encroachment on the environment.

For the correct insertion of new contents so that the areas function ambiguously in the broader sense of protection environment and management, it is necessary to have a good design of the area, good professional background and control, local community involvement and joint management plan.

The benefits of setting up artificial reefs are numerous: protection and restoration of marine habitats, increase resistance to environmental changes, protection of endangered, commercial and other species, creation of areas which can be hatcheries and breeding grounds for fish and restoration of stocks of shellfish and other marine organisms.
A direct consequence of this is the preservation of local traditional fishing activities and communities connected to the sea.

Immediately after laying, autochthonous vegetation processes will begin on their own within a short time of submerged devices by pioneer benthic algae and sessile animal species and settlement fish and other large species. Reef will thus begin its planned function:
• transformation of the original ecosystem and evolution to a higher level of ecological organization, ie biodiversity

• independent start of production of quantitatively and qualitatively new biomass
• physical protection of original sedimentary biocenoses against illegal trawling and anchoring in the narrow coastal zone
• attraction, settlement, permanent residence and/or occasional shelter and "grazing" by various fish species,

• training ground for studying problems of development, transformation, control and protection of benthic communities and fouling processes in the sea.
• potential possibility of induced cultivation of shellfish, sponges, sea grass meadows and other taxa.
• the announced functions will start independently "ex novo", without additional material costs and others anthropogenic interventions.

The habitat types based on the National Habitat Classification will be presented below.
Four main habitat types are registered along the coastal waters on the habitat map of the Republic of Croatia:

infralittoral fine sands with more or less silt ,infralittoral hard bottoms and rocks , circumlittoral sands ,and circumlittoral solid bottoms and rocks

The locations most planned for the performance of artificial reefs (reefs) are located in the habitat areas:
• infralittoral fine sand with more or less silt and
• circumlittoral sands

Towards the open sea, up to a depth of 20 - 25 meters, we find biocenoses of fine surface sands. Although at first glance the seabed seems barren, the surface layer of sand is inhabited by multitudes organisms, e.g. bivalves of the genus Acanthocardia, several species of the genus Tellina, Venus, Donax, snails of the genus Murex, Nassa, then many species of polychaetes of the genus Spirografis, Sabella, Spirorbis then lampreys of the genera Cerianthus and Condylactis, amphipod shrimps, prawns, small decapod crustaceans, urchins Sphaerechinus, Echinus and Psamechinus and, buried in the sand, urchins of the genus Echinocardium and Spatangus and starfish of the genus Astropecten.

This is the area where flatfish feed: the leaves (Solea), turbot (Bothus), flounder (Pleuronectes) and other demersal fish species. It often appears and the association of sea grasses with the taxon Cymodocea nodosa, which is characteristic of the silty biocenosis sands of protected shores and in the same area we can come across smaller colonies of large sea grasses like Posidonia oceanica

Biocenoses of circumlittoral sands in the most of area of the counties coast are represented by Biocenosis of muddy detritus bottoms and Biocenosis of coastal detritus bottoms .

The mentioned biocenoses originate from a common substrate: coastal sands mixed with terrigenous mud, the proportions of which primarily depend on the dynamics of sea water: currents and waves, and on the intensity local inflows of pluvial torrential waters, which wash away red soil and in shallow coastal waters they bring significant amounts of terrigenous silt, which is mixed with the sandy substrate. Sandy fraction was created by abrasion of lithic structures, but it is mostly of biogenic origin, that is detritus remains of snails, bivalves, crabs, sea urchins and calcified algae.

Characteristic taxa are: calcium-encrusted red algae of the genera Lithophyllum and Lithothamnion, Cryptonemia, and Peyssonnelia; Suberites sponges; bivalves Chlamys, Laevicardium, Acanthocardia, Tellina, Tapes; several species of polychaetes; single crabs Paguristes, Anapagurus; echinoderms Ophiura, Astropecten, Echinaster, Echinus, Sphaerechinus, Psammechinus and Spatangus, and mantled Aplidium, Phallusia and Microcosmus.

Both mentioned habitat types are on the List of all threatened and rare habitat types from of national and European importance represented on the territory of the Republic of Croatia - Annex II of the Ordinance on list of habitat types, habitat map and endangered and rare habitat types (NN 88/14).

BASIC LEGAL FRAMEWORKS TO SETUP REEFS

The Ministry of Environmental Protection and Energy is responsible for nature protection and the establishment of protected areas however for the conservation of marine biological resources and the management of fisheries that exploit these resources the Ministry of Agriculture is responsible.

According to the Nature Protection Act (Official Gazette 80/2013, 15/2018), the protected area is geographically a clearly defined area intended for nature protection and managed for long-term conservation nature and accompanying services of the ecological system.
Based on Regulation (EU) no. 1380/2013 Common Fisheries Policy (CFP) includes conservation marine biological resources and the management of fisheries and fleets that exploit these resources, means available live marine aquatic species.
Areas with a special fishing effort management regime are declared based on Article 12, paragraph 13 of the Law on Sea Fisheries (Official Gazette No. 62/17). Law on Sea Fisheries (Official Gazette No. 62/17):

III. MARINE BIOLOGICAL WEALTH MANAGEMENT MEASURES Technical measures - Article 12 states that

(1) For the purpose of sustainable management of biological resources, the minister prescribes the following by ordinance
management measures:
.....
10. recovery plans for shellfish stocks and habitats
11. special measures necessary to reduce the impact of fishing activities on the marine ecosystem
12. protected areas and methods of fishing in them for the protection of habitats, fish and other marine species organisms
13. areas with a special management regime.

(2) Regulations from paragraph 1, items 10 and 11 of this article are prescribed by the minister with a prior opinion of the minister responsible for nature protection affairs.

Given that there is currently no public fish hatchery for stocking in the Republic of Croatia, nor any shellfish hatchery which means there is no basis for the development of bivalves, it is necessary to start determining "no take", but I reproductive zones that will enable breeding flocks to be stocked there and spawning to take place undisturbed And where the species depends on the habitat as well as the depth. In the case of shellfish, given that it is in Croatia lack of fry is the main limiting factor in oyster production, the logical solution is construction hatcheries or definition of zones where reproductive flocks would be planted.

Since the larvae of bivalve molluscs look for a solid substrate, they will not settle on the substrate on which it is located fouling such as algae or other benthic organisms. Areas of mediolittoral rocks due to difficult conditions exposed to the sun and waves, they usually have no fouling and are inhabited by bivalves such as mussels and oysters. Newly built structures, static and floating objects in the sea also represent firm substrate, and oyster habitats are found at the bottom of the sea. Settlements adequate for fish and shellfish would represent a significant habitat niche as well as greater interest in the project.

The state of the biostock varies from one fishing zone to another. In general, it is much better in Croatia territorial sea compared to other parts of the Adriatic. In ZERP, the situation does not seem long-term sustainable due to permitted overfishing and constant permitted pressure from the EU fleet. Many more important stocks have been halved or are on the border of safety biological limits. Biologically speaking, code bottom settlements generally record historical minimums of sexually mature individuals, which has the consequence reduced biostock replenishment.

As a reliable indicator of overfishing, it is recorded in many areas disturbed relationship between predator and prey (other organisms). The situation is somewhat better with offshore species, although they are also referred to as migratory, biologically shared and economically divisible fishing pressure is increasing day by day.

Coastal counties recognizing the category of overfishing control of fish, shellfish and others marine organisms, as well as the desire to preserve traditional fishing and create the basis for recovery of resources come to the initiative on the application and the beginning of the establishment of zones for laying static devices- artificial reefs and later establishment of multifunctional management zones. For the pilot project it is necessary is to define the zone of installation of artificial reefs that is within the framework of the existing spatial plans and prepare complete project and technical documentation for the construction of ridges and their installation.

The final level, or the first phase of the project, is the project-technical documentation with special conditions to set up an artificial reef at the proposed location- The location is suggested by the bidder I makes a unique assembly through conceptual and locational solutions.
This option is allowed by the legislation of the Republic of Croatia, and the counties with such an approach start a single entity protection and renewability of natural resources and introduce a management system.

In previous laws, the definition of artificial reef was within the former Maritime Law fishery NN 81/2013 where according to the glossary:

"artificial reef is an undersea habitat planned and established artificially, most often by submersion ships, stone blocks or other similar objects,"

That is, “An environment that offers protection from potential predators, and predators from their own booty" while the new law NN 62/17 does not mention the same category.

The contractor is obliged to harmonize the conceptual and implementation solution with the positive regulations of the Republic of Croatia as well as the EU in the case lack thereof. It is necessary to review the framework of the Regulation on environmental impact assessment (Official Gazette 61/14, 03/17) and create a simple solution that is not subject to the creation of assessments and impact studies environment.

By building artificial reefs, it is necessary to ensure the management of populations and the provision of resources through natural and artificial translocations. Translocation is the relocation of wild individuals from one ecosystem into another. When choosing locations, it is necessary to take care of the frames when proposing species adequate habitats. It is possible to process 3 categories of resettlement when filling ridges:

1. Natural or artificial drift-shift of individuals to new habitats where they did not exist before
2. Re-introduction of individuals into the habitat where they previously disappeared
3. Increasing the existing small population by adding individuals that lived elsewhere

The same pilot project would represent:
- Increasing biodiversity in the coastal area
- A barrier in the coastal zone where trawling is not allowed
- Shelter and habitat for various fish species
- Reef for receiving algae and shellfish
- Tourist and recreational purpose

On the basis of Article 18, Paragraph 3 of the Act on Hydrographic Activities ("Official Gazette", No. 68/98,
110/98, 163/03 and 71/14), the Rulebook on official maritime navigation charts was adopted and
publications, their content, method and conditions of creation, publication and maintenance ("Narodne novine", number 42/16)
In attachment 1, there is a list of buildings, activities and interventions in the area and other data that make up them mandatory content of official maritime navigation charts and plans in official maritime navigational publications, and possible models of artificial reef assembly can be extracted from it.

Later, the opinion of the Hydrographic Institute is attached for the same.
Annex 1 of the Regulations

2.4. ROCKS, RIDGES, CRACKS AND OBSTACLES 2.4.1. trunk, submerged 2.4.2. border of rocky area 2.4.3. danger limit 2.4.4. rock 2.4.5. source 2.4.6. ridge 2.4.7. mast 2.4.8. cake 2.4.9. coral 2.4.10. Coral reef 2.4.11. breaking waves 2.4.12. pole 2.4.13. unclean bottom 2.4.14. harmless bruise 2.4.15. harmless reef 2.4.16. dangerous fracture 2.4.17. stump, submerged 2.4.18. bruise 2.4.19. underwater reef 2.4.20. sunken bruise 2.4.21. submerged columns 2.4.22. fish farm 2.4.23. fishing trap 2.4.24. permanent fishing tool 2.4.25. rock 2.4.26. pillar – submerged 2.4.27. tuna fish 2.4.28. artificial fish habitat 2.4.29. shellfish farm 2.4.30. water 2.4.31. permanent peak 2.4.32. volcano, undersea 2.4.33. obstacle

MANUFACTURING GUIDELINES

The guidelines given through this assignment will be used in part as a basis for making the acceptability assessment offer. In order for the solution in the water area to become biologically shaped and adapted, architecturally, content, cost-balanced, aesthetically rounded and complete whole, it is necessary to follow guidelines, all with the aim of obtaining a quality solution:

- Create a proposal and conceptual solution and full project and technical documentation for the creation of I installation of one pilot artificial reef on the territory of the counties.
- Create a task in accordance with the spatial plan of the county and local municipality-of the city where it is proposed to set up a pilot, and all relevant laws that touch on this topic.
-Place emphasis on the development of the blue economy sector and the circular economy with an increase employment and diversity of offer (fishing, tourism and recreation...)
-To fully see the significance of the water area in terms of fishing resources as well as biological habitats.
-Establish a quality relationship in the design of artificial reefs with micro-habitats where it is planned setting
-Among the existing global solutions for creating artificial reefs, use those solutions and materials which are harmless to the environment, multifunctional in terms of habitat protection and long-lasting
-Contractors are allowed to exceed the boundaries of scope in a reasonable, rational measure, if such a design move affects the quality of the solution.
-The size of the building or device must be below the required 50 m, and it is built and placed in order to create a retention of new fish populations with possible greater abundance, i.e. use of the area for fish shelters.
- Materials for building reef structures (concrete, metals, stone blocks and others) must be inert/ possibly organic in nature, Avoid plastic, rubber...
- With their structure, they must represent as large a surface as possible for the protection of marine organisms - micro I macro depressions, as well as having a connection to fit into the environment
- Provide installation on mobile muddy and sandy bottoms with a favorable current regime.
-Avoid setting up at traditional fishing posts-hunting grounds, as well as at distances greater than 1 Nm from the coast of the mainland or island, as well as at depths less than 20 m and greater than 40 m. Minimum distance from the coast 500 m
-Strictly avoid placing above and near settlements - meadows of sea flowers
-Artificial reefs should be as close as possible to the imitation of natural or historically cultural structures structures (rock structures, wrecks, sunken settlements...) with as much natural as possible settlement of such a reef.

-In addition to biological settlement, the contents should also be attractive for the purpose of expanding the tourist offer (sport and recreational fishing, educational and group diving...)
- Facilitated production, transport and installation of reefs

TECHNICAL SPECIFICATION OF THE BID FOR PLACING ARTIFICAL REEF
- Conceptual design service, i.e. later creation of design and technical documentation for the construction of I the laying of the artificial reef prescribed by the Construction Act must be carried out in accordance with the same
By law, according to the content, type and quantity necessary for the issuance of the administrative act on construction/construction
Permits for the construction of an artificial reef up to 50 meters long, not exceeding 10 meters high, are required depth of up to 40 m.
- The selected bidder is obliged, in addition to creating the entire project-technical documentation, to carry out upon the authorization of the Client, administrative procedure in accordance with the provisions of the Law on Administrative Procedure I of the Construction Act and obtain from the competent public-legal and administrative bodies a notice on the conditions for creation of the main project, special construction conditions, confirmation of the main project, and depending on the special conditions, obtain a building permit, and/or a location permit and other necessary documentation for the realization of the project.
The selected tenderer is obliged to follow the instructions and guidelines of the Client in accordance with the applicable according to the laws, regulations and norms for the planned operation, create the following project-technical documentation:
1. Proposal and conceptual project of laying static devices or buildings - artificial reefs in the area.
2. The main project of construction and laying of artificial reefs (at the level of the implementation project)

The main project should be created at a level that enables the issuance of the construction-laying act device, and in accordance with valid laws, technical rules and regulations for such and similar interventions.

The content of the main project will be defined according to the administrative-legal procedure and the list of public-legal ones bodies.
The main project must contain all the data and accompanying projects necessary to bring about a positive outcome solutions in the process of issuing the appropriate act for construction (main architectural project plus others)

Create the main project, that is, the individual projects it contains, depending on the type of work, if that is the case prescribed by a special law or if necessary, it is necessary to prepare the corresponding studies as to meet special conditions. Elaborations are made according to the need established in special conditions of public law bodies, all in accordance with the valid Law on Construction, other regulations governing them requirements and conditions for construction and the rules of the profession. All major projects of individual professions, essays and the substrates must be coordinated with each other and thus coordinated must show a complete intervention in technical-technological and functional sense.
The equipment project should be harmonized with the remaining project-technical documentation for the planned one the procedure of construction, transfer and sinking of artificial reefs. They are defined by the main project specifications, quantities and location of equipment for the operation as well as individual cost lists.

The designed equipment must be elaborated in detail to a level that enables manufacturing, transportation, installation, use and maintenance of artificial reefs. The equipment project is made for all technical interventions in which outdoor activities are planned. The equipment project is made at the level that enables the procurement or production of specified equipment, and in accordance with applicable laws, technical rules and regulations.

CRITERIA FOR SELECTING
Conceptual and project-technical documentation must be created in accordance with the prescribed conditions spatial planning documentation, special conditions, the Fisheries Act, the Protection Act of nature, the Law on the Protection and Preservation of Cultural Property, the Law on Spatial Planning, the Law on construction, technical regulations and other regulations adopted on the basis of the Construction Act, hydrographic regulations and other regulations governing the requirements and conditions for this type of intervention I purpose and rules of the profession.

Design and technical documentation can be created only by persons and companies that have permission to work on creation of architectural and engineering projects.

DELIVERY OF THE CONTENTS OF THE CONCEPTUAL SOLUTION
Project documentation must contain:
• textual and graphic explanation of the idea and concept of the architectural solution of the artificial reef,

• relationships and the structure of the useful surfaces of the spatial scope of the artificial reef, with an overview individual surfaces, divided into individual functionally separate units - shelters for fish and shellfish and other marine organisms
• situational presentation of fish shelter solutions with volume ratios that are sufficient for clear graphic presentation
• cost presentation of the creation of an artificial reef, transport, delivery to the location and diving and all dependent costs related to setting up the reef.
• all other representations that are necessary for a clear explanation of the project along with the definition of the steps

EVALUATION OF POSSIBLE REEF SOLUTIONS
The evaluation can be done following criteria as follows:
1. Setting of shelters for fish - ratios of volume and number of shelters in relation to the reef
2. Quality, durability, acceptability of materials, ease of construction and installation
3. Attractiveness for attracting other activities
4. Rationality and economy - Rationality and economy of construction and use
5. Deadline for creating project technical documentation

MARINE FARMS as places of collection of fish and other marine organisms can be evaluated also as a type of reef due to high aggregation possibility but on opposite can have some biological influence which come from escape of organisms from cultivation
Monitoring of fish losses over three years in a sample of 6 countries revealed a loss of over 9 million pieces of fish (Jackson et al. 2015). Most of the accidents are caused by improper anchoring and the selection of inappropriate anchoring equipment and cage installations and nets.

The causes of the escape of fish from breeding are the breaking of the net due to being bitten by predators, the material of the net which is old and worn, it broke during cleaning from fouling, due to unfaithfulness and high waves, bad installations and moorings, human error or when transferring fish from cage.

Change in the behavior of predatory species due to the availability of new food sources
Aquaculture involves a large amount of individuals that represent food not only for humans but also for other marine animals. The presence of food attracts predators and causes them to change their natural behavior patterns and adapt to exploit this new potential food source. In doing so, predators cause damage, but cultivation also affects predators. Smaller fish also attract larger species of predators, such as tuna, dolphins and sharks, which are often found near the breeding grounds.

Gathering of individuals of the same species around the cage for spawning

Individuals of the same species also gather around the cage. As for the purposes of breeding the largest possible fish, fish are kept in breeding for up to 3 years, and at that age, bream and sea bass already become sexually mature females and begin to produce eggs. These eggs are released into the environment and can be fertilized by wild individuals that are attracted to the spawn and are outside the cage. In this way, genetic material can be transferred to wild populations, however, the survival of larvae that could reach the natural environment in this way is not certain.

Transfer of genetic material to wild populations

In addition to spawning, the genetic material of cultured species spreads due to the escape of cultured organisms. As a result of infidelity or attacks by predators, there may be a rupture of the network on the installations. It was found that the escaped fish can survive in the natural environment, but it is easy to catch because it is not trained to run away from people and fishing tools. Because of this, there is also the possibility that the flock will be caught again and returned to the cage. Šegvić-Bubić et al. (2011) Šegvić-Bubić et al. (2016). On the other hand, bred individuals are the result of natural genome selection, so genes that are not present in the natural population are not expected. In the worst case, it takes time to re-establish the most environmentally adapted genome, which is the one characteristic of the natural population.

Introduction of new species

The indigenous oyster species in the Adriatic Sea is the European flat oyster (Ostrea edulis). In the rest of Europe, at the beginning of the last century, there was a mass mortality of flat oysters, and the less appreciated Japanese or Pacific oyster (Crassostrea gigas or Magallana gigas, Thunberg, 1793) began to be produced in farms. The Pacific oyster has already started to spread in natural habitats in the Adriatic as an invasive species. Given that it is more resistant to environmental conditions, grows faster and has external fertilization, it is a common phenomenon that its younger ones are caught in larger numbers on the collectors and suppress the younger European oysters.

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