

ACTION D.5: D.5 Evaluation of the socio-economic impact of conservation actions

Preliminary report on analysis of the local economy of the Amvrakikos Gulf



Beneficiary responsible for implementation: HCMR, ALMA

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Executive summary

The Ambrakikos Gulf, situated along Greece's western coastline, represents a vital nexus where natural ecosystems and human activities converge. This report aims to provide a specific analysis of the socio-economic landscape within this region, examining the interplay between the environment, local economies, cultural heritage, and community dynamics. This report examines the economic structures prevalent in the Ambrakikos Gulf, and investigates key sectors such as fisheries, tourism, agriculture, and commerce. Furthermore, the report addresses environmental considerations, examining the Gulf's ecological significance and the benefits implored to the area through the successful implementation posed by factors such as habitat preservation, pollution, and sustainability. By analyzing these facets, this report aims to provide insights that can inform strategies for balanced growth, sustainable development, and the preservation of both the natural environment and cultural heritage within the Ambrakikos Gulf. The information presented here is predominantly sourced from the detailed analysis of the Amvrakikos River basins completed via the Water Framework Directive River Basin Management Plans.

The pilot project area experienced a slight increase (1.4%) in permanent residents in the period of 2001 - 2021, in comparison to the general decrease in the national population. For the wider river basin area, there is a greater concentration of employment in the primary sector (agriculture, forestry, fishing) (13% against 10% of the whole country) and a general lag in the manufacturing sector compared to the country as a whole (6.7% vs 9.2%). There is a higher share of the total RPA of the Ministry of Education in the primary sector (7.7% against 4.4% of the total of the country) and a lagging GPA in the manufacturing sector (6.1% against 9.2% of the country as a whole) compared to the national level. There is a higher productivity per employee in the primary sector compared to the national level (GRP per employee in agriculture, forestry, and fishing is €20.4 thousand, whereby the corresponding amount for the national level is €18.6 thousand). The main pressures for the study area are farming and livestock units which contribute to over 90% of the nutrient load of the basement. The spatial locations of the livestock units are included in the GIS platform constructed by HCMR for the Life-Transfer project.

The cost of implementing the suggested measures identified by the pressures and economic analysis undertaken within the framework of the WFD totals 240,000 Euros and includes supplementary measures that involve the key stakeholders of the regions i.e. the Management Authority of the protected area of Amvrakikos Wetland, the Authorities of fishermen cooperative and farming and breeding bodies of the region. The main stakeholders that benefit from conservation measures proposed by the Life-Transfer project are the local fishman cooperatives. Landing trends for the lagoons in the study area reveal that the most abundant typical lagoon fish species have all largely decreased in the last decades (Katselis et al., 2013), and it appears this is associated with the less-than-good environmental status of the lagoons since 2013. Due to the novelty of the restoration measures implemented within the Life-Transfer project, the measures are of a limited spatial and temporal scale. Ecologically, while the immediate impact on the lagoon's health appears limited due to the scale of planting, the long-term projections demonstrated a positive trajectory in seagrass coverage and

biodiversity. However, the true success of the project unfolds in the socio-economic realm. The engagement of local fishermen will not only result in a noteworthy increase in their income through planting endeavors but will also showcase a remarkable shift in their understanding and appreciation of the lagoon's ecological significance. The educational component may elevate their awareness, with a transition in fishing practices towards more sustainable methods. Moreover, this shift in mindset and practices among the fishermen may create a ripple effect within the community, fostering a heightened sense of stewardship and commitment to safeguarding the lagoon for future generations.

Study area

The Ambrakikos Gulf, situated along Greece's western coastline, represents a vital nexus where natural ecosystems and human activities converge. This report aims to provide a comprehensive analysis of the socio-economic landscape within this region, examining the interplay between the environment, local economies, cultural heritage, and community dynamics. This report examines the economic structures prevalent in the Ambrakikos Gulf, and investigates key sectors such as fisheries, tourism, agriculture, and commerce.

Furthermore, the report addresses environmental considerations, examining the Gulf's ecological significance and the benefits imploded to the area through the successful implementation posed by factors such as habitat preservation, pollution, and sustainability. By analyzing these facets, this report aims to provide insights that can inform strategies for balanced growth, sustainable development, and the preservation of both the natural environment and cultural heritage within the Amvrakikos Gulf.

There are two main river catchment areas associated with the Amvrakikos Gulf and the pilot study area (Louros and Aracthos rivers). Both discharge into the Northern part of the Gulf in close proximity to the donor and recipient sites selected by the executive project (Deliverable A4). The Aracthos river has a drainage basin of 2209 km squared and Louros has a drainage basin of 963 km squared. The two main administration districts associated with the current project are the district of Arta and the district of Preveza (Figure x), and both are located within the Epirus river basement district (GR05) in accordance with the Water Framework Directive (2000/60/EC). Below is a breakdown of the socio-economic activities of these two districts and the Epirus River Basement District.



Figure 1. Map of study area with regional cities (Arta, Preveza) and WFD monitoring stations (Table 1)

The greater part of the Arta-Preveza catchment areas, which covers areas of RB of Acheronta, Lourou, and Arachthos is officially designated as areas vulnerable to nitrates in the RBD of Epirus (05). According to Common Ministerial Decree 19661/1982/1999, the urban wastewater recipients of the Amvrakikos Gulf, Metsovitikos, Arachthos River, and the Louros River have been identified as “sensitive” (Annex II, Common Ministerial Decree 5673/400/1997) (Hellenic Ministry of Environment & Energy, 2023).

- Current ecological status of surface water bodies in study area

Ecological status mainly concerns biological parameters, depending on WB category, and secondly general physico-chemical conditions or other parameters (specific pollutants).

The surface WBs that will not achieve “good” status by 2015 are estimated at seventeen (17) in the Epirus RBD from a total of one hundred and six (106). The ecological status of three (3) rivers, with a total length of 44.64 km, which corresponds to 4,06% of the total length of all rivers of the RBD, is classified as “high ecological status”, sixty-six (66) rivers, with a total length 928.77 km, which corresponds to 84.43% of the total length of all rivers of the RBD, is classified as “good ecological status”, while the ecological status of six (6) rivers, with total length 69.99 km, which corresponds to 6.36 % of the total length of all rivers of RBD is classified as less than good ecological status. The ecological status of one (1) lake, with a surface area of 19.24 km², which corresponds to 38.35% of the total area of all lakes of the

RBD, is classified as less than good ecological status. The ecological status of one (1) transitional water, with a total surface area of 4.16 km², which corresponds to 1% of the total surface of all transitional waters of RBD, is classified as “good ecological status”, when the ecological status of four (4) transitional waters, with total surface 407.46 km², which corresponds to 98.31% of the surface area of all transitional waters of RBD is classified as less than good ecological status, and this also includes the two coastal lagoons (Mazoma and Logarou) selected for the current project. The table below presents the current chemical, ecological, and overall environmental status of the WFD monitoring stations (coastal, transitional, and freshwater) associated with the Amvrakikos Gulf. The sites highlighted in bold are directly related to the pilot project area (Table 1).

Table 1. Current (2018) Chemical, Ecological, and Environmental quality status of the WFD stations located in the Amvrakikos Gulf (European Environment Agency, 2023)

| Code | Name | Waterbody type | Chemical | Ecological | EQS |
|-------------------------------|---|-------------------------------|-------------|-----------------|-----------------|
| EL0546R000 201077N | Louros R. | Freshwater | Good | Good | Good |
| EL0514R000 201050N | Aracthos R. | Freshwater | Good | Moderate | Moderate |
| EL0546T000 3N | Louros Delta - Rodia, Tsoukalio, Logarou Lagoons | Transitional water | Good | Moderate | Moderate |
| EL0513T000 4N | Mazoma Lagoon | Transitional water | Good | Moderate | Moderate |
| EL0415C000 9N | South Amvrakikos Gulf | Coastal water | Good | Poor | Poor |
| EL0514T000 2N | Aracthos Delta | Transitional water | Good | Moderate | Moderate |
| EL0513C000 7N | North Amvrakikos Gulf | Coastal water | Good | Moderate | Moderate |
| EL0415R000 901066N | Voutumias River | Freshwater | Good | Poor | Poor |

| | | | | | |
|-----------------------|----------------|------------|------|------|------|
| EL0415R001 101067N | Nissis River | Freshwater | Good | Good | Good |
| EL0415R001 301068N | Amfilochias R. | Freshwater | Good | Good | Good |
| EL0514R000 100048N | Dipotamon R. | Freshwater | Good | Bad | Bad |

- Resident population and temporal variation

The Epirus Water District (EL05) includes all the Local districts of Thesprotia, Preveza, Ioannina, and Corfu and the largest part of the district of Arta. The permanent population of the Water Division of Epirus (EL05), based on the service area of water providers, is estimated at approximately 424, 998 inhabitants in 2021. Concerning 2011, there is a small downward trend of the permanent population of the Water Division of -0.46% per year, in contrast to the previous decade, 2001-2011, which had, albeit marginal, an annual increase of +0.04 %. Below is a table of the estimated number of permanent inhabitants in the pilot project districts (Table 2). The Municipalities of Arta (all show a steady decline since 2001 (-35%), and the municipality of Preveza showed an overall increase in the 2001 - 2021 period (+10%) (Figure 2). The permanent residents of the pilot project area increased by 1.4 % from 2001 - 2021, a higher rate than the rest of the country (4.13% decrease from 20001 - 2021) (Eurostat, 2023).

Table 2. Permanent residents of the municipalities included in the pilot project from 2001 - 2021 (Hellenic Ministry of Environment & Energy, 2023)

| District | Municipality | 2001 | 2011 | 2021 |
|----------|-------------------------|--------|--------|--------|
| Arta | Arta | 44.136 | 43.166 | 41.600 |
| Arta | Skoufa | 14.491 | 12.753 | 11.356 |
| Arta | Kentrikon Tzoumerkou | 7862 | 6178 | 5948 |
| Arta | Georgioy Karaskaki | 7131 | 5780 | 5278 |
| Preveza | Preveza | 30137 | 31733 | 30841 |
| Preveza | Zirou | 7245 | 13892 | 13079 |
| Preveza | Pargas | 12597 | 11866 | 10762 |

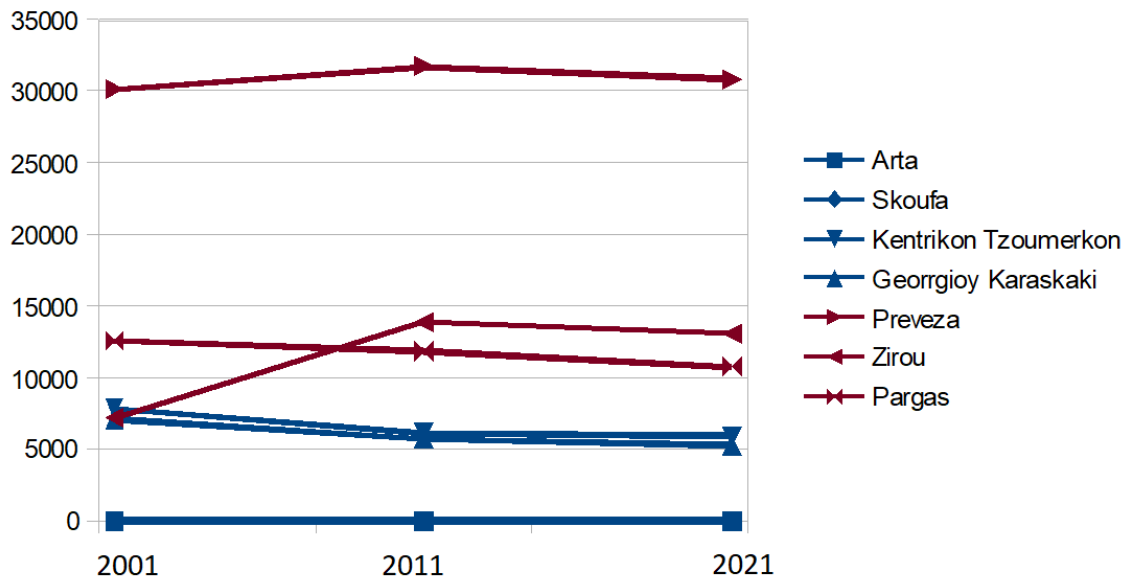


Figure 2. Change in temporal change in resident populations

Land uses of the study area

Based on the 2009 agriculture/livestock census of the Hellenic Agency for Statistics (ELSTAT), taking into account the Regional units that are entirely included in the Water Department, it is estimated that the used agricultural area in the Water Department of Epirus is 1,060 ha and the irrigated area is measured as 344 ha. The most recent agriculture-livestock census of the Hellenic Statistical Authority (EL.STAT) is 2021 (for the reference year 2020). A reduction in the number of irrigated lands and the used agricultural area is recorded in both regions (Table 3) in the period 2009-2021. Given this change, it is expected that in the Water District of Epirus there may be a downward trend in agricultural and irrigated areas.

Table 3 Number of agricultural holdings (2021) (Hellenic Ministry of Environment & Energy, 2023)

| | Arta District | Preveza District |
|---|---------------|------------------|
| Number of agricultural holdings | 11270 | 7656 |
| Number of Holdings with used agricultural area | 11173 | 7521 |
| Used agricultural area (thousand km ² .) | 204 | 211 |
| Holdings with irrigated areas | 9474 | 5127 |
| Irrigated lands (thousand | 110 | 97 |

| | | |
|-------|--|--|
| km2.) | | |
|-------|--|--|

Current economic information for the study area

In the River Basin District of Epirus (EL05) the estimated product production in terms of Gross Added Value (GVA) of €4,890 million in 2019, which corresponds to 3.1% of the country's GVA in the same year and total employment of 142.5 thousand employed according to the 2011 census, which corresponds to 3.8 % of the Greece's total employment (Hellenic Ministry of Environment & Energy, 2023).

The structure of the economy in the River Basin, as derived from its composition of Gross Value Added (GVA) and employment, compared to the National level and based on the share of each branch/sector in the total of sizes, is summarized in the following three points:

- Greater concentration of employment in the primary sector (agriculture, forestry, fishing) (13% against 10% of the whole country) and a lag in the manufacturing sector (6.7% against 9.2% of the country as a whole) compared to the country as a whole.
- A higher share of the total GVA of the Ministry of Education in the primary sector was noted for the region (7.7% against 4.4% of the total of the country) and a lagging GVA in the manufacturing sector (6.1% against 9.2% of the country as a whole) compared to the country as a whole
- The region has a higher productivity per employee in the primary sector compared to the national level (GRP per employee in agriculture, forestry, and fishing is €20.4 thousand, whereby the corresponding amount for the national level is €18.6 thousand).

Description of pressures in the study area

In order to follow an ecosystem-based integrated approach to determine the environmental status, the lagoon biodiversity in Amvrakikos was assessed in an integrated manner and closely linked to the effects of pressures from the surrounding human activities. A GIS tool/platform was developed as a risk-based assessment methodology interrelating multiple pressures and their cumulative impacts on the status of the lagoon biodiversity. The GIS tool is used from the management body of Amvrakikos to estimate the management effectiveness, and design management measures, priorities, and decisions with respect to local, as well as regional needs (Deliverable A5; <https://hcmrathens.maps.arcgis.com/apps/instant/basic/index.html?appid=474f5840d8ba4cbf9c74de724c6bfcde>). The GIS platform has the major objective to define the state of the art on the pressures affecting Amvrakikos Gulf, with special reference to the restoration site and to evaluate the resulting vulnerability of Logarou lagoon. To this aim, the GIS platform involved a data mining activity on the existing information on anthropogenic driving forces (agriculture livestock, aquaculture, fisheries, urbanisation, tourism) including remote sensed images, data systematisation, data analysis and image analysis.

Overall, the estimation of pressures in the water bodies takes into consideration recorded pressures as a whole (pollution, water abstraction, morphological changes, etc) are presented

here to clarify the way pressures impact water bodies separately and to comprehend the most significant management problems and failures in each river basin, so that accurate analysis of the socio-economic impact of the conservation actions can be assessed. The pressures are categorized as either point pressures (originating from a clear geographical source) or diffuse pressures operating at a wider geographical scale for the two river basins (Arachthos and Louros Rivers)

- Point pressures

The main point pressure for the study area (both the Louros and Arachthos Rivers) and originates from livestock farming (Table 4, Table 5). In all Regional Units of the Epirus River basin there is a significant number of pig, poultry, and cattle farm units. The spatial information for these sites can be found on the GIS platform constructed by HCMR for the LIFE-TRANSFER project. Most of them have been registered in the River Basin of Kalamas and Louros. Collected data concern 140 poultry farm units (2 are IPPC facilities), 9 pig farm units (2 are IPPC facilities) and 2 cattle farm units. Non-stabled livestock contributes to more than 90% of the total organic load in the above river basins.

Table 4. Total annual load of Biochemical Oxygen Demand, Nitrogen, and Phosphorus that are produced in Arachthos RB (EL0514) from point sources (Hellenic Ministry of Environment & Energy, 2018)

| POINT SOURCES OF POLLUTION | BOD (t/y) | N (t/y) | P (t/y) |
|-------------------------------------|-----------|---------|---------|
| Waste Water Treatment Plants (WWTP) | 15.68 | 15.94 | 2.92 |
| Discharges not connected to WWTP | 8.07 | 1.61 | 0.34 |
| Hotels | 0 | 0 | 0 |
| Industrial Sites | 63.66 | 8.95 | 1.77 |
| Livestock units | 2529.11 | 684.56 | 358.56 |
| Aquaculture – Fish farming | 922.91 | 258.26 | 41.09 |
| TOTAL | 3539.43 | 969.33 | 404.67 |

Table 5. Total annual load of Biochemical Oxygen Demand, Nitrogen and Phosphorus that are produced in n Louros RB (EL0546) from point sources (Hellenic Ministry of Environment & Energy, 2018)

| POINT SOURCES OF POLLUTION | BOD (t/y) | N (t/y) | P (t/y) |
|-------------------------------------|-----------|---------|---------|
| Waste Water Treatment Plants (WWTP) | 3.78 | 1.7 | 0.44 |
| Discharges not connected to WWTP | 25.43 | 5.09 | 1.06 |
| Hotels | 0 | 0 | 0 |
| Industrial Sites | 57.05 | 33.09 | 13.9 |
| Livestock units | 3432 | 808.64 | 341.5 |

| | | | |
|----------------------------|--------|--------|--------|
| Aquaculture – Fish farming | 538.34 | 108.23 | 18.19 |
| TOTAL | 4056.6 | 956.74 | 375.09 |

In the RBD of Epirus fourteen (14) Wastewater Treatment Plants (WWTP) operate WWTP of Ioannina, Kerkyra, Arta, Igoumenitsa, Preveza, Parga, Meliteion, Agiou Markou, Filippiada Metsovo, Kynopiaston, Palaiokastriton, Benitson, Agiou Stefanou, which serve 300,000 habitants (80% of total RBD of Epirus population) that correspond to 85% of the population in the Priority A, B, and C agglomerations. The greatest point pressure is from WWTPs that serve a population of over 10,000 habitants e.g. the WWTPs of Ioannina, Kerkyra, Arta, Preveza, Igoumenitsa, and Parga.

- Industry

In the RBD of Epirus, two hundred and ninety-two (292) industrial facilities have been recorded. Among these, six (6) are IPPC facilities according to the Directive 2001/8/EC, and eleven (11) are SEVESO according to the Directive 1996/82/EC. In the RBD of Epirus, there are the industrial sites of Ioannina and Preveza and the industrial park of Thesprotia.

The majority of the industries (49.8%) concern olive oil mills, a percentage of 13.7% belong to abattoirs and other facilities for meat process, while a high percentage (20.1%) belong to other types of food industry (milk industry, fruit, and vegetable canning industry). 8% of the industries belong to the sector of Metal Industry and the remaining are related to the Manufacture of Refined Petroleum Products, Production and Processing of Metals, Processing of Wood, Chemical industry, and Thermal Power Stations.

- Landfill Sites – Uncontrolled Waste Dumping Sites

In the RBD of Epirus operate four (4) Sanitary Landfills, in the regions of Igoumenitsa, Arta, Paramithia and Kentriki Kerkyra.

- Aquaculture

In the RBD of Epirus there are 110 aquaculture sites (44 sea water and 66 freshwater aquacultures). The majority of them have been registered in the River Basin of Kalamas (43.6%), Louros (28.2%), and Acherontas (12.7%). In the area of Vouliastas-Mousiotitsas of Louros river, there is a number of freshwater aquacultures facilities that they are installed over WB Louros P.5 area. The spatial information for these sites is included in the GIS platform constructed by HCMR for the LIFE-TRANSFER project (Deliverable A5; <https://hcmrathens.maps.arcgis.com/apps/instant/basic/index.html?appid=474f5840d8ba4cb>)

- Diffuse pressures

Diffuse sources of pollution include all sources of nutrients (BOD, N, P). The list of these pressures includes: Agriculture, Discharges not connected to sewerage network, Farming and Other diffuse sources. From the above diffuse sources of pollution derives the annual load of BOD, N and P produced (Table 6, Table 7).

Table 6. Total annual load of Biochemical Oxygen Demand, Nitrogen and Phosphorus that are produced in Arachthos RB (EL0514) from diffuse sources (Hellenic Ministry of Environment & Energy, 2018)

| LAND USE | BOD (t/y) | N (t/y) | P (t/y) |
|---------------|-----------|---------|---------|
| URBAN | 155.48 | 44.42 | 1.09 |
| AGRICULTURE | 0 | 49.7 | 1.22 |
| FARMING | 1483.76 | 461 | 121.74 |
| OTHER SOURCES | 0 | 154.14 | 1.04 |
| TOTAL | 1639.24 | 709.27 | 125.09 |

Table 7. Total annual load of Biochemical Oxygen Demand, Nitrogen and Phosphorus that are produced in n Louros RB (EL0546) from diffuse sources (Hellenic Ministry of Environment & Energy, 2018)

| LAND USE | BOD (t/y) | N (t/y) | P (t/y) |
|---------------|-----------|---------|---------|
| URBAN | 93.61 | 26.74 | 0.81 |
| AGRICULTURE | 0 | 42.76 | 1.32 |
| FARMING | 1428.31 | 338.33 | 68.44 |
| OTHER SOURCES | 0 | 30.85 | 0.49 |
| TOTAL | 1521.92 | 435.68 | 71.06 |

As recognized by the analysis of the point sources of pressure, farming is by far the largest pressure for the region and contributes to over 90% of the nutrient load of the study area.

Socio-Economic analysis of conservation measures proposed for study area

- WFD Basic and Supplementary measures

The Water Framework Directive has identified 74 measures to be taken within the Epirus River Basin to ensure that all waterbodies obtain at least a Good Ecological Status and achieve the 2000/60/EC Directive objectives (Hellenic Ministry of Environment & Energy, 2023). The measures are divided into basic and Supplementary measures. Basic measures result from the implementation of national and European legislation on water protection, including the 2000/60/EC Directive and the overall environmental policy. Supplementary measures include measures designed and implemented in addition to the basic measures. In the Epirus River Basin District, it is proposed that seventy-three (73) measures, 39 basic, and thirty-four (34) supplementary measures should be implemented by 2027. Of the proposed measures two supplementary measures are associated with the Recreation and restoration of Wetlands and two are related to Environmental agreements after Negotiation. One of these negotiations includes Initiatives on making an environmental agreement between the Management

Authority of the protected area of Amvrakikos wetland and the Authorities of fishermen and aquaculture to limit any possible negative effects of the extensive and intensive aquaculture on the status of the transitional and coastal water bodies and ecosystems). The socio-economic analysis of implementing all of the proposed measures suggested by the WFD (Hellenic Ministry of Environment & Energy, 2023) is presented below.

The economic analysis includes the socio-economic parameters that need to be taken into account in improving, on the one hand, the quantitative and qualitative state of water bodies and, on the other hand, the local economy, in relation to the current situation (baseline scenario) through conservation measures such as habitat restoration.

The socio-economic impacts of the management plan projections in the base scenario are highlighted in the following two points:

- 1) In the evaluation of the economic effectiveness of the proposed program of measures, which aims to improve the qualitative and quantitative status of water bodies, where deemed necessary. In the current Management Plan, they are evaluated as having the highest economic efficiency and measures are proposed that deal with the environmental and water resource sufficiency problem with low or zero cost interventions that can easily be integrated into the existing operations of the proposed implementing bodies. Additionally, they have either a short-term (up to 2027) or medium-term (up to 2033) implementation and performance time horizon.
- 2) The assessment of the river basin and/or water systems where less stringent environmental objectives must be set taking into account socio-economic parameters, such as the product produced per cubic meter of water withdrawal, in order to ensure, on the one hand, the quantitative and qualitative water sufficiency, on the other hand, to make a rational use of water without affecting the sustainability of economic activities.

The produced Gross added Value (GAV) per Riverbasinis an indicator of the utilization of water in the production activity of the region. 70.7% of the total water withdrawals for industrial use in the DH of Epirus are carried out in the Kalama Watershed, but the production of added value for industrial use is 18.66 €/m³. Significantly lower limited about all other PPE of the Water basin, as in the basin of Arachthos the GAV is estimated at €59.65m³. Therefore, it is deemed necessary to investigate the mix of industrial activity in the area of each basin to improve the utilization of water for industrial use, wherever required. The support of higher GAV per sq.m. indicates that spending financial resources to ensure water resource sufficiency may become more feasible in the region.

For the proposed supplementary measures a Cost Effectiveness Analysis (CEA) was carried out. The CEA is used for assessing the cost-effectiveness of potential measures for achieving the environmental objectives set out in the Directive, and in particular for making judgments about the most cost-effective program of measures and assessing the cost-effectiveness of alternative measures. The analysis included the following parameters: 1. degree of effect, 2. number of relevant Water Bodies, 3. period of implementation, 4. period of efficiency, 5. social impact, 6. economic impact, 7. environmental impact. These parameters received an appropriate rating and the rate of effectiveness was estimated. By taking into account the

discounted cost of the measures, a factor of economic efficiency was calculated. In this way the group of the most effective measures was identified.

The implementation cost of all the proposed supplementary measures is estimated to 581,84 M€. It was estimated that 26 of 34 supplementary measures have zero or low cost of implementation. 7 supplementary measures have cost below 100.000€ and 1 of them costs between 100 and 250 Thousand Euros. The table below shows the main costs of some of the suggested measures directly related to the pilot project area (Table 8)

Table 8. Suggested measures by the River Basin Management plans of the WFD

| Category | Proposed supplementary measure | Cost |
|--|--|----------|
| Environmental agreements after Negotiation | Initiatives on making an environmental agreement between the Management Authority of the protected area of Amvrakikos Wetland and the Authorities of fishermen and aquaculture in order to limit any possible negative effects of the extensive and intensive aquaculture on the status of the transitional and coastal water bodies and ecosystems. | 20000 € |
| Environmental agreements after Negotiation | Taking initiatives to conclude an environmental agreement between the Management Unit of its protected area wetland system of Amvrakikos and bodies of the farmers and the breeders to limit the effects of agriculture on the status of wetlands ecosystems | 20000 € |
| Reconstitution and restoration areas wetlands | Hydrodynamic improvement works for communication between parts of wetland systems Amvrakiko where they face problems of adequate supply of fresh or salt water | 100000 € |
| Research, development & demonstration Programmes | Monitoring of anoxic episodes that are observed in the Amvrakikos Gulf and the time evolution it displays through the water column | 100000 € |

- Life-Transfer restoration measures

Amvrakikos lagoons are important drivers for the regional economy, not only for the income deriving from fisheries, but also for their naturalistic and recreational appeal.

The main activities carried out within the restoration site, Logarou lagoon, are fisheries, water management, nature conservation and research. Therefore, due to the limited touristic value of the system(table x), the main stakeholders that benefit from conservation measures proposed by the life transfer project is the local fishman co-operative.

The fishery exploitation in Logarou in the past was mostly based on traditional fish barriers consisting of wooden poles sustaining a net of reeds, however, after the 1980s most of these installations were replaced with cement installations that copied the Italian vallicoltura capture systems. Since the natural entrance of fry and juveniles into the lagoon has decreased, this was also a result of ecosystem alteration such as seagrass decline, fishers have felt the need to start increasing fish biomass by restocking and stocking practices, whereas most restocking is carried out with hatchery produced fry.

Landing trends for the lagoons in the for most abundant species revealed that the most abundant typical lagoon fish species-groups such as Mugilidae (*Mugil cephalus*, *Chelon labrosus*, *Liza saliens*, *Liza aurata* and *Liza ramada*), eels (*Anguilla anguilla*) and Gobies (mainly *Zosteriosessor ophiocephalus*) have all largely decreased in the last decades ([Katselis et al., 2013](#)), and it appears this is associated with the less than good environmental status of the lagoons since 2013 (Table x).

Due to the novelty of the restoration measures implemented within the Life-Transfer project, the measures aim to increase biodiversity and ecosystem services, however at this stage are of a limited spatial and temporal scale. Ecologically, while the immediate impact on the lagoon's health appeared limited due to the scale of planting, the long-term projections demonstrated a positive trajectory in seagrass coverage and biodiversity. However, the true success of the project unfolds in the socio-economic realm. The engagement of local fishermen will not only result in a noteworthy increase in their income through planting endeavors but will also showcase a remarkable shift in their understanding and appreciation of the lagoon's ecological significance. The educational component will significantly elevate their awareness, with a palpable transition in fishing practices towards more sustainable methods. Moreover, this shift in mindset and practices among the fishermen may create a ripple effect within the community, fostering a heightened sense of stewardship and commitment to safeguarding the lagoon for future generations

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