Exploring the Compensation Plans Under International Laws from Offshore Oil Facilities and Relationship between Oil Production, Trade and Carbon Emission: An Evidence from Global Economy

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ABSTRACT

The world dependency on oil is not diminishing. This article aims to sift through the liability rules applicable to oil spill accidents from offshore drilling. The discussion will explore the scope of compensation heads in offshore oil accidents e.g., employee deaths, community losses, related economic losses, natural resources damage. To find answers procedural issues such as class-tort claims need broad attention. The civil and criminal charges/ penalty against the responsible parties in oil industry, and possible defense strategies, are also discussed theoretically. Additionally, this article offers some recommendations to re-invent international legal system for better protection of the environment by the offshore oil companies through better preparedness rules, stronger insurance system and efficient liability laws. Besides, this study has also explored the empirical relationship between crude oil production, trade and carbon emission in six different regions. Findings of the study providing the empirical evidence that in different region, production and trade of oil are primarily responsible for the increasing carbon emission in natural atmosphere. Such findings provide a significant evidence for both practical and managerial implications in the coming time. However, study is limited in terms of providing the empirical facts for only three indicators, while the factors like total energy production, energy intensity of GDP, oil products production, natural gas production and LNG production and their association with carbon emission is entirely missing which may address in future studies.

Keywords: Marine Environment, Offshore Oil Company, Compensation, Polluter Pays Principle, Carbon Emission, Oil Production, Oil Trade
JEL Classifications: J38, K33, O24

1. INTRODUCTION

The oil trade for commercial purposes began in mid-1800s, and became more widespread when petroleum and vehicle engines were invented consuming that petrol (Burger, 1997; Kubat et al., 1998). The world's largest oil companies, as well as some small and medium sized enterprises (SMEs), involve in offshore activities (Hansen and Steen, 2015; Iakovleva, 2013; Narcizo et al., 2013). Only very few offshore operators are classified as "majors" in the Gulf of the Mexico (Iledare et al., 1997; Zalik, 2009). In the EU and Norway, a few large companies play a key role in offshore oil activities, while SMEs also control a considerable number of

wells (Faure et al, 2015). But crude oil has special challenge i.e., it is underground as fossil fuel, and needs complicated, technological procedures to fetch it to surface (Hashemi et al., 2014). As a result, many accidents occur and cause environment damage. Various regional economies are getting significant benefits from the oil production and through selling of related products. It is estimated that offshore oil systems produce around 15.4 million barrels of oil per day globally (Mortensen, 2013). In the US, there were 2657 offshore installations in 2013 (Cardwell and French, 2007; Guruswamy, 1998). These installations provide approximately 5% of US domestic natural gas production and about 21% of domestic oil. In EU and Norway, over 90% of the oil and over 60% of the

gas produced comes from offshore operations (Fantazzini et al., 2011; Gary et al., 2007; King, 2012).

Various economies are primarily depending upon the deep-sea exploration like United States of America (USA). However, one of the significant and alarming issue in the natural environment is the production of oil, its trade and the environmental threats in various way (Khoo and Tan, 2006; Kvenvolden and Cooper, 2003). Figure 1 provides the outcomes for the global offshore investment in terms of billion US dollars, during 2010-2025 with annual observations.

2. THE RISK OF OIL POLLUTION AND REGULATIONS

Although the oil pollution occurring from land is more serious, but such effects are still possible to be tackled than oil pollution at sea waters and natural environment as well. This is the reason that better laws are needed to intervene for prevention (Eweje, 2006; Harrison, 2015). Although the oil pollution occurring from land is more serious, but such effects are still possible to be tackled than oil pollution at sea waters and natural environment as well. This is the reason that better laws are needed to intervene for prevention. Compensation in various accidents is important not only because it provides relief to the victims and environmental restoration, but also because it helps giving incentives to operators and stakeholders to prevent these spills while growing their businesses. A balance is needed in all this for the smooth running of the oil exploration and the safety of the environment. The question that deserves attention is how a major offshore-related accident like the Deepwater Horizon spill can be compensated.

The deep-sea oil drilling safety is a challenge because the mechanical pressure becomes unmanageable as the drill goes deeper into the seabed of ultra-deep waters. The risks are mainly two (Humphreys and Thompson, 2014):
a. Insolvency of the companies due to heavy costs of cleaning and removal of effects
b. Lack of just, quick compensation for the victims due to ineffective laws.

The trend has been to adopt some regional agreements to confront the issue. However, most of the regional arrangements deal with problem in a secondary manner and they lack global application. Some international conventions that regulate oil and gas activities are:
1. International Convention on Civil Liability for Oil Pollution Damage, 1969
2. The United Nations Convention on the Law of the Sea 1982 (UNCLOS 1982)
3. The International Convention for the Prevention of Pollution from Ships 1973 Annexure I (MARPOL 73/78)
4. International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC Convention).

Meanwhile some other authors have discussed the core categories of the risk factors (Hammoudeh and Li, 2005; Kamran et al., 2019). The international conventions are limited to shipping industry and ship owners only. For example, the International Convention on Civil Liability for Oil Pollution Damage 1969 (CLC 1969) and the International Convention on the Establishment of International Fund for Compensation for Oil Pollution Damage 1971 (Fund Convention 1971) apply to cruise ships or tankers carrying oil as cargo (Humphreys and Thompson, 2014; Van Hanswyk, 1988; Wilkinson, 1993). These agreements are being used for offshore oil facilities only because offshore drilling units/machines have been artificially categorized as "ships" within the definitions of the CLC 1969 and the Fund 1971. Meanwhile, International Maritime organization has ruled that offshore unit is to be considered "mobile floating unit" like a ship in the sea waters. But actually, some offshore units are fixed too and they cannot be treated as a ship (Kashubsky, 2007) points out that legal provisions for state responsibility under these treaties for the pollution from offshore installations are limited. He is of opinion that only two conventions presently can help holding coastal states liable in relation to offshore marine pollution:
a. United Nation Convention on Law of the Sea 1982
b. International Convention on Oil Pollution, Preparedness, Response and Cooperation 1990.

Kashubsky also argues that these treaties do not set any definite or specific legal standards to be followed and only encourage

Figure 1: Global offshore investments (USD billion)
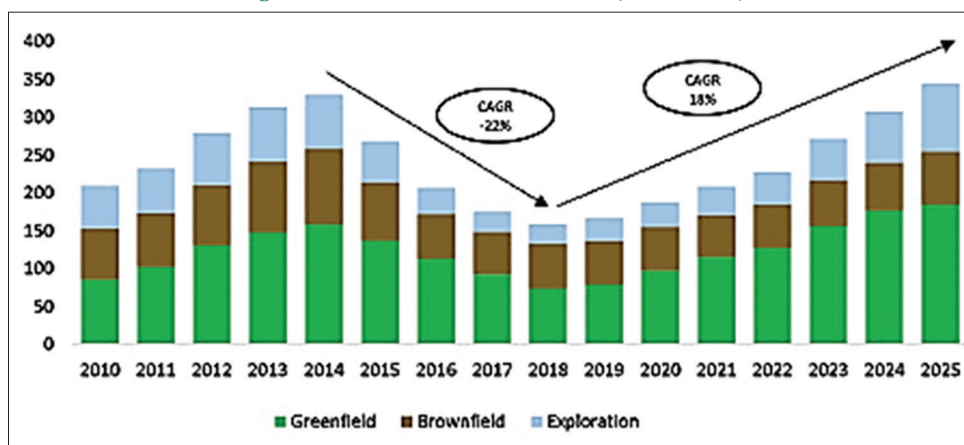
Source: Rystad energy U cube

coastal states to cooperate with each other to develop national laws to tackle oil pollution. In other words, only goodwill and good-faith is the duty, which is not enforceable in legal sense. The process for referring to other countries under international law of flag-state rule (called flag-state referrals) in such oil leak incidents occurring outside US jurisdiction does not appear to be working.

However, regional arrangements not global and are meant for individual seas. As a result, International treaties for oil industry insist to use mainly local or coastal state's domestic legal provisions for rectifying environment damage occurring from offshore technology. Perhaps the reason is that majority of offshore operations take place on the maritime zone of continental shelf which falls within the scope of the national jurisdiction of the coastal States in International law (Wannier and Gerrard, 2013). But domestic laws related to environment problems can be really challenging in providing adequate compensation which prove ineffective.

Analysis of the individual country's national laws on offshore activities again points to same lacuna that these laws were developed only after major accidents. It is like becoming wiser after the accident and a fire-fighting attitude. USA, United Kingdom (UK), Norway Australia, Denmark and Canada have strong offshore oil interests, yet have no specific liability regime for preventing and compensating marine pollution therefrom. UK has no law of its own for offshore oil operation or pollution. It uses Offshore Oil Pollution Liability Association Ltd. (OPOL), which is a private company limited by guarantee and operates under voluntary compensatory scheme. UK Government requires oil companies to first become signatory to OPOL before any license is issued. Under OPOL operating companies agree to accept liability for marine pollution damage and the cost of remedial measures up to a maximum of US $250,000,000 per incident. This is not sufficient in many cases due to extraordinary oil damage to marine environment and the victims are pushed into long court litigation under common law principles of Tort Law which is time consuming and burdensome. In United States has federal law of Oil Pollution Act 1990 (OPA) which is constantly challenged by states. Australia has Australian Offshore Petroleum Act 2006, Norway has Norwegian Petroleum Activities Act, Canada has Canada Oil and Gas Operations Act and there is also Subsoil Act of Denmark.

The financial instruments/tools that are currently used in national corporate sector to cover liability following a major marine oil accident include:
a. Self-insurance by the operators and (re)insurance
b. Risk pooling schemes
c. Fund
d. Various combinations of the above.

It means that most oil companies will not make full compensation due to cap or imposed legal limits after accident, then how can we expect them to take efficient precaution measures for future risks. Economic analysis of law has always guided that if there are strong liability regime for oil companies, they will plan to prevent oil pollution. Many oil companies use "self-insurance" method whereby they use their internal financial resources

for compensations, and if they fall short, there is no payment. Operators use their own balance sheet to guarantee payment in case of a major accident (Faure, 2003). Figure 2 provides an overview about the total energy production in the world economy during 1990-2018 with annual observations.

Offshore oil industry is risky and complex activity and the operating company holds the information required to evaluate the costs of accidents and prevention. If such companies are held liable for damages on a strict liability basis, they will have economic incentive to take cost-efficient precautionary steps. Strict liability also motivates operating companies to undertake optimal levels of precautions. Judge Carl J. Barbier of the District Court of United states for the Eastern District of Louisiana in the Deep water Horizon trial noted:

> *"A greater degree of care is required when the circumstances present a greater apparent risk."*
> (Shilliday et al., 2006) comments on use of strict liability:

> *"The rationale for strict liability is that it shifts the loss from the innocent to the responsible State which, in view of its "presumed knowledge" of the hazard created, is considered to be in a better position to decide whether or not the benefits of the activity are likely to outweigh its potential costs and provides a powerful incentive for the prevention of accidents."*

However, the critics say that strict liability rule simplifies matters for the claimants without any burden of proof and shifts all blame to the offshore operators, who are presumed guilty from the start. Result was setting up of another Trust management to settle claims of disgruntled claimants and yet again the trustees could not disburse costs until approved by the administrator or as directed by BP.

E.g., under Norwegian Law "Channeling of Liability" is made very difficult against a licensee company unless the direct fault is established. In USA, Oil pollution Act (OPA 90) Sec. 6.5 lays the responsibility of offshore oil pollution directly on the license holder company. In UK under OPOL "operator" is the responsible party, definition of which is:

> "*A Person which by agreement with other Persons has been authorized to manage, conduct, and control the operation of an Offshore Facility, subject to the terms and conditions of said agreement, or which manages, conducts and controls the operation of an Offshore Facility in which only it has an interest*"

It is necessary that the treaties should require number of policy tools to mitigate problems e.g., compulsory insurance, vicarious liability rule for fixing liability on all facilitators, minimum asset-retention requirements, special taxation and adding some criminal liability. This is not new because criminal liability along with financial one has been incorporated into both US and European legal regimes. To minimize the risk of judgment-proof parties international treaties should apply a stronger obligation of retaining minimum assets by oil companies along with compulsory liability insurance and added vicarious liability for parties who have some

Figure 2: Total energy production through oil and gas (Mtoe)
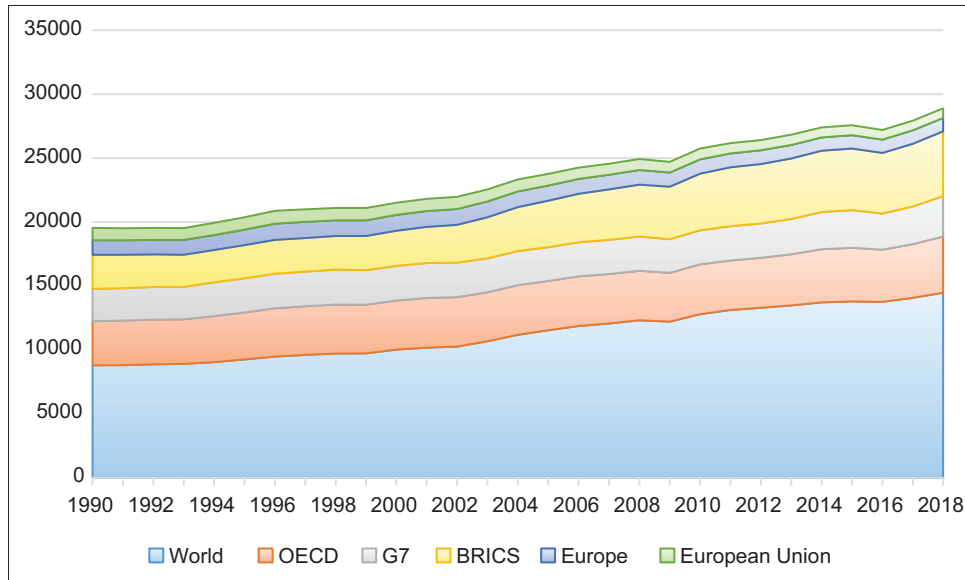
Source: Enter data (2018)

control over the polluter's behavior (i.e., lenders). Practical hitches may prevent the implementation of all these tools, additional policies should be explored to address the problem during the time of diminishing oil company value, like requiring operating companies to deposit part of their profits into a compensation fund and encouraging small companies to merge and create a body with greater overall asset.

With this legal diversity in court rulings and companies taking advantage of it, there is need to let claimants find an international system that offers claimants one system of better services, and better compensation. Compulsory risk pooling schemes under the international treaties may be more effective for settling claims fast because they are based on law of strict liability.

3. DATA AND RESEARCH METHODS

This study has considered six major regions in the world economy to explore the relationship between oil trade, oil production and various proxies of carbon emission. For this purpose, Arab World, United Arab Emirates (UAE), USA, UK, South Asia, and Euro Area were observed during 1990-2018 with annual data. For the analysis purpose, this study has applied various regression equations to explore the relationship between explanatory and outcome variables of the study. Followings are the regression equations for each of the selected region which are tested in the later section.

3.1. Exploring the Relationship between World Oil Production (WPO) and Carbon Emission in Arab World, UAE USA, UK, South Asia, and Euro Area

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (metric tons per capita)}) + e \tag{1}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from liquid fuel consumption (\% of total))} + e \tag{2}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from liquid fuel consumption (kt))} + e \tag{3}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (kt))} + e \tag{4}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (kg per 2010 US\$ of GDP))} + e \tag{5}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from gaseous fuel consumption (\% of total))} + e \tag{6}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from gaseous fuel consumption (kt))} + e \tag{7}$$

$$Y(WPO) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ intensity (kg per kg of oil equivalent energy use))} + e \tag{8}$$

3.2. Exploring the Relationship between Crude Oil Balance of Trade (COBT) and Carbon Emission in Arab world, UAE USA, UK, South Asia, and Euro Area

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (metric tons per capita))} + e \tag{9}$$

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from liquid fuel consumption (\% of total))} + e \tag{10}$$

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from liquid fuel consumption (kt))} + e \tag{11}$$

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (kt))} + e \tag{12}$$

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions (kg per 2010 US\$ of GDP))} + e \tag{13}$$

$$Y(COBT) = \beta 0 + \beta 1 \text{ (CO}_2 \text{ emissions from gaseous fuel consumption (\% of total))} + e \tag{14}$$

$$Y\ (COBT) = \beta 0 + \beta 1\ (CO_2 \text{ emissions from gaseous fuel consumption (kt)}) + e \quad (15)$$

$$Y\ (COBT) = \beta 0 + \beta 1\ (CO_2 \text{ intensity (kg per kg of oil equivalent energy use)}) + e \quad (16)$$

4. ANALYSIS AND DISCUSSION: OIL PRODUCTION, TRADE AND CARBON EMISSION

To deeply understand the relationship between oil production and its international trade and their effect on carbon emission, present section provides empirical findings. For regional implications, this study has focused on the Arab World, UAE, UK, USA, South Asia and Euro Area and findings are presented in a comprehensive way. Table 1 below provides the findings for the effect of WPO on different proxies of CO_2 emission in Arab World during 1990-2018 with annual observations. For the empirical findings, eight regression models were generated while using the STATA-14 version. It is found that for CO_2 emission per metric ton (Model 1), indicates a significant and direct influence. It means that the emission in CO_2 emissions (metric tons per capita) has been increased over the last 29 years because of the production of oil in the world economy. For Model 2, CO_2 emissions from liquid fuel consumption (% of total) is observed over the same period of study which is found to be negatively and significant determined by WPO. However, for the remaining six dimensions of CO_2 emission (CO_2 emissions from liquid fuel consumption (kt), CO_2 emissions (kt), CO_2 emissions (kg per 2010 US\$ of GDP), CO_2 emissions from gaseous fuel consumption (% of total), CO_2 emissions from gaseous fuel consumption (kt), CO_2 intensity (kg per kg of oil equivalent energy use) have shown a direct influence from WPO. This fact implies that more the production of oil in the world economy, increasing the emission of CO_2 in the Arab world and vice versa.

Table 2 provides the findings for the effect of WPO on CO_2 emission in UAE over 1990-2018. It is observed that the effect of WPO on eight proxies is significantly positive, except for Model 1.

It shows that production of oil in the world economy over the last 29 years is also vulnerable to natural environment, specifically in the region of UAE. Although the effect under Model 1 is negative but it is found to be insignificant, explaining the fact that there is no effect of WPO on CO_2 emission in terms of per metric ton. As per the model explanatory power, Model 1 indicates a lowest variation, comparatively to all of the findings, whereas Model 7 shows the highest explained variation of 86.1 in CO_2 emissions from gaseous fuel consumption (kt) through WPO.

Table 3 provides the regression output for the effect of WPO on CO_2 emission in UK over the period of study. It is observed that CO_2 emissions (metric tons per capita), CO_2 emissions from liquid fuel consumption (kt), CO_2 emissions (kt), CO_2 emissions (kg per 2010 US\$ of GDP), and CO_2 intensity (kg per kg of oil equivalent energy use) have shown a highly significant and negative influence from WPO. It means that the economy of UK is showing a good trend with lower effect of WPO against CO_2 emission under different dimensions. However, the effect of WPO under Model 6 and 7 indicates a directly significant influence on CO_2 emission in terms of CO_2 emissions from gaseous fuel consumption (% of total), and CO_2 emissions from gaseous fuel consumption (kt) respectively.

Table 4 provides the findings for the USA. It is found that for the CO_2 emissions (metric tons per capita), CO_2 emissions from liquid fuel consumption (% of total), and CO_2 intensity (kg per kg of oil equivalent energy use) are showing their indirect effect through WPO over the period of study. Whereas, rest of the indicators have provided the fact that WPO is directly impacting the CO_2 emission in the region of USA during 1990-2018. It means that out of eight proxies, six have shown a serious threat for the environment with higher emission because of world production of oil.

Table 5 provides the findings for the effect of WPO on CO_2 emission in South Asia over 1990-2018. It is observed that the effect of WPO on eight proxies is significantly positive, except for Model 5. It shows that production of oil in the world economy is showing its direct influence in the region of South Asia. Although the effect under Model 5 is negative, but all other

Table 1: Effect of WPO on CO$_2$ Emission in Arab World

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	0.000322***	−0.0102***	113.1***	253.9***	9.26e-06**	0.000703***	92.94***	2.25e-05*
	(1.67e-05)	(0.00148)	(3.997)	(10.49)	(4.40e-06)	(0.000121)	(2.449)	(1.26e-05)
Constant	0.411**	66.84***	−562,463***	−1.531e+06***	0.667***	27.13***	−569,874***	3.086***
	(0.191)	(1.692)	(45,695)	(119,864)	(0.0503)	(1.384)	(27,991)	(0.144)
Observations	29	29	29	29	29	29	29	29
R-squared	0.832	0.639	0.667	0.556	0.141	0.556	0.482	0.105

WPO: World oil production

Table 2: Effect of WPO on CO$_2$ emission in UAE

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	−0.000216	0.00662**	21.07***	40.57***	5.66e-05***	0.00670**	16.38***	0.000243***
	(0.000618)	(0.00279)	(4.817)	(3.819)	(1.09e-05)	(0.00259)	(1.265)	(6.55e-05)
Constant	28.65***	−44.93	−190,399***	−320,395***	−0.117	139.1***	−104,399***	0.0647
	(7.069)	(31.85)	(55,061)	(43,655)	(0.125)	(29.63)	(14,465)	(0.748)
Observations	29	29	29	29	29	29	29	29
R-squared	0.005	0.173	0.415	0.807	0.499	0.198	0.861	0.338

WPO: World oil production

proxies are showing their direct influence from WPO. As per the model explanatory power, Model 4 indicates a highest variation, comparatively to all of the findings, whereas Model 2 shows a lowest explained variation of 50.4 in CO_2 emissions from liquid fuel consumption (% of total) through WPO.

Table 6 provides the regression output for the effect of WPO on CO_2 emission in Euro Area over the period of study. It is observed that CO_2 emissions (metric tons per capita) under Model 1, CO_2 emissions from liquid fuel consumption (kt) under Model 2, CO_2 emissions from liquid fuel consumption (kt) under Model 3, CO_2 emissions (kt) under Model 4, and CO_2 emissions (kg per 2010 US$ of GDP) under Model 5 have shown their indirect influence from WPO. It shows that Euro Area has significantly lowers the increasing emission through CO_2 as defined by WPO. However, the effect of WPO under Model 6-8 indicate a direct influence of WPO on last three proxies of carbon emission.

Table 7 provides the findings for effect of COBT on various proxies of carbon emission in Arab World. It is observed that only for CO_2

emissions (kg per 2010 US$ of GDP) under Model 5 indicates a significant and negative influence from COBT. It shows that in Arab World, COBT shown an adverse effect on fifth proxies of carbon emission. Additionally, all the other proxies have shown their insignificant relationship with COBT.

Table 8 shows the findings for the relationship between COBT and carbon emission indicators in UAE. It is found that CO_2 emissions (metric tons per capita) is negatively and significantly determined by COBT. While Model 7 or CO_2 emissions from gaseous fuel consumption (kt) shows a direct and significant influence from COBT. It means that more carbon emission from gaseous fuel consumption is directly effected by COBT. However, rest of the indicators have shown their insignificant influence from COBT. As per the explanatory power, Model 7 indicates a highest variation of 20.7 in carbon emission from gaseous fuel consumption (kt).

Table 9 provides the regression output for the effect of COBT on CO_2 emission in UK. It is observed that CO_2 emissions (metric tons per capita) under Model 1, CO_2 emissions from liquid fuel

Table 3: Effect of WPO on CO_2 emission in UK

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	−0.000468***	−0.000177	−7.390***	−17.59***	−3.51e-05***	0.00304***	11.05***	−5.36e-05***
	(4.05e-05)	(0.000122)	(0.683)	(2.195)	(1.61e-06)	(0.000452)	(2.847)	(9.47e-06)
Constant	14.18***	38.21***	274,735***	727,056***	0.664***	−3.767	35,441	3.113***
	(0.463)	(1.390)	(7,809)	(25,088)	(0.0184)	(5.165)	(32,545)	(0.108)
Observations	29	29	29	29	29	29	29	29
R-squared	0.832	0.073	0.813	0.704	0.946	0.627	0.358	0.543

WPO: World oil production

Table 4: Effect of WPO on CO_2 emission in USA

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	−0.000429***	−0.000418***	26.61*	113.7***	4.21e-05***	0.000837***	66.60***	−2.15e-05***
	(8.41e-05)	(0.000126)	(13.02)	(28.88)	(1.20e-06)	(0.000167)	(7.435)	(2.86e-06)
Constant	23.73***	46.16***	1.886e+06***	3.998e+06***	0.926***	12.43***	404,701***	2.725***
	(0.962)	(1.437)	(148,875)	(330,176)	(0.0137)	(1.911)	(84,989)	(0.0327)
Observations	29	29	29	29	29	29	29	29
R-squared	0.491	0.290	0.134	0.364	0.979	0.482	0.748	0.676

WPO: World oil production

Table 5: Effect of WPO on CO_2 emission in South Asia

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	0.000133***	−0.000850***	67.09***	289.5***	−2.32e-05***	0.000426***	30.39***	0.000119***
	(7.54e-06)	(0.000162)	(3.434)	(14.68)	(4.33e-06)	(7.30e-05)	(1.199)	(8.08e-06)
Constant	−0.617***	37.89***	−402,520***	−1.981e+06***	1.291***	3.703***	−225,662***	0.811***
	(0.0862)	(1.855)	(39,253)	(167,838)	(0.0495)	(0.834)	(13,706)	(0.0923)
Observations	29	29	29	29	29	29	29	29
R-squared	0.921	0.504	0.814	0.935	0.514	0.557	0.660	0.890

WPO: World oil production

Table 6: Effect of WPO on CO_2 emission in Euro area

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WPO	−0.000213***	−0.00171***	−24.68***	−56.27***	−2.33e-05***	0.00211***	53.54***	7.87e-05***
	(3.85e-05)	(0.000215)	(7.821)	(14.25)	(1.40e-06)	(0.000107)	(6.004)	(4.76e-06)
Constant	10.42***	67.77***	1.488e+06***	3.262e+06***	0.509***	−1.956	−47,795	3.132***
	(0.441)	(2.453)	(89,407)	(162,911)	(0.0161)	(1.222)	(68,631)	(0.0544)
Observations	29	29	29	29	29	29	29	29
R-squared	0.530	0.701	0.269	0.366	0.911	0.935	0.747	0.910

WPO: World oil production

consumption (kt) under Model 3, and CO_2 emissions (kt) under Model 4 have shown insignificant relationship with COBT. It shows that UK has insignificant effect of COBT for specifically these stated carbon emission proxies. However, rest of the carbon emission indicators have shown their direct effect from COBT under sample period of the study. As per the explanatory power, Model 7 shows the value of $R^2 = 73.5$ which means a good variation in carbon emission as defined by COBT.

Table 10 provides the regression output for the effect of COBT on CO_2 emission in USA over the period of study. It is observed that CO_2

emissions (metric tons per capita) under Model 1, CO_2 emissions (kt) under Model 4, and CO_2 emissions (kg per 2010 US$ of GDP) under Model 5 have shown a highly significant and positive influence from COBT. It means that the economy of USA is showing an adverse trend with direct effect of COBT against CO_2 emission under different three dimensions out of eight. However, the effect of COBT for rest of the carbon emission proxies is found to be insignificant, indicating no relationship with COBT in the world economy.

Tables 11 and 12 demonstrates the findings for the South Asia and Euro Area. For the findings under Table 11, effect of COBT

Table 7: Effect of COBT on CO_2 emission in Arab World

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	0.000485	−0.000627	143.1	184.0	−4.01e-05*	0.00118	110.3	−9.21e-05
	(0.000308)	(0.00123)	(107.8)	(248.6)	(2.26e-05)	(0.000884)	(88.20)	(6.47e-05)
Constant	2.556**	57.21***	276,191	769,586	0.894***	31.47***	141,231	3.114***
	(0.949)	(3.791)	(331,594)	(764,820)	(0.0695)	(2.720)	(271,357)	(0.199)
Observations	29	29	29	29	29	29	29	29
R-squared	0.084	0.010	0.061	0.020	0.105	0.062	0.055	0.070

COBT: Crude oil balance of trade

Table 8: Effect of COBT on CO_2 emission in UAE

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	−0.00754**	−0.0242	−46.64	−4.508	−7.11e-05	0.0221	40.35**	−0.000486
	(0.00276)	(0.0147)	(30.34)	(43.67)	(7.62e-05)	(0.0139)	(15.20)	(0.000393)
Constant	49.23***	103.6**	189,660*	150,872	0.738***	−4.114	−42,969	4.291***
	(8.480)	(45.14)	(93,347)	(134,355)	(0.235)	(42.80)	(46,753)	(1.210)
Observations	29	29	29	29	29	29	29	29
R-squared	0.217	0.091	0.080	0.041	0.031	0.086	0.207	0.054

COBT: Crude oil balance of trade

Table 9: Effect of COBT on CO_2 Emission in UK

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	6.74e-06	0.00111*	−1.735	10.43	7.30e-05**	0.0135***	79.55***	−0.000205***
	(0.000496)	(0.000598)	(7.921)	(20.17)	(3.20e-05)	(0.00266)	(9.192)	(5.82e-05)
Constant	8.883***	39.60***	196,705***	496,844***	0.491***	−10.73	−82,901***	3.136***
	(1.527)	(1.839)	(24,370)	(62,069)	(0.0984)	(8.171)	(28,281)	(0.179)
Observations	29	29	29	29	29	29	29	29
R-squared	0.010	0.113	0.002	0.010	0.162	0.490	0.735	0.315

COBT: Crude oil balance of trade

Table 10: Effect of COBT on CO_2 emission in USA

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	0.00122**	−0.00101	30.8	830.7***	6.80e-05*	−0.000767	28.	1.68e-05
	(0.000544)	(0.000725)	(39.92)	(87.13)	(3.90e-05)	(0.00116)	(19.26)	(2.51e-05)
Constant	15.18***	44.51***	1.267e+06***	2.743e+06***	0.659***	24.21***	764,795***	2.431***
	(1.674)	(2.230)	(122,827)	(268,064)	(0.120)	(3.561)	(216,182)	(0.0771)
Observations	29	29	29	29	29	29	29	29
R-squared	0.156	0.067	0.678	0.771	0.101	0.016	0.109	0.016

COBT: Crude oil balance of trade

Table 11: Effect of COBT on CO_2 emission in South ASIA

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	6.97e-05	0.00117	70.50	148.1	−2.67e-05	0.00190***	29.96	0.000196
	(0.000134)	(0.00114)	(65.75)	(288.1)	(3.08e-05)	(0.000413)	(29.44)	(0.000116)
Constant	0.674	24.74***	138,715	831,261	1.111***	2.702**	25,500	1.558***
	(0.411)	(3.494)	(202,297)	(886,527)	(0.0948)	(1.270)	(90,576)	(0.358)
Observations	29	29	29	29	29	29	29	29
R-squared	0.010	0.038	0.041	0.010	0.027	0.440	0.037	0.095

COBT: Crude oil balance of trade

Table 12: Effect of COBT on CO_2 emission in Euro Area

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COBT	0.000456	0.00446**	148.4***	73.19	−4.42e-05*	0.00470**	210.0***	−0.000143*
	(0.000269)	(0.00178)	(36.04)	(88.83)	(2.21e-05)	(0.00191)	(44.24)	(7.49e-05)
Constant	6.631***	62.13***	756,035***	2.404e+06***	0.381***	7.498	−85,535	2.680***
	(0.827)	(5.463)	(110,880)	(273,314)	(0.0679)	(5.866)	(136,105)	(0.231)
Observations	29	29	29	29	29	29	29	29
R-squared	0.096	0.189	0.386	0.025	0.129	0.183	0.455	0.118

COBT: Crude oil balance of trade

on CO_2 emissions from gaseous fuel consumption (% of total) is highly significant at 1%. It indicates that in South Asia, World trade of crude oil is creating carbon emission in the form of more consumption of fuel. However, rest of the indictors of carbon emission have their insignificant relationship with COBT. Findings under Table 12 provides the empirical evidence for Euro Area while exploring the impact of COBT and carbon emission. It shows that only the CO_2 emissions (kg per 2010 US$ of GDP) indicates a negative and significant relationship with COBT. Whereas, five out of remaining seven carbon emission proxies have demonstrated their direct and significant relationship with COBT.

5. CONCLUSION

The rush to offshore oil and gas exploration and exploitation is not about to end. Forecasts show a continuing growth of production in traditional offshore regions e.g., Western Africa, Gulf of Mexico (PCF Energy, 2011). Therefore and significant development in new areas (such as Eastern Africa and the Eastern Mediterranean) oil pollution should be considered a grave socio-economic problem encouraging accountability and responsible risk management. A single comprehensive Universal treaty under United Nations like UNCLOS should oversee the offshore oil pollution problem. Under such a treaty the continental shelf zone where most offshore drilling is carried out can be better regulated in a broader meaning under UNCLOS 1982 because Exclusive economic zone under maritime law is beyond 200 km of the Coastal State's Sea.

Having various treaties like at present overlap many issues, therefore one international treaty regulating the offshore oil activities will be more beneficial and avoid regulatory replication (Zong). In fact USA took a very key step toward such legislation in 2018 (Dresser, 2018) when congress passed the bill for making offshore drilling companies held exclusively responsible for all oil spills in an executive decision to allow 90% of United states continental shelf for oil and gas exploration at Maryland sea coast. Additionally, this study has provided a new insight for inspecting the relationship between oil productions, trade and carbon emission in selected regions.

It is observed that for the Arab world, UAE, USA, UK, South Asia and Euro Area, production of oil in the world economy and international trade of crude oil has significantly created a problem of carbon emission. In some region their relationship was directly significant while in some proxies of carbon emission, the effect of oil trade, and its production is not very much alarming for the natural environment. Findings of the study providing the empirical evidence that in different region, production and trade of oil are primarily responsible for the increasing carbon emission in natural atmosphere. Such findings provide a significant evidence for both practical and managerial implications in the coming time.

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