

HR&A



# Final Report | Economic Analysis of Proposed Aquaculture Farm Poros, Greece

August 2023

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## GENERAL LIMITING CONDITIONS

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## ACRONYMS/KEY TERMS

**AVRAMAR**, aquaculture company headquartered in Spain.

**Economic Impact**, the sum of the direct, indirect, and induced impacts generated in the economy. The direct economic activity generates indirect (i.e., spending on goods and services) and induced (i.e., spending from workers) impacts.

**EL STAT**, the Hellenic Statistical Authority, independent authority on Greece's national statistics.

**Full-Time Jobs**, HR&A uses IMPLAN's industry standard conversion to convert jobs into full-time equivalent (FTE) jobs. This is defined as total hours worked divided by average annual hours worked in full-time jobs, which is assumed to be 2,080 hours in a standard year. Unless otherwise noted, the impacts in this report are shown as total full-time equivalent (FTE) jobs, which includes direct, indirect, and induced jobs.

**GDP**, Gross Domestic Product, monetary value of final goods and services.

**IMPLAN** is the leading provider of economic impact data and analytical applications. For decades, IMPLAN has served the economic data needs of researchers, policy makers, decision makers, advocates, business leaders, governments, etc. As of this study, IMPLAN is available in Greece at the national level only.

**INSETE**, Institute of SETE-INSETE, is a non-profit organization that focuses on the Greek tourism market. It is a collaboration that comprises four partnership organizations: the Greek Tourism Federation (SETE), Hellenic Hoteliers Federation (HHF), the Hellenic Association of Travel & Tourist Agencies (HATTA), and the Confederation of Entrepreneurs of Rented Rooms and Apartments (SETKE).

**Katheti** is a cultural and educational center that serves the people of the Poros, Troizinia and Methana region.

**POAY**, Area of Organized Aquaculture Development, developed from the legislative framework under Law 2742 to designate areas for aquaculture activities.

**The Rauch Foundation** is a family foundation that invests in ideas and organizations to spark and sustain systemic change.

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# Executive Summary

## ECONOMIC TRENDS IN GREECE

Tourism is one of Greece's fastest growing economic sectors and generates benefits beyond the tourism industry. It has helped power Greece's economic recovery in the past few years.



Source: INSETE, "The contribution of tourism to the Greek Economy," 2022. Note: Tourism includes hospitality, entertainment, and jobs that help support tourists. \*Direct tourism expenditures indirectly induces and supports other spending and economic outputs in other industries in Greece's economy.

## ECONOMIC IMPACT OF TOURISM IN POROS

The existing tourism industry in Poros supports **780 FTE jobs**, generates **13.5M € in labor income**, and **75M € in total economic impact**. Based on national estimates of the size of the informal economy, the tourism impacts in Poros could be as **much as 25% larger**.

### ESTIMATED 2023 TOURISM IMPACTS



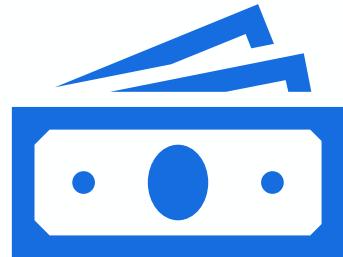
**780**

Total FTE Jobs



**13.5M €**

Total Labor Income



**75M €**

Total Economic Impact

### TOURISM DRIVES POROS' ECONOMY

- The tourism industry supports up to **80% of the existing workforce in Poros.\***
- Tourism in Poros is focused on small, family operated businesses and hotels. This economic activity helps to support **the 200+ businesses located in Poros**.
- In addition to labor income, owners associated with **tourism-related businesses also retain profits** which are included as part of the total economic activity.

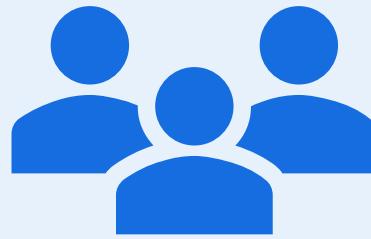
Source: HR&A analysis using IMPLAN; International Labour Organization, "Diagnostic report on undeclared labor in Greece," 2016; National Statistical Service of Greece. "Greece Labor Force Participation Rate...", 2023; World Bank, "Age Dependency Ratio (% of Working-Age Population) – Greece," 2022. Note: All jobs are shown as full-time equivalency (FTE). These impacts represent economic impacts on an annual basis using the 2018 Greece national IMPLAN model. The informal economy is not calculated in the economic impact of tourism; thus, there is additional economic activity from the informal economy not calculated in this analysis. All numbers are rounded. \*This estimate is based on information provided by Katheti.

## AQUACULTURE'S LIMITED ECONOMIC IMPACT

Aquaculture is currently a very minor portion of Poros' economy. Its expansion could come at the cost of the tourism industry, which drives a significantly larger part of Poros' economy.

**Even with the future aquaculture expansion, tourism in Poros will continue to exceed aquaculture's impact, as it will generate 5X the impacts on jobs and income and 3X the economic impact of aquaculture expansion annually.**

### JOBS



**5X**

More FTE jobs than the aquaculture expansion

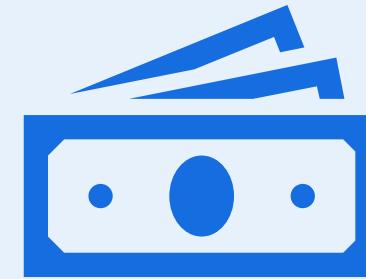
### LABOR INCOME



**5X**

More total labor income than the aquaculture expansion

### ECONOMIC IMPACT



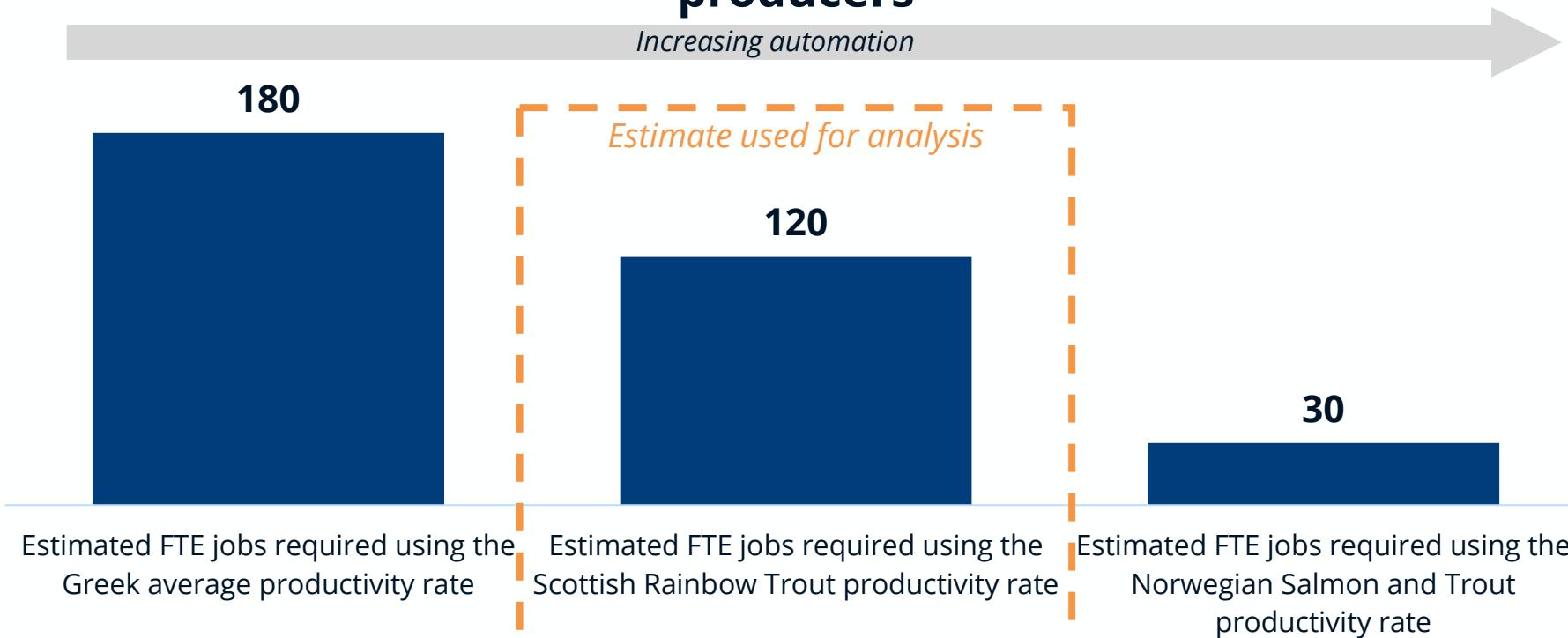
**3X**

More total economic impact than the aquaculture expansion

## INCREASING PRODUCTIVITY IN AQUACULTURE

Furthermore, aquaculture is becoming more efficient and fewer jobs will be needed in the future, decreasing any future potential job creation in Poros.

### Estimated workers needed assuming AVRAMEC improves labor productivity in line with EU-leading producers



Source: ELSTAT, "Aquaculture Survey: 2021," 2023; Scottish Government, "Scottish Fish Farm Production Survey 2021," 2022; Directorate of Fisheries, "Key figures from the Norwegian Aquaculture industry," 2021; Ambio, "Designation of Areas...Strategic Environmental Impact Study," 2015. Note: Tonnes refers to long tons or metric tons; These jobs are based on 7,700 tonnes of fish produced; All worker numbers have been converted to full-time equivalency; All numbers rounded to the nearest 10.

\*This estimate is based on information provided by Katheti. \*\*The mean productivity increased from 31 tonnes per job to 37 tonnes per job between 2020 and 2021.

**15**

People working at the existing farms in Poros\*

Between 2020 and 2021, productivity in Greece's aquaculture sector **improved by 19%**, resulting in 390 fewer jobs in aquaculture across Greece.\*\*

## ENVIRONMENTAL IMPACTS

Fish farms have been known to cause severe environmental degradation, which can lead to the collapse of existing fisheries and dissuade tourists from visiting.

### SALINIZATION/ ACIDIFICATION OF SOILS



Image source: Shutterstock | Richard Whitcombe

- The soil at former farms is left hypersaline, acidic, and eroded for long after it closes.
- This, along with the accumulation of natural sediment, can contribute to the decline of native seagrass such as *Posidonia oceanica*.

### POLLUTION OF WATER



Image source: Shutterstock | Andriy Nekrasov

- Antibiotics, pesticide usage, disease, parasites, or leftover food spilling into the ocean causing nutrient pollution can pollute water.
- A 2011 study found that a Greek farm producing 100 tonnes of fish discharges 9 tonnes of nitrates, which ends up on the seabed and deteriorates the environment.

### DESTRUCTION OF NATURAL ECOSYSTEMS



Image source: Oregon State University via EcoWatch

- Aquaculture can cause severe environmental degradation, including the collapse of existing fisheries due to invasive species, outbreak of disease, and algae blooms.
- In 2007, Chile's salmon farming industry experienced an outbreak of infectious anemia that cost the sector \$2B and 20,000 jobs.

Source: Martinez-Porcha and Martinez-Cordova, "World Aquaculture: Environmental Impacts and Troubleshooting Alternatives," 2012; Cho, "Making Fish Farming More Sustainable," 2016 ; FAIRR Initiative, "Shallow Returns? ESG Risks and Opportunities in Aquaculture," 2019 ; M. Holmer, "Sedimentation of organic matter from fish farms in oligotrophic Mediterranean assessed through bulk and stable isotope ( $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ) analyses", 2007, Tsagaraki, "Beyond the cage: Ecosystem modelling...", 2011.

## AQUACULTURE IMPACTS

Finally, the expansion of aquaculture may introduce a variety of negative environmental, social, and economic consequences that will cause harm to the thriving, existing tourism economy and the general wellbeing of residents.



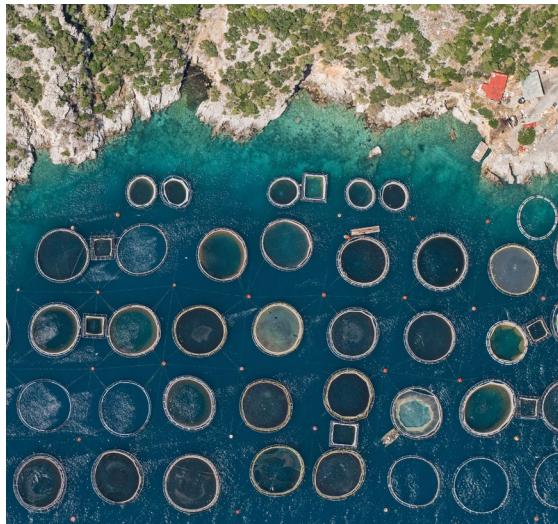
*Image source: Katheti underwater footage near fish farms February 2023*

Waste and degraded natural environment around **existing fish farms** in Poros.



*Image source: footage from Healthy Seas, "Journey to Ithaca"*

Trash and abandoned infrastructure left by abandoned fish farms in Ithaca are left for the wider community to bear **the cost of cleanup**.



*Image source: Bernhard Lang*

Farms can be **visually unappealing** for tourists and cause noise, odors, and waste that disturb tourists and residents alike.

"We are having, because of **climate change**, better conditions for the development of these harmful algal blooms," Greenpeace's Estefania Gonzalez said. "What is the other ingredient that the harmful algal blooms need to be super strong and really developed? **Nutrients**."

Gonzalez cited research from outside of Chile that has demonstrated the connection between **harmful algal blooms and an overabundance of nutrients**.

"A lot of the **impacts are not visible** until you are in a **state of big crisis**."

## KEY FINDINGS

Tourism drives Poros' economy and has significant potential for growth and expansion. The expansion of aquaculture could come at the cost of the local tourism economy, which supports generations of local residents and supports the local economy.

1. Tourism is key to Greece's economic growth and has helped Greece recover from a decade-long crisis. The tourism sector employs **1 in 10 workers** in Greece and the tourism-related industry in Poros supports **up to 80%\*** of the existing workforce in Poros.
2. The number **of jobs supported by tourism is likely to expand** as Poros invests in **year-round visitation** while **aquaculture jobs could decline** as the industry becomes more efficient.
3. The estimated 2023 tourism industry in Poros supports **780 FTE total jobs**, generates **13.5M € in labor income**, and **75M € in total annual economic impact**. This economic activity helps to support the 200+ businesses located in Poros.
4. Tourism related impacts in Poros generates **3X** the economic impact, **5X** the labor income, and **5X** the number of FTE jobs than in the expanded aquaculture proposal on an annual basis.
5. In other cases of human-caused natural disasters such as algae blooms and oil spills, **tourism has decreased by up to 70%**. Aquaculture has been shown to cause similar types of environmental harm to the surrounding area (including algae blooms) and could cause similar levels of visitation disruptions.
6. There are additional consequences of aquaculture including **added stress on the local infrastructure** and shifts in the **perception** of the broader region's role in Greece's tourism economy. This will further **hurt both local and regional tourism**.
7. AVRAMEAR is not based in Poros or Greece, so is **unlikely to invest back into the community** and build local wealth. Tourism is a local industry and provides opportunities for local residents to be employed, grow their businesses, and thereby retain economic activity within Poros.

Source: HR&A analysis using IMPLAN; International Labour Organization, "Diagnostic report on undeclared labor in Greece," 2016; National Statistical Service of Greece. "Greece Labor Force Participation Rate...", 2023; World Bank, "Age Dependency Ratio (% of Working-Age Population) – Greece," 2022; Waló, "Economic impacts of oil spills in island tourism destinations. An application to the Canary Islands," 2016. \*This estimate is based on information provided by Katheti.



01

# Study Objectives

## STUDY OBJECTIVES

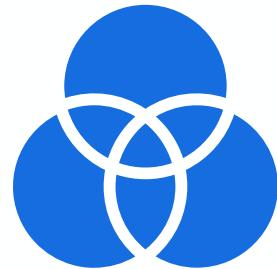
HR&A was engaged by the Rauch Foundation to conduct an economic impact analysis of the proposed expansion of aquaculture farms in Poros, with particular focus on the impacts on the tourism industry.

**It is important to note that there is a lack of empirical studies on the impacts of aquaculture expansion on local tourism. HR&A developed a methodological approach by analyzing information from a variety of sources:**



### INTERVIEWS

Conducted interviews with local officials and experts in Poros.



### CASE STUDIES

Reviewed aquaculture case studies and case studies examining the impacts of human-made natural disasters on tourism.



### ECONOMIC TRENDS

Examined economic trends in tourism and aquaculture at local and national levels. Additionally, HR&A evaluated trends in aquaculture productivity and labor needs.

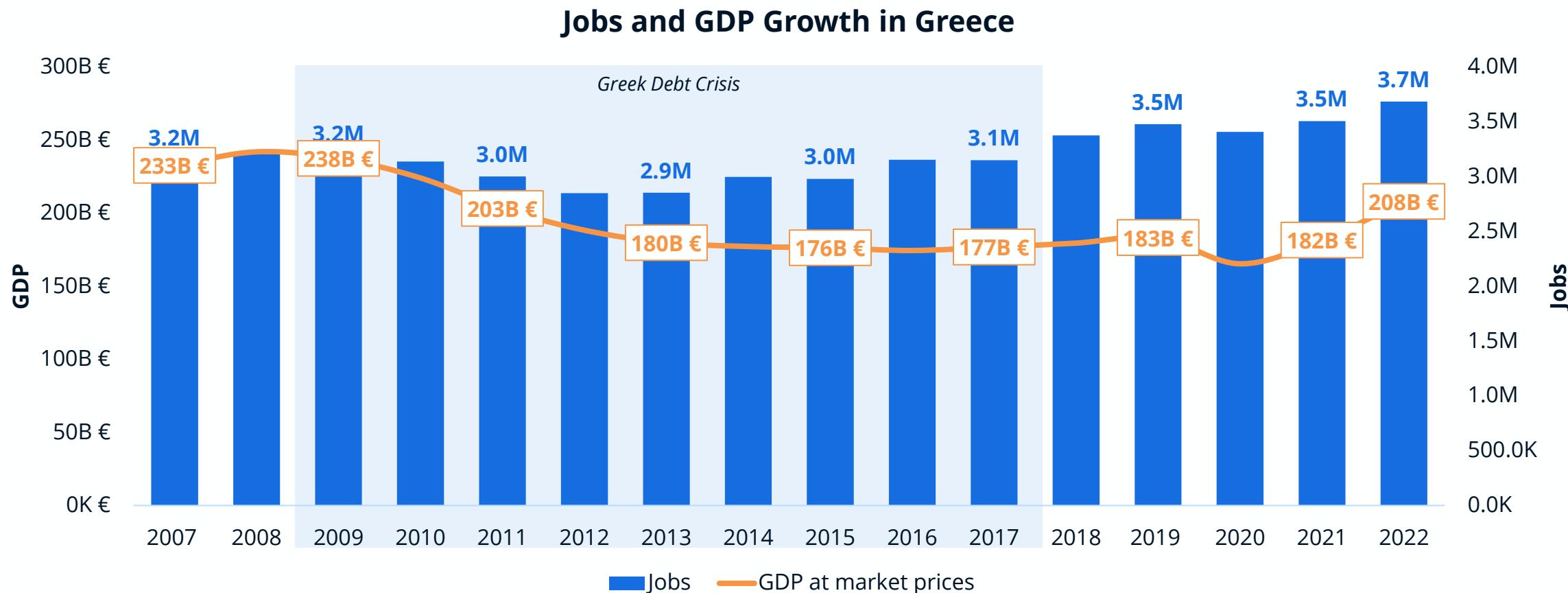
A dark, semi-transparent rectangular overlay covers the top half of the slide. Inside this overlay, a vertical white bar is positioned to the left of the page number. The page number '02' is displayed in a large, bold, light blue sans-serif font.

02

# Greece's Economy

## ECONOMIC TRENDS IN GREECE

In the past five years, the Greek economy began to grow after almost a decade of crisis and austerity.



Source: ELSTAT, "Gross Domestic Product," 2023. Note: Gross domestic product (GDP) at market prices is the final result of the production activity of resident producer units. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation.

## ECONOMIC TRENDS IN GREECE

Tourism is one of Greece's fastest growing economic sectors and generates benefits beyond the tourism industry. It has helped power Greece's economic recovery in the past few years and expand past pre-COVID levels.



Source: INSETE, "The contribution of tourism to the Greek economy," 2022. Note: Tourism includes hospitality, entertainment, and jobs that help support tourists. \*Direct tourism expenditures indirectly induces and supports other spending and economic outputs in other industries in Greece's economy.

**TOURISM BENEFITS MANY SECTORS**

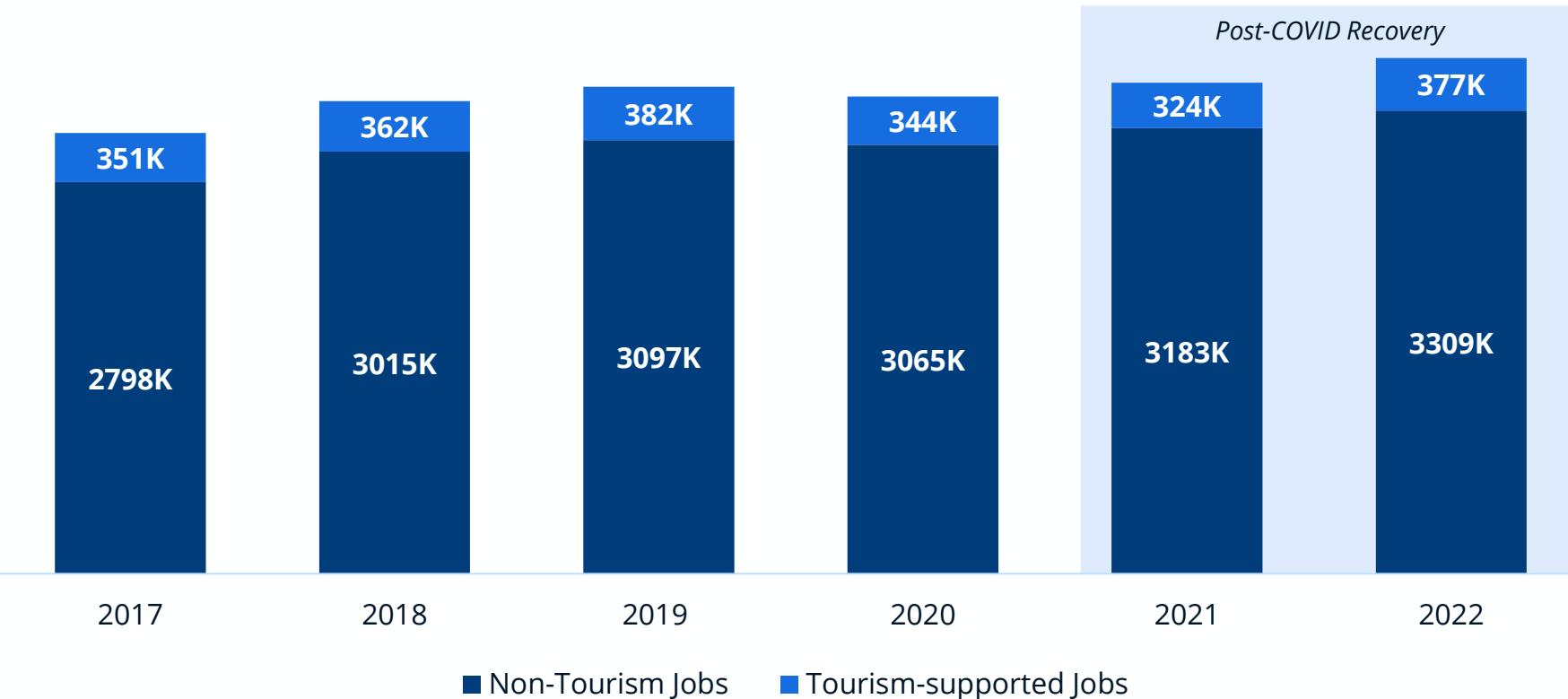
**+31%**

Of the total GDP is supported directly or indirectly by tourism\*

## ECONOMIC TRENDS IN GREECE

The tourism sector employs 1 in 10 workers in Greece and has grown by 7% since 2017. In the post-COVID era, tourism jobs have increased at 4X the rate of all other sectors.

### Employment in Greece

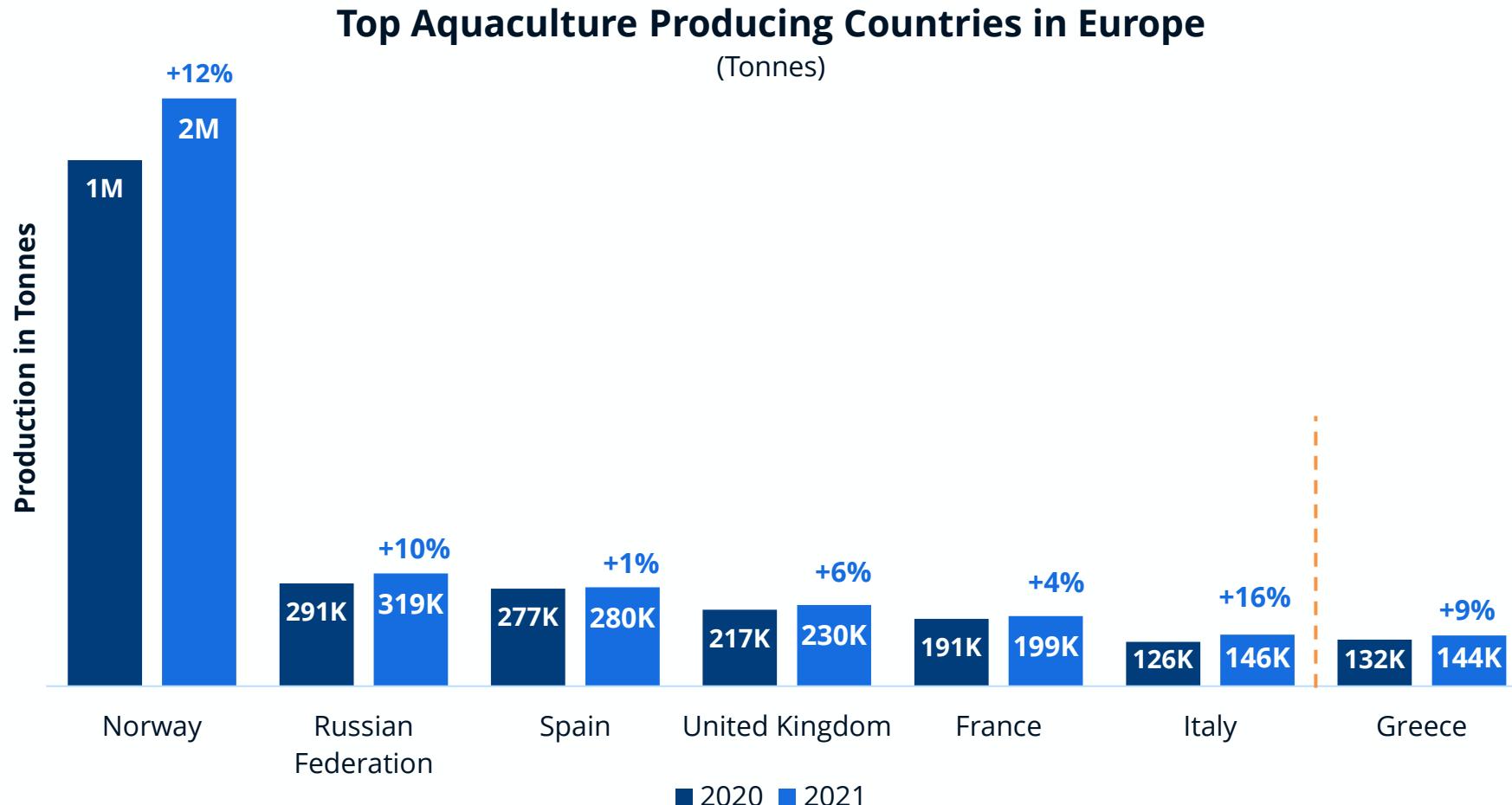


**10%**

Of the workforce is involved in the tourism industry

## ECONOMIC TRENDS IN GREECE

While the industry is growing, Greek aquaculture only ranks 7th in Europe and 34th globally in terms of production.



**7th**

Top producing European country in production volume, 2021

**34th**

Top producing country globally in production volume, 2021

## ECONOMIC TRENDS IN GREECE

Tourism supports **100X** more jobs than aquaculture in Greece.

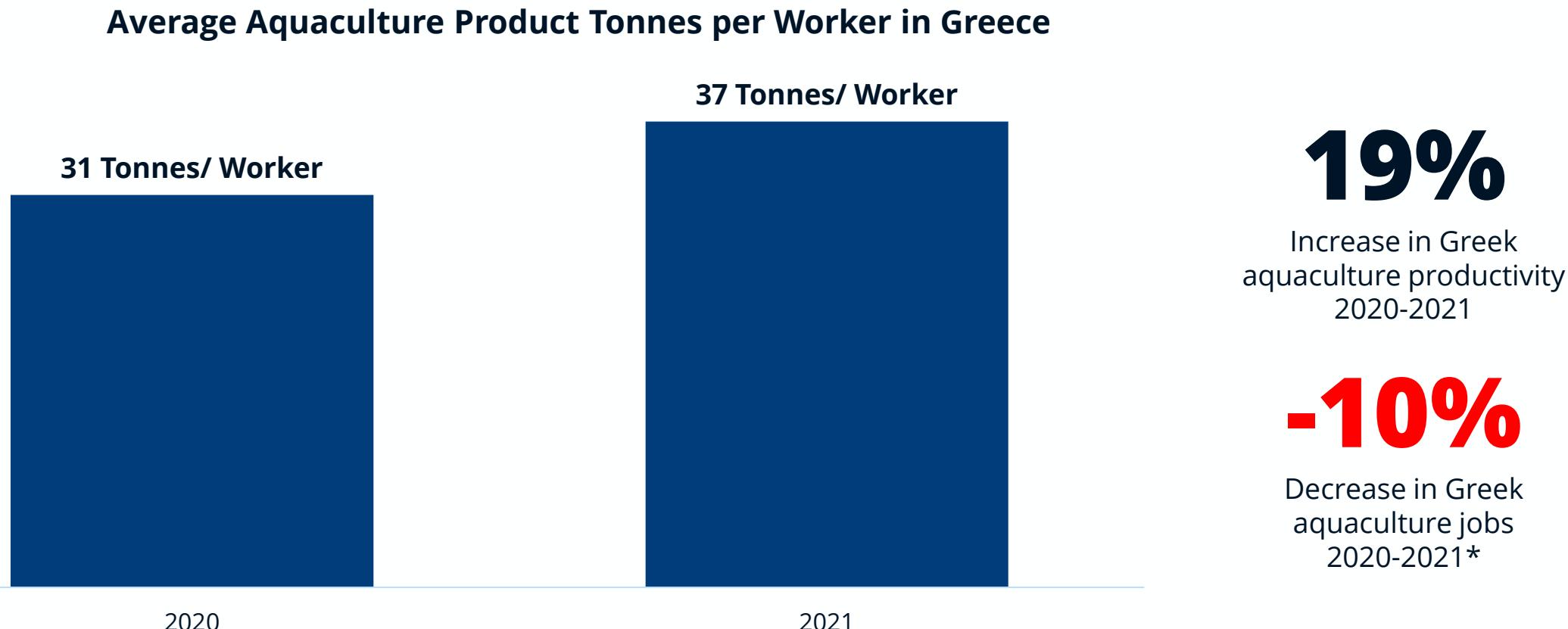
**Aquaculture and Tourism Jobs in Greece, 2022**



Source: INSETE, "The contribution of tourism to the Greek Economy," 2022, ELSTAT, "Aquaculture Survey: 2021," 2023.

## ECONOMIC TRENDS IN GREECE

Furthermore, if rapidly improving productivity trends in the aquaculture industry continue, fewer workers will be needed in the future to produce the same volume of fish.



Source: ELSTAT, "Aquaculture Survey: 2021," 2023. Note: The average productivity per worker includes both seasonal and full-time workers. The number was calculated by dividing the total Greek output by total workers. Tonnes refers to long tons or metric tons. \*This decrease is for full-time workers.



03

# Tourism in Poros

## TOURISM IN POROS

Poros' natural beauty and central location have helped build a robust tourism economy that includes over 200 small businesses employing many local residents.



Image source: Shutterstock | Alex Bayer



Image source: Shutterstock | Kudla



Image source: Shutterstock | Dimitrios Karamitros



Image source: Shutterstock | S. Borisov

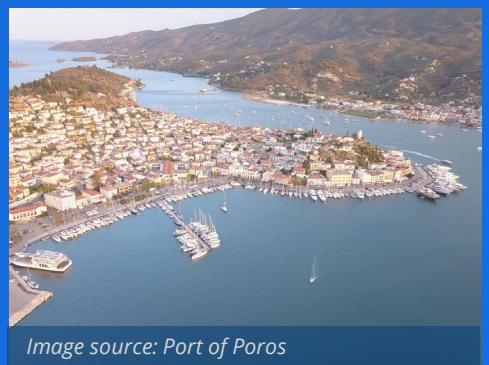
## TOURISM IN POROS

Must-see spots in Poros that showcase the natural beauty of the island extend past the central town, and many are accessible only by boat.



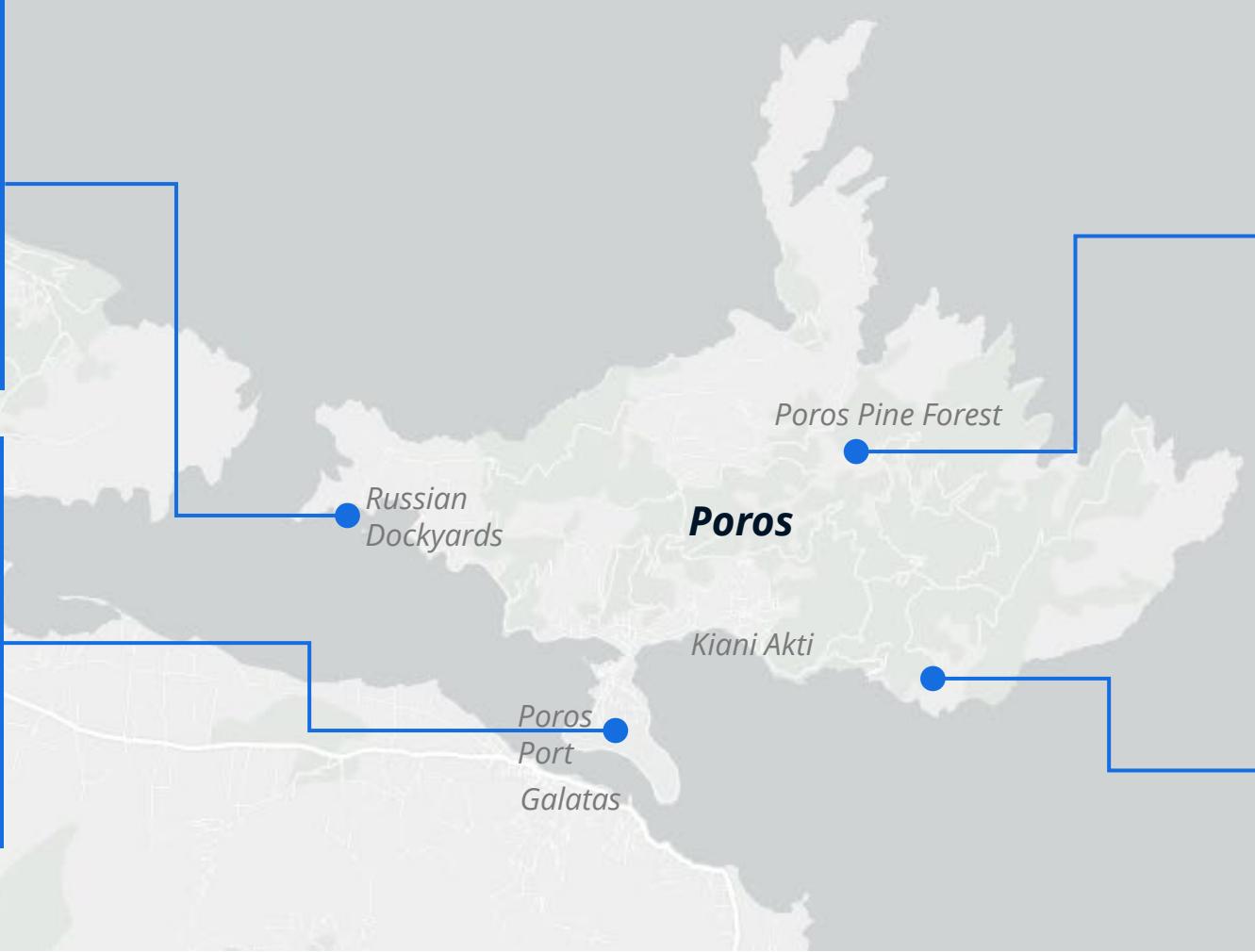
*Image source: Wikimedia Commons*

**Russian Naval Station beach**



*Image source: Port of Poros*

**Town of Poros**



*Image source: Shutterstock | S. Borisnov*

**Sanctuary of Poseidon**



*Image source: Shutterstock | Constantinos Iliopoulos*

**Monastery Beach**

## TOURISM IN POROS

Additionally, Poros is part of a larger region that is steeped in history and has important tourism destinations that support Greece's reputation as a top vacation destination.



**Mycenae**

*Image source: Carole Raddato*



**Troezen**

*Image source: Greectravel.com*



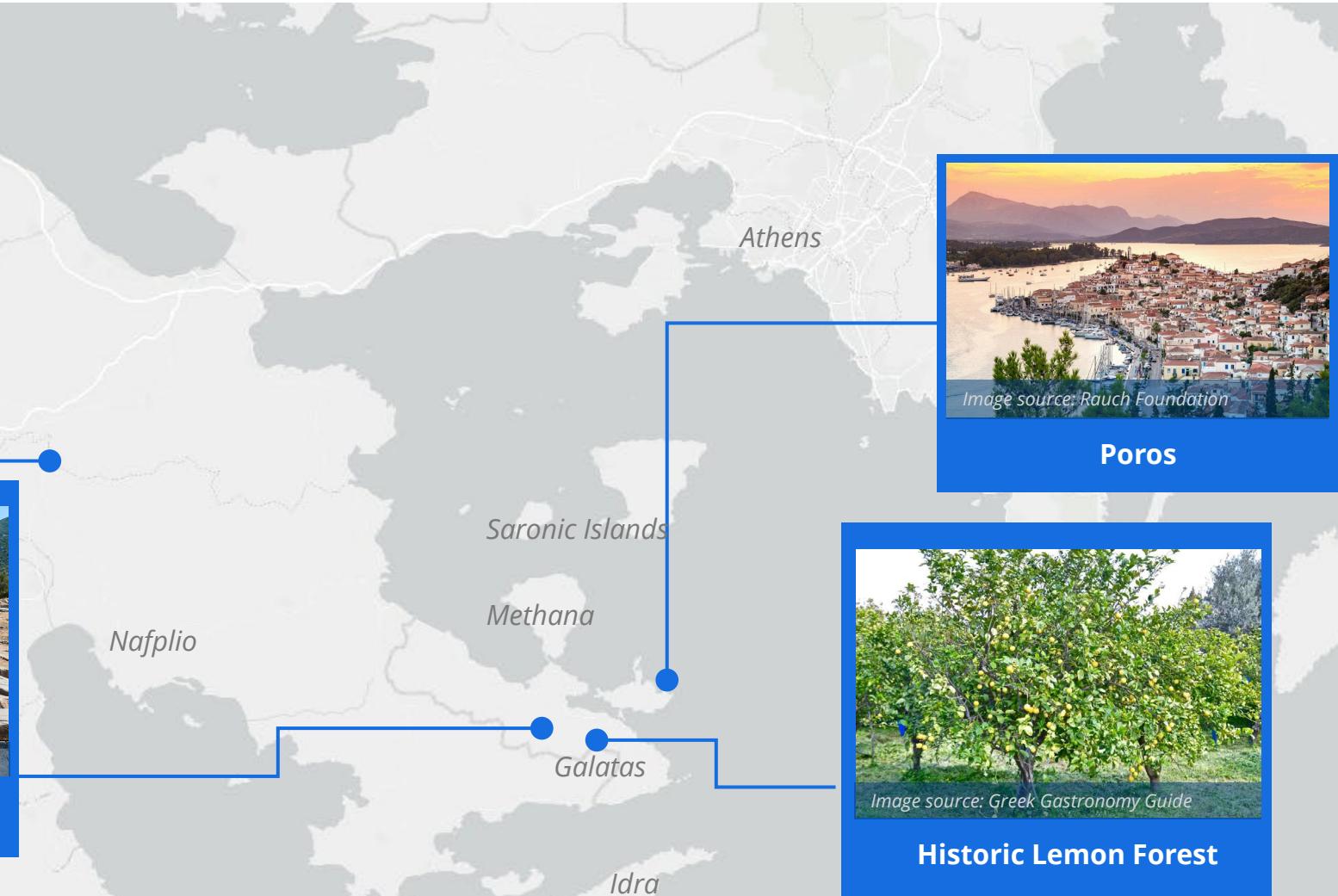
**Poros**

*Image source: Rauch Foundation*



**Historic Lemon Forest**

*Image source: Greek Gastronomy Guide*



## TOURISM IN POROS

Tourists often arrive to Poros via boat. Boating and Poros' pristine waters are a central part of Poros' identity as a tourist destination.

**2,000**

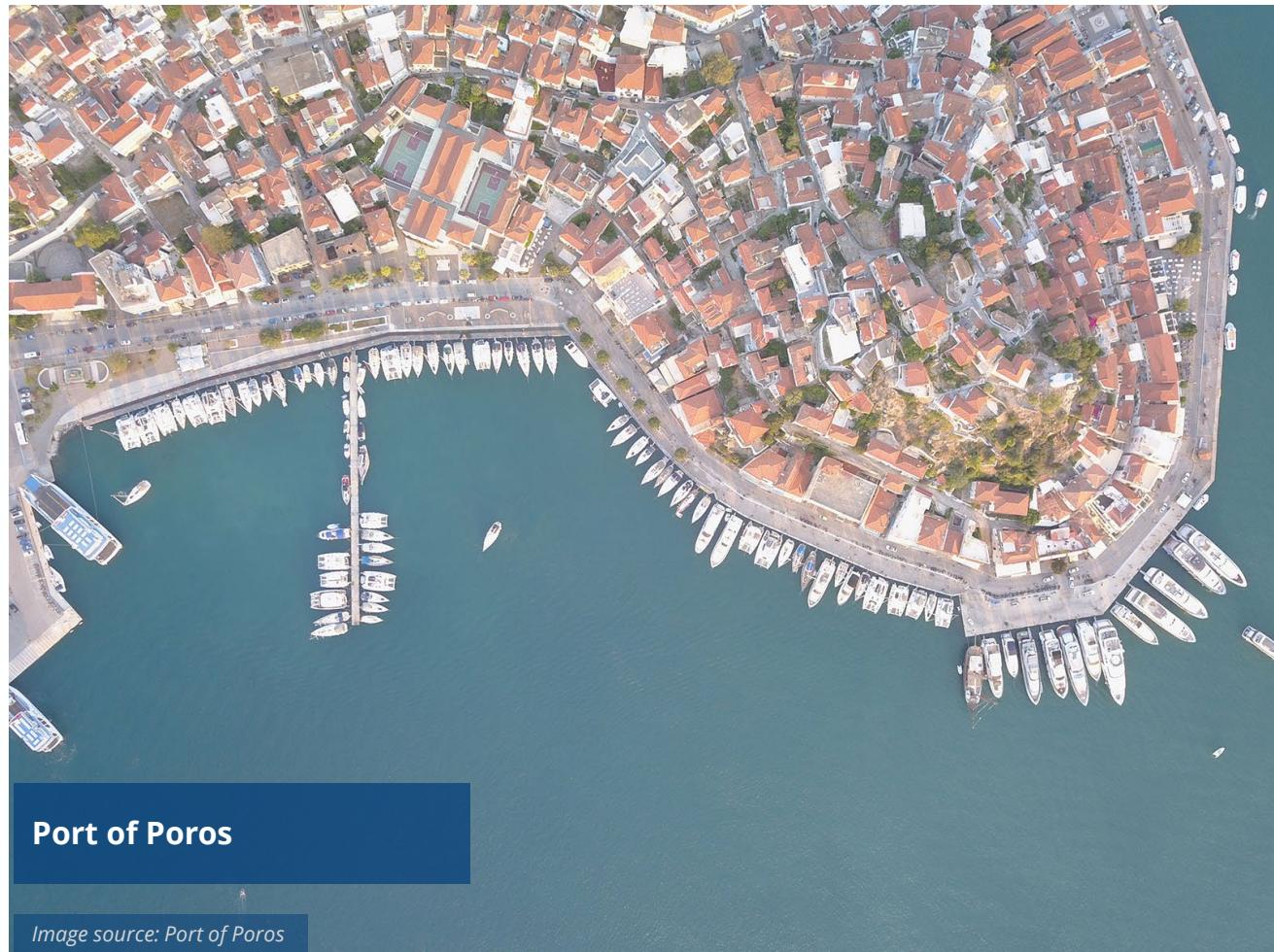
People enter Poros per day by boat  
in high season

**311,000**

Annual boat passenger arrivals  
(2022)\*

**18,000**

Boat invoices issued by the Port of  
Poros in 2022. These fees help to  
support the maintenance of the port  
and are indicative of overall tourism  
visitation levels



**Port of Poros**

*Image source: Port of Poros*

Source: Based on sources from primary interviews. \*INSETE, 2023.

## TOURISM IN POROS

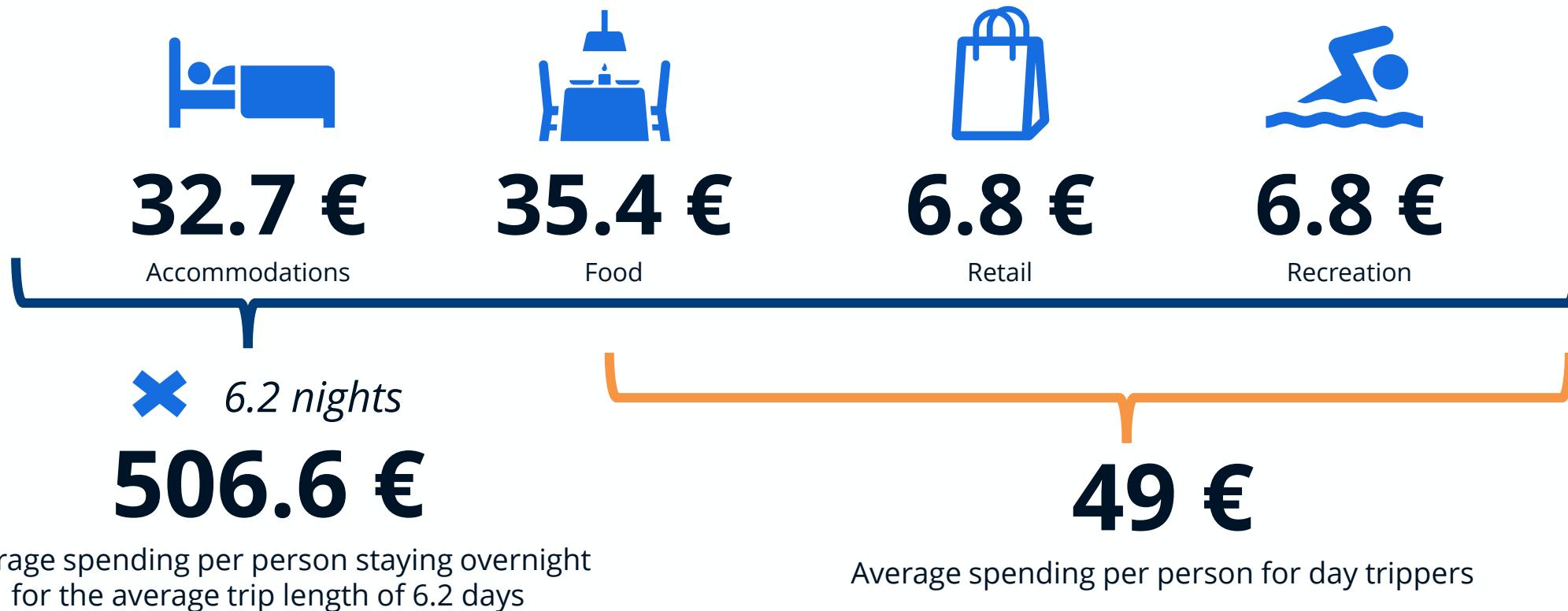
While Poros has traditionally been a summer destination, efforts are being made to hold events that will increase Poros' year-round visitation, increasing tourism's economic value.



## TOURISM IN POROS

Visitors to Poros, including domestic and international tourists, spend an average of 506.6 € over the course of their visit on local businesses.

### DAILY AVERAGE TOURISM SPENDING



**Effective tourism policies, including modern facilities, better amenities, and additional offerings can increase the number of tourists and the average trip spend in Poros.**

Source: Total daily spending data is from INSETE and the spending ratios are based on interviews with primary sources on Poros. Numbers are rounded. These numbers are 2022 values. The actual output of analysis has been inflated to reflect 2023 values.

## TOURISM IN POROS

Local tourism is still rebounding from the impacts of COVID, but assuming visitation to Poros has recovered as it has across Greece, tourism will generate 43M € of direct spending in 2023 and is anticipated to continue to grow.

### Total Tourism Spending in Poros

#### 2023 Tourism Estimates (+20% from 2022)

Total Overnight Visitation to Poros (2023 Est.)	<b>64,000</b>
Total Day Trip Visitation to Poros (2023 Est.)	<b>166,600</b>
Total Visitors to Poros (2023 Est.)	<b>230,600</b>
Direct Tourism spending (2023 Est.)	<b>43M €</b>

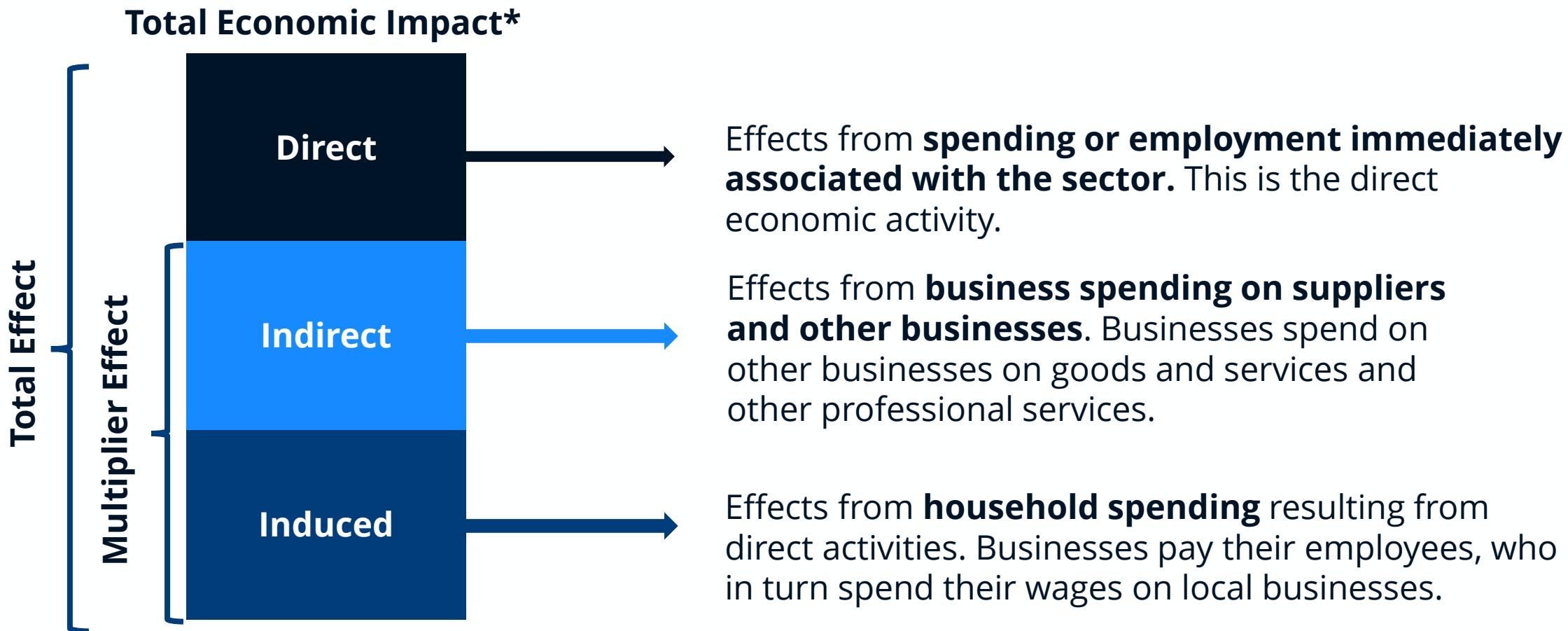
In 2022, Greece welcomed 93% of the number of tourists it had in 2019, its peak year in terms of tourism. Visitation in 2023 is anticipated to **exceed the 2019 peak by 20%**.



Source: ELSTAT, "Hotels, rooms for rent and tourist campsites / 2022," 2023; ELSTAT." Passengers disembarked, by ports (coastal - ferries traffic) Q1-Q4 2022," 2023. Greek Travel Pages, "Greece Anticipating Record Year in Tourism," 2023. Note: For the estimated 2023 impact, 2022 average spending was used but inflated to 2023. Day trip visitors captures visitors who did not book a hotel, room for rent, or short-term rental. This number was estimated by looking at the peak season boat disembarkment and offseason, subtracting all overnight visitation and assuming that 70% of off season disembarkments were local residents. HR&A estimated 2023 visitation levels to be 20% higher than 2022 levels. All numbers are rounded.

## ECONOMIC IMPACT OF TOURISM IN POROS

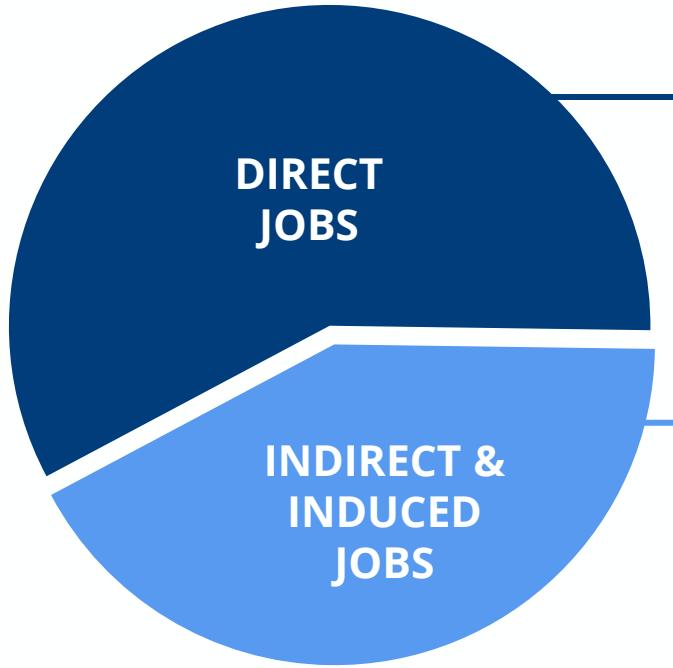
HR&A uses the IMPLAN economic model and inputs either direct spending or direct employment to estimate the indirect and induced impacts of business and household spending that occurs in the formal economy.



*Note: \*All impacts (jobs, labor income, and output) shown are total impacts, which is the sum of the direct, indirect, and induced activities, unless stated otherwise. IMPLAN is only available on the national level for Greece and a portion of indirect and induced jobs and impacts will occur outside of Poros.*

## ECONOMIC IMPACT OF TOURISM IN POROS

Total jobs refer to the sum of jobs from direct, indirect, and induced jobs. Direct tourism spending goes on to support a multitude of industries throughout Poros.



**Direct Jobs** include hotel staff, tour operators, travel agents, cruise operators, etc. These types of jobs are **almost always located in Poros**.

**Indirect Jobs** would include jobs such as food and beverage suppliers, landscapers, accountants, marketing professionals, etc. These jobs could be located in Poros, **but some of these jobs would be located elsewhere in Greece**.

**Induced Jobs** would include jobs like grocery store and retail workers, realtors, and other jobs associated with day-to-day household spending. **These jobs could be located in Poros, but some of these jobs would be located elsewhere in Greece**.

HR&A uses IMPLAN's industry standard conversion to **convert jobs** into **full-time equivalent (FTE) jobs**. This is defined as total hours worked divided by average annual hours worked in full-time jobs, which is assumed to be 2,080 hours in a standard year. Unless otherwise noted, the impacts in this report are shown as **total full-time equivalent (FTE) jobs, which includes direct, indirect, and induced jobs**.

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### ESTIMATED 2023 TOURISM IMPACTS



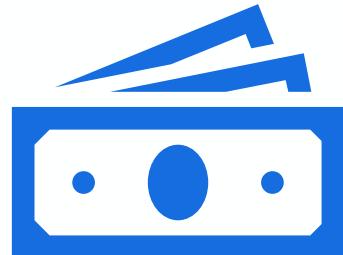
**780**

Total FTE Jobs



**13.5M €**

Total Labor Income



**75M €**

Total Economic Impact

### TOURISM DRIVES POROS' ECONOMY

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- Tourism in Poros is focused on small, family operated businesses and hotels. This economic activity helps to support **the 200+ businesses located in Poros**.
- In addition to labor income, owners associated with **tourism-related businesses also retain profits** which are included as part of the total economic activity.

Source: HR&A analysis using IMPLAN; International Labour Organization, "Diagnostic report on undeclared labor in Greece," 2016; National Statistical Service of Greece. "Greece Labor Force Participation Rate...", 2023; World Bank, "Age Dependency Ratio (% of Working-Age Population) – Greece," 2022. Note: All jobs are shown as full-time equivalency (FTE). These impacts represent economic impacts on an annual basis using the 2018 Greece national IMPLAN model. The informal economy is not calculated in the economic impact of tourism; thus, there is additional economic activity from the informal economy not calculated in this analysis. All numbers are rounded. \*This estimate is based on information provided by Katheti.

## ECONOMIC IMPACT OF TOURISM IN POROS

In addition to its economic benefits, tourism has many social and cultural benefits that contribute to the uniqueness of Poros.



### LOCAL BUSINESSES

Tourism supports and helps local small businesses grow, which retains more economic activity in the island.



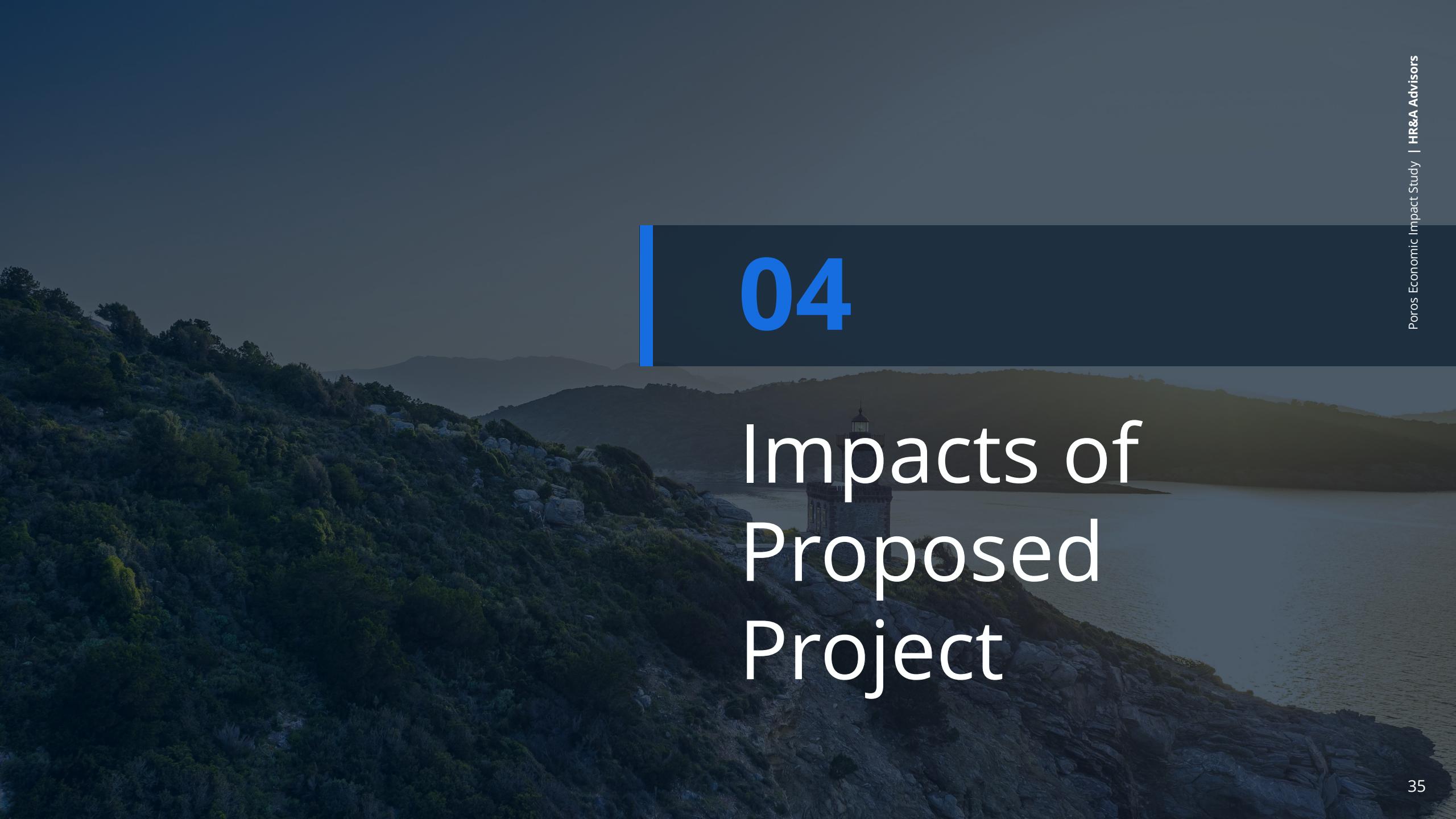
### CULTURAL HERITAGE

Sustainable tourism growth can support the preservation of local handicraft, archeological sites, unique local food, and local culture.



### YEAR-ROUND ACTIVATION

Poros is investing in attracting year-round tourism, which will allow for more job growth and stability.

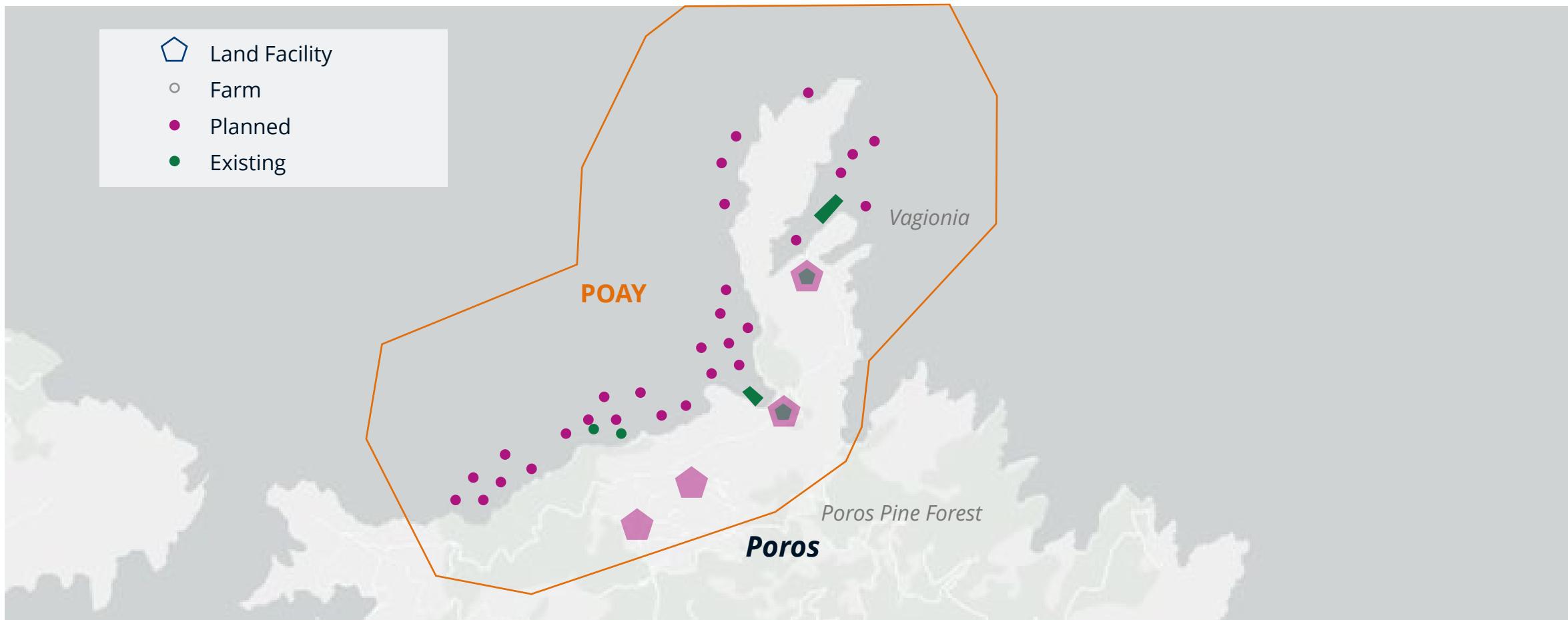


# 04

# Impacts of Proposed Project

## PROPOSED POAY EXPANSION

AVRAMAR, an aquaculture company based in Spain, is proposing a drastic-expansion of fish farms in Poros, designating the area as an "Area of Organized Aquaculture Development" (POAY).



Source: Ambio, "Designation of Areas for the Organised Development of Aquaculture within the Administrative Boundaries of the Municipality of Poros," 2015

## PROPOSED POAY EXPANSION

This expansion includes both farms in the sea and landside interventions like processing facilities, increasing commercial traffic on land and sea.

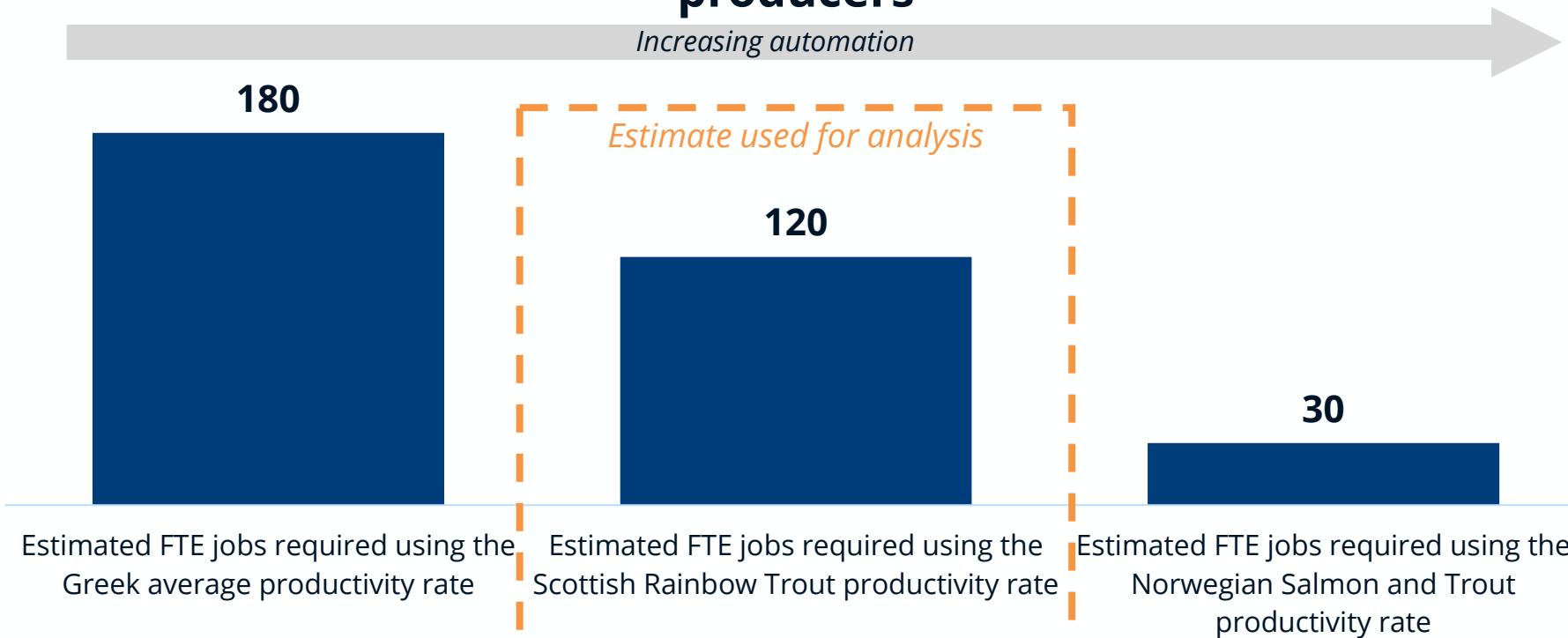


Source: Ambio, "Designation of Areas for the Organised Development of Aquaculture within the Administrative Boundaries of the Municipality of Poros," 2015; ELSTAT, "Aquaculture/2021," 2022.  
Note: One Stremma is equal to 0.25 acres. Tonnes refers to long tons or metric tons.

## INCREASING PRODUCTIVITY IN AQUACULTURE

Furthermore, aquaculture is becoming more efficient and fewer jobs will be needed in the future, decreasing any future potential job creation in Poros.

### Estimated workers needed assuming AVRAMEC improves labor productivity in line with EU-leading producers



Source: ELSTAT, "Aquaculture Survey: 2021," 2023; Scottish Government, "Scottish Fish Farm Production Survey 2021," 2022; Directorate of Fisheries, "Key figures from the Norwegian Aquaculture industry," 2021; Ambio, "Designation of Areas...Strategic Environmental Impact Study," 2015. Note: Tonnes refers to long tons or metric tons; These jobs are based on 7,700 tonnes of fish produced; All worker numbers have been converted to full-time equivalency; All numbers rounded to the nearest 10.

\*This estimate is based on information provided by Katheti. \*\*The mean productivity increased from 31 tonnes per job to 37 tonnes per job between 2020 and 2021.

**15**

People working at the existing farms in Poros\*

Between 2020 and 2021, productivity in Greece's aquaculture sector **improved by 19%**, resulting in 390 fewer jobs in aquaculture across Greece.\*\*

## PROPOSED POAY EXPANSION

While AVRAMAR has not provided any information about the number, type, and location of jobs to be created by the proposed expansion, it is likely that only a portion of these jobs will be located on Poros.

### LIKELY TO BE DIRECTLY ON POROS



Farmworkers



Waste management



Technicians



Managers

### LIKELY TO BE LOCATED ELSEWHERE IN GREECE



Fish Processing



Feed Manufacturing



Truck Driving



Administrative

## ECONOMIC IMPACT OF PROPOSED AQUACULTURE EXPANSION

Using the Scottish aquaculture productivity rate and AVRAMAR's projected crop tonnage, it is estimated that the additional fish farms could generate **160 FTE jobs, 2.6M € in labor income, and 26M € in total economic impact** annually.

### ECONOMIC IMPACTS OF PROPOSED FISH FARMS



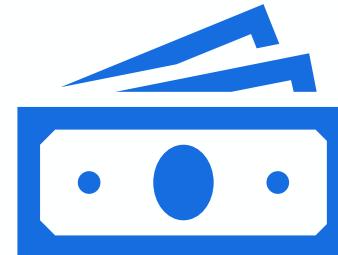
**160**

Total FTE Jobs  
(*Direct + Indirect + Induced*)



**2.6M €**

Total Labor Income



**26M €**

Total Economic Impact

- The fish farm expansion will support **120 direct FTE jobs**, but these jobs may have a limited contribution to the local economy as a portion of the workers could be based elsewhere.
- While IMPLAN does not estimate the number of multiplier jobs by location, a portion of the multiplier jobs will not be based out of Poros.

**As AVRAMAR is not a local company, a majority of the economic impacts will likely occur outside of Poros.**

Source: HR&A analysis using IMPLAN. These impacts represent economic impacts on an annual basis in Greece. The direct economic impact is based on 138 direct jobs inputted (120 FTE), reflective of the current aquaculture productivity rate. All other outputs reflect Scottish mean productivity of 56 tonnes per staff. Some of the impacts may not occur in Poros, but in the broader Greek economy. All jobs are shown as full-time equivalency. All numbers are rounded.

## LIMITED IMPACT OF AQUACULTURE

Furthermore, AVRAMAR is not based in Greece, so it is **unlikely to invest back in Poros** and as a result a portion of the **economic impacts and earnings will leave Poros**.

### AVRAMAR

- AVRAMAR is owned by an **American private equity firm**, Amerra Capital Management, and a **United Arab Emirates** sovereign wealth fund, Mubadala.

**70%**

Of Greek aquaculture production is owned by AVRAMAR, which is **based in Spain**.



Source: Augustinis, Francesco de, and Angela Symons. "Help Us Save Poros: Tiny Greek Island Threatened by Fish Farm." Euronews, June 8, 2023.

## COMPARISON OF IMPACTS: TOURISM vs PROPOSED AQUACULTURE EXPANSION

Tourism supports **5X the FTE jobs**, **5X the labor income**, and **3X the total economic impact** of the expanded aquaculture proposal.



## IMPLICATIONS OF AQUACULTURE EXPANSION – TOURISM

Additionally, aquaculture's environmental practices, spatial needs, and environmental impact conflict with Greece's tourism strategies, which rely heavily on pristine waters.

### SUSTAINABILITY IN TOURISM



Image source: Vladimir Elexa

- Sustainability is a priority of both the government and Prime Minister, placing **biodiversity at the heart of tourism planning**.
- The current tourism strategy is to expand destinations by marketing both mainland Greece and **lesser-known islands** based on traveler preferences.

### YACHTING AS TOOL FOR TOURISM GROWTH



Image source: Flickr | dronepicr

- Coastal and maritime tourism is viewed as **a key tool for development** of Greece's economy.
- According to Christie's International Real Estate, the Greek islands are placed as the second-best **destination for luxury yachting**.

## CASE STUDIES

There are precedent case studies that indicate that large scale aquaculture can negatively impact tourism. However, Poros may experience larger impacts as its economy is more tourism-dependent than these other areas.



- A 2021 legislative ban on open net salmon farming was passed due to local resistance to large scale **aquaculture** and the **incompatibility** with the **tourism industry** as evidenced by aquaculture in neighboring Chile. Chile experienced devastating environmental consequences from **algae blooms** caused by fish farm waste leading to the **death of 20M fish** in 2021.
- One study estimated that a new fish farm in Calpe could cause a negative impact of 83M € to 911M €, assuming decreased visitation levels of **1%, 5%, or 10%**—even though the farms are located to 2km offshore in Calpe versus in Poros whereas farms are 50m offshore.
- A study surveyed 120 travelers where **10% of respondents** stated that the presence of fish farms would prevent them from visiting natural attractions in Scotland.

*Source: Cockburn, "Argentina Becomes First Country to Ban Open-Net Salmon Farming due to Impact on Environment." 2021. Buenos Aires Times, "Tierra del Fuego Province bans salmon farming in open-net pens", 2021; Perles-Ribes, et al, "Aquaculture in tourist destinations: the need to consider economic aspects in environmental impact studies,"2022; Nimmo, et al, "Does fish farming impact on tourism in Scotland?" 2011.*

## ENVIRONMENTAL IMPACTS

Fish farms have been known to cause severe environmental degradation, which can lead to the collapse of existing fisheries and dissuade tourists from visiting.

### SALINIZATION/ ACIDIFICATION OF SOILS



Image source: Shutterstock | Richard Whitcombe

- The soil at former farms is left hypersaline, acidic, and eroded for long after it closes.
- This, along with the accumulation of natural sediment, can contribute to the decline of native seagrass such as *Posidonia oceanica*.

### POLLUTION OF WATER



Image source: Shutterstock | Andriy Nekrasov

- Antibiotics, pesticide usage, disease, parasites, or leftover food spilling into the ocean causing nutrient pollution can pollute water.
- A 2011 study found that a Greek farm producing 100 tonnes of fish discharges 9 tonnes of nitrates, which ends up on the seabed and deteriorates the environment.

### DESTRUCTION OF NATURAL ECOSYSTEMS



Image source: Oregon State University via EcoWatch

- Aquaculture can cause severe environmental degradation, including the collapse of existing fisheries due to invasive species, outbreak of disease, and algae blooms.
- In 2007, Chile's salmon farming industry experienced an outbreak of infectious anemia that cost the sector \$2B and 20,000 jobs.

Source: Martinez-Porcha and Martinez-Cordova, "World Aquaculture: Environmental Impacts and Troubleshooting Alternatives," 2012; Cho, "Making Fish Farming More Sustainable," 2016 ; FAIRR Initiative, "Shallow Returns? ESG Risks and Opportunities in Aquaculture," 2019 ; M. Holmer, "Sedimentation of organic matter from fish farms in oligotrophic Mediterranean assessed through bulk and stable isotope ( $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ) analyses", 2007, Tsagaraki, "Beyond the cage: Ecosystem modelling...", 2011.

## BROADER REGIONAL IMPACTS

Research shows that human-caused natural disasters significantly impact tourism even if an area is not directly impacted by the disaster. This suggests that aquaculture in Poros could impact the broader Attica and Peloponnese regions' tourism economy.

### FLORIDA RED TIDE | 2018

*A red tide algae bloom in Florida severely limited coastal access in Florida*



*Image Source: Mote Marine Laboratory's Manatee Research Program*

**-\$318M**

Change in the total economic impact of the red tide event on just the Airbnb market in Florida. There were also 2,900 jobs lost as a result of the red tide event.

### HEBEI SPIRIT | 2007

*A major oil spill along the Western Korean shore*



*Image source: Wikimedia Commons*

**-70%**

Change in tourism visits the summer after the oil spill compared to the previous year.

### PRESTIGE | 2002

*An oil tanker caused a major oil spill along northwestern Spain*



*Image source: Wikimedia Commons*

**-5M**

Overnight visits were lost in the region. 737M € were deployed to clean up the oil spill and 98% of the costs were paid by local communities. The spill also caused major changes in overnight spending.

## IMPLICATIONS FOR AQUACULTURE EXPANSION - INFRASTRUCTURE

The proposed farms are located near remote areas of Poros, and the current infrastructure and roadways are not equipped to handle heavy traffic, which may further impact visitation.



### INADEQUATE EXISTING ROAD INFRASTRUCTURE

- Main roads through town are home to tourist shops that rely on the **quaint atmosphere** to attract tourists.
- The roads on the Northern portion of the island are **not equipped for large trucks** needed to support the farms.



### INADEQUATE PORT FACILITIES FOR AQUACULTURE

- Current port fees are not enough to fund the additional maintenance from increasing boat traffic due to the proposed fish farms.



### CONSTRAINED HOUSING MARKET AND SOCIAL SERVICES

- The fish farm expansion will attract workers from outside of Poros. As the **rental market is constrained**, there will be increased demand and not enough units to house the influx of workers.
- There will also be **constraints on public services** from the increase in population.

## KEY FINDINGS

Tourism drives Poros' economy and has significant potential for growth and expansion. The expansion of aquaculture could come at the cost of the local tourism economy, which supports generations of local residents and supports the local economy.

1. Tourism is key to Greece's economic growth and has helped Greece recover from a decade-long crisis. The tourism sector employs **1 in 10 workers** in Greece and the tourism-related industry in Poros supports **up to 80%\*** of the existing workforce in Poros.
2. The number **of jobs supported by tourism is likely to expand** as Poros invests in **year-round visitation** while **aquaculture jobs could decline** as the industry becomes more efficient.
3. The estimated 2023 tourism industry in Poros supports **780 FTE total jobs**, generates **13.5M € in labor income**, and **75M € in total annual economic impact**. This economic activity helps to support the 200+ businesses located in Poros.
4. Tourism related impacts in Poros generates **3X** the economic impact, **5X** the labor income, and **5X** the number of FTE jobs than in the expanded aquaculture proposal on an annual basis.
5. In other cases of human-caused natural disasters such as algae blooms and oil spills, **tourism has decreased by up to 70%**. Aquaculture has been shown to cause similar types of environmental harm to the surrounding area (including algae blooms) and could cause similar levels of visitation disruptions.
6. There are additional consequences of aquaculture including **added stress on the local infrastructure** and shifts in the **perception** of the broader region's role in Greece's tourism economy. This will further **hurt both local and regional tourism**.
7. AVRAMEAR is not based in Poros or Greece, so is **unlikely to invest back into the community** and build local wealth. Tourism is a local industry and provides opportunities for local residents to be employed, grow their businesses, and thereby retain economic activity within Poros.

Source: HR&A analysis using IMPLAN; International Labour Organization, "Diagnostic report on undeclared labor in Greece," 2016; National Statistical Service of Greece. "Greece Labor Force Participation Rate...", 2023; World Bank, "Age Dependency Ratio (% of Working-Age Population) – Greece," 2022; Waló, "Economic impacts of oil spills in island tourism destinations. An application to the Canary Islands," 2016. \*This estimate is based on information provided by Katheti.



05

# Appendix

## ECONOMIC IMPACT OF FISH FARM EXPANSION IN POROS

The proposed fish farm expansion in Poros is estimated to generate **26M € in annual economic impact**, **2.6M € in labor income**, and **160 FTE jobs** on an annual basis.

### Total FTE Jobs Impact



Proposed Aquaculture Expansion  
■ Direct Jobs ■ Multiplier Jobs

### PROPOSED FISH FARM EXPANSION IMPACTS

Direct

**1.7M €**

Labor Income

Multiplier

**910K €**

Labor Income

Total

**2.6M €**

Total Labor Income

**20M €**

Economic Output

**6M €**

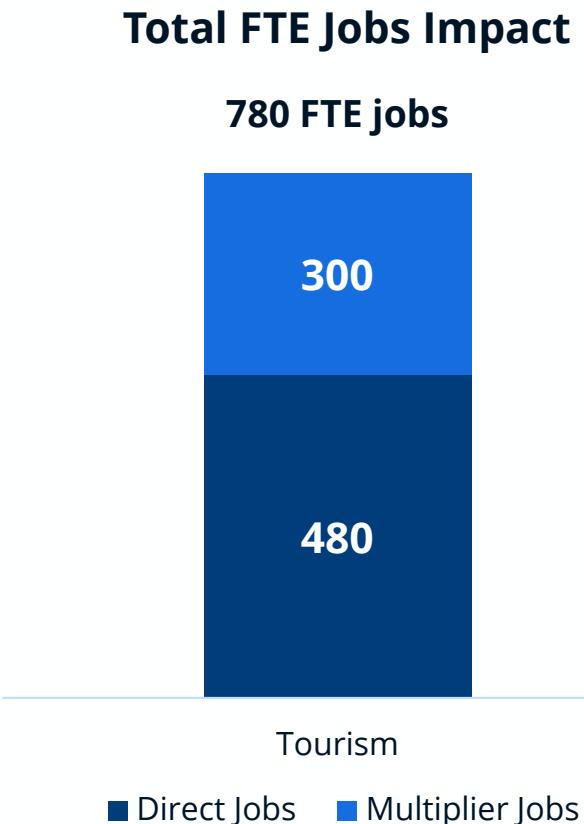
Economic Output

**26M €**

Total Economic Impact

## ECONOMIC IMPACT OF TOURISM IN POROS

The existing tourism industry in Poros generates **75M € in annual economic impact**, **13.5M € in labor income** and **780 FTE jobs** on an annual basis.



### EXISTING TOURISM IMPACTS

Direct

**8.1M €**

Labor Income

Multiplier

**5.4M €**

Labor Income

Total

**13.5M €**

Total Labor Income

**43M €**

Economic Output

**32M €**

Economic Output

**75M €**

Total Economic Impact

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## INTERVIEWS

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HR&A



# Final Report | Economic Analysis of Proposed Aquaculture Farm Poros, Greece

August 2023