



## **“MORE MONEY, MORE PROBLEMS”**

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**ECONOMIC DYNAMICS OF THE ARTISANAL OIL  
INDUSTRY IN THE NIGER DELTA OVER FIVE YEARS**



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SDN supports the efforts of those affected by the extractives industry and weak governance. We work with governments, companies, communities and other stakeholders to ensure the promotion and protection of human rights. Our work currently focuses on the Niger Delta.

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## Executive Summary

This report calls for an alternative approach to tackle artisanal oil refining in the Niger Delta, based on an analysis of how the improvised artisanal oil refining value chain has adapted and changed in Bayelsa and Rivers states over the past five years.

Our analysis indicates that all levels of the artisanal oil refining value chain are better organised and more profitable than five years ago. Data simulations indicate there are more refineries in operation, that are capable of producing larger volumes of fuel.

The industry is characterised by severe threats to stabilisation, which will continue to escalate if the drivers of the industry are not addressed effectively. These include poor working conditions, environmental pollution, health hazards, revenue loss to the government, increased risk of armed confrontation between associates, and raids on communities by security agencies. These problems are layered upon, and a result of, the environmental destruction, economic underdevelopment, and insecurity which has been caused by the actions and poor governance of the oil industry in the region.

At the same time, the supply chain is efficient in processing large amounts of fuel to feed the growing domestic demand that cannot be met by the Federal Government. The informal system observed appears to be functioning for many people - providing not only fuel, but livelihoods and a sense of economic and environmental justice.

The situation demonstrates that the current responses are not addressing the complex economic dynamics that sustain the industry and encourage new entrants. Instead, the focus on militarised policy appears to be catalysing the development of the industry at a rapid rate.

To encourage withdrawal of those embedded in the industry, as well as those drawn into it for employment, policies should prioritise the development of economic alternatives that put the demonstrated skills to use in the formal economy, as well as the energy poverty driving demand.

## Key Findings

### **Rapid growth in all areas of the supply chain over the last five years.**

It is estimated that there are five times the number of refineries in Rivers and Bayelsa as there were five years ago, and that annual earnings across the supply chain increased by twenty-four times to more than £540 million (N240 billion).

### **The refining industry is now more organised and more profitable.**

Informal business associations improved information sharing and coordination of the supply chain. With fewer workers and more efficient practices, profit levels increased to above 60% for refinery owners, who on average can breakeven on initial investment within 9 to 20 days, depending on the size of the refinery.

### **Increased dependency on the industry for fuel supplies and income generation.**

National fuel scarcity increased the demand for diesel, kerosene and petroleum, which is being met by black market supply. It enters tankers, mixing with official fuel supplies, and is supplied to filling stations across the region, and so is increasingly becoming a national problem. Demand for the easiest products for makeshift refineries to produce - diesel and kerosene – continues to increase into 2018. As this report shows, the financial incentive to meet that demand means there is a sustained flow of investment into artisanal refining, from a wide range of investors, incentivised by the high returns on investment, and the relative absence of attractive economic opportunities in the local or national formal economy.

### **A reduction in the number of workers per refinery reduced the total wage bill by forty percent over the five year period.**

In Bayelsa, the average annual salary of a refiner had more than doubled by 2012, while in Rivers state salaries remained stagnant. In both states however, the majority of increased earnings was captured by camp owners and distributors, and invested into a range of local formal economic enterprises.

### **Militarised policy responses are insufficient and catalysing growth of the industry.**

The rate at which refineries are established far outstrips the rate at which they can be identified and destroyed. This approach also encourages counter-militarisation by industry actors. Therefore, the current approach to eradicate the industry threatens other efforts to stabilise the Niger Delta, and challenges relationships within and between communities, government, and oil and gas companies. It is estimated that over five years bribes increased from £1.5 million to £30 million per annum, a twenty-fold increase. A detailed understanding of these fees is difficult and dangerous to investigate, and total informal taxes are expected to be much higher than these calculations indicate.

**Production, consumption and eradication are damaging the environment.**

Refining practices pollute, and the low quality fuel produced is likely to release more emissions when consumed. Security agencies often burn what they find at site, or pour it out onto land and waterways. The hazardous soot plaguing Port Harcourt over the last two years is expected to be a direct result of these factors, and others including the poor environmental standards of the State Port Harcourt Refinery.

**Artisanal oil refiners would be a willing target demographic and entry point for policy responses.**

The individuals that manage and work at refining camps - but do not own them - are most disadvantaged when it comes to profit share in the value chain, opportunities for personal advancement, and level of exposure to environmental, health and security hazards. The findings indicate that this core group have the most to gain from withdrawing from the industry, and engaging in appropriate and acceptable alternative livelihoods .

The findings demonstrate that the current militarised policy response is not capable of addressing factors driving the artisanal oil refining industry, and may be catalysing its evolution. Under this approach, the industry is likely to become more organised, more profitable, and more resilient. The policy response thus needs to be reframed and treated as a socio-economic and environmental issue, with a reduced role in responses for the security agencies.

Our recommendations to guide this adjustment are as follows:

**1. Develop alternative livelihood options for those working in the artisanal oil refining industry.**

Options should be generated through a community-led-dialogue with people in locations that have a high concentration of refining activity. This will ensure alternatives designed are based on local skills and resources to generate productive economic opportunities, suitable for those in the industry, and the broader group at risk of entering the industry.

**2. Demonstrate the feasibility of this approach, with a view to scaling up and replicating pilot projects in other locations.**

There is little evidence of successful approaches, so piloting alternatives is essential. Monitoring and evaluation throughout implementation can inform the development of a framework that can guide more effective policy responses elsewhere.

**3. Target investment into alternative livelihoods in locations that would have the greatest impact on reversing growth of the artisanal oil refining industry.**

This, together with improved coordination between livelihood projects implemented by NGOs in the region, would support stabilisation. These should also align with plans by the Federal Government Inter-Ministerial Committee on Niger Delta, and the Niger Delta Development Commission, as they will be responsible for defining the immediate priorities for economic development in the region.

**4. Support appropriate agencies to responsibly dismantle camps, confiscate and dispose of crude oil and refined products, and document all progress recorded.**

The House of Representatives has mandated eight Joint Committees to improve approaches to the destruction of refineries and confiscated products, and prevent environmental degradation. The first step should be to reassign the responsibility from security agencies to another agency with the mandate to reduce the environmental impact. Documenting progress would mean the scale of the industry and changes over time can be measured more accurately. Together with better guidelines and a uniform approach, this would improve coordination between security agencies and policy makers, and thus improve the impact of responses.

**5. Address demand for black market refined products. To do this, it will be essential to increase alternative energy sources to meet residential and commercial needs.**

Managed local investments would be an opportunity to generate employment for skilled workers currently engaged in the informal industry. Off-grid gas-to-power or renewable options would be one way to deliver electricity to riverine communities at the heart of the artisanal oil industry.

**6. Launch an investigation into the impact of consuming this fuel on air pollution levels.**

Production efficiency increased from 45% to 88%, with evidence the quality of fuel produced is less pure and contains more waste and dangerous carcinogens. A market sample can be collected for lab analysis to determine toxicity.

## Research Approach and Limitations:

A production-led model was developed to illustrate the linkages between the supply chain, providing a tool to analyse the value added at each stage.

Data was gathered from individuals working at different points in the value chain, from crude oil tapping through to refining camps, distribution, sales and finally end consumers. Each dataset provided a scenario for the model to simulate the revenue flow throughout a section of the artisanal oil refining industry from a specified volume of crude oil.

To help explain the evolution of the industry, the distribution of resources were identified at and between sections of the supply chain, indicating the share of profit between economic agents. When compared over periods and locations, factors such as growth and evolution can be deduced.

The qualitative data gathered during key informant interviews, focus group discussions, and policy workshops with actors engaged in the practice, helps to provide a narrative to the evolution of the industry in this period, explaining economic trends in terms of power shifts within the industry.

Overall, there are a number of limitations, but the findings indicate industry trends to help build a picture of the economic dynamics at a particular time. Whilst our estimates should be treated with a degree of caution, our model, which is based on empirical research, conservative assumptions, and a detailed understanding of the industry, demonstrates the need for alternative policy responses that differ from military responses.

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## Glossary of terms

**Artisanal Oil Refining** - Locally-fabricated refineries that can refine crude oil into different petroleum products. The process is untaxed and unlicensed.

**Bunkering** - A term used to refer to the industry as a whole i.e. tapping pipelines, refining, and domestic and international distribution and sales (somebody involved is therefore a 'bunkerer'). Not to be confused with the nautical term, meaning to transfer fuel ship-to-ship.

**Camp** - The site where refineries are located, usually at clearings with hidden entry points in the maze of riverine mangrove forests. Also known as a dump or bunk.

**Cooking** - The process of heating the crude oil in an oven in a process of hydrocarbon cracking that produces, in varying amounts, short-chain hydrocarbons such as diesel, petroleum, and kerosene.

**Earnings** - The money made during supply or production. It is preferred to the term 'profit', as there are a number of costs that cannot be captured with the research, so the terms are often used interchangeably.

**Informal Economy** - The informal economy is understood as the set of all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements. Workers in the informal economy are usually covered insufficiently or not at all by social protection; indeed, the lack of social protection coverage is sometimes used as a criterion by which to identify informal employment. At the same time, extending social protection coverage to workers in the informal economy helps to address some of the risks that trap workers in informality (such as the lack of health coverage) and support transitions to formalization, as set out in the Transition from the Informal to the Formal Economy<sup>1</sup>.

**Oven** - The part of the refinery where crude oil is heated by an open fire, usually fuelled by the waste product from a previous cycle. Also known as "Kom-Kom".

**"Kpo-Fire"** - The informal name for the refining industry and the fuel it produces.

**Presidential Amnesty Programme (PAP)** - National agency responsible for the disarmament, demobilisation and reintegration of ex-militants in the Niger Delta. In operation since 2009.

**Niger Delta Development Commission (NDDC)** - National agency responsible for investing into infrastructural development, in line with policy set by the Federal Ministry of Niger Delta Affairs.

**Niger Delta Drum (NDD)** - Locally-fabricated barrels that contain roughly 200 litres (compared to international barrels, which store 159 litres).

**Production Efficiency** - The ratio of petroleum products produced to waste products during a refining cycle. For example, if 100 drums of crude oil are input to a refining cycle, which produces 40 drums of diesel, 20 drums of petrol, 20 drums of kerosene, and 20 drums of waste, then the production efficiency will be 80%.

**Tapping** - Perforating a crude oil pipeline, with tools or chemicals, and diverting a small volume of flow for collection and sale to exporters and refiners.

**Vandalism** - Used to describe intended damage to pipelines and other oil and gas infrastructure. Can be done to get revenge, trigger release of clean-up or surveillance contracts, attach a tapping point, or send a political message.

£ - Great British Pound, accurate at time of research

₦ - The Nigerian Naira

# 1. Introduction

Artisanal oil refining is one of the few livelihood options for individuals living in remote parts of the Niger Delta. Thousands of ad hoc refineries built from scrap metal, are camped deep in the mangrove forest and provide an important source of fuel to generate electricity and cook for communities without access to a legal supply of energy. These communities are often inaccessible by road, and in receipt of little in the way of investment or state support.

Outside the region, national fuel shortages have catalysed a thriving domestic black market for sub-standard petroleum, diesel, and kerosene. The prevailing militarised response by the Federal and State governments to the phenomenon has neither curtailed the practice, nor contained the export of crude oil and refined products in large quantities to other markets in West Africa and beyond.

The Organisation for Economic Co-operation and Development recently reported that eighty percent of illicit financial flows from West Africa are generated from the theft of natural resources, principally crude oil<sup>2</sup>. With finances transiting and ending up in the international system; revenues and government responses driving violence; the negative environmental and health impacts of the process; the lost revenue; and the stalemate in debate on governance of resources: addressing the industry is of regional and international importance.

The research analyses the economic evolution of the improvised artisanal oil refining value chain in the Niger Delta over the past five years. Primary data from a range of crude oil tapping sites, petroleum production camps and distribution markets is presented and discussed to improve understanding of how the industry is organised, with a view to informing discussion on policy responses.

Starting with an anatomy of the current nature of the value addition mechanics, the report compares how this has evolved over the past five years, highlighting the sustaining factors that previous approaches have failed to address.

Next it outlines one of the main reasons that the industry grew and became more resilient over the last four decades. The research indicates the creek industry is sustained by complex and interconnected formal and informal political and military networks. The report does not specify historic interconnectivity, but the current cross-over between formal and informal oil industry, military, and other enabling actors is discussed to contextualise the economic analysis.

Finally, the report outlines recommendations for an alternative policy response to the current approach of militarisation. The journey of research and dialogue demonstrates that there are many benefits to the inclusion and participation of industry actors in the development of policy responses. They will be more attuned to addressing the underlying drivers to entering the sector, either as labour or investors, and also what is required to bring out those already embedded in the industry.

Workshops with individuals engaged at different levels of the industry, convened by SDN, were parallel components in a wider community-led process that has led to mass voluntary desistance, momentarily maintained across neighbouring local government areas in one of the research states. This has created a forum to generate and validate assumptions used to model the economics of the industry. The research has unearthed similar opportunities available in other locations with a high concentration of refining activity, where the process of dialogue to develop alternative livelihoods could be replicated and scaled up, by harnessing existing financial resources allocated to the Federal and State governments, and international donor assistance in the Niger Delta.

The process is still in the formative stages, and further work is being done to document the transition of those engaged in the industry through a transformative process of identifying, planning and ultimately implementing options for alternative livelihoods. Given the failure to end the industry using the current military approach, the research shows that providing alternatives that harness the skills and entrepreneurialism demonstrated would be a more effective way to undermine the supply side elements of the industry.

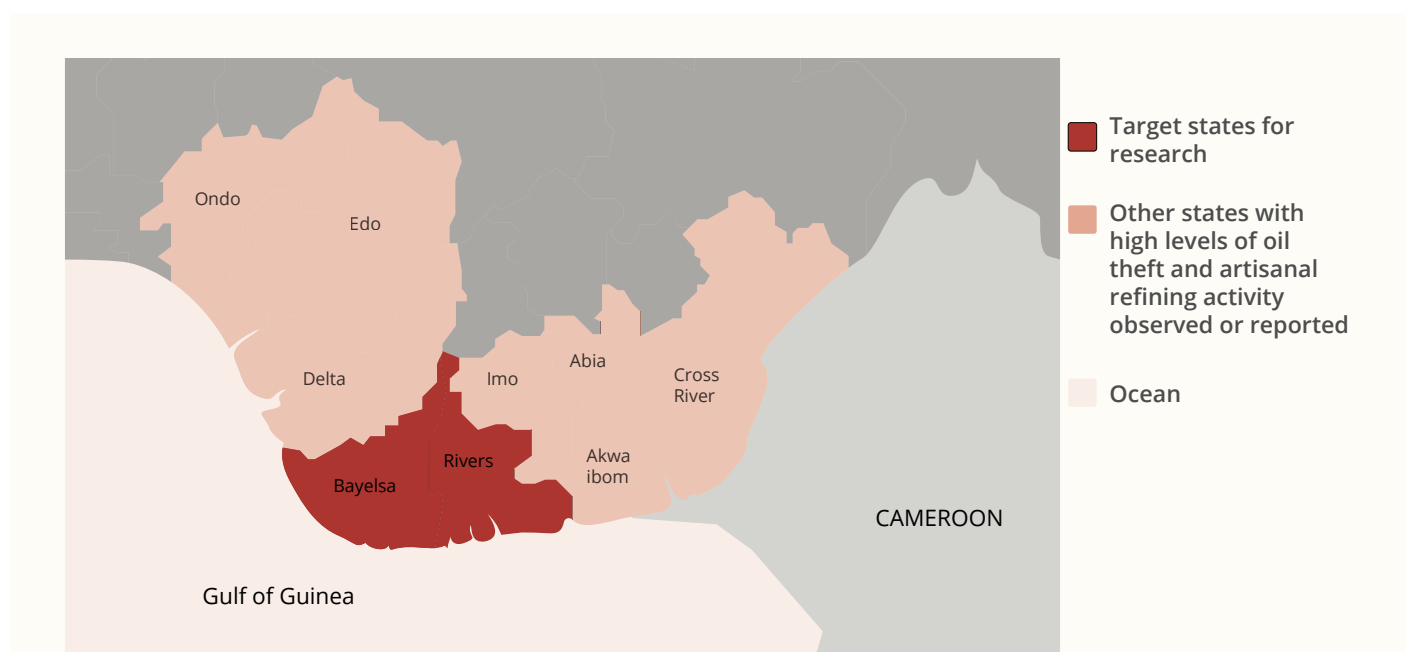
Progress remains fragile and unbinding, and is restricted to one small area in a vast region where the practice proliferates. The feasibility for community-run enterprises to replace refining in this unit is currently being explored by SDN and will be documented throughout an iterative implementation process. It is hoped this approach will adapt as implementation unfolds, and in the process generate mutual learning that can be documented, and ultimately scaled up or replicated elsewhere in the region.

## 2. Research methodology

### 2.1 Data collection

The target area for data collection covered Bayelsa and Rivers states, which lie adjacent to each other and are discharge points for Nigeria's rivers into the Gulf of Guinea in Nigeria's South-South delta region. The swamps here are the centre of the formal onshore oil and gas production industry. The informal sector has been able to establish itself alongside the overland pipelines and other ancillary infrastructure of the formal industry. At times the informal industry has also directly interacted with formal sector actors, for example in distribution of products using formal sector infrastructure.

Actors in a range of these roles in the formal and informal industry were engaged to provide an anecdotal walk-through of the mechanisms involved, while supply side actors granted access for the team to collect quantitative data at refining camps across this region - first in 2012 and 2013 then again at multiple times throughout 2016 and 2017<sup>3</sup>.



*Figure One: Map of research target area*

More than one-hundred refineries were visited during the most recent phase of data collection in the target areas. Data was collected on many variables, such as the capital cost and lead time for setting up an artisanal refining camp, running costs, the price paid for crude, the quantity of crude held at site, the amount of crude input per refining cycle, the volumes of different products produced, the individual sale prices, the days that camps are active per month, a camp's duration on its current site, the number of workers and their labour costs, and the fees for security agents, worker unions and shareholders. These are fundamental variables of the industry which have formed the assumptions for an economic model that simulates the sector across the two states. Information on the separately controlled practice of crude oil theft and the subsequent distribution following refining was collated for the model, but is not the focus of this particular research.

## 2.2 Reliability

The authors are mindful that data solely provided by actors with strong interests in the highly sensitive issue under observation has limitations in reliability and validity. By aggregating the data from multiple sites we can identify trends and commonalities to determine estimated average variable values across locations within a state. These averages were then fed back into interviews and workshops with actors engaged at different stages of the practice throughout the period, to gain a common understanding of the industry as a whole. This produced figures that compare reasonably with anecdotal accounts. This method of triangulation therefore indicates that while there may be inaccuracies, the values are credible for comparison.

The sample size, while sufficient, is by no means comprehensive. The practice has adapted to be highly responsive to market forces and security threats. Simultaneously there are new camps emerging daily and huge numbers being destroyed by the military. At different times in different areas, large networks will quickly go into hibernation to avoid being shut down, while elsewhere others are exploiting an open market and prospering. The industry therefore varies greatly, and real production could be above or below this level in any given month based on exogenous factors. Consequently, it will always be difficult to provide a linear analysis with comprehensive data across time and space.

Data collected across Rivers and Bayelsa in 2012 was largely indistinguishable. For the calculations used, reliability improves with the size of the data sample. Therefore, to maximise this, the data for this period was collated and is not differentiated between states throughout the report. As will be shown, after five years the two states have grown to be very different, so the 2016 data for Bayelsa and 2017 data for Rivers states were analysed and are presented separately to illustrate this evolution.

## 2.3 Modelling

A production-led model was created as a tool to improve understanding of the separate components of the chain of production<sup>4</sup>. The model can be used to evaluate the chain of value that is added at each stage as a volume of crude oil is input and distributed through the system. These values can be compared like-for-like with the value chains in different locations to analyse trends within and between different segments of the industry as a whole.

This gives us great insights into the impact of evolving industry structure and systems of management in this informal industry. Together with ongoing qualitative research it is possible to deduce the impact of each of the systems on employment, distribution of earnings and productivity, as well as industry organisation and the negotiated conditions for operation. This is useful to help understand the factors that repeatedly push individuals to establish, revive or suspend activity, and identify influences with the potential to pull them out of the industry permanently.

The major input, supply of crude oil, was held at a conservative level across the two states, to identify minimum earnings and production capacities. Increasing economies of scale in both states over the past five years has a multiplier effect on refining larger allocations of crude oil, with possibilities such as spreading fixed production costs at larger camps. This is accounted for in the data.

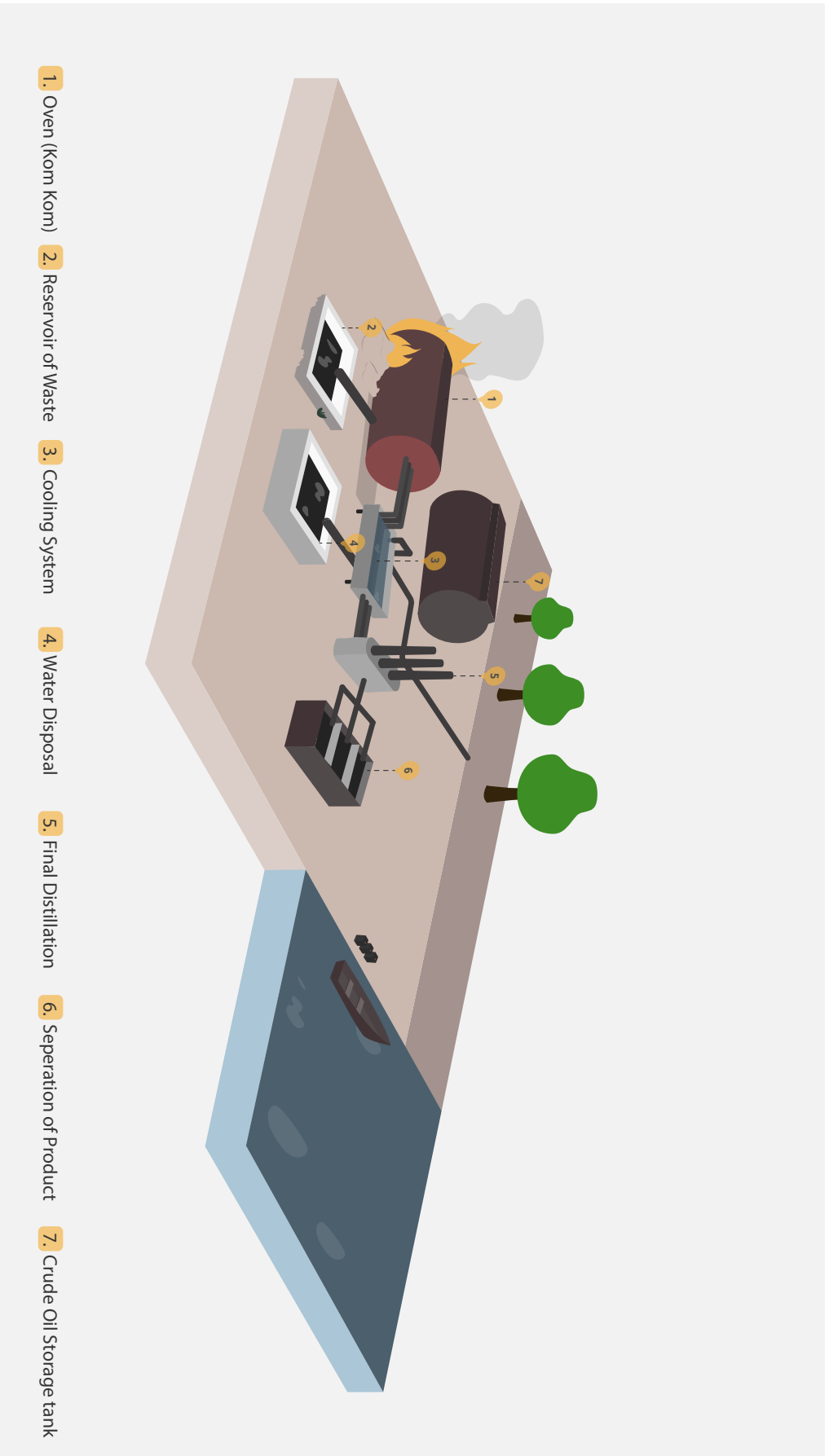
Currently, hypothetical scenarios can be modelled on the partial data available, with calculations such as the estimated size of the sector and earnings at each stage of the value chain developed by scaling up production in line with supply and absorption estimates based on contextual factors. But without the same level of detail in data on crude supplied and temporal dynamics of production, the estimates provided are largely for discussion<sup>5</sup>.



### 3. Industry operations & Analysis: Five - Year Dynamics (2012-17)

Following the analysis of the 2012 dataset it was apparent that while there were some variations in artisanal refining outfits, operations and outputs were broadly similar across Rivers and Bayelsa state. The practice was largely ad hoc and opportunistic. With such similar processes, data from both Rivers and Bayelsa states (2012 and 2013) were amalgamated into one model and is referred to throughout as 2012.

Over the last five years, the practice has evolved along very different trajectories between states, which will be highlighted by maintaining the separation of the most recent dataset for Bayelsa (2016) and Rivers (2017) states.



*Figure 2: Diagram of a typical artisanal oil refinery*

## 3.1 Crude oil pipeline tapping

### 3.1.1 Increased profitability for individuals involved in crude oil pipeline tapping and sales

The production model shows that tapping remains the most lucrative part of the value chain, because individuals running theft and supply as a business are getting their major input for free, which is a valuable commodity in local and international markets. The total industry supply volume, tapped from a crude oil pipeline, cannot be examined in detail without a greater understanding of other crude sources, but indications of profit share can be drawn from the research.



*Small delivery of crude oil to a refining camp*

Profitability increased from 89% in 2012 to 97% in Bayelsa for the actors at this starting point for the supply chain. Placing this into context, one organised group came to control all major tapping points in Bayelsa state after the security agencies drove out competitors. With a monopoly on the means to produce and the supply, this group was able to tap efficiently and effectively to meet the high market demand for crude oil. Its monopoly allowed the group to control the tapping price, spread tapping costs across multiple sites, and as a result capture additional profits made available through consolidation.

### 3.1.2 Increased volume of crude sold on domestic markets to meet demand for refining

Field research and reports consistently indicate that the overall rate and volume of oil theft has not decreased, but the volume of exports to international markets has. The research in 2012 estimated that just 25% of total crude stolen was sold domestically, but field research with crude dealers five years later indicates sales locally now exceed 75% of total volume.

Niger Delta Drum (NDD) per day	2012	2016	2017
Estimated crude oil stolen nationally <sup>6</sup>	175,000 (100%)	175,000 (100%)	175,000 (100%)
Share sold on international black market	131,200 (75%)	26,200 (15%)	43,700 (25%)
Share sold on domestic black market	43,700 (25%)	148,700 (85%)	131,200 (75%)
Estimated domestic allocation of stolen crude oil sold in Bayelsa and Rivers collectively	26,200 (60% of 25%)	74,300 (50% of 85%)	118,100 (90% of 75%)
Ratio of crude oil sold in each state (Bayelsa:Rivers)	50:50	50:50	50:50

*Table 1: Estimated distribution of annual crude oil theft to international, domestic, Bayelsa & Rivers markets*

The ability of the domestic market to absorb 130,000-150,000 Niger Delta Drums (nnd) of crude oil per day indicates a higher demand from more productive refineries. External factors have also influenced the higher proportion of crude oil supplied domestically.

Sea piracy has made the Gulf of Guinea one of the most dangerous waters in the world<sup>7</sup>. In 2017, 80% of the piracy attacks in Nigeria were off the coast of Brass, Bonny and Bayelsa<sup>8</sup>. These groups harbour in the mangrove forests, and cause largely unreported damage to the local population, through robbing vessels of goods, valuables and engines, kidnapping, and participating in shootouts with the military that have claimed the lives of civilian bystanders. Such incidents are seen on a daily basis, and there are large areas where the security services are unwilling to enter. In response to this, there is also an international military presence in the Gulf of Guinea. Combined, this makes it very difficult to move large quantities of crude or products out through this challenging terrain into the Atlantic.

In addition, the logistics of smuggling large vessels past authorities has become more difficult. Investigations into the former Minister of Petroleum Resources, and her chain of oil deals without relevant approval, has put the previously opaque space within which to arrange such deals under the spotlight<sup>9</sup>.

Notwithstanding these developments, there are still middlemen taking the risk and the international market remains a significant destination for crude oil, while refined petroleum products also filter into the legitimate fuel markets in West African countries.

### **3.1.3 Despite the global oil price collapse, sale prices on the black market remained steady across the region, and increased in Bayelsa**

Despite the global oil price collapse, and increasing domestic black market supply of crude oil, the price of crude oil increased in Bayelsa, while in Rivers, the price has slightly weakened over the last five years:

Crude Price per NDD	2012 Rivers & Bayelsa	2016 Bayelsa	2017 Rivers
Black Market Average	₦2300	₦6000	₦800
Official Market Average <sup>10</sup>	₦51,200	₦19,600	₦22,800
Black market to market average multiple	22.3x	3.3x	28.5x

*Table 2: Comparison of price difference between official Platts Market Data for Bonny Light Crude and the same available on the black market at the time.*

In 2016, the incoming federal government fuel subsidy adjustments caused disarray in refined product markets. Simultaneously there was a drop in production to 800,000 barrels per day, down from 2.5 million capacity, as a result of a peak in militant attacks to pipelines. The foreign exchange shortages restricted the ability of the Federal Government to import fuel to quell the national demand. The lack of progress to supplement this supply (either through state refineries or improved supply chain efficiency) is manifesting in national fuel shortages that started in 2017 and have subsequently increased pump prices for official products. This has given black market fuel dealers across the region the freedom and justification to raise the sale price of artisanal fuel (discussed later in detail).

This was tracked by crude oil dealers, who have used the opportunity to also increase the cost of their supply. Increasingly, domestic sales have been prioritised in response to a drop in demand in the international market, and to negate the new risks of export posed by sea pirates and national, international and paramilitary security agencies. As will be discussed later, this increase in supply to domestic markets is a significant factor impelling more refining activity.

### **3.1.4 Complex relationships between suppliers & enablers are factored into low commodity prices in Rivers state**

In Bayelsa, an organised body emerged that oversaw the industrial activity in the state. The payments made by this union to intermediaries in security agencies have been documented. But the payments - or 'kickbacks' - within security agencies and to the high-level enablers safeguarding the continued existence of the monopoly are unknown. As a result, the profitability estimate at this level appears higher than in reality<sup>11</sup>.

The same challenge is faced in Rivers state, but anecdotal evidence suggested that profitability for tapping crude oil is lower because the price of relationships with security agencies is factored into the sale price. By 2017 there was one supplier in Rivers state selling very large quantities of crude to refiners for as little as N200 per NDD, and elsewhere the average price was still low at an average of ₦1,000 per NDD.

Interviews revealed large kickbacks to security agencies were in place in Rivers at the time, and that in one location the relationship came with an additional condition that the sale price of crude oil should be purposefully held low to benefit those with major interests in exports and refining. Respondents claim security agents themselves often invest directly into camps, and would therefore benefit from lower crude oil prices, while another account is that there were more senior interests with complex political relationships dictating this price fix.

Another factor making it less profitable to source crude oil direct from a tapping point in Rivers state is because Port Harcourt harbours some of the largest black markets for crude oil in the region, laundering multiple sources from across the Niger Delta, including oil confiscated by security agencies. This makes it easier for refiners in Rivers state to buy crude oil and less profitable to source direct from a tapper.

## 3.2 Artisanal oil refining

### 3.2.1 Camp set-up costs have increased, but the break-even point for investors has decreased

When a new outfit enters the artisanal refining industry, they must have sufficient funds to cover set-up and initial operating costs. The table below illustrates refining is an attractive sector to enter for investors, and presents a rare opportunity in the local market to generate high and rapid returns on investment. In a deteriorating formal economy, investor backing can be raised from an increasingly wide range of individuals, such as security agents, political aspirants, business owners, traditional rulers, militant groups, and black market hustlers.

Calculations adjusted for inflation offer an indication that over the past five years the initial capital costs for camp set-up have increased from £2,830 to £7,142 in Rivers. In Bayelsa the initial investment required for a camp is now quadruple that of Rivers, but note that this is to build larger camps that can process almost ten times more refined product.

		2012/13	2016/17	2016/17
Per camp	Unit	Bayelsa & Rivers	Bayelsa	Rivers
Average Investment	Camp set-up	£2,800	£31,500	£7,100
	Average number of refineries per camp	1	12	2
Estimated Average Earnings	Month	£4,400	£93,100	£6,600
	Year	£52,300	£1,117,000	£78,800
Profitability	Percent	17%	59%	62%
Breakeven Point	Days	20	9	18
Annual Return on Investment	Multiple of Initial Capital	18x	35x	11x

*Table 3: Camp set up cost and payback over time*

### 3.2.2 The rapid rate of return on investment is high for investors compared to a local and national economy that cannot generate the same yields

Estimated average earnings per camp increased more than twenty-fold in Bayelsa, from 2012 to 2016, and increased by 50% in Rivers between 2012 and 2017. As a result, break-even points after repaying initial capital costs have decreased by two days per camp in Rivers, while in Bayelsa, the increased economies of scale in the average camp has resulted in a breakeven point of nine days, twice as quick compared to 2012.

Comparing estimated average annual earnings against the initial investment yields an estimated return on investment (ROI). ROI in 2012 was 18x the initial investment, growing to 35x in 2016 in Bayelsa, and reducing to 11x in 2017 in Rivers<sup>12</sup>. As shown later, camps in Rivers roughly doubled in refining capacity over the period – and with the higher earnings this can generate, investors can pay back the initial capital costs quicker.





*Refineries increasing in size (clockwise)*

### 3.2.3 Attractive financials are likely to sustain flow of investment

From an investor's point of view, the opportunity to fund a refinery is clearly very attractive. The prevailing attitude is that overcoming the motivations of actors already involved in the practice will not be enough:

*"[The industry will continue it's a vicious cycle. It goes on, and on, and on. Even if we stop today, others tomorrow will continue from where we stopped.] More money, more problems." – Multiple camp owner*

This highlights the importance of not just focusing on solutions that draw out those already engaged in the practice, but to take a broader focus on community employment opportunities that provide alternatives to actors looking to cross the threshold into the industry for the first time.



Figure 3: Comparison of payback period and quarter one earnings between states

The lifetime of a camp can be between a few months to over a decade. As the above payback period and profitability illustrates, owners quickly recoup investment and can close down, or be shut down, and reestablish another camp without any significant financial impact.

### 3.2.4 Local demand for diesel and kerosene encourages supply

Data collected on input and output quantities of camps suggests an increased production efficiency, up from 45% in 2012 to 88% in 2016 and 2017. This compares favourably with the consolidated production of formal sector refineries in Nigeria, which averaged 89% efficiency between November 2016-17<sup>13</sup>.

While some minor improvements to efficiency have been made across informal refineries, the technology has remained largely the same since the Biafran civil war (1967-1970), which is summarised in the diagram on page nine. This indicates that the fuel produced is of lower quality compared to official standard fuel, as discussed later.

In addition, waste is reduced in Bayelsa by separating and selling the dense liquid at the bottom of the pot for fuel oil. In traditional crude oil cracking processes, the most dense products such as bitumen and tar are produced and sold to build roads. This was documented in a few cases across both states during the research, namely to maintain roads, but most of this waste is put on the fire of a subsequent refining process to heat the oven-load of crude oil.

Using the waste in this way was observed across the area researched, thus replacing firewood as the dominant firing agent. Burning the waste can sustain higher temperatures, production

capacities, and potentially quality of products, but is significantly worse for the environment, producing the thick black plumes of smoke often seen emanating from the creeks.

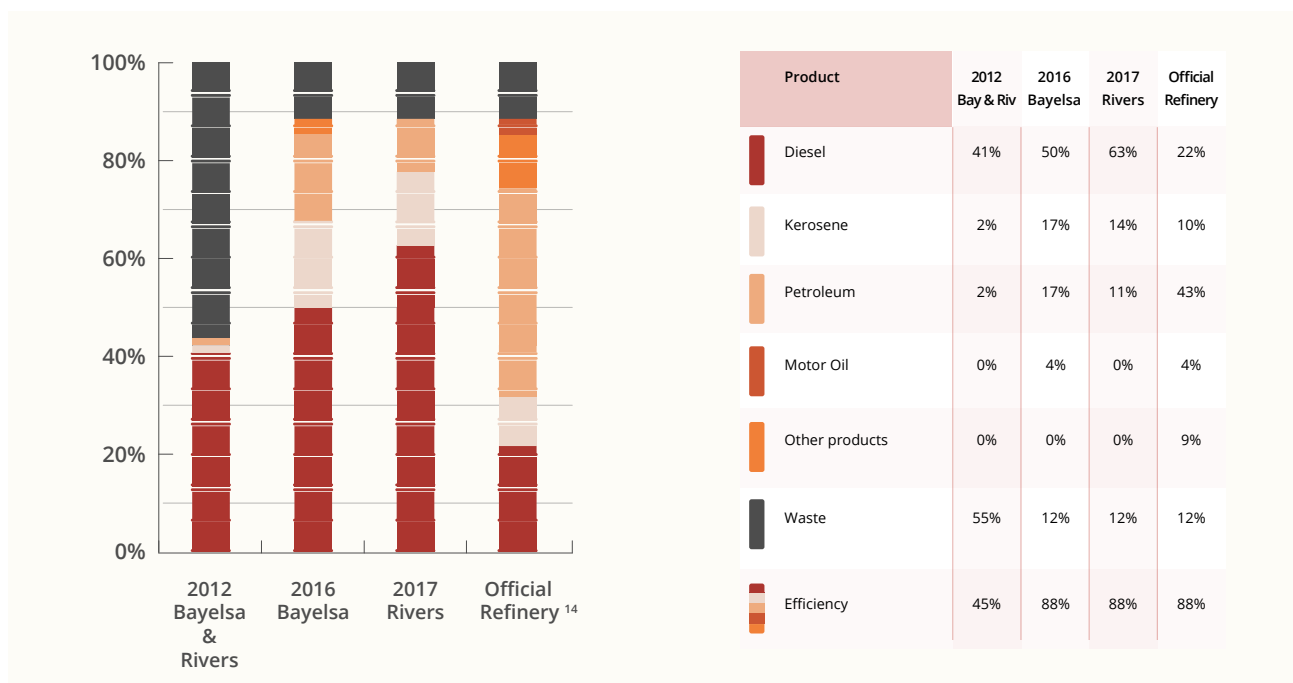


Figure 4: Production efficiency per barrel of crude oil refined. Yield as a percentage of input.



Oven and waste pool at artisanal refining camp





*For most operators, waste management is not an issue, while for others it is separated and either sold as engine oil or disposed of away from the camp.*

### 3.2.5 Local demand for diesel and kerosene encourages supply

Diesel production remains a priority for refiners to meet high demand across the region to fuel cars and generate electricity for residential and commercial use. However, kerosene and petroleum production have gone from a minor by-product in 2012 to significant products in the sales mix.

*"It is a lot more easier to deal diesel and kerosene than other products. These two do not have much complexities; also, the market demand is stable and ever growing" – Marketer*

Riverine communities remain dependent on kerosene to meet their household needs for cooking and light. Without legitimate supplies due to inefficiencies in official supply chains, communities are forced to source on the black market. As these are the simplest products to produce from a refining enterprise, it has the effect of lowering the requirement threshold for individuals to enter the refining practice. Meanwhile, national fuel shortages have increased the domestic demand for these products, in cities such as Port Harcourt, Yenagoa, Warri, and further afield."

### 3.2.6 The quality of fuel produced is expected to be poor (but needs further analysis)

Those involved in the practice argue that the quality of artisanally refined products has improved in the period. Bayelsa refiners in 2016 added one drum of black or white condensate to every ten drums of crude oil<sup>15</sup>. The claim is that this increases the quantity and quality of finished products<sup>16</sup>. The overpowering aroma at camps and storage facilities suggests a higher concentration of aromatic compounds present, indicating that the product smells more like legitimately refined fuel compared to products produced without condensate, which typically have a distinct smell that can be identified by a keen nose.

However, such aromas could indicate presence of highly carcinogenic compounds such as benzene, which in a usual pharmaceutical environment would be handled with great care and protection. Camp workers often conduct operations barefoot and without protective gear, which may contribute to the shortened life expectancies of those within the industry.

While the gains recorded potentially indicate technology transfer across states to produce comparable levels of products, it is likely that the increased quantity of final products produced is of lower quality. These are sold to consumers, mixed with more operational waste, and therefore resulting in a lower-grade, more polluting, and more dangerous fuel being consumed. This could help explain the great increase of soot and smog from the “kpo-fire” fuel that has shrouded Port Harcourt in the last two dry seasons. Further tests will be done on samples of this fuel to help determine quality across locations.



*Superficial differences in fuel produced - such as colour, consistency and aroma - can be perceived between camp refining cycles.*

### 3.2.7 Increased worker productivity did not translate into higher salaries

The average number of individuals employed at a refining camp has reduced by around 40% over the last five years, but with more refineries in operation, there are now more employees overall. As such, the total wage bill increased to £13 million per year in Bayelsa, and £28 million in Rivers state.

The average salary increased by 7% when adjusted for inflation over five years, but there is a significant difference between states. A closer look at the data indicates that growth in refining operation earnings is not a variable for the number of workers employed or wages paid.

What is clear, however, is that worker productivity has increased substantially, resulting in more profits distributed to owners and investors rather than workers. For every £1 spent on salaries, each worker in 2012 contributed to 55p of earnings. This indicates that while the sector was profitable at the time (with a 17% margin), refining operations were not productive as camps employed far more workers than was required to efficiently operate a camp. As a result, a high proportion of the operating costs were on salaries. This helps explain the industry's subsequent measures to reduce labour requirements in camps by 15% in Rivers by 2017.

In Bayelsa, the total number of workers employed in 2016 was 75% less than in 2012. With the efficiency measures implemented, £29 in earnings could be generated for every £1 paid in salary. These changes had a huge impact on the earnings and profits available to camp owners that were not passed on as wage increases to workers. Salaries in Bayelsa more than doubled over the period, while camp earnings increased twenty five times as a result of camp consolidation and the monopoly on supply.

In Rivers, total estimated refining sector earnings increased substantially, yet worker salaries remained stagnant at around £6,000 per annum. Therefore, while the system in 2012 was operating with too many workers to make it efficient and profitable, any profits generated were more equally shared with those engaged in the practice.



	2012/13 Rivers & Bayelsa	2016 Bayelsa	2017 Rivers
Refining Sector Earnings (per camp)	£52,300	£1,117,900	£78,800
Direct worker incomes (per camp)	£95,500	£38,400	£20,400
Average annual salary (per worker)	£6,400	£12,800	£6,100
Productivity per worker (£ profit per £1 of salary)	£0.55	£29	£4

*Table 5: Comparison of worker salaries*



*Workers at artisanal oil refining camps work in dangerous conditions and lack safety equipment. They often have to work without clothing, to avoid fire risks*



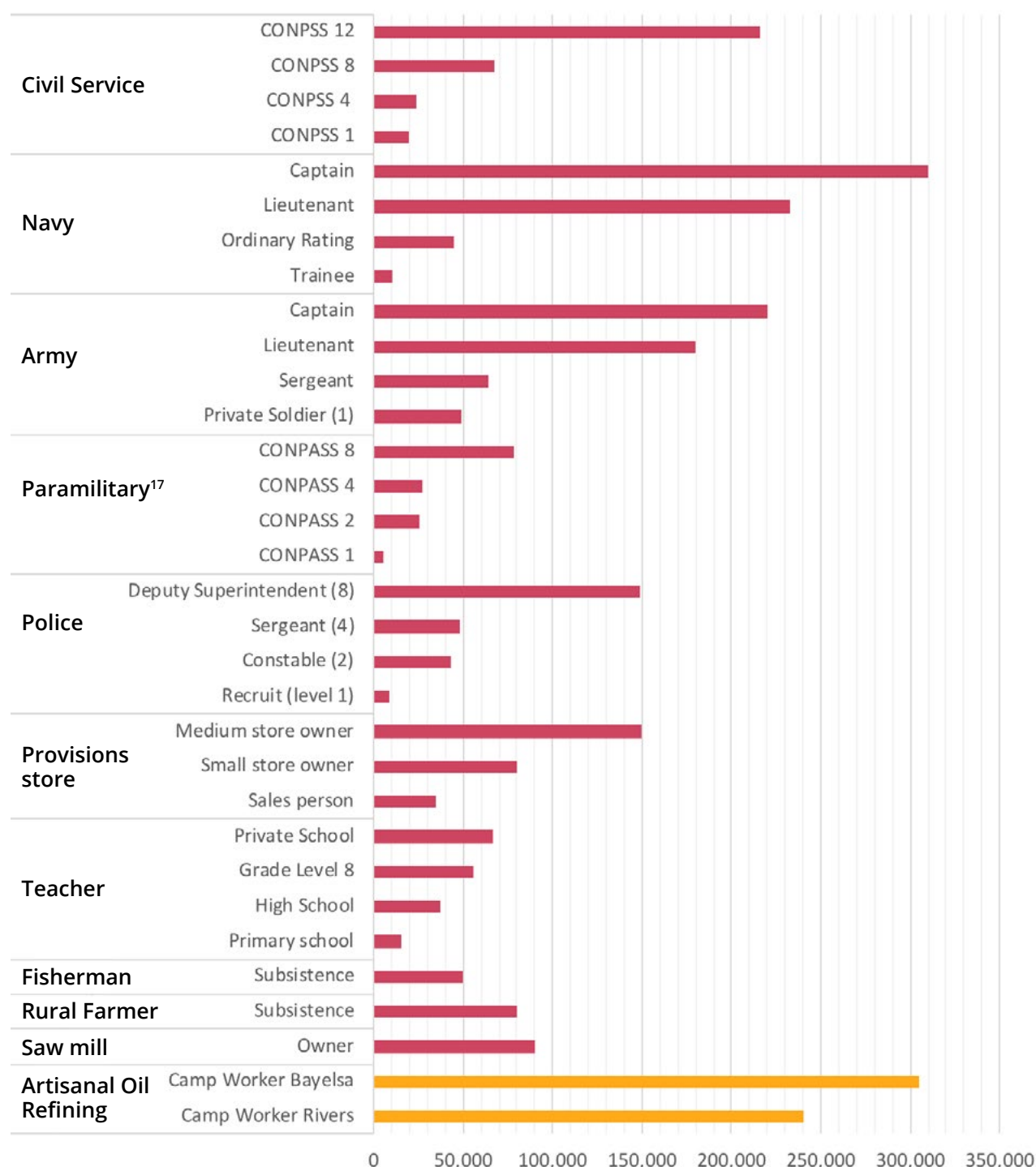
*Workers around diesel storage tank*

### 3.2.8 Camp owners captured the additional earnings generated by productivity

Fast forward five years and both systems have evolved to the benefit of the camp owner and investors, not in favour of the camp worker. That said, the salaries available in Bayelsa were significantly higher than in Rivers in 2017, with additional employment benefits, such as low interest loans and camp insurance packages. Meanwhile in Rivers it is now much easier to be an independent owner of a camp (due to a more fragmented market), and capture the share of increased earnings for yourself. But as a worker, salaries have remained at similar levels over the last five years, with very little additional benefits.



Figure 4: Comparison of salaries available to workers in a range of informal & formal sector jobs.



The salary value provided for civil servants, security agencies and paramilitaries is an average of the total number of steps within that grade, for example, grade 8 of the Consolidated Paramilitary Salary Structure (CONPASS) has 10 steps of incremental value - ranging from ₦888,956 to ₦988,991, the average of which is ₦939,974 per year, or ₦78,331 per month (£163). This does not include allowances for civil servants, which can include accommodation, transport, and clothing.

## 3.3 Sales and distribution

### 3.3.1 Bribes to security agents and measures to avoid detection kept products flowing

Refineries sell their refined product to a distributor who ships it and sells it at market. The large shipments and distances to local markets mean that distributors are exposed to financial demands from security agencies to protect their cargo. However, high profit margins mean that this is a risk worth taking, especially as the risk is eliminated once they reach the market and blend supply with official product, inserting the contraband product into legitimate supply channels (tankers and filling stations).

In Bayelsa state the date for sales of refined product was set by the camp owners in line with information provided to the refining Union<sup>18</sup>. However, it was middlemen who sent boats to camps to buy and load refined product, and bear the risks and costs associated with transportation to market. While they may get stopped multiple times by the Joint Task Force (JTF), their vessels can pass through after negotiating a bribe.

*"They know our vehicles so immediately they spot us, for them it's like: Merry Christmas, can I have my package right now? They do not want to know whether you are making profit or not, or on delivery at that time." - Marketer*

Originally, product was carried direct to market in 200 litre drums, but due to increased attention on the waterways, distributors began using alternative tactics to transport their product, such as filling refined product into waterproof rice and garri sacks, and water tanks usually seen atop borehole structures. Packaged in this inconspicuous way, product can be distributed on multi-purpose transport vessels carrying food, resources and passengers around the creeks. These attract little attention compared to the speedboats loaded with drums used previously. Nonetheless, many of the more established actors prefer to keep using speed boats as they are better for escaping and more efficient for transport.

*"The more quantity of product you convey per time, the more money you are required to pay for illegal marine taxes. Nothing goes for nothing." – Distributor*

Insight from security agents involved in the trade reveals that there is competition within ranks to get posted to the region. One soldier profiting for ten years vowed that if he is posted out of the delta, he will resign from the army and return to the region to join the artisanal oil refining industry.

### **3.3.2 The national fuel subsidy removal has increased demand for refined products, stimulating investment into refineries and greater volumes of production.**

After the subsidy paid to official marketers to import refined products was altered by the Federal Government,<sup>19</sup> supply challenges led to an increase in the national pump price for petroleum products. With a national fuel scarcity and poorly functioning refineries, there is competition between consumers, who know they can get fuel at a cheaper rate and without queuing at a filling station for around three hours, multiple times a week. Road tankers struggling to access fuel on the formal market are often seen waiting around black market sites in cities, with drivers filling their truck and collecting the savings made by buying at a lower rate than on the official market.

Once the diesel and petroleum are delivered to filling stations, common practice is to mix artisanal product with official NNPC product to mask any irregularities in composition, appearance, aroma, and performance. Stolen crude oil therefore forms part of the official state supply chain for petroleum products, compromising the grade and credibility of fuel supply. The scale on which this occurs, is an opaque area and currently unmeasured. It is also clear the sale of products goes beyond the local market, into the national or international network. Existing cross-border fuel smuggling networks, which previously fed off Nigeria's heavily subsidised fuel, may be connected<sup>20</sup>. Out of the 17 billion litres of petrol and three billion litres of diesel consumed per year in Nigeria, 90% and 60% respectively are imported<sup>21</sup>. If supply of imports is interrupted, it is therefore likely that demand will consequently increase for domestic artisanal products.

*"As long as official supply is not extended to our people in the creeks, pipelines will be vandalised to refine crude oil. They also need kerosene and petrol to do their business and cook at home. If the government does not find a way out for them, then they will help themselves." - Panucci, dealer*

### 3.3.3 Price of black market petroleum products tracks official prices

As official and unofficial retail prices rose throughout 2016 and 2017, camps took the opportunity to increase their refined product sale prices, resulting in significant monetary gains throughout the value chain. A comparison of prices shows that camps remained profitable, while still discounting the official rate, therefore providing a choice of prices to consumers<sup>22</sup>.

	Diesel			Kerosene			Petroleum		
NAIRA	2012 Bay & Riv	2016 Bayelsa	2017 Rivers	2012 Bay & Riv	2016 Bayelsa	2017 Rivers	2012 Bay & Riv	2016 Bayelsa	2017 Rivers
Purchase from camp	60	118	38	70	40	45	60	65	33
Sale price by marketers on black market	100	156	150	120	200	125	100	190	100
Official market price (NNPC)	155	125	190	No data	150	150	97	145	145
Difference between black market and official price	▼ -35%	▲ +25%	▼ -21%	No data	▼ -16%	▼ -53%	▲ +3%	▲ +31%	▼ -31%
Price paid by households in the state	No data	187	201	No data	297	278	No data	147	147
Difference between black market price and price paid by households	No data	▼ -13%	▼ -25%	No data	▼ -33%	▼ -55%	No data	▲ +29%	▼ -32%

Table 6: Comparison of cost of fuel over time

## 3.4 Overview of the upstream and downstream value chain evolution

### 3.4.1 Profitability increase throughout the value chain

Camp profitability roughly tripled from 17% in 2012 to 60% and 62% in Bayelsa and Rivers state respectively, which is largely attributed to a very low crude purchase price and an increase in refining efficiency in both states from 45% to 88%. It is interesting that margins are roughly similar despite the different scales of production. This reflects the common approach to refining, and the modular nature of production.

		2012	2016	2017
Sector	Measure	Bayelsa & Rivers	Bayelsa	Rivers
Refining	Estimated Annual Earnings	£5,172,800	£68,148,000	£100,448,400
	Estimated Annual Earnings per Camp	£52,300	£1,117,000	£78,800
	Profitability	17%	60%	62%
Distribution to market	Estimated Annual Earnings	£19,199,300	£96,589,000	£313,323,600
	Profitability	39%	45%	64%
Total Supply Chain	Estimated Annual Earnings	£24,372,100	£164,737,000	£413,772,000

*Table 7: Comparison of value chain profitability - estimates of earnings based on data*

As distributors work with large transport vessels and source from multiple suppliers, their overall earnings are also high. Overall distributor earnings were higher in Rivers, mainly due to the greater number of camps and market share of stolen oil. Distributor profit margins were also slightly higher (64%) than camp profits (62%). In Bayelsa, total earnings are around 40% higher for distribution than refining, but profit margins are actually lower than refining,

reflecting the value addition on production and monopoly control of supply that puts refineries in a strong position to set purchase price with distributors in line with black market prices. Another factor influencing the favourable conditions for refining in Bayelsa is increased vertical integration in the supply chain by tappers and refiners using their profits to invest in distribution vessels and markets (filling stations). This was not observed on such a scale in Rivers state.

### **3.4.2 Total supply chain earnings increase twenty-four-fold over five years**

Across the supply chain, total earnings grew from an estimated £24 million in 2012 to £578 million in 2016/2017.

In Rivers state, estimated supply chain earnings in 2017 were £413 million, as more camps processed a greater market share of crude oil. In Bayelsa, absolute earnings in 2016 appeared less at £165 million, but this is because the model captures a much smaller number of camps benefiting a smaller number of beneficiaries than in Rivers. This is highlighted by looking at the estimated earnings per camp. The much larger camps in Bayelsa take advantage of significant economies of scale available to earn an estimated £1,117,000 per camp compared to £78,800 in Rivers.

### **3.4.3 The estimated number of camps is five times that of five years ago**

There is now estimated to be at least five times the number of refining camps in the area researched than there was five years ago, largely due to the number established in Rivers state. Moreover, camps tend to have more refineries at site, so now there are estimated to be six times the total number of refineries than previously.

### **3.4.4 Camps are better prepared for supply shortages**

While camps are smaller in Rivers state, they are more likely to house storage facilities, storing an average of 70,000 litres of crude oil – 440 barrels roughly equivalent to the requirement for one day's refining. This measure helps smooth production in face of supply challenges, and is an advantage held over Bayelsa camps where the approach observed was largely "just-in-time" production – taking a delivery of crude and commencing refining that same day or shortly after. It also indicates a more stable system, where advance orders can be arranged for precise amounts required. The smaller camps in Rivers are less visible, and movement is easier unlike in Bayelsa where heightened security is the major influence of the "just-in-time" production approach observed.

### 3.4.5 The absorption capacity of crude oil has increased

In Bayelsa an estimated 61 camps processed 46,750 nnd per day in 2016, compared to 535 camps in Rivers processing the same amount. In 2017, the model estimates that due to Bayelsa's security clamp-down, the number of camps reduced to 48. This contrasts to a large increase to 1,275 camps in Rivers, reflecting the increasing processing capacity required to refine the increasing market share of crude oil available in Rivers state in 2017 (75%).

### 3.4.6 Annual estimated earnings of security agencies increased more than twenty-fold

When a new entrant seeks to enter the refining sector, the most profitable entry point appears to be via security services charged with patrolling the waterways. It is a role that requires no logistical expenses for the security services, as these are provided as part of the role as officer in one of the many security outfits responsible for securing the waterways, borders and transport networks.

	2012 Rivers & Bayelsa	2016 Bayelsa	2017 Rivers
Annual estimated total paid to security agencies across the supply chain (£)	£1,523,200	£11,922,300	£20,414,200

*Table 8: Annual estimated total paid to security agencies across the supply chain*

The annual estimated earnings of the various security agencies across both states rose from £1.5 million in 2012 to more than £30 million five years later.

### 3.4.7 The full scale of security fees is difficult and dangerous to calculate

Data was provided, in detail, openly by refiners, but is a much more guarded secret by the crude oil cartels. As such, the data captures the known prices they pay, such as access, labour, and transport. But the distribution of security fees among the powerful patronage networks behind the particular crude oil source that earns them so much money, would never be revealed, and therefore the true revenue of the beneficial owners cannot be captured in this research. The estimated figures therefore represent the average minimum earnings; real earnings within the cabal that enables the industry to proliferate are expected to be significantly higher.

## 4. Summary of findings

### Tapping points

- Profitability for those in crude oil pipeline tapping has increased.
- The volume of crude oil sold on domestic markets to meet demand for refining has increased relative to the amount sold on international markets. 25% is now estimated to be sold internationally, while 75% is sold in Nigeria.
- Despite global oil price collapse, the total volume of crude oil available on the black market remains steady
- Complex relationships between those who supply and enable the supply of crude oil are sometimes factored into black market prices

### Refining camps

- Camp set-up costs have increased, but the breakeven point for investors has reduced from 20 days to 9 days in Bayelsa, and 18 days in Rivers
- The rapid rate of return on investment is high for investors compared to a local and national formal economy that cannot generate the same yields
- Attractive financials are likely to sustain flow of investment
- The production efficiency, and therefore capacity, of refineries has increased from 45% to 88% for both states
- High local demand for diesel and kerosene encourages supply



- The quality of fuel produced is expected to be poor, although this needs to be further analysed
- Fewer employees (-42%) has helped improve productivity, although this has not translated into higher salaries for camp workers. Instead, camp owners captured the wider profit margins generated by the increased productivity.

## Distribution and sales

- Bribes to security agents and measures to avoid detection are one factor that keeps the industry operational.
- The removal of the national fuel subsidy has increased demand for artisanally refined products, stimulating investment into refineries and generating greater volumes of production.
- The price of black market petroleum products closely follows official prices

## Industry estimates

- Profitability has increased throughout the value chain
- Total supply chain earnings increased twenty-four-fold to an estimated £578 million
- There are five times the number of refineries as five years ago
- Camps are more organised and better prepared for external shocks
- The capacity of camps to absorb crude oil has increased
- The annual estimated earnings of security agencies has increased from £1.5 million to £30 million, a twenty one-fold increase over five years.
- The full scale of security fees is difficult and dangerous to calculate, but expected to be much larger.

## 5. Discussion of findings

### 5.1 Entrepreneurial actors in the informal sector

The research highlights the resilience of informal economies and structures in the Niger Delta, which often provide a better service than underperforming formal state services. Communities are not passive in the face of this failure, but instead have 'adapted in a variety of ways to minimise risk and increase predictability in their dangerous environments'<sup>23</sup> .

The research shows that an efficient and effective value added process producing a range of petroleum products in large quantities, is thriving in the informal economy. A complex supply chain has evolved and succeeds in getting the crude to refining camps, and then on to markets and legitimate filling stations. Unlike the formal economy, the informal system has a limited number of intermediaries affecting production, the tax system is known and the governing structures are adaptable. As a result, profits are higher for all parties involved, including the State security services who work in a crumbling institutional environment, with budgets that are diminished by patronage, encouraging the creation of alternative sources of funding to supplement salaries and finance operations<sup>24</sup> .

National recession and insecurity do not create a productive environment for diversified economic activity which limits what alternative opportunities are available for those involved in the practice. This is especially true for graduates in relevant disciplines such as chemical and petroleum engineering. The business environment does however retain basic elements required for artisanal oil refining to function. Essential skill sets are readily available across the region, such as welding and operating vessels<sup>25</sup> , and the labour-intensive camp work is comparable with other rural economic opportunities, such as agriculture and fishing.

*"Lack of meaningful employment and monetary needs prompted my indulgence. When I saw friends making huge profits from illegal oil refining and living comfortable, I had to join them since I couldn't beat them". – High level beneficiary with a BSc in Petroleum Engineering*

These observations contrast with the public understanding of actors engaged in the practice as lazy, unskilled, greedy young men, some already caught up in violent crime, that want the luxury goods that fast money can buy. Increasingly the new entrants to refining are pushed in,

rather than pulled in, by poverty and to meet basic needs.

*"It's money matter, when people have needs and we cannot even provide for ourselves, not to mention our families, what do they expect us to do? We cannot die of hunger so we used our God given wealth to make blessings for ourselves and families". – Tapping point owner.*

*"I have a wife and two children, if not for this work how will I take care of my brothers, sisters, parents, wives and children? My hope is that one day I will meet someone that will help me to achieve my dreams and get a good legitimate livelihood." 'Oil and gas' – Refinery Worker.*

*"For me as a woman, I have nobody to help me. Nobody to give me a helping hand without making funny demands in return for help, so what, do you expect me to sit and watch my family go hungry and maybe die of poverty? That is how I started this bunkering and it is really helping me small-small". – Camp manager*

Once invested in the business, participants find that large profits accrue quickly, so there is a strong temptation to remain in the business, investing in increased capacity to meet the high demand for low-cost refined products, and therefore to increase profits.

It is also increasingly common to see investment in vertical supply chain integration, running tapping points supplying crude oil, and investing in camps for production, barges and road tankers for transport, and floating and land-based filling stations for sale to end users. This includes not only those at the top of the hierarchy, but camp owners who are branching out, using revenue for individual accumulation and growth.

*"I intend to set up more fuel filling stations across the Niger Delta to make petroleum products readily and competitively available, stop environmental pollution and other unwholesome practices that degrade our environment and make it uninhabitable. I also intend to establish a refinery here in Bayelsa and be the Dangote [Aliko, the richest man in Africa] of the Niger Delta because my refinery, when established, would spread across the Niger Delta and create job opportunities for our people." - Chairman of the Bayelsa Union*

*"I want to set up a gas manufacturing plant where domestic gas (butane) would be refined daily. Such a plant would also generate energy for electricity which I'd distribute to my host community as CSR. By then, if there is a road network to my community, I'd site the project in my community. I don't need a gigantic gas plant, just enough to take care of our local demand here in Bayelsa and neighbouring states." Refining Camp Owner.*

The enterprising nature of those engaged in the practice acknowledges the risk associated with illegal oil refining, and over-dependency on one source of income. Participants often use money accumulated in the informal sector to invest in the formal economic space, in effect laundering their earnings. Investments have been made into river dredging companies, vessel leasing, restaurants, hotels, shipping yards, security services, pipeline surveillance, and oil and gas servicing companies, which operate on a fully commercial basis. These are typical commercial conduits to exploit overblown state contracts and divert government resources. Using this avenue for laundering the ill-gotten gains of refining is a logical move in the context.

## 5.2 Formalisation of the informal economy

During these processes of interaction between sectors, the research suggests there has been a significant formalisation of the informal industry. The most notable example is the acceptance of regulatory bodies to manage the process.

At the beginning of 2016 all aspects of the practice in Bayelsa state were controlled by a cartel, which described itself as a 'Union'. This formal hierarchy acted in the interests of those engaged in the practice, regulating the inputs, processes and outputs. The purpose of this association was in line with the definition of a union: to address official grievances, negotiate on behalf of workers, improve working conditions, and protect the productivity and integrity of the trade.

In practice, those involved managed the relationship with security services and communities, and control the tapping points, distribution channels, refining camps and refined product sales. Their roles were organised into an executive committee, and were defined and structured based on their ability to manage these processes.

Role	Responsibility
Chairman	All crude oil procurement and supply activities. Negotiations with security operatives for and on behalf of members.
Vice Chairman	Coordination of camps to ensure industry regulated so as not to draw attention.
Secretary	Supervisory role to ensure camps are compliant with the regulations.
Treasurer	All crude oil procurement and supply activities. Negotiations with security operatives for and on behalf of members.
Community Liaison Officer	Local informants who ensure residents do not expose the activities of refiners to security operatives. Usually nominated by a local militant or gang leader, with an armed enforcement team
Camp representatives	Each camp has a representing member, paying a monthly fee to the union.

*Table 9: Crude oil supply and refining union Executive Committee structure*

The Union streamlined a strategy across enterprises for minimising the negative externalities of the practice that are impacting surrounding communities and consumers.

*"We are obviously more coordinated with little or no incidence of environmental pollution."- Union Member*

*"We have little or no risks associated with our loading crude at the moment. As you can see, we are better organised now, it is no longer like before where the supply point was rowdy with criminal and reckless people being involved in the business. I know some disgruntled fellows would argue with me, but let me ask you this: when was the last time you heard of an explosion at a tapping point in Bayelsa and bunkers losing their lives or sustaining critical degree of burns as a result of some careless behaviour which led to the explosion?"*

*We do not have cases of environmental pollution resulting from our activities, because this is the situation which used to arouse high tensions between our local refiners and our various host communities – so there are no more cases of sabotaging our own environment." – Chairman of Bayelsa Union.*

In addition, the Union would offer members loans for a variety of purposes, within the following four categories:

1. Rebuilding operations after security services enter and raze camps to the ground
2. Investment in increasing production of the camp through employment of more operatives or improving equipment
3. Building of houses (in some cases investing in estates), hotels and other facilities that become investments in diversified sources of income
4. Consumption of better goods for family or for occasions such as weddings and funerals

Loans were interest free for categories 1 and 2 above, for 3 and 4 interest was low at five percent, which is significantly cheaper than commercial rates that sit around twenty percent.

The Union's primary motive was to maintain capital accumulation and growth, but they did go beyond the minimum requirement to keep the practice regulated. They also negotiated a new space within the local environment for the practice. Previously, crude oil suppliers and refiners carried out the practice without consideration of negative impacts on local communities. But this mattered to the Union as much as the relationship with the security services. As the practice transitioned from Union control back to amateur artisans at the end of 2016 in Bayelsa, the concern for negative externalities is less clear.

The industry in Rivers state also demonstrated organisation into groups of actors registering themselves as unions, but where this is done it is fragmented into different sub-state units, usually revolving around a different supply of crude oil – via the trans-region black market, links with security agencies, or direct from source. These mutually exclusive units have beneficial interactions with one another on a regular basis, selling and buying crude and products.

As camps are operating at a smaller scale in Rivers state, the profits are lower versus the workload required, and those involved do not achieve the same profits as those operating under the Union in Bayelsa did previously. Instead, the practice represents a livelihood characterised by subsistence workers on the margin of poverty that cannot afford to think beyond making enough money to get by.

## 5.3 Crossing between the informal-formal divide

The informal economy represents “socio-political entities, with their own rules, forms of organisation and internal hierarchies, and [constitutes] a node of resistance and defiance against state domination”<sup>26</sup>. The estimated average size of informal economic activity as a share of GDP in Nigeria is 65% – employing 70% and creating 90% of new jobs<sup>27</sup>.

To look at the institutional rules and procedures created, enforced and communicated within (or beyond) officially sanctioned and public channels, this section is informed by the distinction between formal and informal institutions offered by Helmke and Levitsky<sup>28</sup>. They posit that there are no rigid lines demarcating formal and informal institutions as they necessarily overlap and interact with one another.

Starting with direct crossover, the informal oil value chain has been observed to rely on formal infrastructure in a number of ways. Crude tapping is often done on the basis of information provided by actors within oil companies who can reveal when pipeline pressure will be down. Installing a tap is an incredibly dangerous operation that is mostly done by individuals with formal training in pipeline welding, often gained at formal institutions funded by oil company scholarships or through the Presidential Amnesty Programme for ex-militants. Similarly, at the artisanal refining level, numerous graduates of universities with qualifications in the petroleum and engineering fields are employed that cannot find employment in the formal sector.

Other formal sector infrastructure used by the informal industry includes the distribution of crude to refineries and refined products to filling stations. In this regard, the formal sector is reliant upon the informal sector to maintain the supply of crude and products to customers. The blending of legal and illegal products in tankers and depots is the most obvious mechanism of this convergence, and indicates that the legitimacy of national (and to a certain degree international) markets is compromised.

The industry also sustains a parallel economy – directly, through inputs such as materials and vessels, and indirectly, by providing the fuel required for broader business and social activity. A number of actors in the informal industry have used their earnings to invest into businesses in this parallel economy, especially in the fabrication and leasing of vessels for other uses, including to security agencies to conduct operations to stop the industry.

The complicity of security agencies sent to stop the practice is therefore an obvious area of informal-formal authority crossing over. Their presence was observed at multiple pipeline tapping points, refining camps and black markets to facilitate smooth sales to distributors. Monthly allocations are paid to security actors, and expected to be shared within the institutions. In a two-way exchange, those engaged in the practice can obtain from security contacts information regarding patrols, and inform their workers to avoid confrontation by vacating camps or transporting cargoes via other routes. Rates for dues are prearranged, including for encounters on the waterways where there are 'sensible' amounts negotiated for the passage of different size cargoes.

The security agencies in the region are also accused of selling confiscated crude oil and product. Early indications are that this does happen, but more work is needed to understand the scale of this problem. There are also indications that the relationship means that powerful actors in the industry can rely on security agencies to eradicate competitors, drawing on state resources and industry intelligence.



## 6. Assessing the Impact of Current Policy Responses

### 6.1 The militarised policy response needs to be broadened

Over the last two years, a number of Nigerian government military operations have reported success in destroying refineries, reducing pipeline breaks, and the percentage of oil spills reported caused by pipeline sabotage.

	2016	2017
January	President assents to the Bill for the year's budget to become law.	Operation Rivers Sweep phase I and II (Navy), Tsare Teku phase IV and V (Navy), Crocodile Smile II (Army), Octopus Grip phase I and II (Navy), and Eagle Eye phase II (Navy)  Temporary Naval War College launched in Rivers State, where Governor donates significant military hardware to Navy. Navy built 1,000 housing units to accommodate 4,500 additional people recruited 2016-2017
Total number of refineries claimed destroyed <sup>29</sup>	1,000	2,183
NNPC Pipeline Breaks Recorded <sup>30</sup>	2,567	808
Oil Spills reported (% caused by Sabotage) <sup>31</sup>	616 (75%)	392 (71%)

But as the supply chain analysis shows, the rapid return on investment across the supply chain means that military action has not deterred new actors from entering the industry, nor prevented the same actors from re-entering:

*"Arrests and raids may work if intensified. But as soon as there's cash someone else will open another point or bunk." – Artisanal refinery worker*

*"We have suffered raids and survived it. Should I mention incurring losses on goods (refined products) to the Army on numerous occasions? Yet we return to settle with them and start afresh from where we fell off. My brother leave am." - Tapping point*

*"I lost my boats, goods, and army invaded my house seizing my properties because of this business. Yet, I am not deterred. Still I rise!" – Tapping point*

*"Raids may work somehow but that's not the solution because it will cause grievances. Personal injury and arrests could deter bunkerers a bit. However, that is not the way forward because it will encourage militancy upsurge." – High level beneficiary, 2016.*

*"Arrested and sent to prison - but that didn't deter me, because I have to survive. I sincerely need a decent living and legitimate job to leave this bunkering business and anything associated with illegitimacy, soon as I find a legitimate one." – Marketer*

Moreover, the lower number of pipeline breaks recorded in 2017 is mainly due to a dialogue process, led by the Pan Niger Delta Elders Forum (PANDEF) and Vice President. The pipeline attacks in 2016 demonstrated that actors close to critical oil and gas infrastructure have capacity to orchestrate a small but devastating number of pipeline attacks, which the increased military presence in the region could only partially stop or react to. National production halved during this period as major infrastructure was down for long periods. These down periods provide a window before flow resumes to add sophisticated tapping equipment to pipelines undetected by pressure gauges, providing a new financial tributary.

There appears to be some distinct differences between the approaches of various private security providers to addressing the trade - which further analysis could differentiate in detail - but the common approach is to destroy large camps and burn the crude and products at site, with waterway and aerial support provided by the armed forces under the Joint Task Force (JTF)'s

Operation Pulo Shield, Operation Delta Safe, Operation Crocodile Smile, and Operation Octopus Grip amongst others. Clearances of camps and obliteration of vessels and cargoes causes huge negative environmental impacts. Around Port Harcourt, it is increasingly cited by experts as a major cause of the air pollution in the city. In other situations, crude, products and vessels confiscated find their way back onto the black market.

Those that can continue operations are those best at developing a mutually lucrative relationship with the security services sent to stop them. Members of the Unions had unwritten permission to continue operations so long as they adhered to a set of principles, namely to share a cut of the revenue generated with key security personnel, limit negative externalities such as pollution or violence, provide periodic information on individual actors involved in crude oil theft and refining that could be arrested for public success stories, and operate at a coordinated and modest scale to avoid drawing outside attention. These are never spoken, but nonetheless are adhered to.

## **6.2 The proposed modular refineries are predicted to entrench marginalisation of locals in economic development and resource control**

Aside the militarised response, the economic and development policy pursued by the Federal Government is to develop the oil and gas industry by leveraging investment from, and the capacity of, the private sector<sup>33</sup>. The logic behind privatisation is that it will create opportunities and incentives for international and national companies to develop the sector, in turn directing investment into the Niger Delta, thus creating local job opportunities.

Within this oil and gas portfolio, a policy option put forward as a solution to the artisanal oil refining industry (and insecurity in the region writ large) is legislation and regulation of refining, and licensing of modular refineries. These small refineries can be imported from abroad and delivered to site. Capacity of those proposed ranges between 10,000 barrels per day and 150,000 barrels per day, with 30,000 the most common<sup>34</sup>.

This proposal is supported in demands from local politicians, militant groups, civil society organisations, and was the repeatedly the first solution highlighted during the research by those currently engaged in the informal industry. However, the research indicates that modular refineries will not satisfy the underlying motivations of those in the artisanal refining industry

or the motivations of the other groups advocating for this solution, for a number of reasons. Refiners are of the mindset that the policy will in effect legalise their current operations, and this is often the position articulated by politicians pledging state support. The reality is that only actors able to raise hundreds of millions of pounds will be able to operate in the formal market. The average capacity of current advanced projects is 30,000 bpd, which would require £133 million initial investment, with an 8 year payback period<sup>35</sup>. This is not financially viable for State governments in the region, who have some of the most burdensome debt profiles in the country, and informal industry actors, who while wealthy, do not have sufficient liquidity to establish an industry standard operation.

Another cause for concern is the operational record of the nation's existing refineries, which have the worst performance record in Africa, currently operating at only 11% capacity, compared to 81% for Egypt and 85% for South Africa<sup>36</sup>. There is a risk that poor official standards and practices would be replicated in potentially hundreds of new refineries. This would have dire impacts on the environment in the Niger Delta, and could risk producing a poor quality fuel for consumption on the domestic market, which is not much better than the artisanal supply. Furthermore, informal industry actors have demonstrated high-level skills, but would need formal training to operate and manage such operations.

Therefore, the high capital investment strategy outlined by the Federal Government will be structured to benefit those few actors that can generate millions of dollars of credit, take high risks in an emerging capital market with a non-existent infrastructure, have existing expertise to draw upon to ensure efficient operations, and that have the political capital to negotiate a favourable economic environment: namely national and international oil companies. It will thus have a limited positive impact on stabilisation or development.

For greater stabilisation and development, it would be more productive to direct the finances towards developing an economy that provides a range of livelihood opportunities that are not dependent on crude oil production. Such livelihoods can still address some of the motivations behind modular refineries – greater resource control and employment. Alternatives such as natural gas bottling and off-grid power supply operated under a local business model could satisfy these criteria, and other options with potential include environmental clean-up and forest management.

## 6.3 The proposed pipeline surveillance response is likely to repeat the shortcomings of the presidential amnesty programme

Another policy response at the top of the agenda is community pipeline surveillance jobs. The Presidential Amnesty Programme Chairman last year announced that a programme to engage 10,000 youth in pipeline surveillance jobs, rising to 50,000 under a Federal development plan, would start in September 2017.

Progress has not been communicated publicly, but this approach would replicate the unsustainable aspects of the Amnesty Programme itself, namely, paying locals a monthly salary in expectation they will not attack, but instead protect, vital oil and gas infrastructure.

Just like awarding modular refinery licenses to actors engaged in the industry, this approach would inadvertently bring legitimacy to non-state local elites, especially the beneficial owners of camps. This would subject them to regulation and monitoring by national and international (market) actors, but at the same time may also result in their use by more powerful actors who act against the interest of local economic development and security. After the State granted legitimacy to the Bakassi Boys in Cross Rivers state, they evolved from an informal vigilante group to a tool for electoral rigging and rule by violence<sup>37</sup>. In this case, selecting agitating groups to provide security was a flawed solution, and without proper support, artisanal refiners may too become vulnerable to the interests of their sponsors.

Community pipeline surveillance models have credible potential for a number of reasons: the oil is extracted from beneath, and exported through, their land so locals are conversant with the terrain that the infrastructure is situated within. They also know those involved in artisanal refining and pipeline attacks, and the location of their enterprises. In traditional approaches, it is only the intelligence on actors that is paid for by security agencies. Instead, a broader range of skills and knowledge could be leveraged through employment in community-based pipeline surveillance providers, to safeguard the integrity of oil and gas infrastructure. Further research is needed to examine the effectiveness and risks of taking this approach – currently employed to varying degrees by a number of private contractors – before stronger recommendations can be made.

## 6.4 External factors provide opportunity for change

The artisanal oil refining industry is based on finely balanced relationships that are highly vulnerable to outside forces:

- Militant attacks on oil facilities and pipelines affecting flow of crude oil.
- A zero tolerance policy response, which has led to the heavy militarisation of the region.
- Changes in military personnel stationed in the region disrupting established networks
- Changes in the global oil price.
- Price dynamics, such as the removal of the domestic fuel subsidy in Nigeria and other West African countries.
- National fuel scarcity.
- Poor performing electricity sector without investment to improve supply.
- Foreign exchange crisis.
- Other economic factors such as recession, inflation and economic collapse.
- Sponsors looking for perpetrators of armed violence for political or financial gain.
- Corruption in the military and the national oil company.
- The Presidential Amnesty Program, which has struggled to maintain regular payments and is planned to end in 2018, although it is likely that this will be extended to keep the calm before February and March 2019 elections.

These external factors have forced the practice into periods of booming industry and hibernation, meaning production is increasingly irregular. In the face of these issues, by the end of 2016, actors controlling the Union in Bayelsa state illustrated a willingness to desist from the practice. By late 2017 they had demonstrated a prolonged period of desistance from production in the expectation of better things. The challenge ahead is to formalise the aspirations for life beyond oil theft and illegal refining, and getting support from the Federal and state governments to implement that vision.

The Federal Government Inter-Ministerial Committee on Niger Delta has been tasked with designing and delivering a holistic development plan for the region. This is seen as a broader compact with the people (and militant groups) in the region for the Federal Government to act in their interest. While this is developed and implemented, initiatives targeting the most at risk communities are needed to build trust with the most hostile actors so they can work with the government to make shared processes possible.

## 7. Recommendations for an alternative approach

It is clear that current policy solutions, focused on militarised responses, have struggled to contain the artisanal oil refining industry. Instead it has established symbiotic relationships that mutually benefit the industry actors and security agents. An intensification of this approach is therefore likely to entrench the enabling environment established so far, encouraging involvement in the industry, and fuelling opportunities for new actors to enter.

The following recommendations for an alternative approach are based on the analysis, engagements, opportunities, and processes already initiated, and forms a framework for an approach to addressing pipeline tapping and artisanal oil refining in the Niger Delta.

Core to this framework, is engagement with actors involved in the industry throughout the process of research, desistance, demobilisation and dialogue, who have defined - as the overarching priority - the need to develop pathways for reintegration into alternative economic livelihoods, through a transformative process of dialogue.

Our recommendations for an alternative approach are as follows:

### 1. Develop alternative livelihood options for those working in the artisanal oil refining industry.

Options should be generated through a community-led dialogue with people in locations that have a high concentration of refining activity. This will ensure alternative livelihoods designed are based on local skills and resources to generate productive economic opportunities, suitable to those in the industry, and the broader group at risk of entering the industry.

*"Our teeming Youths need job opportunities to channel their energies towards positive engagements. Our Youths are innovative and mind you, we have women and university graduates deeply involved in artisan refining of crude oil as well. You can train them and give them legitimate jobs so that way they'd channel their energies towards nation building".*  
- Local teacher and former refiner

This research could not have been achieved without continuous dialogue with actors engaged in the practice. Their understanding of location, scale and interconnectivity of operations will continue to be important to increase the reach of future engagements. Traditional leadership

institutions, such as Paramount Rulers, Community Development Council Chairmen, Councils of Chiefs, Women Groups, and Youth Groups are important components of local governance. Throughout the process, they demonstrated an ability to mobilise actors directly engaged in the practice. They helped facilitate sensitisation on topics to be discussed, and ensured participation at dialogue sessions where motivations and alternatives were discussed.

## **2. Demonstrate the feasibility of this approach, with a view to scaling up and replicating pilot projects in other locations.**

There is little evidence of successful approaches, so piloting alternatives is essential. Monitoring and evaluation throughout implementation of the initial pilots can begin to inform the development of a framework to guide more effective policy responses and scale up interventions.

Managing expectations on what these roles will offer will be a challenge. But throughout the dialogue process SDN has conducted so far it has become clear that there is a widespread willingness to accept lower but more regular salaries for work that does not incur the environmental, security and health costs of the artisanal oil industry.

## **3. Target investment into alternative livelihoods in locations that would have the greatest impact on reversing growth of the artisanal oil refining industry.**

This, together with improved coordination between livelihood projects implemented by NGOs in the region, would support stabilisation. There has been a lot of good work by programmes such as the Nigeria Stability and Reconciliation Programme (NSRP), the Market Development Programme (MADE), Partnership Initiatives in the Niger Delta (PIND), and the Facility for Oil Sector Transparency and Reform in Nigeria (FOSTER). However, further work is needed to target high risk areas, which would have a higher impact in terms of stabilisation and economic development.

Agencies should also align with the Federal Government Inter-Ministerial Committee on Niger Delta Affairs as it defines the priorities for economic development in the region. Modular refineries may be a short-term priority, and could alleviate a shortage of formal refining capacity, but they will not generate mass employment or satisfy spiralling demand for fuel.



**4. Support appropriate agencies to responsibly dismantle camps, confiscate and dispose of crude oil and refined products, and document all progress recorded.**

The House of Representatives has mandated eight Joint Committees to improve approaches to the destruction of refineries and confiscated products, and prevent environmental degradation. The first step should be to reassign the responsibility from security agencies to another agency with the mandate to remove refineries, crude and refined products, without damaging the environment. Documenting progress would mean the scale of the industry and changes over time can be measured more accurately. Together with better guidelines and a uniform approach, this would improve coordination between security agencies and policy makers, and thus improve the impact of responses.

**5. To address black market demand it will be essential to increase alternative energy sources for residential and commercial needs.**

While modular refineries have been proposed to address demand for energy, they are unlikely to be the most effective solution. Managed local investments would be an opportunity to generate employment for skilled workers currently engaged in the informal industry. Off-grid gas-to-power or renewable options would be one way to deliver electricity to riverine communities at the heart of the artisanal oil industry.

**6. Launch an investigation into the impact of consuming this fuel on air pollution levels.**

Production efficiency increased from 45% to 88% during the period examined, with evidence that the quality of fuel produced is less pure and contains more waste and dangerous carcinogens than official standard products. Market samples should be collected for a laboratory analysis to determine their toxicity, and inform understanding of sources of the soot currently plaguing Port Harcourt in Rivers state.

## 8. Conclusion

Artisanal oil refining is a cause of a number of environmental and social challenges in the Niger Delta. However, many also depend on it for their livelihoods, and the entrepreneurial skills demonstrated by those working in the shadows of the formal economy must be recognised as opportunities for economic development and stabilisation. Leadership and organisation are going to be vital assets in the transition of actors from the informal to formal economy, and more broadly for the reintegration of ex-militants into society following the planned end of the Presidential Amnesty Programme in 2018.

A sharper analysis and more evidence-based focus on informal regulatory systems is needed to avoid repeating the same mistakes of previous policy responses, which have been insufficient to address industry drivers over the last five years, and have arguably catalysed its development.

The priority for policy must be development of economic alternatives for those driven into the informal industry, which ultimately benefits them least, encouraging those already engaged to desist, and to put the skills demonstrated to productive use in the formal economy.

Options should be generated through dialogue so that root motivations can be revealed, developed, and addressed in the design of alternative livelihoods. For example, during a dialogue approach piloted with actors engaged in the industry, demands quickly moved away from modular refineries to more achievable solutions that improve inclusivity in natural resource governance.

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**“More money, more problems”**

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**Economic dynamics of the artisanal oil refining industry in the Niger Delta over five years**

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SDN supports the efforts of those affected by the extractives industry and weak governance. We work with governments, companies, communities and other stakeholders to ensure the promotion and protection of human rights. Our work currently focuses on the Niger Delta.

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