Oil and gas foreign direct investment and the role of institutions in moderating oil related environmental degradation in West-Africa: the Nigerian and Ghanaian experiences

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Introduction

Despite concerns, foreign direct investment (FDI) is widely thought to have a positive effect on the economic growth of developing countries (Herzer, 2012). However, in the face of climate change, skepticism around growth and its adverse environmental effects is increasing (Opuku & Boachie, 2020). Dhrifi et al. (2019) find the African continent to be an outlier where FDI harms the environment and fails to promote development. To examine the FDI-Environment relationship further, this thesis delves into the continent's most polluting, yet important and growing industry: oil and gas (O&G). While consensus on the industry's negative environmental impacts is widespread, fortunately, some of its environmental degradation can be avoided, namely oil spills. To avoid these recurrent "environmental tragedies" (Gossen & Velichkina, 2006, p.) many oil-producing countries have attempted to better their institutions surrounding oil spill prevention and mitigation (Asif et al. 2022). Concurrently, broader literature finds institutional quality as a determinant of FDI (Carril-Caccia et al., 2019) a key to ensuring FDI-induced growth (Herzer, 2012) and in a smaller subset, as a moderator of FDI-induced environmental degradation (Bopkin, 2017; Duodo, 2021, Sabir et al., 2020; Chang, 2015). Given the large share of FDI in the African O&G industry (Odumosu-Ayan, 2019), and the centrality of institutions in preparing for, and mitigating oil spills (Asif et al. 2022) host-country institutions must analysed when studying FDI's effect on the environment in the O&G sector.

Since its 2004 to 2014 boom, Africa's O&G sector has been receiving an, albeit inconsistent, increasing inflow of FDI (Gui-Diby, 2014), on which oil-producing African economies rely to support the sector's growth (Graham & Ovadia, 2019). While not exclusively, African oil-producing countries are concentrated around the Gulf of Guinea's large O&G reserves in West Africa (Graham & Ovadia, 2019). Among these, is the continent's top oil producer, Nigeria, which in recent years has attracted significant media attention as a result of incessant oil spills, subsequent popular discontent and legal battles. Consequently, Nigeria's institutions have been heavily scrutinized in the effort to diagnose the cause. However, these studies are not integrated in the broader scholarship of institutional quality's moderating role in the FDI-environment relationship, nor do they include strong comparative elements, especially with neighboring oil-producers. This thesis therefore asks: *What is the effect of institutional quality on preventing and mitigating FDI-related oil spills in West-Africa?*

This thesis conducts a comparative case study of Nigeria and Ghana, to determine whether their institutions can act as moderators in alleviating O&G FDI's negative

environmental impacts, and identify whether certain aspects of institutional quality exert more influence. Analysing the O&G sector provides insights on industry specific dynamics in the FDI-environment-institution nexus. The comprehensive conceptualisation of institutional quality enables a comparison of its components in terms of their influence. Furthermore, this study carries societal relevance by singling out which components must be strengthened in order to prevent and ensure effective mitigation of oil spills, in West African countries.

The thesis lays the groundwork with literature review, broken down into four sections: FDI and its effects on the environment, / FDI in African O&G, / O&G and the environment, / FDI, institutions and environmental quality. This is followed by the conceptualisation, theoretical framework, and methodology. These lead into the analysis. The results are compared and discussed, to finally conclude and present the limitations and recommendations for future research.

Literature review

A) FDI and its effect on the environment

Since the 1980s most developing countries have tried to attract FDI, believing it promotes growth (Herzer, 2012) through knowledge and technological spillovers, (enabled by technological transfers), the introduction of new processes and managerial skills, linkages between foreign and domestic firms, plus human and physical capital accumulation (Alfaro et al., 2009). However, some authors find a strong causal relationship between FDI and growth, others simply don't. This is especially the case for developing countries (Alfaro et al., 2009).

The debate on whether FDI engenders growth continues, as does the debate on its effect on the environment, leading to theories such as the Environmental Kuznets Curve (EKC) (Grossman & Krueger 1991, as cited in Ojewumi & Akinlo, 2017, the Halo Effect (HEP) (Neumayer, 2001, as cited in Opoku & Boachie, 2020) and the Pollution Haven Hypothesis (PHH) (Copeland, 2005, as cited in Opoku & Boachie, 2020). Assuming FDI leads to growth, the EKC posits that environmental pollution levels increase as a country grows, but once growth rises beyond a critical point, pollution levels start to fall (Ojewumi & Akinlo, 2017). More specifically about FDI, the HEP advances that foreign firms increase environmental sustainability and quality through their superior technologies (Opoku & Boachie, 2020). The PHH takes a more pessimistic stance, claiming that when developing countries open up to trade and FDI, this leads to pollution and greater GHG emissions. The logic is as follows: multinational corporations (MNCs) from developed countries move their production to

countries with poor environmental regulations; over time the production of these 'dirty' goods becomes these countries' comparative advantage; their pace of pollution thus keeps increasing (Opoku & Boachie, 2020). Whether the HEP or the HPP holds is sector and wealth specific. The HEP holds for the service sector, and the PHH for 'dirty' sectors: agriculture, mining and manufacturing, affecting poorer countries more (Doytch & Uctum, 2011, as cited in Opoku & Boachie, 2020)

B) FDI in Africa: African oil and gas

Gui-Diby (2014) finds that, overall, FDI has promoted African continent growth over the last 30 years. After an initial phase of skepticism, as well as failed import-substitution strategies, most African countries turned to outward looking development from the mid-90s. Dropping trade barriers and foreign exchange controls, governments attempted to incentivise savings, domestic and foreign investment, exports, and efficient markets (Marandu et al., 2019). Nevertheless FDI falls short of the continent's needs, unevenly distributed across its regions and countries. In 2019, West Africa followed South and North Africa, attracting 23% of the continent's FDI. Furthermore, FDI is concentrated in resource-rich West African countries, the top two being Nigeria (53%) and Ghana (16%). Historically, the primary and extractive sectors have been the main recipients of FDI, especially for oil and petroleum. Today the service sector is (Marandu et al., 2019) yet most West African countries remain fossil fuel and metal producers and exporters (Anyanwu & Yameogo, 2015). In terms of drivers of West African FDI Anyanwu & Yameogo (2015) find that foreign investors are mainly attracted to the region's natural-resource endowed countries.

Furthermore, Kimiagari et al. (2023), claim that natural resources, and especially O&G, are important for African economic development, with African countries becoming important players in global oil production and exportation. Despite many reserves being owned by the state or state concessionaires (Graham and Ovadia, 2019), due to local companies lack of knowledge, oil production and exploration in Africa is only possible when financed by foreign investors (Kimiagari et al., 2023) through joint venture, production sharing agreements, service contracts or straight concessions (Graham and Ovadia, 2019). To benefit from MNCs' higher capital resources, know-how and technology, attracting FDI becomes a priority for African O&G (Kimiagari et al., 2023). However, successfully doing so has led to MNCs market domination, with most of the profits transferred out to the parent company (Kimiagari et al., 2023). Graham & Ovadia (2019) indicate that this domination by both international oil companies and oil-poor emerging countries is unusual. As result, a recent continent-wide

counter-trend characterised by a rise in resource nationalism, increased state participation, mandatory local inputs and equity, and participation requirements, has arised. However, due to weak regulatory institutions, these developments have mostly been ineffective in promoting petro-development so far.

C) Oil and gas and the environment

The negative environmental effects of O&G exploration and production, such as land clearance, oil spills and natural gas emissions, have greater impact in developing economies due to their higher biological diversity and ecological vulnerability (Graham & Ovadia, 2019). In their comprehensive review of the O&G industry's environmental problems and their causes Gossen and Velichkina (2006) find that oil producing and refining releases tons of chemicals into the atmosphere and tons of polluted wastewater per year, via oil-spills, wastewater discharge, incineration and disposal of petroleum wastes. The accumulation of spills and sludge damages soil and vegetation cover, leading to soil erosion and desertification, decreasing the availability of land and ecosystem populations. The main causes of such environmental degradation are the specific geographic conditions of producing regions, oil recovery technology, and the properties of oil and reservoir fluid. Accidents occur during preparation, processing and transportation of crude products, increasing in frequency as facilities age. The authors claim that while oil-spills are an environmental tragedy, routine activities such as tank cleaning, refinery waste discharges are far more disastrous in terms of contamination. While spills contribute less in terms of overall contamination, their avoidability (Asif et al. 2022), makes them interesting to analyse from an institutional perspective. To avoid repetition, spills are defined in the conceptualisation.

D) FDI, institutions and the environment: a moderating effect?

Institutions act as determinants of FDI and are a crucial aspect to promote FDI-induced growth. In the O&G sector, broader literature on the FDI-environment-institutions nexus revolves around the resource curse (Ross, 2015) and determinants of FDI (Carril-Caccia et al., 2019). Despite there being little literature on institutions' moderating role in the O&G industry, Odumosu-Ayan (2019), mentions an unabated relationship between economic development and environmental protection in an O&G industry that relies on FDI. The author implies that where there is reluctance to translate environmental awareness into enforceable legal commitments, institutions become influential in this relationship.

Concurrently, this moderating role has been explicitly researched by a number of authors, using different conceptualisations and methodologies across different industries and

geographies. Bopkin (2017), operationalises institutional and governance quality as property rights & rule based governance and analyses their effect on FDI, natural resource and forest resource depletion in Africa. He finds that FDI can negatively affect the environment, however when FDI interacts with quality institutions, with strong governance to check the conduct of FDI-financed businesses and task environmental protection agencies with regulatory monitoring and enforcement, the relationship is reversed, increasing environmental sustainability.

Duodu (2021), looks specifically at the merits of policy and institutions for environmental sustainability and measures their effect on CO2 emissions, natural resource and forest reserve depletion in Sub-Saharan Africa. The effect changes according to the dependent variable. Duodu's overall conclusion is that institutions mitigate environmental harms in the short and long term. He also finds domestic investment an important factor in improving environmental quality; an interesting finding considering the domination of FDI in Africa's O&G sector. By incentivising their country's economy to implement policies that improve environmental quality, institutions, specifically those for sustainability, are key. These findings are consistent in other regions. Sabir et al. (2020) find that in South Asian countries, government stability decreases environmental degradation whilst corruption increases degradation, measured as environmental footprint. However they find no evidence for rule of law. Chang (2015) exploring corruption and environmental degradation on a global scale, finds that once corruption reaches a certain threshold, FDI results in environmental degradation (measured as CO2). He notes that "high-level corruption is, on average, characterized by preexisting government failure and abundant natural resources" (p. 98); another relevant finding given the focus on the African O&G sector.

Oil-spills research cites quality institutions as key in creating the robust administrative framework (Asif et al., 2022) needed to create and implement regulations relating to prevention and preparedness, plus emergency and recovery response. Spills can be managed provided that "access, equipment and expertise are made available and tested by contingency planning" (Little et al., 2021, p.12). Mitigation and remediation remains a large problem.

E) Conceptualisation

1. *FDI-related oil spills*

FDI: Duce & España (2003) advances that FDI "reflects the aim of obtaining a lasting interest by a resident entity of one economy (direct investor) in an enterprise that is resident in

another economy (the direct investment enterprise)" (p. 2). A foreign direct investor owns at least 10% of the enterprise, earning significant influence over its management.The O&G industry, and especially West Africa's (Anyanwu & Yameogo, 2015; Kimiagiri et al., 2023; Graham & Ovadia, 2019), attracts multinational direct investment enterprises such as subsidiaries, associates or branches (Corbineau, 2021), depending on host country regulations (Duce & España, 2003). A *subsidiary* being "an incorporated enterprise in which the foreign investor controls directly or indirectly [...] more than 50% of the shareholders' voting power" (p. 3). An *associate* "is an enterprise where the direct investor and its subsidiaries control between 10% and 50% of the voting shares (p. 3), and a *branch* "is a wholly or jointly owned unincorporated enterprise" (p. 3). In order to capture all FDI-related oil-spills, this paper's conceptualisation of O&G FDI covers all 3 types. It includes inflows into companies in upstream (exploration and production) and midstream, (transportation and storage) and downstream (refining and marketing) activities (Library of Congress, n.d).

Oil spills: It includes primarily onshore/offshore spills due to data constraints. Water-spills originate from marine and refinery terminals, non-tank vessels, tank barges, tankers, platforms and pipelines (Michel & Fingas, 2016). The severity of a water spill depends on its volume and speed but most importantly on disaster management response (Chang et al., 2014). Once spilled, floating oil has both ecosystem and societal impacts, harming marine and bird species and damaging human health, safety, and local economy. Spills are worse in intertidal zones where floating oil can reach a larger number of species. Damaging human clean-up procedures include chemical dispersants, combustion via scorching, mechanical removal, washing-off the shoreline, and skimming or absorption off the surface. Natural processes such as oil-eating bacteria and wave action take longer but are less harmful. Clean-up costs depend on size of the spill, location sensitivity in adapting the response methods to the environment, and natural resource financial damages (Michel & Fingas, 2016).

FDI-related oil spills can be traced back to FDI inflow, which due to the capital-intensive nature of O&G activities means an MNC subsidiary, associate or branch. It is assumed that a majority of oil spills are FDI-related, due to African O&G's reliance on FDI and monitor's inability to differentiate between domestic/foreign corporations.

2. *Institutions: components of institutional quality*

This paper focuses on legal and explicit institutions due previous findings and uncomplicated measurement, contrary to nonlegal/informal institutions (Hodgson, 2006). Authors differently conceptualise and operationalise institutional quality, rarely referring to all

components. This conceptualisation uses the World Bank's (WB) indicators, to provide a holistic conceptualization of institutional quality. They are defined as:

> "-Political Stability and Absence of Violence, measured by the likelihood that the government will be destabilized by unconstitutional or violent means, including terrorism
> -Government Effectiveness, measured by the quality of public services, the capacity of the civil service and its independence from political pressures, and the quality of policy formulation
> -Regulatory Quality, measured by the ability of the government to provide sound policies and regulations that enable and promote private sector development
> -Rule of Law, measured by the extent to which agents have confidence in and abide by the rules of society, including the quality of property rights, the police, and the courts, as well as the risk of crime
> -Control of Corruption, measured by the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as elite "capture" of the state" (Zhuang et al. 2010, p. 8)

"Political stability and Absence of violence" are found to have an effect by Sabir et al. (2020), and Chang (2015). Little et al. (2021) point to their relevance in O&G through case studies showing security breakdowns and war leading to poor spill prevention, mitigation and clean-up. Therefore, government instability and violence could lead to policy reversal (Sabir et al., 2020), poor policy implementation and corruption (Chang, 2015), potentially lead to poor spill preparedness and response.

"Regulatory quality", here is adapted to "Environmental regulatory quality", following the Duodo's (2021) findings on institutions for sustainability's importance in moderating FDI-related environmental degradation, as well as Bopkin's (2017) on the importance of an effective legal system and rule-based governance. Asif et al. (2022) point to their relevance in O&G, arguing that sound policies, agreements and regulations are key to the prevention, preparedness, emergency and recovery response of oil spills. It is crucial to link these observations to the moderation role of institutions conceptualised as regulatory quality.

"Government effectiveness", while not explicitly researched in the FDI-environment-institutions scholarship, it is alluded to in spill research, in terms of public services' ability and capacity to conduct spill monitoring, surveillance (Asif et al., 2022), mitigate slick contamination (Little et al., 2021) and ensure proper reporting. In relation to FDI, governments enter into a collaborative agreement with MNCs, however when failing in their effectiveness, the MNC inevitably becomes its own regulator, thus avoiding spill-related responsibilities (Oluduro & Oluduro, 2015).

"Rule of law" despite mixed results, seems relevant to explore for O&G, as legal accountability, in the form of penalties and lawsuits, are key to holding MNCs accountable for their environmental degradation (Kingston, 2011).

"Control of corruption" has gathered widespread consensus on mitigating FDI-related environmental degradation (Sabir et al., 2020; Chang, 2015). Given O&G industry high rates of corruption (Mahdavi, 2020), it is important to understand whether corruption increases the occurrence of oil spills and poor clean-up from MNCs.

Theoretical Framework

African countries have been, and are trying to, promote FDI as a means for economic development (Marenda et al., 2019). Whether FDI succeeds in promoting growth, a large share of FDI, especially West Africa, flows to natural resources, including O&G (Anyanwu & Yameogo, 2015). While lucrative, O&G, from production to consumption, is inherently polluting (Gossen and Velichkina, 2006). Institutional quality has been hypothesised to act as a moderator of FDI-related environmental degradation (Bopkin, 2017; Duodo, 2021, Sabir et al., 2020; Chang, 2015). Given global dependency on O&G, and the industry's inherently 'dirty' nature, institutions can only do so much in regulating and preventing its core polluting activities. However they can regulate and prevent the avoidable environmentally disastrous problem of spills. Findings on institutions' moderating effect of FDI-related environmental degradation, show that the mechanism acts through several of its components: political stability (Sabir et al., 2020, Chang, 2015), regulatory quality (Bopkin, 2017, Duodo, 2019), government effectiveness in implementing such regulations, rule of law (Bopkin, 2017) and control of corruption (Chang, 2015). This thesis explores whether this is the case in the O&G sector, asking: *what is the effect of institutional quality in preventing and mitigating FDI-related oil spills in West Africa ?*

Drawing on previous findings, this thesis argues that strong institutions can decrease FDI-related oil spills by fostering a "robust administration", consisting of spill prevention, preparedness, plus emergency and recovery response (Asif et al., 2022). Each component of institutional quality plays its role in creating the causal mechanism. Regulatory quality lays the groundwork for effective preparedness and mitigation, by setting rules and applying penalties when they are disrespected. No matter how clear and holistic regulations are, quality implementation and enforcement are key to their effectiveness. Effectiveness of regulations

depends on 3 additional institutional components: government effectiveness (as in capacity), rule of law and corruption. See the below visualisation:

When each component is present, institutions as a whole can decrease FDI-related oil spills, thus hypothesising :

> *H_1: quality domestic institutions decrease the likelihood of FDI-related oil spills and ensure an effective clean up.*

Confirming empirical evidence of this causal mechanism includes the presence and, proof of effectiveness, of policies and regulations on O&G FDI including : oil spill prevention and mitigation clauses in MNC-government investment agreements, oil spill contingency planning incorporating public-private partnerships, reprehension and accountability in the case of MNC infraction, effective control of corruption in the sector.

Differing conclusions resulting from the varied conceptualisations and operationalisations of institutional quality, imply that certain aspects of institutional quality may carry more influence. It is hard to hypothesise which, due to the lack of research on this relationship in the O&G sector.

Methods

A) Methods of Data Analysis

To answer the research question this thesis conducts a comparative case study of Nigeria and Ghana, for the methods' affinity for investigating institutions (Eisenstadt 1968, as cited in Porta & Keating, 2008), and its ability to make middle-range generalisations (Lijphart, 1975, as cited in Porta & Keating, 2008). Exploring the complexity of the causal relationship is thus prioritised over the claim’s generalisability. The thick description is key in relating

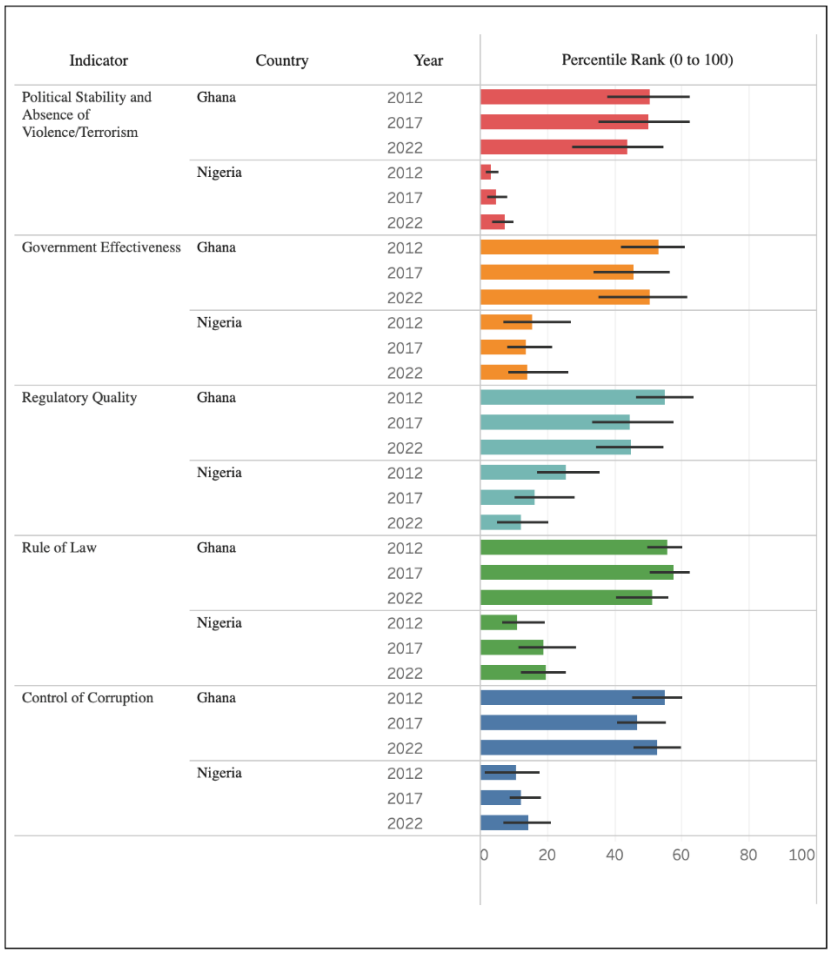
domestic institutions to its O&G FDI management, and understanding how they may prevent and manage oil spills. Finally, it balances the mainly quantitative findings in the FDI-environment-institutions nexus, which risks building theory on insufficient knowledge (Porta & Keating, 2008). The comparative case study will use a narrative strategy where the "one criterion for judging a causal argument rests with the ability […] to meaningfully assemble specific information concerning the histories of cases into coherent processes" (Mahoney, 1999, p. 1168, as cited in Porta & Keating, 2008). Narrative strategy enables piecing together findings on each component of institutional quality, and matches them to empirical evidence of FDI-related spills. The end product can be used to determine whether the posited causal mechanisms can link the explanatory variables to the specific outcome (Porta & Keating, 2008).

B) Case selection

Analysing only two cases means that they must belong to a similar 'category', to control key variables (Porta & Keating, 2008). The case selection follows a most-similar systems design (MSSD) in order to maximise the variance of the independent variable (institutions), and minimise controls (FDI, economic development, contextual elements). MSSD is ideal for hypothesis testing (Gerring, 2008), to identify whether institutions mitigate FDI-related oil spills. Nigeria's significant oil spill problem makes it an interesting case in this framework : its institutions have been investigated, though not placed within broader literature on institutions' moderating role in FDI-related environmental degradation. In line with common practice in MSSD, this study stays limited to West Africa, as focusing on a common geographical area sharing common historical traditions, cultural traits and economic development controls for important contextual factors (Porta & Keating, 2008). Ghana is the best fit: it varies in terms of institutional quality, and scale of spills, but its FDI is relatively similar.

Nigeria is the continent's biggest oil producer, and had garnered the largest amount of O&G FDI (Marenda et al., 2019). However, in 2018 Ghana received similar amounts of O&G FDI and overtook Nigeria in 2020 (Appendix, "*FDI data*"). Nigeria's smaller share of FDI could be explained by the relative maturity of its industry. Nonetheless, Ghana is the second largest producer in the region, despite their differences, they are the most comparable in terms of FDI and industry size. In terms of oil spills relative to FDI, Nigeria suffers more from spills than Ghana (see: Analysis) Their institutional quality also differs significantly, as measured by the World Bank, in 2012, 2017 and 2022 (WB, n.d). Compared to the region's other potential cases, Ghana's institutions stand out, ranking higher than neighbouring oil producers

(Appendix: "*institutional data*"), while suffering less from oil spills proportionally to industry size (Najoui et al., 2019).



Source: *Worldwide Governance Indicators (www.govindicators.org)*

Figure 1. WB Governance Indicators (WB, n.d)

C) Operationalisation

FDI-related oil spills:

For Nigeria, O&G FDI is measured according to the amount of FDI inflow in the O&G sector per quarter as reported by the National Bureau of Statistics (NBS) for Nigeria and the yearly inflow is calculated by hand (Appendix: "FDI data"). For Ghana, FDI is measured yearly by the Ghana Investment Promotion Centre (GIPC).

Due to difficulties in accessing data for both cases, this analysis uses the presence of oil slicks as a proxy. Oil slicks are "microscopically thin and highly transient floating layers of liquid hydrocarbons" (Dong, 2022, p.1). Most often a result of oil spills (Corchado & Mata, 2008), they can originate from accidental or intentional discharge from ships, offshore oil/gas infrastructures and land sources, but can also seep from seafloor hydrocarbon reservoirs (Dong,

2022). Their negative effects are the same as spills (Dong, 2022). Furthermore, slick predictability is key to deploying efficient clean-up measures (Corchado & Mata, 2008).

Ideally, FDI-related oil spills are measured as t*otal area of oil slicks per million USD* O&G *FDI inflow*. However, these can only be assessed visually through snapshots from monitors.

Institutional quality:

"Stability and Absence of violence" using non-governmental sources, is measured as the occurrence of a coup, internal conflict (Little et al., 2021), or policy reversal (Sabir et al. 2020) being identified as a cause of an FDI-related spill or of poor preparedness and response (Little et al.).

"Regulatory quality" refers to the judicial framework (Bopkin, 2017), including policies, laws, regulations, licenses, and MNCs' subsidiaries, associates or branches contract clauses. It also includes the presence of national oil spill prevention and clean-up plans, plus environmental agencies managing oil spills, preferably included in public-private partnerships and clauses in aforementioned contract (Duodo, 2020).

"Government effectiveness": measured as evidence of government commitment to the policies (World Bank, n.d) identified in " regulatory quality", enabled by its capacity in terms of equipment and expertise.

"Rule of law": measured as enforceability of contracts and degree of enforcement of court orders (World Bank, n.d), which apply in the case of improper conduct, this commonly involves penalties, sanctions and lawsuits against foreign direct investors and MNCs by the host government.

"Control of corruption": when inadequate oil spill preparedness, clean up and penalty, is identified as a consequence of corruption between administrations and foreign companies (World Bank, n.d).

D) Methods of Data Collection

To analyse these cases, this study uses FDI statistics from the NBS for Nigeria and the GIPC for Ghana. For the scale and number of oil spills, a combination of spill and slick monitors is used. For Nigeria, the Nigerian Oil Spill Monitor by the National Oil Spill Detection and Response Agency (NOSDRA). For Ghana, spills are observed through non-governmental sources, including a snapshot from the Ghana Oil Spill Detection Service for 2021, developed by the European Space Agency (ESA) within the EO4S-marine framework, as well as Cerulean,

developed by SkyTruth, which observed slicks in both cases in 2022 and 2023. Monitor descriptions are in "*monitor information*" in the Appendix.

Data on institutions is drawn from domestic laws, regulations, policies and oil spill contingency plans, plus investment contracts. For Nigeria, these are complemented by academic articles. To inform on the causal-mechanism, news articles, governmental and non-governmental reports on FDI-related oil spills are used.

Analysis

Nigerian O&G exploration dates back to 1908, production began in 1958 (Udosen et al., 2009). In 2021, 566 129 000 barrels were produced, with a revenue of USD$ 8,097,842,000 (NEITI, 2021). The upstream sector is dominated by foreign producers (DPR, 2018). The distribution of concessions that the majority of oil production is conducted through production sharing (PSC, 42%) and joint venture (JV, 23%), (DPR, 2018). The mid and downstream sectors are more balanced (Mordor Intelligence, 2014). The larger presence of indigenous companies in the mid and downstream sectors can perhaps be a result of 2021 PIA revamping local companies (Ele, 2022). It is not covered as its effect is not yet measurable.

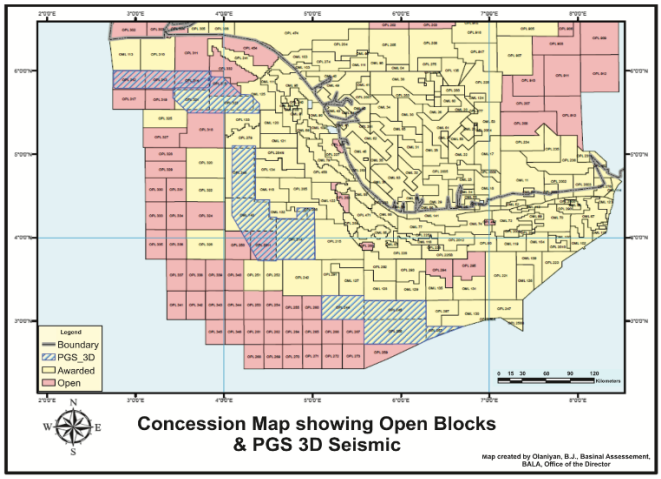
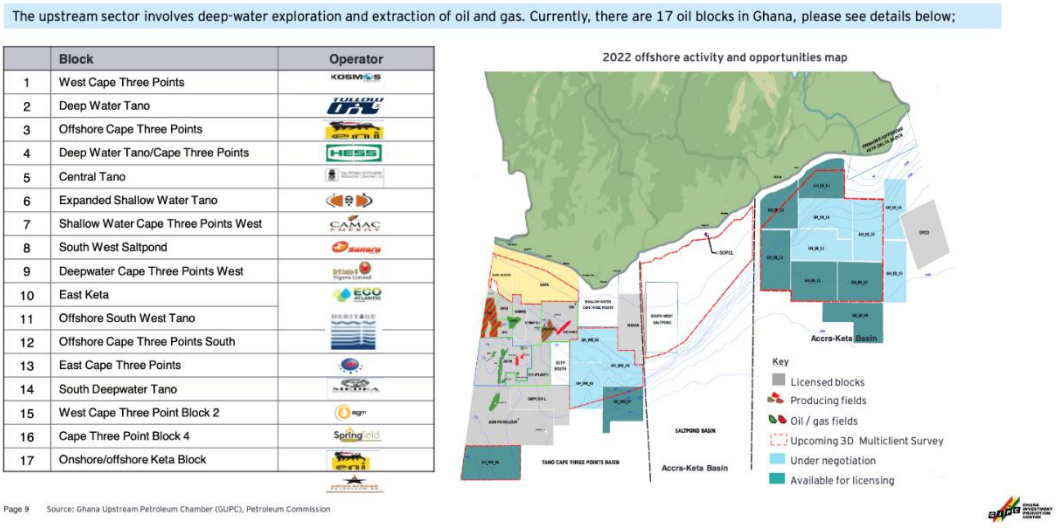


Figure 6: Concession Map showing Open Blocks & PGS 3D Seismic

Figure 2. Concession Map showing open blocks & seismic activities (DPR, 2018).

Following the first significant deepwater discovery in 2007, Ghana's commercial production of O&G began in 2010. The 2021 output was of 55.06 million barrels, amounting to US$ 783 million (Ministry of Business Development, n.d).The biggest player remains the Ghana National Petroleum Corporation (GNPC), benefiting from a contractual relationship with the state and prospective investors in the upstream sector, plus the right of entry into open

acreages for exploration (Ministry of Business Development, n.d). Upstream licensees are comprised of international, independent and local companies (GIPC, n.d). The downstream industry is more Ghanaian oriented, although the top producer is a British company (NPA, 2023). There is no information for top midstream companies. All industry rankings are in the Appendix ("top producers").



The upstream sector involves deep-water exploration and extraction of oil and gas. Currently, there are 17 oil blocks in Ghana, please see details below;

	Block	Operator
1	West Cape Three Points	
2	Deep Water Tano	
3	Offshore Cape Three Points	
4	Deep Water Tano/Cape Three Points	
5	Central Tano	
6	Expanded Shallow Water Tano	
7	Shallow Water Cape Three Points West	
8	South West Saltpond	
9	Deepwater Cape Three Points West	
10	East Keta	
11	Offshore South West Tano	
12	Offshore Cape Three Points South	
13	East Cape Three Points	
14	South Deepwater Tano	
15	West Cape Three Point Block 2	
16	Cape Three Point Block 4	
17	Onshore/offshore Keta Block	

Page 9 Source: Ghana Upstream Petroleum Chamber (GUPC), Petroleum Commission

Figure 3. Ghana's upstream sector (GIPC, n.d).

A) FDI-related oil spills

Nigeria and Ghana's O&G industries differ in size, production output, foreign company presence and regulatory frameworks. However, levels of FDI are very similar (Appendix: "FDI data"). Despite similar levels of FDI, the number of spills is much larger in Nigeria.

Nigeria notoriously suffered decades of spills and very poor clean-up, severely affecting local communities (Amnesty International, 2009; Ratcliffe, 2020). The data for spills from 2021 until today, as reported by NOSDRA:

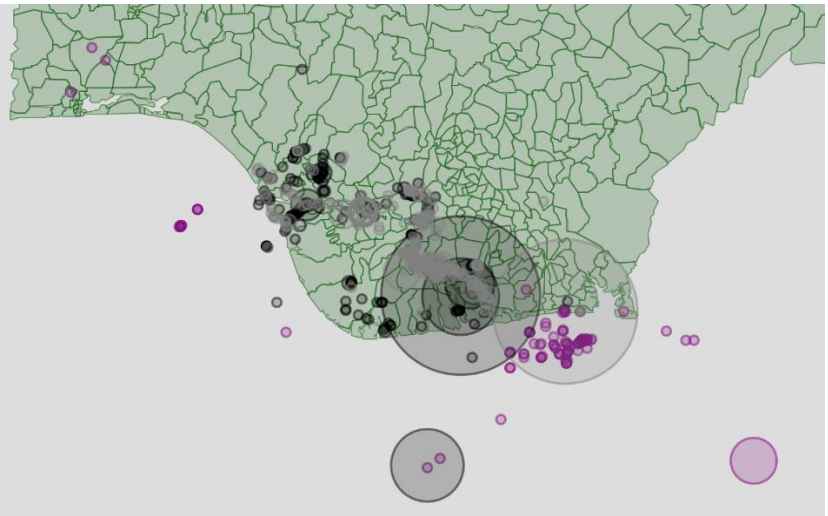


Image 1. Oil spills (black: oil company, purple: not visited, grey: not cleaned up), (NOSDRA, 2021)

Due to NOSDRA misreporting (Kumor, 2021), the analysis employs the Cerulean (n.d) slick monitor for 2023 and 2024. There is no anterior mapping. The slicks identified by Cerulean and differ from NOSDRA reports.

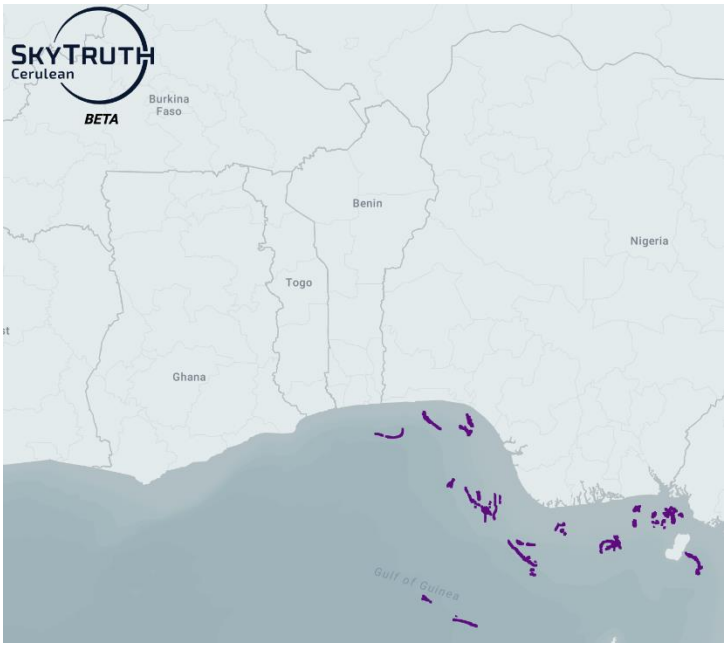


Image 2. Cerulean, vessel oil slicks from 2023 and 2024 (Cerulean)

Overlooking possible inaccuracies, NOSDRA reports on the number of barrels spilled and by whom : 38,982.04 barrels in 2021 and 47,610.47 in 2022. The biggest spillers, by far, were Nigerian Agip Oil Company (NOAC, an ENI subsidiary) and the SPDC; both foreign companies. The distribution per company is in Table 2.

2021		
	Incidents	Barrels reported spilled
Agip Energy Natural Resources Limited (AGIP)	2	0.00
Aiteo Exploration and Production (Aiteo E&P)	3	244.15
Chevron Nigeria Limited (CHEVRON)	10	10.55
Enageed Resource Limited (ERL)	7	75.00
Esso Exploration and Production Nigeria Limited (ESSO)	1	27.48
Eroton Exploration & Production Limited (Eroton E&P)	14	19314.69
First Hydrocarbon Nigeria (FIRST)	4	2.27
HHOG: HEIRS HOLDING OIL AND GAS LIMITED	7	5.77
Heritage Energy Operational Service Limited (Heritage)	20	484.00
Mobil Producing Nigeria Unlimited (MPN)	30	12404.13
Midwestern Oil & Gas Corporation (Midwestern)	3	19.28
Nigerian Agip Oil Company (NAOC)	220	1522.48
ND Western (NDWEST)	2	70.80
National Petroleum Development Company (NPDC)	12	1142.12
NPSC/NNPC	1	0.00
Neconde Energy Limited (Neconde)	3	23.00
NewCross Exploration and Production (NewCross E&P)	1	1.00
Platform Petroleum Limited (Platform)	4	1.01
Seplat Petroleum Development Company Limited (SEPLAT)	10	44.34
Shell Petroleum Development Company (SPDC)	186	3543.04

Table 2: Oil spills per company 2021 (NOSDRA)

The only evidence of spills in Ghana is an ESA shot over Q1 to Q3 of 2021 (Image 3). The scale of slicks seems much smaller than Nigeria's. Unfortunately, no further information can be extracted from the data. Furthermore, as shown by the Cerulean monitor (Images 4/5), while no spills were detected in Ghana in the years 2023 and 2024 the technology employed did observe spills in other West-African oil producing countries (Appendix: "spill shots"). While none of these monitors inform on spill origin, given the reliance of African O&G FDI, and its large inflows into Ghana, it is assumed that at least some are FDI-related.

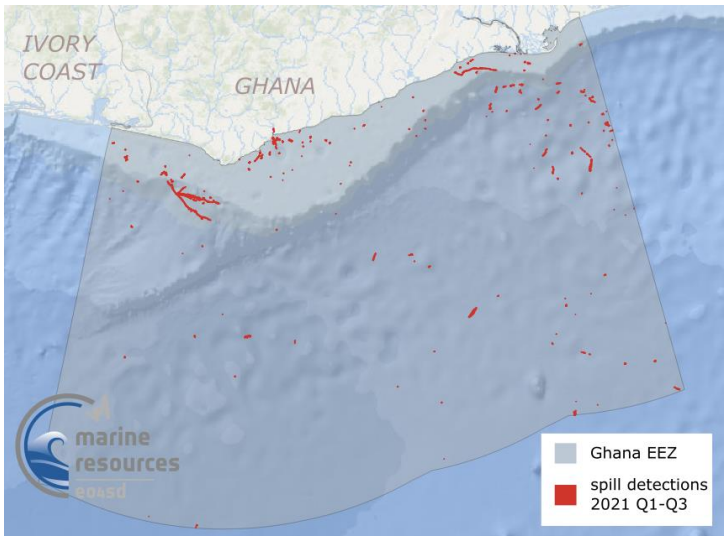


Image 3. Spill detections 2021 observed by ESA

Finally, Cerulean provides maps on infrastructure and vessel slicks. Whilst limited in terms of data interpretation, they are the only evidence of recent slick observations made by the same satellite monitor.

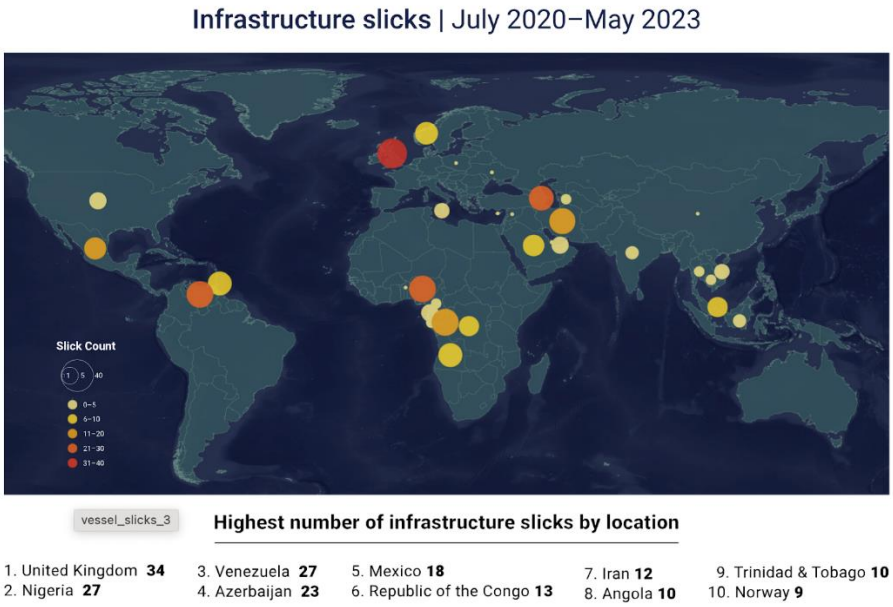


Image 4. Cerulean infrastructure slicks from July 2020 to May 2023

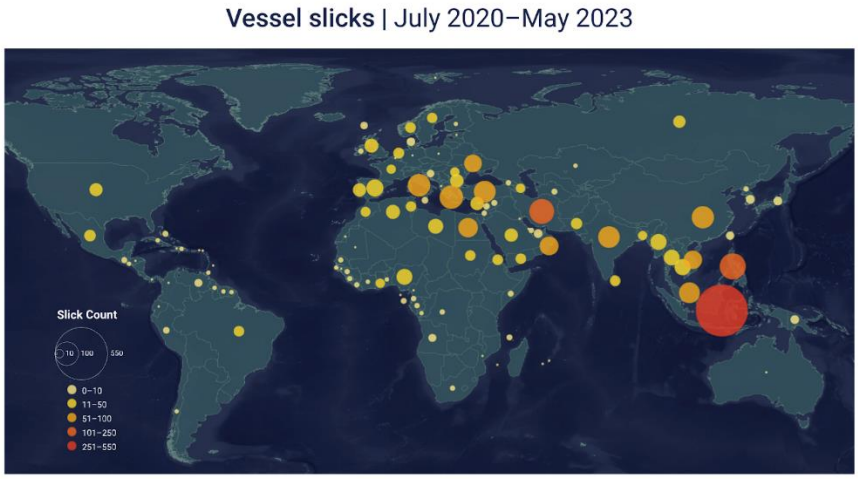


Image 5. Cerulean vessel slicks July 2020 to May 2023

B) Institutions

NIGERIA:

1. Domestic regulations and contingency plans

Nigerian spill regulations are numerous, but scattered across acts and ministries (Kadafa, 2012) criticized for their vague wording, difficult applicability and poor legal duty (Oloduro, 2015). The most relevant document, in the country's O&G environmental protection framework, is the Nigerian National Oil Spill Contingency Plan (NOSCP). The last accessible version is from 2010. It works as a tiered system based on the number of barrels spilled, whether the spill occurs on land, or coastal/offshore waters. The NOSCP defines the roles of each

government department and agency, with the National Oil Spill Detection and Response Agency (NOSDRA) as leader, co-opting any necessary agency or ministry. Essentially, Tier 1 spills are managed by the operator, Tier 2 by the on-scene commander (OSC) and non-profit Clean Nigeria Associates (CNA), and Tier 3 by national-level intervention. Following the "Polluter Pays Principle" the NOSCP requires the polluter to cover the costs. For Tier 3, the polluter covers response logistics, and Ministries cover the rest. In cases of doubt of the spill's origin, costs are covered by the Ministries and agencies involved in the clean-up. Penalties and fines can be attributed to companies if they fail to report in under 24 hours, or clean-up the site.

Many gaps have been identified in Nigeria's institutions. Odeome (2013), claims there is a regulatory gap, with no enforcement agency for environmental degradation in the O&G sector. The National Environmental Standards and Regulations Enforcement Agency (NESREA) covers everything except O&G. NOSDRA was never intended to enforce regulations, but was mandated to fine wrongdoers. Additionally, there is confusion around NOSDRA's mandate and its National Control and Response Centre (NCRC) branch (Ezeibe, 2011) stemming from their similar roles during major spills : NRCR is mandated to receive reports, coordinate response, conduct surveillance and ensure compliance. The same for NOSDRA, who remains a key actor in Tier 3.

Nigerian legislation and regulatory framework does attribute responsibility to O&G MNCs and demands fault compensation, though it has significant gaps. Overlaps undermine enforcement, and operators not knowing who to report to, impedes clean-up speed (Ezeibe, 2011). Furthermore, insignificant penalties are the opposite of deterrents to MNCs, as paying a fine costs less than managing a spill: reporting after 24 hours incurs a 500 000 Naira fine, approximately 350 USD at today's exchange rate. Improperly cleaning the spill incurs a 1 million Naira/700 USD fine.

2. Environmental regulations tied to O&G MNC FDI

The provisions and conditions by which MNCs are contractually bound are as important. Environmental legislation often refers to the provisions applicable to the license or lease contract, however oil spills are never explicitly mentioned. The most recent pre-PIA contract examined from www.resourcecontarct.org is a production sharing agreement from 2011 between Nigerian Petroleum Development Company Limited and Atlantic Energy Drilling Concepts Nigeria Limited for the development and production of OML30. The agreement stipulates that it is governed by the aforementioned *unclear* laws. Contract Article V, instructs

the Operator to give prompt notice of important petroleum operational incidents such as "fire, accident, sabotage, or acts of God involving loss of life or serious property damage, strike and riots, changes in production level affecting quota or relevant government actions." (p. 43). Both provisions can potentially be interpreted as oil spills, although not explicitly stated. There are no other provisions regarding environmental degradation or spills. The layout is the same/similar in every contract, whether a historical spiller like AGIP, or a smaller operator like Atlantic. As this contract has no miscellaneous provisions, the repercussions of disrespecting conditions are not elaborated on, perhaps this should be explicit in contractual agreements, given the scale of the problem.

3. Effectiveness, Rule of Law and Corruption

While regulations do have gaps, the lack of enforcement is the most important problem in Nigeria (Kadafa, 2012). This has been linked to huge deficiencies in government capacity. The Nigerian Federal government lacks equipment for monitoring, transportation to spills, water sample testing laboratories (Oluduro & Oluduro, 2015). The reliance on MNCs for the implementation of regulations, transforms them into regulators (Oluduro & Oluduro, 2015). While the 2015 MARENDA exercise praised Nigeria's tightened partnerships with producers, staff training, geographical mapping, in 2021 Kumor finds persistent MNC reliance. Pre-PIA, effectiveness was undermined by the government's conflict of interest; their heavy involvement in NNPC as a majority shareholder. Through joint-venture, government involvement incentivises lax enforcement, and risks the effectiveness of its own clean-up requirements, in the face of economic losses. It additionally puts military and legal powers at the disposal of oil companies (Oluduro & Oluduro, 2015).

Rule of law deficiencies caused by regulatory confusion impedes the effectiveness of the judicial system. Unclear regulations dictate no obvious jurisdiction holding MNCs accountable (Odoeme, 2013), nor agency collecting fines (Ezenwa-Ohaeto et al., 2020). Such gaps in a complacent judicial system provide opportunity for MNCs to easily escape liability (Oluduro & Oluduro, 2015). Poor rule of law is also illustrated by NOSDRA's blatant failure to enforce regulations, with "recurring questions about the fulfillment of contractual obligations on the issue of effective cleaning up of oil spillages and the restoration of affected localities back to conducive states" (c 2018, p.). MNCs are not adequately sanctioned for disobedience (Agbonifo, 2016).

In Nigeria, corruption is also a key variable. Amnesty International (2009) claimed that regulatory certification in relation to oil spill and clean-up investigations was meaningless, with

regulators unlawfully signing off investigations containing incorrect data. In their investigation, Nigerian newspaper, *Premium Times*, finds evidence of NOSDRA corroborating an untruthful spill start date, despite contradictory eyewitness and NGO reports. Coming full circle, Hennchen (2015) points to how corruption has delayed regulations and policy implementation, probably to ensure uninterrupted revenue (Odoeme, 2013).

GHANA:

1. Domestic regulations and plans

Environmental regulations were created immediately upon commercialisation of oil (Luki, 2016). The first National Oil Spill Contingency Plan (NOSCP) implemented in 2010 was improved in 2020. It is uses the same a tiered system as Nigeria, but assigns either Statutory or Combat responsibility to relevant actors. For Tier 1, the company responds, using its own industry arrangements. Above Tier 1, responsibility is transferred to the Statutory Agency, for Tier 2 local stakeholders were mobilised, for Tier 3, the Environmental Protection Agency (EPA). From 2020 onwards, the EPA manages Tier 2. Statutory responsibility entails “the institution of prosecution, and the recovery of clean-up costs on behalf of all participating agencies” (p. 2). Additionally, for Tier 1, the plan dictates that companies have a contingency plan and provide resource access for spills beyond their agency. A clear division of roles and accountability mechanism; both signs of regulatory quality.

An incident management team (IMT) is appointed by national/statutory agencies. From 2020, Combat Agency no longer appoints the media and liaison officer, the Statutory Agency does. The plan insists on rapid response plus subsequent publication of pollution and situation reports. The 2020 plan notes that assuming Combat Agency does not indicate "admission of liability for the source of the spill or acceptance of the costs of a spill” (p. 21), and affirms that “liability for a spill is to be determined by due legal proceedings” (p. 21). While both versions state that financial arrangements are agreed in Inter-Agency Agreements, regrettably they are not publicly accessible.

Changes in the 2020 plan reflect the government’s increasing role in mitigating spills, potentially reflecting an improvement in governmental capacity. Forwarding liability claims straight to Ghanaian courts can avoid MNCs escaping responsibility by simply paying fines, as is the case in Nigeria. Taking over the appointment of media-liaison officer ensures that the government controls the narrative. However, while penalty distribution and collecting authority is clear, assessment criteria and penalty amounts are not accessible.

Throughout the petroleum industry's broader regulations, most provisions on environment are bundled with health and safety provisions. The Petroleum (Exploration and Development) Regulations from 2018 asks for Strategic Assessments to include "a description of the foreseeable environmental impact" (p. 5) and more importantly, "proposed measures for the prevention, reduction, mitigation, rehabilitation and compensation of possible negative impacts, including emergency preparedness in case of major spills and accidents" (p. 5). These regulations refer to the health-safety-environment bundle requirements for tender process (§15.(c)) and the Minister's evaluation criteria for petroleum agreement (§16.(3)). Furthermore, corporations are to vet its operators based on health-safety-environment experience, same for operators vetting contractors (§23.(4)). The bundle also appears in Information Sharing (§43.(iv)), Test Production (§4); Facility Location and Route Survey (§4.(e)). Spills themselves are rarely mentioned, however, an obligation of environmental protection can be interpreted as an obligation to care for oil spills, though this may create uncertainty. Failure to respect these regulations results in fines or imprisonment, though details of which are unspecified.

The 2017 Petroleum Exploration and Production (Health, Safety and the Environment) Regulations, only explicitly mentions spills in the provision for Tanks and Storage (§45.(b)). This same health-safety-environment grouping, is referred to in the Design of Petroleum Facility (§15.(1)(b)), on Manning and Competence (§102), Reporting (§157) and the Application for Consent, Approval and Permit (§171). The same penalties and offenses apply here. While the NOSCP divides roles and assigns enforcement capacity more clearly than in Nigeria, its regulations use vague wording, potentially creating space for uncertainty.

2. Environmental regulations tied to O&G MNC FDI

To undertake production, oil companies must submit an Environmental Impact Statement or Preliminary Environmental Report to apply for an environmental permit. This permit is conditional on the submission of periodical monitoring and evaluation reports plus an Environmental Management Plan (GHEITI, 2020). Contracts contain an article titled "Safety and Environmental Protection". In the 2016 field concession agreement between the GNPC, ENI, Vital Upstream and Woodfields Upstream, this article requires that parties respect the EPA's and State agencies' environmental laws and regulations (§17.2). The article outlines specific rights and responsibilities: minimum ecological damage and destruction, control of flow or prevention of waste escape of petroleum discovered or produced from the contract area (§17.4). If oil releases into the environment, §17.5 requires companies to take prompt steps to clean up and repair to the maximum feasible. If environmental damage results from

contractor's, subcontractors' or affiliates' gross negligence, the costs are borne by the contractor and are not included under the agreement's petroleum costs. The inclusion of this article is an indicator of regulatory quality and an attempt to integrate environmental concern into MNC decision-making. There remain anomalies including; reporting to the GNPC to trigger the clean-up response. This seemingly unnecessary step creates potential incentive to misreport. Through fear of revenue loss, a government owned company, the GNPC, and a consortium partner, may try to avoid liability for spills. Again, spills are not explicitly mentioned, nor is a strict obligation to adhere to the NOSPC, this seems like a small yet significant omission.

3. Effectiveness, Rule of Law and Corruption

The capacity of the government to enforce such regulations is rooted in its public-private partnerships in spill preparedness. The Ghanaian government seems to rely less on MNCs to monitor and access spills, as attested by the increased responsibilities allocated in the 2020 NOSCP. Norwegian Partners, praised the preparedness of the Ports and Harbours Authority (GPHA, 2023). Reports from the 2015 MARENDA and Oil Spill Response Limited (OSRL) (n.d) trainings support this. MARENDA, which targeted government and industry representatives, attested to an efficient partnership between government and offshore producers. Nonetheless, it found that monitoring equipment could be improved. This deficiency was also identified in the OSRL training with Tullow Ghana Limited, however it also praised the MNCs significant preparation, especially its cooperation with local stakeholders.

Unfortunately there is little evidence to assess rule of law. Only three news articles, from the 2010s on Tullow's disregard of environmental laws (Global Policy Forum, 2012), the Mediterranean Shipping Company (MSC) fine for failing to clean up a spill in 2016 (Berkett, 2016), and Kosmos' attempt at avoiding fines for excessive spilling (GhanaWeb, 2010). There is evidence of Kosmos paying the fine, albeit below the demanded amount. There is little historical evidence of MNCs fines or payment.

Finally, corruption in Ghana is considerably lower than other West African countries. While there have been some instances of corruption in contract signing, (Kwaka & Kantelberg, 2020) none have been flagged for oil spill cover up and the lack of accessibility to audits may effectively mask corruption evidence.

Results

A) Comparison

Both cases have extensive regulatory and legislative frameworks, referred to in contracts. Importantly, they also have NOSCPs that attempt to create an effective government-producer relationship. Nigerian institutions tend to be vague, scattered and have an unclear accountability mechanism. In terms of contracts, there are close to no environmental conditions and requirements. These are all issues of regulatory quality. However, Nigeria's biggest hurdle is poor government capacity in enforcing regulations, the inefficiency of its judiciary and corruption covering up poor spill management.

Generally, Ghana's institutions seem to perform better on the gaps identified in the Nigerian case. It's NOSCP, has a simpler yet effective division of roles and is proven to be effective. Some important inclusions, such as the article on "Safety and Environmental Protection" on contracts with MNCs, and the NOSPC's section on preparedness are indicative of regulatory quality. Evidence points to government effectiveness, in terms of its capacity to respond to spills, independently of MNCs. However there is less evidence on the rule of law, leading to inconclusive results on its importance. Corruption doesn't seem to be a problem, though this could be due to fewer investigations. Yet Ghanaian institutions are occasionally a vague and open to interpretation, whether this is the case is unknown due to lack of evidence on possible conflicts over legislation.

B) Discussion

In light of such results, The Nigerian case seems to depict the causal mechanism, scoring low on each institutional component, and how these poorly prepare for and mitigate spills. It also shows how the causal mechanism may be more complex than hypothesised, by illustrating how each component mutually reinforces one another; unclear regulations impede on the rule of law, corruption is identified as a cause for poor regulations, poor government capacity has helped MNCs escape liability… While, the Nigerian case seems to depict the causal mechanism, the Ghanaian case does so only partially. Regulations do seem more holistic, though their gaps, create uncertainty in drawing inferences on regulatory quality. There lacks much evidence to infer on rule of law. Nonetheless the country's emphasis on preparedness, subsequent government capacity and effective collaboration in oil spill clean-up seems be the most effective in reducing the likelihood of disastrous spills. Contrasted with Nigeria's heavy reliance on MNCs, this component seems to be most important.

This finding mirrors broader literature on institutions' moderating effect. Though it serves to criticise the conceptualisation and operationalising of institutional quality in the broader literature FDI-environment-institutions. Simplistic and narrow conceptualisations cannot testify of institutional quality as a whole, and the mutually reinforcing relationship between its components.

Conclusion

In answering; w*hat is the effect of institutional quality on preventing and mitigating FDI-related oil spills in West-Africa's?* This comparative case study only partially confirm the causal mechanism, containing some uncertainty regarding certain components (Regulatory Quality, Rule of Law and Corruption), and highlighting additional complexity. Nonetheless, it highlights the importance of institutions in managing environmental degradation caused by the O&G industry, and provides some evidence towards claims on their moderating role. Finding some differences in component influence; the thesis concludes that: regulatory quality is a good basis, but institutions must perform well on government effectiveness, rule of law and control of corruption to meaningfully implement and enforce said regulations. However this cannot entirely be confirmed due to the lack of evidence on the performance of other components.

This thesis is a first step in examining the moderating effect of institutions in FDI-related oil spills. It adds to the literature on the FDI-environment-institutions nexus by incorporating existing literature and new findings on a new type of environmental degradation; oil spills. Despite the results, this research can inform Nigeria and Ghana, on their oil spill preparedness and clean-up gaps. This information can serve other oil-producing countries in the region and beyond.

The most important limitation concerns data. Due to the lack of harmonisation between spill monitors it was impossible to divide the surface area of slicks by the amount of FDI. This limited the measurement of the DV to a simple visualisation relative to similar FDI levels. Contining on FDI, it could not be divided by O&G sector (upstream, midstream or downstream), which may have inflated the amounts, especially as downstream industries include the oil-service sector. Data collection also proved to be an issue for institutions. Despite claiming transparency, not all Nigerian and Ghanaian laws, regulations, contracts and audits, can be accessed by the general public, which may be indicative of poor institutions in of itself.

While justified, MSSD's generalisability is limited (Porta & Keating, 2008), and two cases can never be similar enough (Dogan & Passy, 1990). Limited generalisability was

expected as this is only a first step in understanding institutions' moderating effect in the O&G industry. While insightful, Nigeria is sometimes viewed as an extreme case, compromising the fruitfulness of the comparison. Additionally, despite controlling industry size to the maximum feasible extent, the sheer size of Nigerian oil production surpasses Ghana's, leaving some room for spills to be proportional. Its *extreme* nature, has made Nigeria the center of the academic research, ultimately informing the analysis. Conversely, this meant that Ghana's institutions and especially their effectiveness have barely been investigated. This thesis thus urges further research on seemingly functional institutions in order to single-out best practices in oil spill preparedness and mitigation.

Wrapping up, this thesis urges Ghanaian and Nigerian institutions to increase their transparency around FDI and spill reporting, and increased accessibility to older laws. Suggestions for future research include the aforementioned NGO investigations in Ghana. In light of the poor data availability, future research should be undertaken by academics with a legal background and better resources.

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Appendix

4. FDI data

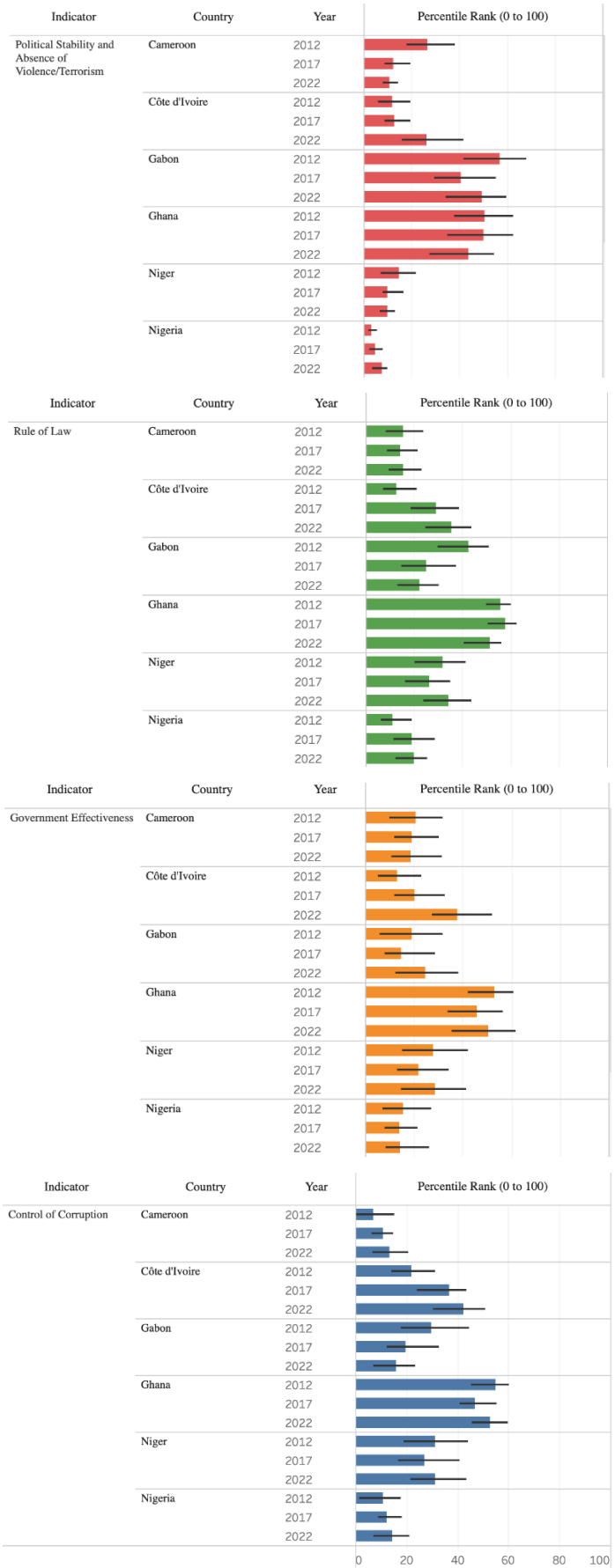
- Nigerian Oil and Gas FDI (National Bureau of Statistics) https://nigerianstat.gov.ng

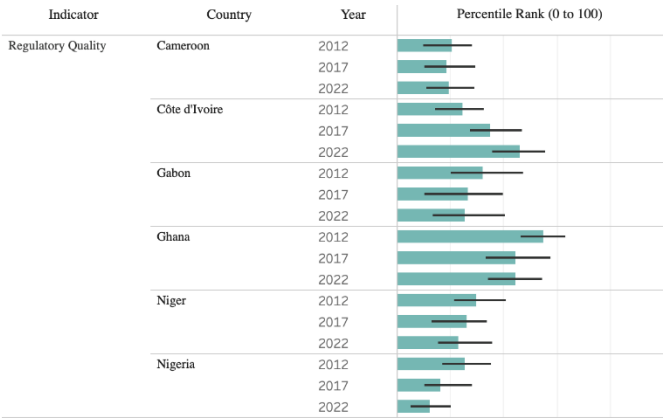
	Q1	Q2	Q3	Q4	**Total**
2011	/	/	/	/	**22.92**
2012	/	/	/	/	**156.77**
2013	/	/	/	/	**129.62**
2014	201.14	3.83	3.16	0.05	**208.18**
2015	9.47	4.86	2.21	13.22	**29.76**
2016	20.83	200.39	171.63	327.30	**720.15**
2017	101.08	190.39	16.97	23.83	**332.27**
2018	85.62	24.85	7.73	15.31	**133.51**
2019	17.22	30.05	38.66	20.62	**216.23**
2020	10.09	6.55	25.03	11.83	**53.51**
2021	57.25	11.32	0.94	32.31	**101.82**

	Q1	Q2	Q3	Q4	**Total**
2017	/	/	/	/	**493.86**
2018	/	/	/	/	**134.00**
2019	/	/	/	/	**/**
2020	/	/	/	/	**222.55**
2021	/	/	/	/	**265.87**

- Ghanian Oil and Gas FDI (GIPC

5. Institutional quality data: Comparison of West-African oil producers





6. Spill Monitor Information:

-NOSDRA provides information on the company, the number of incidents in a given timespan (from 2006 until today), start and end date of each spill, number of barrels spilled, quantity, estimated spill area, site location, cause, description of impact and cleanup information.

-Cerulean monitors human-caused oil slicks occurring in both Nigeria and Ghana, using machine learning to identify the slicks in radar satellite imagery, to then analyse "the locations of marine vessels and offshore oil platforms to identify each slick's potential source". It reports on the timestamp, length, area and location of the slick, and its potential sources, including vessel type and nationality

7. Top producers:

Nigeria:

-Upstream: Exxon Mobil, Deep Star, Chevron, SPDC, SNEPCo, ESSO Erha field , NPDC, Total Upstream, NOAC (ENI subsidiary), ESSO Usan field (DPR, 2018).

-Midstream companies: Duport Midstream Company Limited (DMCL), Nigerian National Petroleum Corporation (NNPC), Chevron Nigeria Iimited, ENI SPA, Shell PLC.

-Downstream: Niger Delta Exploration & Production Plc (NDEP), NNPC, Indorama Eleme Petrochemicals Limited, KBR Inc., and Midoil Refining & Petrochemicals Company Limited.

Ghana:

-Upstream: Tullow, Kosmos, Eni, Aker, Camal Energy, ExxonMobil, Amni, Sahara Group, Britania-U, Eco Atlantic, Gosco, UB Resources, Medea, AGM, Springfieldand Swiss African Petroleum (GIPC; Ministry of Business Development)

-Downstream: Tema oil refinery is the government-owned refinery (Ministry of Business Development), however the top 5 refineries in the 2021 were: Geoenergy Company Limited,

Juwel Energy Limited, Maranatha Oil Services Limited, Blue Ocean Investments Limited and Dominion Int. Petroleum Limited (NPA).

8. Spill shots:

-West-African spills, by Cerulean