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Original Research Articles

From Climate Change to Occupational Risks: The Vulnerability of the Fisheries Sector to Climatic Accidents

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With the increase in global average temperature due to climate change, a large number of workers are exposed to high-temperature working environments. Therefore, this study examines the impacts of fisheries production, consumption of fossil fuels, economic growth, and governance on climatic occupational accidents amid global change in the EU from 1990 to 2022. Using the novel Moments Quantile Regression (MMQR) method with fixed effect components, the findings showed a significant link between the expansion of the fisheries industry and climatic occupational accidents at higher quantiles. The results also showed that developed members in the EU14 believe that the expansion of the fisheries industry has a bigger impact on climatic occupational accidents than developing countries in the EU13. Regarding how the use of fossil fuels affects maritime climatic occupational accidents, it has been shown that the majority of this variable's quantiles are positively correlated with the prevalence of threats. However, in the original and emerging EU13 and EU14 countries, economic development lowers climatic occupational accidents, supporting the growth hypothesis for fisheries-producing nations. The relationship between climatic occupational accidents and governance was found to be significant in the first through the ninth quantiles across the EU27 nations.

1. INTRODUCTION

With the increase in global average temperature due to climate change, a large number of workers are exposed to high temperature working environments. It is estimated that among the 3.4 billion workers globally, more than 2.4 billion may be exposed to excessive heat at work. High-temperature environments can lead to heat-related stress, which in turn can trigger cardiovascular diseases, kidney diseases, and other health problems, increasing the risk of death. Each year, 22.85 million work-related accidents caused by high temperatures result in 18,970 deaths and the loss of 2.09 million disability-adjusted life-years. In 2020, there were approximately 26.2 million people globally suffering from chronic kidney disease caused by workplace heat stress. Climate change can lead to deteriorating air quality. Approximately 1.6 billion workers are exposed to workplace air pollution, which can cause respiratory diseases, cardiovascular diseases, and cancer. Each year, air pollution leads to the death of 860,000 outdoor workers.

According to recent research from the International Labor Office (ILO) published in 2022, up to 24,000 fishermen and others involved in fisheries farming and processing are murdered yearly, making fisheries and associated activities among the deadliest of all vocations.[1] The data emanating from the fisheries administration and groups of fishermen shows that the accident rate keeps rising in the sector of the artisans of developing countries, which constitutes a significant concern.[1] Most often, changes in the fundamental nature of fisheries operations are to blame for the rise in climatic occupational accidents, including fisheries of coastal resources, improvements in vessel and fisheries technology, such as the use of motors engines and fisheries gears that are of new type gear, absence of required training, little or no experiences, and skills deficit, undue pressure coming from the commercial angle, and changes in the management of fisheries regime.[1]

The Fisheries sector is a high-risk industry, with a fatal accident incidence rate of 23.82 compared to the average incidence rate of 1.65.[2] Consequently, the European Union's fisheries industry is virtually the riskiest. Additionally, the incidence rate is four times greater than in the construction sector, which is often considered a high-risk industry. Further, the number and rate of accidents de-

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clined consistently between 2010 and 2020; the fisheries and aquaculture industry are an exception to this.[2] Given the tiny statistics for this industry, care must be used when interpreting this data, which makes it challenging to draw definitive conclusions and identify patterns.[3] However, national occupational statistics show comparable outcomes. Construction accounted for around 25% of worker fatalities, followed closely by manufacturing with about 18% of deaths, and agriculture, forestry, and fisheries with about 25% of fatalities in 2021–2022.[3] According to data, the working environments of farming, breeding, fisheries farming, and coastal zones account for about half of all workplace accidents in the fisheries industry.[3] Around 5.74 percent of all fatal incidents in the fisheries industry are caused by accidents on or above water; additionally, more employees than usual in the fisheries industry report having to deal with dangers at work.[3]

Since the incidence rate of fatal accidents in the UK's fisheries industry was 15 times greater than the national average, the fatality rate of accidents within the UK's fisheries subsector happens to be 15 times above the country's average, the danger does not correspond to the sector's size.[4] According to estimates, the rate of crew fatalities on fisheries vessels registered in the UK was around 43 per 100,000 crew members in 2017 and 2018. The pace was approximately 55 per 100,000 crew members on fisheries vessels registered in the UK on average between 2013 and 2018.[4] Even though this drop is good, it is still high compared to other sectors. To put this in perspective, the Health and Safety Executive (HSE) study indicates that in Great Britain in 2017, the initial rate of fatal injuries was about 0.45 fatalities per 100,000 employees across all sectors.[4] Similarly, it was 22 times higher in Sweden than the national average and eight times higher in Spain than the national average.

Also, in the UK, the non-fatal accident rate for the fisheries and aquaculture industry is over two times the national average, in terms of the incidence rate, which is the number of non-fatal accidents. The value of this indicator is 3514. 05 compared to 1556. 86 of the previous year. As in the case of fatal accidents, it is important to point out that the sector for Fisheries and Aquaculture does not have a general decreasing tendency. Said authors further added that.[5] People in this line of work are off work longer due to serious injuries than in other industries. A large proportion of the non-fatal injuries in the sector led to 7 days or more lost time, but the proportion of accidents leading to less than six days was much lower.[5] This leads to increased costs, such as social security costs, and reduced output for business and social welfare.

As reported by Guillot-Wright et al.,[5] the European Structural and Investment (ESI) Funds are intended to promote employment-based recovery and economic growth in Europe. The European Marine, Fisheries, and Aquaculture Fund (EMFAF) has provided funding for new employment opportunities and improvements in the quality of life in coastal areas of Europe, helping fishermen change towards sustainable fisheries management and sustainable aquaculture management. The EU parliament, together with the EU Council, has reached an understanding to disburse the budgeted allocation of €6. 108 billion within the year 2021-2027 to the European Marine, Fisheries, and Aquaculture Fund (EMFAF). It can be seen that the rate of increase in the number of cases is gradually declining.[5] The main problem is that while the EU27 region aims at promoting fisheries and aquaculture and providing support during crises, financial measures that will increase the fleet's capacity, including funding vessel improvements and imposing many constraints on first-time vessel owners, that's are a death knell to fisheries sustainable management practices and the EU's blue growth.[6,7]

Going by sustainable fisheries management standards, overfishing in the EU has reached an alarming rate, with some fishing fleets level three times more than required. The fisheries industry now has to deal with another problem since the EU will buy new engines and fisheries boats up to 24 meters long with public funds, among other things, to make sure that hunting continues.[8,9] This will not only hurt the below-sea life, but also go against the Green Deal, and hurt marine environmental goals that the EU countries have agreed to with the Blue Growth strategies. On the other hand, at the emission levels in the year 2000, air pollution from fisheries ships operating in the North Sea and the Baltic Sea caused €22 billion in yearly health damages in Europe.[2] Due to the adoption of the more stringent fisheries ship fuel sulfur limits approved by the International Maritime Organization (IMO) in 2008, this amount is predicted to drop to €14.1 billion by 2020. However, according to the Danish Centre of Energy, the cost of international fisheries ship travel for health-related reasons in Europe rose from €58.4 billion in 2000 to €61.4 billion in 2020.[2] According to data on marine incidents in the EU, there were 18 deaths in accidents involving ships registered in EU Member States in 2021, an increase from 15 in 2020. Furthermore, 95% of fatal marine casualties in the EU in 2021 included crew members.[2]

As the climate warms, the habitats of vectors such as ticks and mosquitoes expand, and the spread of diseases they carry increases. More than 870 million agricultural workers may be exposed to pesticides, and each year, more than 300,000 people die from pesticide poisoning. In addition, vector-borne diseases cause 15,000 work-related deaths each year. Climate change has led to an increase in the frequency and intensity of extreme weather events such as floods, droughts, and wildfires. These events not only directly endanger the lives of workers but also increase the risk of accidents and the spread of diseases, thereby increasing occupational mortality. For example, wildfires can expose firefighters and nearby workers to toxic smoke and high temperatures, increasing their risk of death.

The study's main questions were: (1) Is there a relationship between the fisheries industry and climatic occupational accident rate due to climate change in European countries between 1990 and 2022? (2) Are EU members more open toward sustainable fisheries management than against climate change in EU seas? (3) Is it possible for the fisheries activities to develop properly and help the European Union in meeting its 2050 blue growth targets? (4)

To measure the degree of climatic occupational accidents brought about by the growth of the fisheries industry amid climate change in EU seas between 1990 and 2022. (5) To provide a full study of the effects of climatic occupational accidents on the fishery's sustainable management targets in the emerging and emerged EU13 and EU14 nations between 1990 and 2022. (6) To study the magnitude effects of climatic occupational accidents resulting from the growth of the fisheries industry in emerged and emerging countries between 1990 and 2022.

This research related to sustainable fisheries management in the EU has made significant contributions and novelties in several areas: (1) the author have developed innovative tools like ecosystem models and regression analysis techniques to assess the impact of fisheries activities on climatic occupational accident under the sustainable management strategies; (2) this research has focused on understanding the social and economic impacts of fisheries management decisions, including on coastal social welfare communities and livelihoods; (3) this research addressing collaboration between various disciplines, including ecology, economics, sociology, and policy studies, also, allows for a more comprehensive understanding of complex issues and the development of innovative solutions; (4) unlike traditional regression methods that focus on the average relationship between variables, MMQR allows this research to examine the entire conditional distribution of the dependent variable, this means we can analyze how relationships change across different quantiles, from the lowest to the highest; (5) the applied MMQR can accommodate heteroskedasticity, meaning that the variability of the dependent variable can differ across different levels of the independent variables, this is important in fisheries, where factors like species, location, and time can influence the variability of outcomes.

Unlike most earlier studies, which mainly concentrated on the fishing industry, this research examines the many consequences of aquatic resource usage on the ocean ecosystem and bioeconomic growth. Furthermore, we examine how rising fisheries yields affect individual economic growth and death rates in EU seas. Unlike most studies, this study examines the correlation between the growing production of fisheries, marine risks, and the development of economies using panel and static regressions. This study mainly works on the linkage between fisheries production, climatic occupational accidents, government, and economic growth in the EU seas between 1990 and 2022. These are the possible improvements this work may bring about. More importantly, the studies examine the many effects on the marine ecosystem and development on the economies of the EU27, as well as the fisheries sub-sector. For studies, this research has categorized the EU27 nations into two sub-regions. The first category comprises the 14 developed nations, and the second category is made up of the 13 developing nations. Furthermore, due to the constant nature of the data, the study employed statistical tests such as the test of co-integration and the unit root test, as the study period, which spans from the years 1990 to 2022, tends to change randomly with drift. This research also studies the links between fisheries output, death rates, government, and economic growth using the MMQR method. (MMQR). Additionally, we do panel regression and static studies on the factors affecting marine risks and deaths. Lastly, we predict the effects of changes in fisheries production growth on marine risks, accidents, and sustainability.

2. DATA AND METHODOLOGY

Based on previous Utilitarianism books by Posner[10] and Broome,[11] utilitarianism, a philosophical theory that emphasizes maximizing overall happiness or well-being, has had a significant influence on economic thought. At the same time, Utilitarianism introduced the theory of utility, which signifies the gratification or desire received as a result of the consumption of goods and services. Economists use utility functions to model individual preferences and choices. In economics, it has influenced various theories and policies, often focusing on maximizing societal welfare. Here are the utilitarian economic hypotheses.

H1: Climatic occupational accidents in the fisheries industry do not maximize societal welfare

H2: Climatic occupational accidents in fisheries activities do not maximize well-being

Utilitarianism is a consequentialist ethical theory that is centered on the maximization of general pleasure or comfort. This theory proposes that ethically correct deeds should be those that yield the maximum benefit aimed at the greatest number of the general public. This research relied on the econometric model propounded by Apergis and Payne,[12] Dogan and Seker,[13] Ehigiamusoe et al.,[14] and Anwar et al.[15] through their latest studies, which are expressed as follows:

$$\mathrm{OI}_{\mathrm{it}} = \mathrm{f}\left(\mathrm{FP}_{\mathrm{it}}, \mathrm{FF}_{\mathrm{it}}, \mathrm{GDP}_{\mathrm{it}}, \mathrm{GR}_{\mathrm{it}}\right)$$

The abbreviations OI and FP stand for climatic occupational accident and fisheries production, respectively. In more detail, the fisheries production growth (FP) is the total catch measured in metric tons, and the Climatic occupational accident (OI) indicates the frequency of collisions and navigational hazards, death, and injury incidents. The numbers for these criteria were provided by the World Development Indicator. Gross domestic product (GDP), a measure of economic growth expressed in constant US dollars, is available on the website of the European Commission. One indicator of the number of fossil fuels utilized is the amount of petrol used in metric tons of oil equivalent, which is available in the European Commission database (FF). Governance (GR), a metric used to assess government effectiveness, was collected via the primary European data stream. In governance variables, the social determinants of occupational risks refer to the social, economic, and structural factors that shape individuals' exposure to workplace hazards and their capacity to mitigate risks. Governance refers to (1) Policy and institutional factors, regulatory frameworks, resource allocation biases (e.g., quota systems in fisheries), and exclusion from decision-making. (2) Community and social support, access to healthcare, social safety nets, and collective advocacy mechanisms. The economies of the European Union from 1990 to 2022 are

Table 1. Data, Units, Transformation, and Source.

Data	Measurement Unit	Variable	Source
Climatic occupational accident	Injury Rate due to Climate Change	Death and injury from Agriculture, Fishery, and Forestry	WDI
Fisheries Production	metric tons	Fisheries and aquaculture production	WDI
Fossil Fuel and air pollution	metric tons of oil equivalent	Energy consumption in vessel activities	Eurostat
Economic Growth	constant US dollars	GDP of (Agriculture, Fishery, Forestry)	Eurostat
Governance	% of confidence in governance	Confidence for governance in agriculture, fishery, forestry	Europa

Table 2. Results of Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
OI	864	2.125	1.189	1.792	2.642
FP	864	4.926	0.825	3.211	6.310
GDP	864	4.378	0.395	3.129	5.253
FF	864	2.752	0.761	0.145	4.600
GR	864	1.868	0.070	1.482	1.979

Source: Author's calculation

the subject of the data utilized in this analysis. All information is deemed accurate for every individual. Our study's objective was accomplished by gathering annual data for the participating nations from the World Bank's World Development Indicators database (WDI), the European Commission's Eurostat database, and the official European statistics website (Europa) between 1990 and 2022. Table 1 provides the data, references, measuring units, sources, and other modifications.

2.1. SUMMARY STATISTICS

We go over the findings in this section. To begin, Table 2 displays the statistical characteristics of the selected parts. (that is, the maximum, lowest, the mean, and the standard deviation). OI, FP, GDP, FF, and GR have relative mean values of 2.125, 4.926, 4.378, 2.752, and 1,868, respectively. For every component of the research, the best standard deviation is 1.189, 0.825, 0.395, 0.761, and 0.070, in that order. The precise properties of the factors allow us to go on to the unit root test.

2.2. PANEL ESTIMATION TECHNIQUES:

For comparison, we choose Fixed Effects Ordinary Least Squares (FEOLS), Dynamic Ordinary Least Squares (DOLS), and Fully Modified Ordinary Least Squares (FMOLS). The FEOLS approach incorporates Driscoll and Kraay standard errors, which are resilient against typical forms of cross-sectional dependencies and correlations over a certain duration. Finding dynamic cointegrated panels is a concern mostly because of heterogeneity issues with variations in cross-sectional means and cross-sectional adjustment to the cointegrating equilibrium, according to Pedroni[16] and Cerrato & Sarantis.[17] To get around these problems, Pedroni's FMOLS model includes individual-specific intercepts and enables various participant error process components to be serially validated. The DOLS estimate outperformed the FMOLS and FEOLS estimators in small sample sizes, according to results from Monte Carlo simulations.[18]

As a result, Kao and Chiang[19] extended the DOLS estimate to panel data sets. Since the DOLS estimator takes endogeneity into account, it lessens endogenous response by increasing lead and lag differences. Because of the limitations of earlier modeling techniques, a panel quantile regression methodology was used to assess the distributional and diverse effects across quantiles.[20] Koenker and Bassett's groundbreaking paper from 1978 introduced the panel quantile regression technique (Koenker and Bassett Jr, 1978). Quantile regressions are normally employed to assess the conditional median or a variety of different quantiles of the response variables, as opposed to regular least-squares variant regressions, which churn out yield computations of the conditional mean of the endogenous variable subject to specific values of the exogenous variables.

Quantile scale regressions are more resistant to mistakes in the outcome. Additionally, it functions best when there is little to no correlation between the two variables' conditional means.[21] However, the Moments Quantile Regression (MMQR) with fixed effects method developed by Machado and Silva[22] was used in this investigation. A quantile regression does not account for any potential unidentified variance among group members and is robust against outliers. The MMQR technique makes it feasible to ascertain the conditional heterogeneous covariance effects of the sources of marine rubbish since it permits individual impacts to influence the whole distribution rather than

only shifting means, as in the situations of Koenker[23] and Canay,[24] among others. The MMQR estimating approach works extremely well when the panel data model is associated with personal goods and incorporates internal explanatory variables. Furthermore, by delivering non-crossing values, the MMQR approach simplifies the interpretation of the regression quantiles. The conditional quantiles QY(τ|X) for a location-scale version model are computed as follows:

$$Y_{it} = \alpha_{i+} X_{it}'\dot{\beta} + \left(\delta_i + Z_{it}\dot{\gamma}'\right) U_{it} \quad (1)$$

Where $P\left(\delta_i + Z_{it}\hat{\gamma} > 0\right) = 1$. $(\alpha, \dot{\beta}, \delta, \dot{\gamma})$ are the values that need to be approximated, Z is a k-vector of identified components of X that are differentiable changes with element *l* provided by: *(α_i, δ_i),i = 1,..., n,* denotes the individual i fixed effects.

$$Z_l = Z_l(X), l = 1, \ldots, k \quad (2)$$

For any given i, X_{it} is independently distributed, identifiable, and independent across time (t). It is normalized to meet the Machado and Silva[22] moment criteria, which do not need strict homogeneity among other things. Additionally, it is distributed independently and identically across people (i) and throughout time (t), and U_{it} is orthogonal to X_{it}. Equation (1) suggests the following;

$$Q_Y\left(\tau \mid X_{it}\right) = \left(\alpha_i + \delta_i q(\tau)\right) + X_{it}'\beta + Zit\acute{\gamma} q(\tau) \quad (3)$$

The vector of independent variables $X_{it}^{/}$ in the present research is composed of the natural logarithm of FI (LFI), the logarithm in a natural state of economic growth, abbreviated as LGDP, the natural logarithm of fossil fuel production (LFF), and the natural logarithm of governance (LGR). The quantile-fixed effect for each i is represented by the scalar coefficient $X_{it} - \alpha_i(\tau) \equiv \alpha_{i+}\delta_i q(\tau)$. The position of the independent variable determines the quantile distribution of the dependent variable Yit, which is the natural logarithm of MW marine waste, represented by $Q_Y(\tau|X_{it})$. In contrast to the typical least-squares fixed effects, the intercept for the particular product stays unaltered. The variations in their outcomes may be seen across the quantiles of the endogenous variable Y's conditional distribution. These parts are not time-dependent. The sample quantile at τ-th is shown by *Y. q(τ)*. It might be obtained by fixing the following optimization problem:

$$min_q \sum_i \sum_t P_\tau \left(R_{it} - \left(\delta_i + Z_{it}\hat{Y}\right) q\right) \quad (4)$$

Where $\mathrm{P}_\tau(\mathrm{A}) = (\tau - 1)\mathrm{AI}\{\mathrm{A} \leq 0\} + \mathrm{TAI}\{\mathrm{A} > 0\}$ denotes the check function.

3. RESULTS AND DISCUSSION

3.1. CROSS-SECTIONAL DEPENDENCE AND UNIT ROOT TESTS

A few common statistical tests were conducted to assess the nature of the data components prior to evaluating the unidentified factors. Initially, the studies checked for the existence of cross-sectional dependency (CD) among the variables. Coefficient predictions may contain real parameter values that are impacted by cross-sectional dependency. When the cross-sectional dependency of variables is neglected, reliance on unknown standard variables, gains in panel data efficiency might be severely curtailed. Phillips and Sul.[25] Thus, more investigation is required to get accurate coefficient values. The study employed the Pesaran.[26] Cross-sectional Dependency (CD) test to estimate cross-sectional dependence among the stated variables. The results from Table 3 below confirm the existence of cross-sectional dependency among the various countries, except for fish production. For the likelihood of error to reduce greatly, the study used a method of cointegration and unit root tests together with a time series panel data estimator, which is resistant to the challenges of non-cross-sectional dependency.[27,28]

For the study to accurately evaluate the integral characteristics of the key variables, this research employed Im, Pesaran, and Shin[29] (IPS) and Levin, Lin, and Chu[30] (LLC) for the assessment of the unit root. Panel unit root testing combines cross-sectional and time-series data to improve test efficiency. To evaluate the unit root null hypothesis alongside alternative hypotheses, some panel unit root tests were generated. Levin, Lin, and Chu's[30] investigation revealed that the homogeneous alternative upholds that all panel series are constant and have the equivalent ratio of return, which is a sharp contradiction to the unit root null hypothesis. Im, Pesaran, and Shin's[29] test result showed that the alternative hypothesis in all series in the panel could not be non-stationary as compared to the null hypothesis. This paper presents a novel test that highlights the stationarity of the panel, hence unavoidably bringing up the LLC architecture. For the Im-Pesaran-Shin (IPS) (2003) test panel, this statement is loosened, allowing every participant to possess an individual autoregressive parameter. The effectiveness of Levin, Lin, and Chu[30] (LLC) offers for small sample sizes as compared to other unit root test estimators makes it suitable for this research. To ascertain the effect that (CD) testing has on the testing unit root, the study used these two tests. All of the unit root test needs variables, as Table 4 demonstrates, to be stationary at beginning differences but non-stationary at levels. Order one, I (1), includes all of the variables in the estimate.

3.2. PANEL COINTEGRATION TEST:

From Table 5 below, the study demonstrated the results of the Pedroni[16] panel cointegration as well as the Westerluns[31] Bootstrapped panel cointegration tests in order to establish if there is a long-run correlation amongst the stated variables. Drawing inspiration from the ideas of Granger and Engle's two-step approach, Pedroni[16] proposed a comprehensive technique for the analysis of panel cointegration. By eliminating those variables in the short run as well as determining forms of individual specificity in the initial development stage, Pedroni's[16] technique accounts for heterogeneity. Pedroni[16] uses the expected residuals to provide seven different test statistics. These tests in Table 5 may be classified as either "grouped" or "between-dimension" tests, or as individual procedure assumption tests (also known as "pooled" or "within-dimension" tests). Going by the methodology developed by Westerluns,[31] the null hypothesis was tested four times

Table 3. Cross-Sectional Dependence Results

Variables	OI	FP	GDP	FF	GR
Pesaran[26]	(97.71)***	(18.82)***	(83.55)***	(65.35)***	(31.30)***

Remark: *** refer importance at the 1%, scale.
Source: Author calculations

Table 4. Panel Unit Root Test Results

Variable	Difference		First Difference	
	LLC	IPS	LLC	IPS
OI	2.99	10.559	-8.170***	-13.160***
FP	-3.076	-3.700	-24.136***	-22.737***
GDP	-1.571	-0.210	-18.74***	-68.362***
FF	-9.255	-4.970	-20.610***	-21.409***
GR	-1.090	-0.254	-23.471***	-23.479***

Remark: *** refer importance at the 1%, scale.
Levin, Lin & Chu test (LLC), and Im, Pesaran, and Shin W-stat test (IPS).
Source: Author calculations

(cointegration not present). Due to the changing aspect observed being both fundamental and in the residual state, the test does away with the conventional factor restrictions that were applied to tests based on residual dynamics. The failure of shared factor restrictions could significantly hamper the effectiveness of residual-based cointegration investigations. That's why structural dynamics are needed.[32]

This restriction has been eliminated; therefore, it is no longer required that the changes made in the long- and short-run modification procedures be equal. As a result of using Westerluns'[31] bootstrap method, we may get durable crucial values while mitigating the falsification consequences of cross-sectional reliance. Table 5 shows that testing cointegration bootstrapped, credited to Westerluns,[31] and Pedroni's[16] testing evaluation both provide strong evidence for cointegration.

3.3. FINDINGS FROM THE PANEL ESTIMATE

Table 6 below demonstrates the results of the DOLS, FMOLS, and FEOLS approximations. Nevertheless, there are distinctions in terms of their mathematical importance. In Table 6, the coefficient values derived from the estimators for the first model are quite comparable, albeit their statistical significance varies. As expected, there is a statistically significant correlation between the rise in fisheries production and the incidence of climatic occupational accidents among EU member countries. However, the coefficients associated with this correlation appear to be inconsistent with cross-sectional specifications regarding DOLS, increasing climatic occupational accidents by 0.041% to 0.048% in proportion to the rise in fish production, concerning the FEOLS and FMOLS estimations. This assertion is supported by the primary findings of Shan,[33] Thorvaldsen et al.,[1] Barrow et al.,[2] and Guillot-Wright et al.[5] Fishers involved in Illegal, Unreported, and Unregulated (IUU) fishing activities, such as overfishing, fishing in protected areas, or using illegal gear, violate ethical and legal norms. This undermines sustainable fisheries and harms marine ecosystems.

The use of hydrocarbons as a source of fuel is the most constant of the three components in the EU region, concerning numerical importance and the magnitude of the coefficient. Hence, an increase in climatic occupational accidents by 0.118% (FEOLS), 0.116% (FMOLS), and 0.290%(DOLS) estimations will be occasioned by a 1% increase in fossil fuel consumption by fisheries vessels. These findings align with prior studies by Arafat et al.,[34] Balsalobre-Lorente et al.,[35] Bekun et al.,[36] Trowbridge et al.,[37] and Perera and Nadeau.[38] Increased fuel costs directly cut into the profitability of fishing operations. This can make it harder for fishermen to cover their expenses, including labor, maintenance, and loan repayments. Rising fuel costs can put economic pressure on fisheries, potentially leading to unsustainable practices like overfishing to maintain profitability.

On the other hand, all tiers of accident occurrences in the EU region are severely impacted negatively by economic growth. A 1% rise in economic growth will be possible by a 0.16%, 0.18%, and 0.08% decrease for the FEOLS, FMOLS, and DOLS estimations. Regarding the cluster of states that produce fisheries products, this lends credence to the growth argument. This investigation replicates a major finding by Pega et al.,[39] Woolley et al.,[40] and Bellerose et al.,[41] which assumed a correlation between fisheries climatic occupational accident and outgrowth of economies, as ethical practices in fisheries could generate a significant influence on the long-term sustainable development and economic viability of the sector.

The governance indicator in the EU region is another variable that was discovered to have a negative influence and is significant in the estimation of climatic occupational accidents. According to the FEOLS and FMOLS estimation methods, a 1% increase in governance will lead to a 0.22%

Table 5A. Panel Cointegration Test is EU countries. Pedroni Residual Cointegration Test

Test	Without Trend	With Trend
Alternative hypothesis: common AR coefficients (within dimension):		
Panel v-Statistic	19.354 (0.000)***	25.170 (0.000)***
Panel rho-Statistic	-0.227 (0.589)	-1.078 (0.859)
Panel PP-Statistic	−7.456*** (0.000)	-6.284*** (0.000)
Panel ADF-Statistic	-7.784*** (0.000)	-6.637*** (0.000)
Alternative hypothesis: common AR coefficients (between dimensions)		
Group rho-Statistic	2.840	0.997
Group PP-Statistic	−8.585***	(0.000)
Group ADF-Statistic	−8.287***	(0.000)

Remark: ***, ** and * refer importance at the 1%, 5%, and 10% scales respectively.
Values in parentheses are *p*-values.

Table 5B. Panel Cointegration Test is EU countries. Westerlund (2007) Bootstrap Panel Cointegration

Statistics	Value	Z-Value	p-value	Robust p-value
Gt	-3.159	-1.722	0.043	0.000**
Ga	-12.211	-3.154	0.999	0.000
Pt	-15.918	-2.016	0.022	0.000**
Pa	-11.729	-1.328	0.908	0.000

Remark: ***, ** and * refer importance at the 1%, 5%, and 10% scales respectively.

and 0.04% decrease in fisheries climatic occupational accidents. There is solid statistical backing for the growth assumption in the FMOLS and FEOLS specifications, but very little statistical evidence for the DOLS guess specification. This harmonized with previous research such as Leite & Weidmann,[42] Mehlum et al.[43]; Kickbusch and Liu,[44] Lanford et al.,[45] and Such et al.,[46] which demonstrated fisheries, as an industry spanning from small-scale artisanal fisheries to large-scale commercial operations, is a complex and vital sector with significant ethical and governance dimensions.

Findings of the panel quantile regression, which indicate a substantial relationship between the expansion of the fisheries sector and the number of occupational mortalities at the third, fourth, fifth, eighth, and ninth quantiles, but not at the first and second quantiles, are presented in Table 7. This indicates that in nations with low quantile scores, fisheries production outgrowth should take precedence over safety and quality standards. Furthermore, countries below the median at lower development phases in terms of quality and safety standards may need assistance in enhancing the safety and quality criteria for the fisheries industry, owing to the associated investment expenses.

Furthermore, the impacts of using fossil fuels are positively and highly correlated with climatic occupational accidents, except for the sixth, seventh, and eighth quantiles. Nonetheless, the effect of using fossil fuels in fisheries vessels is decreasing with larger quantiles.[47] In the same manner, economic growth has a significant and negative impact on climatic occupational accidents as shown by GDP for the majority of quantiles, although it is not required for the sixth, seventh, and ninth quantiles. This finding implies that legislation about marine environments may promote the growth of economies in countries that record substantial effluent into the environment.

Nonetheless, the governance-based findings demonstrated that its impact on marine hazards is adverse across all quantiles and statistically significant in countries with high levels of fisheries waste (from quantile 1 to quantile 9). This conclusion could be explained by a modernist concept, namely, the flawed relationship between governance and fishery safety standards. This bolsters the arguments put out by Weng and Hirata[48] and Zaratin et al.,[49] who said that the government and its management are compelled by the effectiveness of fisheries regulations to pursue blue growth as well as safety and quality standards in the fisheries industry.

Table 8 displays the findings from the FMOLS, DOLS, and FEOLS estimation processes. Although all these differ in statistical significance, the coefficient estimates developed from the three specifications using Model 2 in Table 8 are, on average, relatively similar. Regarding statistical significance and coefficient size, fisheries output and economic development in the EU14 developed nations are the most stable for all three parameters. According to the FE-OLS, FMOLS, and DOLS estimators, a percentage increase in the fisheries sector reduces the likelihood of climatic occupational accidents by 0.15 percent, 0.14 percent, and

Table 6. Model 1. Panel Estimation for the EU-27 Region from 1990-2022

Long-run coefficient	DOLS		FMOLS		FEOLS	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
FP	0.074	(0.045)	0.041	(0.010)***	0.048	(0.012)***
GDP	-1.081	(0.240)***	-0.189	(0.085)***	-0.160	(0.010)***
FF	0.290	(0.025)***	0.116	(0.071)***	0.118	(0.090)***
GR	-0.842	(0.220)***	-0.085	(0.046)*	-0.072	(0.060)

Note: ***, ** and * indicate significance at the 1%, 5%, and 10% levels respectively.
Values in parentheses are P-values.

0.13 percent, respectively. The main findings of Kim et al.,[3] Siame et al.,[4] and Guillot-Wright et al.[5] agree with this result. Fishers involved in IUU fishing activities, such as overfishing, fishing in protected areas, or using illegal gear, violate ethical and legal norms. This undermines sustainable fisheries and harms marine ecosystems.

Using the FEOLS, FMOLS, and DOLS estimators, respectively, shows a 0.28%, 0.10%, and 0.12% increase in climatic occupational accident for a percentage increase in fossil fuel consumption in fisheries vessels, which is consistent with the expected positive statistically significant relationship between fossil fuel and climatic occupational accident in the EU14 developed countries. These results are consistent with earlier findings by Romanello et al.,[50] Safdar et al.,[47] and Oyedele et al. (2022) showed that government subsidies for vessel fuel consumption can influence fishing practices. If subsidies are tied to fuel consumption or vessel size, they might encourage more overfishing, less sustainable methods of fishing, and lower safety and quality standards that cause climatic occupational accidents and injuries.

Additionally, economic development negatively affects the number of occupational moralities in the EU-14 developed nations. Accordingly, a 1% rise in the growth of the economy will lead to growth of 0.02%, 0.03%, and 0.26% on the FEOLS, FMOLS, and DOLS computations. Regarding the EU14 developed nations, this confirms the model of growth. This result aligned with Văidean and Achim,[51] who revealed economic growth's adverse and rigid impact on climatic occupational accidents. It also presents the grave assumption of previous research, such as Akanni et al.[52] and Badida et al.[53] Economic growth is influenced by a variety of factors, including global market conditions, technological advancements, and government policies. It's difficult to isolate the impact of fisheries' climatic occupational accidents on economic growth.

Correspondingly, governance is perceived to have a negative impact and is prominent in the estimated parameter occupational moralities in the EU14 developed nations. This result deviates from Sheehan et al.,[54] however, supports Zaratin et al.[49] and Weng and Hirata[48] concepts in the utility hypothesis. With regards to the FEOLS and FMOLS computations, a 1% rise in Governance negatively influences occupational moralities events by 0.12% and 0.12%, respectively. The FEOLS and FMOLS specifications provide substantial arithmetically important backing for the utility assumption, but the DOLS estimate requirement provides only marginal arithmetically substantial backing. The fishing industry faces numerous challenges, including overfishing, habitat destruction, climate change, and illegal fishing. However, there are also opportunities for positive change. By embracing ethical principles and effective governance, the fishing industry can become more sustainable, equitable, and environmentally responsible.

The effect of fish production on occupational mortalities is important from the statistical point of view, from the first to fifth quantiles, according to panel quantile regression estimation in Table 9. This result confirms the success of the marine strategy in the EU14 developed countries' fisheries sectors. With the earlier and median quantile lethal climatic occupational accident rates, the data demonstrate the validity of the utility hypothesis in the EU14 developed nations. This demonstrates that in the developed EU-14 nations, fisheries production is not determined by fisheries policy. Furthermore, rising nations in the EU14 may need assistance to enhance their fisheries control standards at an earlier quantile at less developed stage of development in terms of quality and safety standards. The amount of fisheries production had less of an impact on occupational mortalities in the EU-14 nations with the highest quantile levels. The various mining techniques used in the EU-14-member states' fishery industry might be the source of these facts.

GDP is used to quantify the impact of economic growth on occupational mortalities across all quantiles. The first through the ninth quantiles exhibit significant impacts on economic growth. This finding bolsters the need for fishery-sustainable management strategies for promoting blue growth in countries with a higher level of environmental degradation. It indicates that norms for occupational mortalities are subordinated to economic growth in the EU14 developed countries.

Furthermore, in the first, fourth, and seventh quantiles, there is a large and direct relationship between the consumption of hydrocarbons and occupational mortalities, while the effects are negligible at the other quantiles. In a similar vein, the effect of using fossil fuels is diminishing with higher quantiles. Lastly, the governance variable showed a notable impact of occupational mortalities that is adverse and statistically significant in EU14 nations (from the 3rd to 8th quantiles). Nonetheless, for other quantiles (first, second, and ninth), the effect of governance on occupational mortalities is insignificant.

Table 7. Panel Quantile Estimation Results for EU27 countries

Variables	Method of Moments Quantile regression with fixed effects										
	Location	Scale	Quantiles								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FP	(0.012)***	(0.013)***	(0.016)	(0.010)	(0.020)**	(0.020)***	(0.013)*	(0.008)	(0.009)	(0.031)***	(0.040)***
GDP	(-0.010)***	(0.018)*	(-0.240)***	(-0.211)***	(-0.193)***	(-0.180)***	(-0.178)***	(-0.097)	(-0.079)	(-0.073)***	(-0.019)
FF	(0.090)***	(0.066)***	(0.096)***	(0.086)***	(0.084)***	(0.057)***	(0.035)***	(0.018)	(0.003)	(0.012)	(0.032)**
GR	(-0.060)	(0.349)***	(-0.380)***	(-0.575)***	(-0.587)***	(-0.612)***	(0.565)***	(-0.997)**	(-2.143)***	(-2.703)***	(-2.904)***

Notes: *,**, and *** indicate significance at 10%, 5%, and 1% levels, respectively.
Source: Authors' computations

Table 8. Model 2. Panel Estimation for the EU-14 Region from 1990-2022

Long-run coefficient	DOLS		FMOLS		FEOLS	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
FP	0.138	(0.083)*	0.147	(0.051)**	0.155	(0.034)***
GDP	-0. 267	(0.028)***	-0.293	(0.038)***	-0.106	(0.026)***
FF	0.128	(0.052)***	0.106	(0.018)***	0.283	(0.016)***
GR	-0.468	(0.290)	-0.388	(0.180)**	-0.230	(0.123)*

Note: ***, ** and * indicate significance at the 1%, 5%, and 10% levels respectively.
Values in parentheses are P-values.

In Model 3, the results of different panel estimation approaches (i.e., FMOLS, DOLS, and FEOLS) are designated in Table 10. These methods provide almost the same coefficient values. The outcome shows that the fisheries industry positively and significantly influences occupational mortalities in EU13 developing countries. 1% growth in the fisheries industry raises occupational mortalities by 0.04%, 0.15%, and 0.17% in the case of FEOLS, DOLS, and FMOLS, respectively. The positive and significant sign of the coefficients of the fisheries industry in all three methods confirms the presence of the utility hypothesis in EU13 developing countries. This finding coincides with Flaten et al.,[55] Thorvaldsen et al.,[1] and Barrow et al.,[2] who report that at the initial stages of development, occupational mortalities increase as fisheries production increases.

Similarly, fossil fuel usage is directly correlated with climatic occupational accidents in FEOLS and DOLS approaches. As a 1% growth in fossil fuel, upsurges in climatic occupational accidents by 0.08% in the case of FEOLS and 0.11% in the case of DOLS. This outcome is in line with Alsaleh[56]; Alsaleh and Yang,[57] suggesting that the type of vessel and its fuel source can influence working conditions. Older, less efficient vessels might have poorer safety standards. Moreover, exposure to pollutants from fuel combustion or other sources can pose health risks to fishermen.

Furthermore, the results demonstrate that GDP has a negative and considerable impact on climatic occupational accidents in the developing EU13 nations. For both FEOLS and FMOLS, a 1% increase in GDP results in an increase in climatic occupational accidents of 0.21% and 0.07%, respectively. The existence of the utility hypothesis in the developing nations of the EU13 is confirmed by the negative and significant sign of the GDP coefficients in all three techniques. This result agrees with the findings of Woolley et al.,[40] Bellerose et al.,[41] and Alsaleh et al.[58,59] who stated ethical practices may have long-term economic benefits for the industry, but short-term economic gains from unsustainable practices can be tempting for some actors.

The empirical results clarify the negative relationship in EU13 developing countries between governance and climatic occupational accidents. In the case of FMOLS and DOLS, respectively, a 1% improvement in governance is found to reduce deaths and accidents by 0.69% and 0.65%. Earlier research, such as Isham et al.[60] and Alsaleh et al.,[61, 62] showed that fisheries management sustainability should promote social equity, ensuring that the benefits of fishing are shared fairly among different groups, including small-scale fishers, coastal communities, and consumers.

The MMQR outcome is shown in Table 11 as follows; (1) there is a significant variation in the number of climatic occupational accidents related to the fisheries industry for every quantile, as the quantile increases (from the first to the ninth), this fluctuation increases from 0.068 to 0.206; (2) There is a significant and positive association between the usage of fossil fuels and climatic occupational accident across all quantiles, showing the effect of fossil fuels consumption grows from quantile 1 to quantile 9; (3) Governance is negatively correlated with higher quantile of climatic occupational accident from quantile 1 to quantile 9.

The estimates from the FEOLS panel have been confirmed by panel FMOLS and DOLS. The panel FMOLS and DOLS coefficients and the panel FEOLS coefficients have the same sign and level of significance, as can be shown. This proves that panel FMOLS and DOLS data are trustworthy and useful for concluding. With a slightly different significant threshold, the FEOLS coefficients have the same sign as the panel FMOLS and DOLS coefficients. Panel DOLS estimates, however, are trustworthy and free of problems with endogeneity and serial correlation. The relationship between fisheries industry growth and climatic occupational accidents is likely moderated by a country's economic development level. Developed nations may leverage resources to mitigate risks, while developing countries face structural barriers that exacerbate vulnerability. This research framework highlights the need for context-specific policies to balance industry growth with occupational safety in a changing climate. The EU 27 countries were divided into two groups—14 developed and 13 developing—to investigate how the growth of the fisheries industry affected the number of climatic occupational accidents in each country based on the level of economic development structure (developed / developing) of each country. Tables 8 and 9 illustrate the anticipated impact of the EU13 developing nations' expanding fisheries industry on climatic occupational accidents. Tables 10 and 11 illustrate the anticipated impact of the expansion of fish production on climatic occupational accidents in the rising EU14 developed European Union countries.

Evidence from Tables 8 and 10 demonstrates that the frequency of climatic occupational accident of climatic occupational accidents is significantly impacted by the expansion of the fisheries industry. The results also indicate that the EI14 perceives a greater genuine benefit from increased

Table 9. Panel Quantile Estimation Results for EU14 countries

Variables	Method of Moments Quantile regression with fixed effects										
	Location	Scale	Quantiles								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FP	(0.034)***	(0.012)**	(0.024)**	(0.009)	(0.014)	(0.022)***	(0.011)*	(0.007)	(0.005)	(0.010)*	(0.010)
GDP	(-0.026)***	(0.014)**	(-0.333)***	(-0.322)***	(-0.356)***	(-0.371)***	(-0.386)***	(-0.359)***	(-0.343)***	(-0.295)***	(-0.246)***
FF	(0.016)***	(0.049)**	(0.057)***	(0.026)	(0.013)	(0.020)**	(0.004)	(0.005)	(0.018)**	(0.008)	(0.022)
GR	(-0.123)*	(0.253)*	(-0.155)	(-0.211)	(-0.376)**	(-0.445)***	(-0.598)***	(-0.594)***	(-0.574)***	(-0.531)**	(-0.269)

Notes: *,**, and *** indicate significance at 10%, 5%, and 1% levels, respectively.
Source: Authors' computations

Table 10. Model 3. Panel Estimation for the EU-13 Region from 1990-2022

Long-run coefficient	DOLS		FMOLS		FEOLS	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
FP	0.177	(0.044)***	0.157	(0.028)***	0.045	(0.011)***
GDP	-0.011	(0.074)	-0.078	(0.048)***	-0.214	(0.010)***
FF	0.110	(0.029)**	0.016	(0.022)	0.084	(0.009)***
GR	-0.656	(0.1710)**	-0.697	(0.119)***	-0.095	(0.052)

Note: ***, ** and * indicate significance at the 1%, 5%, and 10% levels respectively.
Values in parentheses are P-values.

fisheries than the EU13 in terms of a lower climatic occupational accident rate. For EU14 and EU13 countries, the precise scale of the impact is 0.155 and 0.045, respectively. This demonstrates how, in contrast to EU13 members, EU14 members would be able to significantly reduce unsustainable activities by adhering to quality and safety control requirements in the fisheries industry.

Additionally, from the results above, the EU14 members have a higher climatic occupational accident rate due to their higher usage of fossil fuels than the emerging nations of the EU13 members. Both EU13 members and EU14 members possess a magnitude effect of 0.084 and 0.283, respectively. This specifies that EU14 developed countries are more suited to follow fisheries management sustainability than EU13 developing countries due to their strict sustainable development procedures and standards on fossil fuel usage in the fisheries industry.

Nonetheless, the results likewise show that, compared to the EU13 nations, the EU14 nations perceive a more severe and negative effect from economic development. Regarding the EU14 members and EU13 members, the precise magnitude effects are -0.214 and -0.106, respectively. Therefore, this indicates that efforts in fisheries management sustainability play a significant role in reducing climatic occupational accidents more in EU14 developed nations than in EU13 members.

The data shows that, while it is more obvious in developed EU14 nations than in developing EU13 countries, governance also harms climatic occupational accidents. With regards to the EU14 members and EU13 members, the precise magnitude effects are -0.230 and -0.095, respectively. This shows that developed EU14 nations may minimize climatic occupational accidents significantly more than developing EU13 nations by introducing a regulatory system in fisheries management sustainability. This is a result of the fisheries industry now being free from excessive taxation and loaded with government subsidies due to the high expectations of developed EU14 countries to encourage fisheries management sustainability.

4. CONCLUSION AND POLICY IMPLICATIONS

Analyzing the correlation between fisheries' production, consumption of hydrocarbons (FF), an outgrowth of economies, governance, and climatic occupational accidents, together with the assessment of the utility hypothesis, was the main focus of this research. Hence, it contributes to the literature on sustainable fisheries management with a prime focus on marine resources and marine environmental sustainability concerning the fisheries sector and economic growth. This was achieved through a statistical dataset that spans a time lag of 30 years among the 27 European nations. We used tests such as the panel con integration, test for unit roots, and econometric estimators. As a control for marine risks, Governance was selected as a proxy for % of trust people hold in the government employed in the estimation. Every parameter went through an I treatment process and turned out to be a non-fallacious long-term correlation after the testing for cointegration and unit root assessments. With the related result generated from the different demands, conventional panel cointegration estimation approaches point to dissimilarities in coefficient importance. To attain a very robust result, the study utilized the MMQR technique that can aid in the evaluation of numerous impacts of the extraneous issues beyond several quantiles of the uncertain increase in the loss of human life, tragedies, and the unsustainability of the marine ecosystem. The utility hypothesis for the GDP of the 27 European Union countries with a high level is scientifically supported by the results of the DOLS, FMOLS, and FEOLS estimators.

Compared to EU13 developing nations with lower marine threats, EU14 developed countries' inhabitants emphasize quality and safety standards more. Therefore, as a way for the government to secure the trust and mandate of the electorate, policies and programs that tend to solve climatic occupational accidents will be enacted. Climatic occupational accident quantiles, which are the highest in the EU14 most developed European Union countries' fisheries industry, could likewise be susceptible to numerous challenges, underlining the need for fisheries production at a lower fatality accident quantile. Environmental quality and safety standards should not cause a great of disturbances to people or citizens that domicile in these European countries at quantiles that are of closeness to the middle where production of fish shows a significant positive impact towards accidents and fatalities, and this is why the consequences of environmental hazards can be seen right away. Thus, the voting public and the voters will consider the growth of the economy, centred on the fisheries sector processes, dependent on marine risks.

Resistance to EU27 centralized governance often stems from economic nationalism and structural dependencies, particularly in sectors like energy, agriculture, and fish-

Table 11. Panel Quantile Estimation Results for EU13 countries

Variables	Method of Moments Quantile regression with fixed effects										
	Location	Scale	Quantiles								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FP	(0.011)***	(0.108)***	(0.068)*	(0.145)***	(0.096)***	(0.128)***	(0.191)***	(0.190)***	(0.190)***	(0.205)***	(0.206)***
GDP	(-0.010)***	(-0.096)	(-0.152)	(-0.020)	(-0.181)***	(-0.109)	(-0.035)	(-0.035)	(-0.021)	(-0.037)	(-0.010)
FF	(0.009)***	(0.094)***	(0.094)***	(0.066)***	(0.115)***	(0.119)***	(0.122)***	(0.123)***	(0.125)***	(0.092)**	(0.103)**
GR	(-0.052)	(-1.059)**	(-1.143)***	(-0.639)	(-0.362)***	(-0.485)***	(-0.714)***	(-0.728)***	(-0.708)***	(-0.783)***	(-0.720)***

Notes: *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.
Source: Authors' computations

eries. While the EU27's sustainability goals aim to address pan-European challenges like climate change and biodiversity loss, EU13 member states frequently prioritize short-term economic gains and national sovereignty. This tension underscores the need for flexible, context-specific policies that balance EU27-wide objectives with EU13 local economic realities, such as targeted funding for EU13 countries to phase out coal or reforming the Common Fishery Policy to protect small-scale fishers. Without such adjustments, the EU27's sustainability agenda risks being undermined by persistent national resistance.

Owing to the supremacy of activities associated with the fisheries industry by way of a more significant bad resource management present, the impact of governance effectiveness at the lower quantile of the EU14 members and EU13 members in the EU will not be felt. The fisheries industry's negative and substantial impact in the upper quantiles indicates that fisheries in the EU14 members have been enhanced. An assurance that enhancing the degree of Governance will lessen the environmental danger is provided by the experience of the EU as recorded by Alsaleh et al.,[58,59] Brexit as documented by Such et al.,[46] and the US as reported by Lanford et al.[45] and Alsaleh et al.[61, 62] Consequently, the study supports the strengthening of Governance in countries that produce fish, principally in the EU14 members with serious climatic occupational accident rates and fisheries management sustainable issues. Economic growth exhibited a negative connection with climatic occupational accidents in the first to the fifth quantiles. In contrast, fossil fuel use was positive and significant from the first to the fifth quantiles. This study's results support the progress theory in the frame of an earlier study. The outcomes advocate for several justifications for many quantiles from the perspective of fish-producing countries in the EU27 region.

Fossil fuel consumption has an impact on all productive economic sectors. Hence, it is predicted to correlate positively with climatic occupational accident rates across most quantiles. However, the influence of fisheries production on climatic occupational accidents was shown to be most prominent at the highest and lowest at lowest quantiles. As a result of more significant development and efficiency in the consumption of fossil fuels, it does imply an increase in the production of the fisheries industry from the lowest to the highest quantile through a rise in fuel consumption effectiveness from the lowest to the highest quantile can increase the number of occupational mortalities for every developed unit of energy. It also refers to the influence of EU14 countries that can cover the expense of the transition cost from traditional power to green energy production. It might be expected that the usage of energy in the EU14 members and EU13 members will be received through traditional means since fish production remains much higher than that of climatic occupational accidents. According to this finding, more significant work needs to be done to decrease the number of activities in the fisheries sector powered by traditional energy sources to minimize the number of occupational mortalities in the industry in the EU14 developed countries.

Finally, this research may be further enlarged by adding additional elements such as the leisure industry, globalization, and business development, which similarly influence the fishing industry and environmental degradation within the EU jurisdiction. Moreover, employing innovative and trailblazing econometric procedures, this study could be done by individual countries, for instance, the People's Republic of China, or more regions, like ASEAN, BRICS, the Group of Seven, or the Next 11 countries. This type of procedure undeniably has limitations; this study is therefore not immune to these limitations. Owing to statistical data restrictions, the model could not assess the potential benefits of marine hazard diminution, which currently requires detailed research. Furthermore, centred on the constraints of the current study, the model can be observed in locations in dissimilar countries to grasp a comprehensive and appropriate angle. This research is bedevilled with some constraints, although it employed contemporary econometric models to establish these relationships. The current outcomes, for example, were simply estimated through econometric estimations and solely incorporated a restricted set of elements from 1990 to 2022. Going forward, the study recommends that studies be carried out on the effect of public-private participation in the fisheries sector and ocean energy on the production of fish, employing the current set of data and additional variables. Second, only EU countries can apply the present structure, which can be modified by incorporating numerous other states that emit considerable amounts of pollution. Thirdly, to justify the fundamental disruptions in the data, scholars may equate the economic difficulty of marine pollution through numerous eras.

AUTHORS' CONTRIBUTIONS

Conceptualization: [Mohd Alsaleh]; Methodology: [A.S. Abdul-Rahim]; Formal analysis and investigation: [Tian Xia]; Writing - original draft preparation: [Mohd Alsaleh]; Writing - review and editing: [A.S. Abdul-Rahim]; Resources: [Tian Xia].

COMPETING OF INTEREST

No competing interests were disclosed.

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The authors declare that the manuscript does not report studies involving human participants, human data, or human tissue.

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