A leaky system: Strengthening monitoring of oil-related imports and exports in Nigeria

Summary

This brief summarises research on the potential of commercial and independent data to strengthen monitoring of maritime oil-related imports and exports in Nigeria. It also provides an overview of how approaches, such as remote sensing, could be employed to track illicit activities related to crude and refined oil product imports and exports.

There are significant challenges to monitoring the import and export of oil products in Nigeria: for example, metering of oil production sites is often absent, and contractual arrangements in oil trading and other business agreements are opaque. Together, this lack of transparency exposes Nigeria to significant risk in managing its natural resources, including the potential for large-scale oil theft.

SDN’s Creeks to sea research project identified significant and consistent discrepancies between Nigerian government figures on oil exports and refined product import volumes, and those provided by independent sources. Official figures for 2018 appear to over report import volumes up to 41%, and under report export volumes by 3%, compared to independent sources. This is unlikely to be the full picture, but the finding strongly implies that there continues to be major fraud in its fuel subsidy programme, and significant crude oil theft from export terminals. This costs the Nigerian government billions of Naira in revenue, ultimately defrauding Nigerians of funds which should be supporting services and other public goods.

On-the-ground investigations and increasing regulatory transparency remain vital in addressing these risks. However, we identified new methods of monitoring oil movements to help track these risks, using commercial and independent sources of data, which could support the Nigerian government and others to strengthen monitoring of imports and exports and identify suspicious behaviour.

Policy recommendations

• The Nigerian government and international actors—especially those with the ability to support detection and enforce response—should cooperate to develop a systematic approach to monitoring, identifying, and investigating illicit activities. This can be done by building on the approaches outlined in this briefing.

• The Nigerian government, as its major priority, should mandate and oversee the installation of a comprehensive oil volume metering system. This should be capable of taking measurements from the point of production to the point of export and along the transit system. The government should ensure the system itself is independently maintained and monitored.

• The Nigerian government should publish disaggregated data on exports and import volumes by vessel, export terminal, crude oil grade or refined product type, and journey details. This will promote transparency and reduce opportunities for loss of crude oil and associated revenue.
Introduction

This briefing paper summarises the findings from the Creeks to sea research project to investigate the potential of commercial and independent data to strengthen monitoring of maritime oil-related imports and exports in Nigeria.

It contains a short description of the methodology for the research, a summary of some of the key findings from the initial data analysis, and an overview of the potential to develop approaches which might enable the detection of potentially illicit oil-related import and export activity.

Methodology

We explored three approaches to monitoring oil imports and exports:

- First, we compared official data on crude oil export and fuel product import volumes, provided by the Nigerian government, with independent data provided by a commercial maritime intelligence service, and an independent oil monitoring research organisation. This identified discrepancies between different data sources for further investigation.

- Second, we investigated a number of emerging analytical techniques which can be used to investigate specific vessels of interest. These focused on statistical analysis of marine safety location data, and the manual investigation of open-source satellite imagery. These methods can be combined to detect unusual patterns of behaviour which might indicate involvement in illicit oil activity—for example, unreported ship-to-ship cargo transfers. We identified a number of these behaviours as part of the research for this project.

- Third, we conducted and cross-referenced other information from the maritime intelligence data we secured with media reports and public records on vessels of interest. This enables the broader operating background of a vessel to be established, including information on owners, operators, common journeys, and cargos.

Findings

Import data

Fig.1 shows that the volumes of Nigerian fuel imports declared by official sources, in blue and red, are consistently, and in some cases substantially, higher than the volumes reported by independent sources.1

Fig.1: Comparison between official (NBS and JODI) data and independent (Whirlwind) data on Nigerian refined fuel imports, showing significant discrepancies among sources. Volumes are for 2018.

Sources used in this research included:

- Nigerian government information from the Nigerian Bureau of Statistics (NBS), the Nigerian Department of Petroleum Resources, the Nigerian National Petroleum Company, and the self-reported figures the Nigerian government provides to the Joint Organisations Data Initiative (JODI).

- Independent, commercial maritime intelligence datasets. This work has been partially supported by MarineTraffic.

- Satellite imagery available from public research institutions and earth-observation projects (Modified Copernicus Sentinel data 2019-2020/Sentinel Hub).

- Records from international shipping registration sites and Nigerian bodies such as the Corporate Affairs Commission.

- Interviews with a wide range of stakeholders with experience of the illicit oil industry.

- Academic, media, and civil society reports.

1 This data comes from a commercial provider, ‘Whirlwind’, who have asked to remain anonymous, but is based on data directly drawn from traders and others.
These discrepancies are significant. Prior research, including a major report by the Nigerian National Assembly, has indicated that Nigeria’s fuel subsidy programme is prone to manipulation via over-declaration, which would allow importers to receive inflated subsidy payments. The data present here suggest that official figures may over-declare import volumes for gasoline, Nigeria’s largest petroleum import, by up to 40%. This implies major corruption.

**Export data**

There is greater alignment between official and independent sources of data on export volumes. Fig. 2 shows how the average official reported export volumes compared with our independent source of data.

![Fig. 2: Comparison between official (JODI) data vs. independent (Whirlwind) data on Nigerian crude oil exports. Volumes are by annum.](image)

Export fraud operates on the opposite basis to import fraud. By under-declaring exports, those involved can avoid paying taxes and other levies due on the undeclared proportion of a ship’s oil cargo, which can then be sold illegally elsewhere.

The data we analysed shows that on average circa 50,000 barrels of oil per day—3% of Nigeria’s production—appears not to be declared in official sources for 2018. This discrepancy is worthy of further investigation and could be an indication of underreporting of oil exports. At a reference price of USD$65 per barrel, this implies that nearly USD$1.2bn of oil are not reflected in official export figures. Not all of this revenue would be due as tax, but this demonstrates the scale of the potential fiscal loss.

A major challenge with the data is that official figures are, in general, only available at aggregate level. Detailed investigation requires the Nigerian government to release detailed information on a vessel-by-vessel level.

**Detecting potential theft and fraud**

To strengthen monitoring of oil-related exports and imports, we looked at the potential to develop an approach for three potential problem areas:

- **Import fraud**: primarily focussing on possible over-reporting of imported refined product volumes (to extract personal gain from the fuel subsidy programme).
- **Point-of-export theft**: export of stolen crude from official export terminals through under-reporting of lifted crude volumes/overloading vessels.
- **Point-of-origin theft**: export of stolen crude oil tapped from pipelines.

**Import fraud**

The above data suggests that the volume of imported petroleum products could have been inflated by as much as 40%. This needs further study as it may be an indication of subsidy fraud.

Commercial maritime data provides vessel-by-vessel data on imports, and therefore, an approach to strengthen the monitoring of imports could include:

- If vessel-by-vessel port records can be accessed, this would allow a detailed reconciliation against commercial data. If discrepancies were identified, these could be traced to specific vessels, companies, charterers, and commodity traders for follow up.
- Analysing actual payments made under the subsidy programme against the various data sources on import volumes, to understand whether the discrepancies between different data sources do indicate potential fraud.
Point-of-export theft

As seen above, comparison of government data against independent sources of data does provide a potential indication of the scale of theft at point-of-export, or—at a very minimum—shows a discrepancy which merits further investigation. This data can further be broken down by export terminal to identify the locations that these discrepancies originate from, and therefore, the location of potentially suspicious activity.

Official and commercial data on exports could be used to develop an approach to monitoring as follows:

- If detailed export terminal data can be accessed, with vessel-by-vessel crude volumes, this would allow direct analysis of the discrepancy between government and independent export statistics, and follow up on these.
- In the absence of this, it is already possible to isolate vessel data by export terminal, using commercial/independent data sources, and to compare aggregate official and independent export terminal data to identify discrepancies. Vessel movements from these terminals can then be tracked to try to identify the source of these discrepancies. A combination of satellite data, Automatic Identification Systems (AIS) data, and commercial maritime data would allow checks against official data, as well as detailed analysis of vessel movements, such as destinations, ship-to-ship transfers, and journey times.

Point-of-origin theft

In contrast to point-of-export theft, point-of-origin theft is more likely to involve unusual vessel movements, as crude is sourced from non-official export points. Therefore, the use of independent sources of data holds particular promise to strengthen the monitoring of ‘point-of-origin’ theft.

The following approach could be used to identify and follow up on this type of activity:

- A model would be developed to identify suspicious vessels on the basis of characteristics consistent with oil smuggling activity, such as unusual AIS data (this has been done elsewhere, for example, to identify illegal fishing).
- Satellite and oil spill data can detect probable locations of artisanal refineries and tapping points, as well as identify smaller vessels and routes that shuttle between tapping points, artisanal refineries, and offshore storage units/export vessels. This information can be used to narrow down locations for the loading of illicit products.
- Combine the model and data sources above to conduct a detailed route-tracing exercise for each of these vessels, using the remote sensing techniques outlined in the case study below and use commercial or independent sources of data to identify vessels, owners, and other associated data.

Case study: focus on point-of-origin theft

Potential theft hotspots can be identified in a number of ways, for example, through identifying oil spill locations. Once likely hotspots have been identified, new open-source techniques mean it is possible to investigate these activities and associated vessels in detail.

Using Automatic Identification Systems (AIS)

One key source is data transmitted by ships from transponders fitted as part of Automatic Identification Systems (AIS). These safety systems provide location data such as coordinates. Plotting this information on a map can be used to identify anomalies, and hence potentially suspicious activity.

MarineTraffic – Global Ship Tracking Intelligence (www.marinetraffic.com).
For example: ships are able to turn off their transponders. This is an indication that a ship may be trying to conceal its presence in a particular area, such as an artisanal oil refining site. We identified a number of relevant suspicious behaviours. We then established, in discussion with researchers working on other maritime enforcement issues, such as illegal fishing in Australia, that it is possible to use a database of historical ship movements and AIS anomalies to isolate vessels which display a pattern of such behaviour. Developing a system to automatically identify when these vessels approach areas suspected of involvement in illicit oil is one key step that can be taken to monitor oil imports and exports at scale.

**Falling back on satellite imagery**

Once these vessels have been identified, a second key source of information is satellite imagery and other visual data from open-source programmes, such as the Sentinel satellite, accessible using the Earth Observation Browser. This radar can then be used to visually monitor vessel movements and behaviour, even when AIS systems have been turned off.

For example, Fig.3 shows an image of a ship-to-ship transfer. Ships frequently engage in these for a number of legitimate reasons. Such transfers are supposed to be reported to maritime safety organisations, so the details of transfers are made a matter of public record. Where oil-carrying vessels turn off their AIS systems, and satellite imagery shows them subsequently engaging in ship-to-ship transfers, this is an indication of potentially illicit behaviour. Specific examples of this might include a chain of transfers from smaller to larger ships emerging from inshore areas of the Niger Delta estuary, where illicit crude oil refineries are known to operate. As such, this approach would be particularly promising for the detection of oil tapping from the pipelines which criss-cross the region.

**Closing the net**

Based on the isolation and investigation of particular vessels of interest, it is possible to use maritime intelligence datasets and public records to conduct a full investigation of the business and registration background of a vessel. This would include the identification of reported owners, destinations, and cargos of these vessels, and the attempted reconciliation of any known oil cargoes with the volumes apparently being transferred clandestinely. Doing this across the fleet of vessels initially identified using AIS anomalies would potentially allow the identification of wider patterns of suspicious activity by vessels and companies, which—in aggregate—likely account for some of the discrepancies in total oil import and export volumes identified in this brief.

**Conclusion**

Existing commercial and other maritime datasets can be used to provide independent verification of official Nigerian import and export data. Comparing these sources reveals major discrepancies, which potentially corroborate previous research indicating major fraud in the Nigerian oil trade. We explored a number of analytical approaches to investigate vessels suspected of being involved in illicit oil. Combining these would allow a detailed picture to emerge of the likely patterns of behaviour and operating methods of these vessels. This includes the potential to detect illicit oil tapped and transported at source from pipelines in the Niger Delta—point-of-origin theft. Additionally, if the Nigerian government mandates the publication of detailed, official import and export data on a vessel-by-vessel basis, reconciling this against other independent sources of data, would enable significant advances in monitoring and understanding the Nigerian oil trade.
SDN supports those affected by the extractives industry and weak governance. We work with communities and engage with governments, companies and other stakeholders to ensure the promotion and protection of human rights, including the right to a healthy environment. Our work currently focuses on the Niger Delta.

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