

Artificial Intelligence Technologies and the Control of Oil Theft in Warri South-West Local Government Area of Delta State, Nigeria

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Abstract

Oil theft in Nigeria has been a daunting challenge to meeting the approved 1.71 million barrels production per day and has led to the loss of over ten billion US dollars in foreign earnings. This paper examined artificial intelligence technologies and the control of oil theft in Warri South-West LGA of Delta State, Nigeria. Queer ladder theory was employed in explaining the complex dynamics around oil theft in the area. Mixed-methods research design was adopted. The target population was 22,234 and the sample size is 1,250 residents. This is in addition to five interviews that were conducted. Data were collected using structured questionnaire and in-depth interviews (IDI) guide. Quantitative data were analysed using percentage, frequency, charts, and multi-nominal logistic regression, while qualitative data were thematically analysed. Findings revealed that there was a high level of awareness amongst residents on AI enabled technologies used in controlling oil theft in their communities. It also showed that AI-powered devices, such as drones, satellites, CCTV and community-based mechanisms were used in the control of oil theft in the area. It equally indicated that these technologies are potentially useful, but their application was inadequate, leaving respondents skeptical of their effectiveness. It again showed that there was no significant positive relationship between respondents' occupational group and their awareness of AI enabled technological tools for detecting oil theft. It concluded that application of AI technologies is sacrosanct in curbing oil theft, especially when synergized and blended with indigenous knowledge. Recommendations were made in line with the findings.

Keywords: Artificial intelligence, technology, oil theft, pipeline vandalisation.

Introduction

Nigeria is one of the largest oil producing countries in the world, yet it faces daunting challenges of crude oil theft. Criminal cartels and organized groups steal a substantial portion of the country's daily oil production output. The country loses billions of dollars annually due to stolen oil, and it significantly affects national revenue and economic stability. Available statistics show that between January and July 2022, Nigeria lost an average of 437,000 barrels of crude oil to criminals on daily basis, which amounted to about 10 billion US dollars within the seven months period (Yusuf, 2022). This has equally resulted in the shortfall of supply of crude oil below the allotted 1.71 million barrels per day to Nigeria by the Organization of the Petroleum Exporting Countries (OPEC). The report further indicated that Nigeria was only producing about 50% of OPEC's approved target for the country (Obiezu, 2022). This is not unconnected with the prevalence of oil theft in the oil producing communities in the Niger Delta.

The criminality associated with oil theft has indeed become a drain on Nigeria's economy. Oil theft no doubt has triggered and perpetuated a circle of poverty and disillusionment among

ordinary Nigerians, while enriching only a few elitists group and those involved in the illegal business. For most members of oil producing communities, oil resources are seen as a curse because their lives have not been impacted positively by it. There is lack of basic amenities such as pipe borne waters, electricity, good roads, and employment opportunities for teaming youth in the oil rich region (Akpan, Ufomba, Ibewke & Ufomba, 2017). Warri Southwest, which is part of the Niger Delta region is rife with civil unrest, militancy, social disorder, and disruption of the flow of crude oil supplies to illegal refineries, leading to production shortfall (Enuoh & Inyang, 2014). According to Onwuchekwe, Okafor and Madu (2020), the Federal Government of Nigeria has not been able to address most of the challenges dwindling the growth and prosperity of the area.

Evidence has shown that oil theft is not peculiar to any society, but a pervasive occurrence in many producing nations. In 2013, the Algerian Energy Authority reported losing US\$1.3 billion a year as a result of fuel smuggling to neighboring countries (Al-Makhifi 2013). In 2015, during the Syrian civil war, the Islamic State of Iraq and Al-Sham (ISIS) made US\$40 million a month from selling stolen crude oil to brokers. Some of the crude oil was refined into low-grade fuel and was smuggled into Turkey. ISIS sold most of its oil to the Assad regime, despite being its arch-enemy (Ralby, Ralby & Soud, 2017). This suggests a link between illegal access to oil and the funding of terrorism. Similarly, Russia's state-owned investment bank, VTB Capital estimated that in 2013 the country's oil companies were lost between US\$1.8 to US\$3.5 billion annually to oil theft (Khazov- Cassia, 2021). According to Ralby (2017), three million litres of fuel, valued at US\$1.2 billion per annum are smuggled from Malaysia to Thailand through the land alone.

Onwuchekwe, Ezeah and Ikezue (2025) noted that oil deposits are found in different regions in Nigeria, but the issue of theft and lack of adequate control keep leading to losses. It does appear that the sustained oil theft syndrome in the Niger Delta, especially Warri Southwest is due to lack of suitable artificial intelligence (AI) enabled technologies. There is no doubt that lack of AI applications has emboldened oil thieves in the Niger Delta. Jia (2024) observed that non-deployment of modern and efficient technologies to achieve real-time aerial surveillance of oil facilities in the area have enabled oil theft to blossom. Similarly, Mallo (2024) noted that smart technologies, such as Fiber Optic Distributed Acoustic Sensing (DAS) are critical in detecting and classifying third party interference on oil installations. This suggests that AI enabled devices can actually prevent oil theft incidents before they occur.

A number of researches have been carried out on oil theft but none focused on issues of AI in the control of theft in Warri Southwest LGA, Delta State. While Eric and Oluwagbenga (2017) examined the impact of oil theft, illegal bunkering and pipeline vandalism on Nigeria's economy between 2015 and 2016, Odalonu (2015) assessed the upsurge of oil theft and illegal bunkering in the region. Similar studies are either limited in contents, scope or forms, or centred on theoretical analysis of the issue. A preliminary scoping review on few academic databases

including Science Direct, PubMed, Google Scholar and Web of Science showed that AI in the control of oil theft in Warri Southwest LGA, Delta State have not been reported in literature. This presents a gap in knowledge and it is against the backdrop that this paper examines artificial intelligence technologies and their application in the control of oil theft in Warri South-West LGA of Delta State, Nigeria.

Objectives of the Study

The broad objective of this paper is to examine artificial intelligence technologies and their application in the control of oil theft in Warri South-West LGA of Delta State, Nigeria. The specific objectives are;

1. To ascertain respondents' level of awareness about AI enabled technologies in controlling oil theft in Warri Southwest LGA.
2. To identify AI surveillance technologies used in the control of oil theft in Warri Southwest LGA.
3. To ascertain respondents' assessment of the effectiveness of AI enabled communication technologies in the control of oil theft in Warri Southwest LGA.

Hypothesis

1. There is a significant positive relationship between respondents' occupational group and their awareness of AI enabled technological tools for detecting oil theft in Warri Southwest LGA.

Review of Theoretical Literature

Conceptualization of Oil Theft

Oil theft can be referred to in various terms as, oil bunkering, fuel scooping, and pipeline vandalism. It is a highly lucrative criminal activity, usually taking place in the creeks of the Niger Delta, where the pipelines are interconnected like a grid. This hazardous process involves illegally tapping into the pipelines and extracting crude oil (Onuoha, 2008). Crude oil theft, also known as illegal oil bunkering, is the illicit activity or unlawfully appropriating crude oil from pipelines or flow stations, as well as the unauthorized inclusion of additional crude oil into valid cargos without proper documentation or accountability (Asuni, 2009). Oil bunkering is commonly accomplished by breaching pipelines and tapping into them (Adegbite, 2013).

Crude oil theft is the unlawful carting away of crude oil or sabotaging of crude oil facilities through illegal bunkering, pipeline vandalism, fuel scooping, illegal refining and transportation and oil terrorism (Akpan *et al*, 2017). To Obasi (2011) oil theft in Nigeria is a generic term

encompassing not only unauthorized loading of ships but also all acts involving diversion and smuggling of oil. A report by Stakeholders' Democracy Network indicates that oil is being stolen at an industrial scale in the Niger Delta region (Boris, 2016).

According to Ayanruioh (2013:2), oil theft is the process through which crude oil or refined petroleum products are illegally siphoned from pipelines and sold to interested dealers / buyers waiting on the high sea or the unscrupulous individuals. Crude oil theft is often linked to organized crime, militant financing, and State corruption (NEITI, 2023). While traditionally analyzed as an economic crime, emerging studies emphasize its role in exacerbating insecurity (Obi, 2022). Unlike conventional theft, crude oil theft operates through a complex web involving political actors, security operatives, and transnational networks (Ibaba, 2021).

Furthermore, Saje and Abubakar (2023) conceptualized oil theft to mean illegal diversion and trade of either crude or refined petroleum oil by criminals for self-enrichment against the judicious exploitation of oil for revenue generation by the government. Romsom (2022) noted that these thefts are sometimes in small-scale, but the high profits in combination with the ability to penetrate multiple parts of the supply network, create incentives for criminals to expand their operations.

Artificial Intelligence Technologies and Oil Theft

AI is computer applications that simulate human intelligence or imagination to think, monitor, detect, and respond swiftly to threats of crime (David, Mustapha & Abubakar, 2025; Ikiyei & Amassomwei, 2025). The application of AI-enabled technologies in mitigating oil theft is sacrosanct. For instance, AI-powered drones and satellite imaging can be used to monitor oil pipelines and detect any anomaly or unauthorised activities in real time. By analysing the data collected through these technologies, authorities can identify hot spots of potential theft and take proactive measures. Bello, Odor, Busari, Ali, Girei, Alabi and Stephen (2025) noted that AI offers a transformative solution to the challenges posed by oil theft. The authors observed that unlike traditional methods, AI-powered systems can provide real-time monitoring, predictive analysis, and automated threat detection. It also has the capacity to analyze oil flow in the pipeline and identify irregularities.

According to Ibrahim (2022), addressing the problems leading oil theft in the Niger Delta region requires high-breed technologies. Adelowo and Oladele (2022) noted that an anti-theft tracking system, such as pressure sensors can detect if pipelines and their contents were tampered. Similarly, it has been revealed that smart-pipeline technologies, such as fiber-optic sensors can detect leakages and compromise on oil pipelines. Adesuji (2026) argued that AI techniques such as machine learning, computer vision, neural networks, and predictive analytics can process vast amounts of data from sensors, drones, and supervisory control systems to detect anomalies, predict potential failures, and recommend optimal maintenance strategies. The author maintained

that, given the growing complexity of Nigeria's oil and gas operations, traditional manual and periodic inspection methods are no longer adequate. Therefore the adoption of AI enhanced technologies, such as drones, and remote sensing remains sacrosanct in dealing with oil theft.

AI Enhanced Technologies and Communities Mitigating Measures to Oil Theft

Wizor and Wali (2020) examined crude oil theft and oil companies-host communities' conundrum in the Niger Delta. The study revealed that technological installations, such as satellite systems, CCTV and other digital instruments were some strategies adopted in monitoring activities of security men and criminals in the catchment areas. This suggests that not just that criminals are being monitored, but the compromise of State actors is not ruled out. This informs why activities of security personnel are being scrutinised closely using AI enabled devices. Similarly, Adelowo and Oladele (2022) examined the effectiveness of artificial intelligence and internet of things (IoT) in curbing oil theft in Nigeria. The study revealed that AI and the internet of things have been incorporated into Nigeria's oil industry to tackle oil theft. It further posited that technologies, such as satellites, sensors, and communication devices are effective AI-powered devices in combating oil theft in the country.

Bello *et al* (2025) examined AI-assisted crude oil bunkering and illegal theft detection in the Nigerian oil and gas industry. The results showed there is application of AI in oil theft prevention and detection via machine learning, computer vision, and predictive analytics. The study submitted that AI has revolutionised monitoring and control of oil and gas infrastructures in Nigeria. Another study by Adedoyin (2026) on artificial intelligence applications in pipeline monitoring and maintenance for sustainable oil and gas operations in Nigeria revealed that integration of AI-powered technologies has improved pipeline monitoring, maintenance, and overall system reliability.

Furthermore, Akaenye and Onosakponome (2023) examined youth restiveness and the challenges of oil theft in Niger Delta Region of Nigeria. The findings revealed that the government's amnesty programme and engagement of ex-militants in pipelines surveillance helped to address restiveness. It also indicated that community engagement and access to the benefits from oil revenue mitigated oil theft in the area. Similarly, Gimah and Kobani (2024) made an assessment of efforts in discouraging crude oil theft in selected communities in Rivers State. The study found that community strategies for mitigating oil theft in the area included; entrepreneurship education, peace education, human rights advocacy, value-reorientation, agricultural extension and environmental education. However, the upsurge in oil theft in recent times clearly suggests that success has not been achieved.

Theoretical Orientation: Queer Ladder Theory

Queer ladder theory was developed by the American Sociologist, Daniel Bell (1919-2011) in an attempt to explain the instrumental essence of organized crime as a desperate means of economic

empowerment and social climbing (Okoli & Agada, 2014). The theory's basic assumption is that organized crime is an instrumental behavior and a means to an end. It is an instrument of social climbing and/or socio-economic advancement. It is also a means to accumulate wealth and build power (Okoli & Orinya, 2013).

The theory offers an in-depth understanding of the complex power dynamics, resistances, and community resilience towards oil theft in Warri Southwest. What this theory entails is that organized crime thrives in contexts where the government's capacity to dictate, sanction, deter and control crime is poor; where public corruption is endemic; and where prospects for legitimate livelihood opportunities are slim (Okoli & Orinya, 2013). In such situations, the motivation to indulge in crime will be high, while deterrence from criminal living is low. In other words, the benefits of committing a crime surpass the costs and/or risks.

In understanding oil theft in Warri Southwest through the lens of this theory, it points to different angles. One angle is the oil theft activities that are being carried out by organized criminal groups and being facilitated by multi-national corporations and corrupt government officials, who use instrumentality or privileges of the State to indulge in illegal oil activities, such as smuggling of crude oil. On the other hand, the natives who are struggling to make ends meet sees the illegal sale of oil as a means of survival and also perpetrate this crime. It is also important to highlight that despite being rich in oil resources, poverty rate has remained high within the area. This is due to the systemic alienation or marginalization of the oil producing communities. Thus, from the lens of queer ladder theory, oil theft on the part of the community members could be seen as a response to marginalization and economic disparity, which creates an incentive or means of survival.

Materials and Methods

Mixed-methods research design was adopted. The choice of this design is that there is a combination of quantitative and qualitative methods. The general or universal population was one hundred and thirty-three thousand, three hundred and fifty-one (133,351) residents of Warri Southwest LGA of Delta State, while the target population was twenty-two thousand, two hundred and thirty-four (22,234) persons which comprised men group, women group, youth association and members of the traditional rulers council in the area. The sample size is 1,250 and it was statistically generated using Fisher, Laing, Stoeckel and Townsend (1998) formula. The choice of this category of persons is because they are adults and were informed on oil activities in their communities. In addition, in-depth interviews were conducted on notable individuals in the area, such as a Civil Defence Officer, a Vigilante leader, a Naval Officer, a DSS personnel, and a Civil Society Organization member. The choice of these personalities was based on the fact that they are actively involved in the security and advocacy for proper oil resources management. Instruments for data collection were structured questionnaire and in-depth interviews (IDI) guide. Multi-stage sampling techniques were used in selecting the

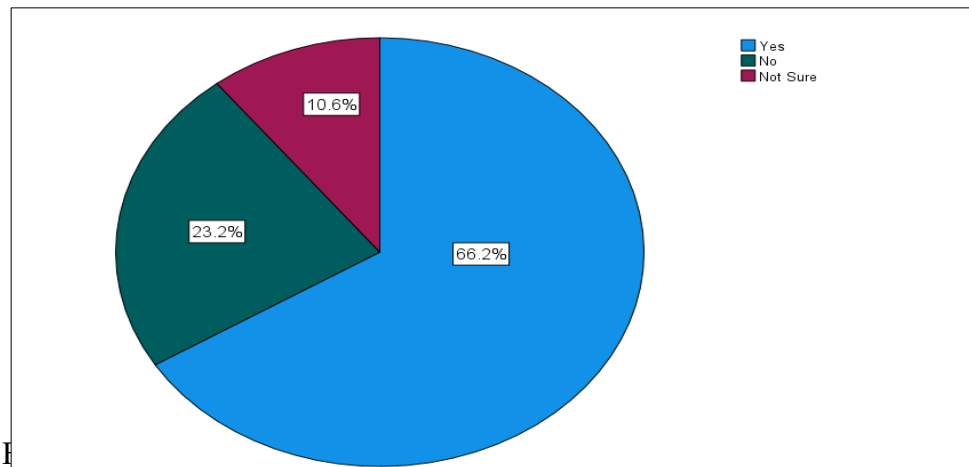
respondents. Quantitative data were analysed using percentage, frequency, bar and pie charts, while qualitative data were thematically analysed through extraction and interpretation of quotes. Hypothesis was tested using multi-nominal logistic regression model.

Results and Discussion

This study administered 1,250 copies of questionnaire, out of which 922 copies that were properly filled were retrieved and used for analysis. This represent 74% response rate and was considered adequate for analysis. Findings are extensively discussed and related to the studies reviewed, thereby highlighting areas of convergence and divergence. The analyses are carried out in line with the specific objectives as follows;

Analysis of Objective One

The respondents' level of awareness about AI enabled technologies in the control of oil theft in their communities was sought for. In doing this, the respondents were asked to indicate whether or not they were aware of theses technological devices. Their responses are presented in figure 1;



Field Survey, 2025

The quantitative findings of figure 1 reveals that majority of the respondents (66.2%) had awareness of AI enabled technological tools being used to detect and control oil theft in their communities in Warri Southwest LGA. By contrast, 23.2% indicated they were not aware of such tools, while 10.6% expressed uncertainty. These results suggest that although awareness of AI enabled technological interventions is relatively widespread, there remains a significant minority who either lack knowledge or feel uncertain about the existence of such measures.

Furthermore, thematic evidence of the IDIs provides nuanced insights into the awareness gap. While the State security personnel interviewed demonstrated a more detailed familiarity with

specific AI enabled technologies, the vigilante member reflected a more general or uncertain awareness. For example, an interviewee who is a Civil Defence Officer had this to say:

I am aware that presently the federal government has put some technology measures... just like when you are installing... CCTV cameras and using drones and all that, some of these measures have been used to send signal to security agents about the activities of oil thieves in this place (Civil Defense Officer, Female, 40, Kurutie, Warri Southwest LGA).

This aligns closely with the 66.2% who indicated awareness, but also shows that knowledge may be more conceptual than technical. Another interviewee reinforced this by referencing newer technological systems:

“There is now an emergence of hybrid AI technologies... CTV cameras are also being put in place to safeguard all these pipelines” (Naval Officer, Male, 36, Kurutie, Delta State).

Such statements reflect both awareness and confidence in specific AI monitoring tools, echoing the patterns captured quantitatively. By contrast, the community-based perspective conveyed more uncertainty, mirroring the 23.2% who reported no awareness and the 10.6% who were unsure. As one interviewee put it:

“If government see any technology that will help, it will be good... cameras can be mounted inside bush... or if they give us drones” (Vigilante Member, Male, 50, Oporoza, Warri Southwest LGA, Delta State).

This submission suggests openness to technological solutions but a lack of concrete knowledge about what systems are currently deployed. These data highlight that differences matter in terms of perspective and awareness about technologies adopted in detecting oil theft. The State actors demonstrated greater specificity, mentioning technologies such as CCTV and Combat Information Centers, while the other category of interviewees provided a more general perspective, highlighting uncertainty and some level of community awareness without technical detail. Generally, the findings indicate that there is a high level of awareness amongst residents of Warri Southwest on AI enabled technologies used in the control of oil theft in the area.

Analysis of Objective Two

The AI surveillance technologies used in the control of oil theft in Warri Southwest LGA are analysed hereunder. In doing this, the respondents were first asked to outline the AI surveillance technologies known to them in the control of oil theft in their communities and their responses are presented in figure 2;

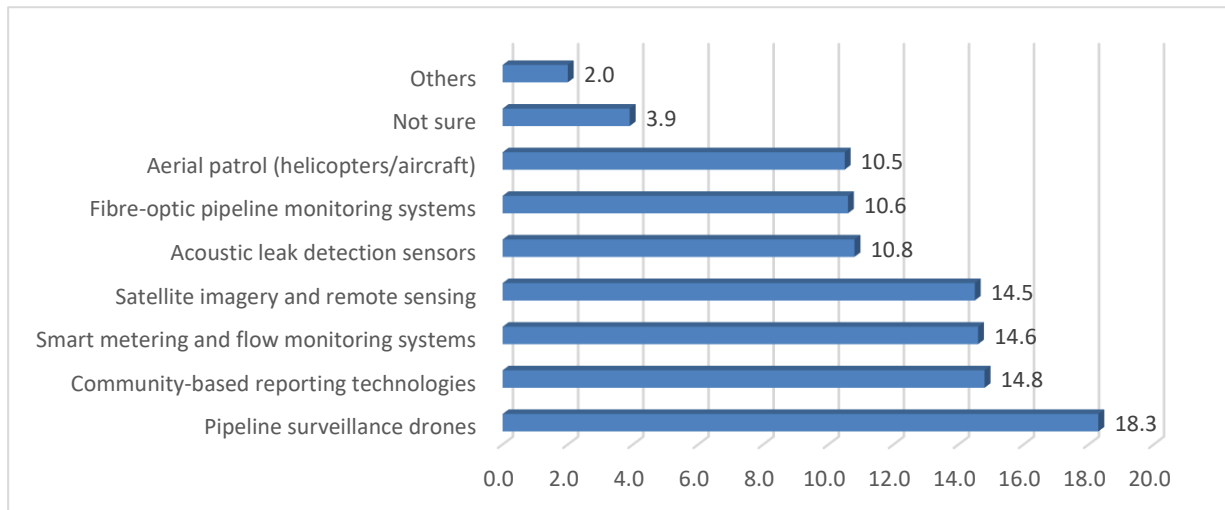


Fig. 2. Respondents' views on AI enabled communication technologies used to detect oil theft in their communities.

Field Survey, 2025

Figure 2 shows that respondents identified a wide variety of AI enabled technologies employed in detecting or preventing oil theft in their areas. Pipeline surveillance drones were the most frequently reported (18.3%), followed by community-based reporting strategies (14.8%), smart metering and flow monitoring systems (14.6%), and satellite imagery with remote sensing (14.5%). In addition, acoustic leak detection sensors (10.8%), fibre-optic pipeline monitoring systems (10.6%), and aerial patrols using helicopters or aircraft (10.5%) were other technological tools identified. However, while a smaller proportion of the respondents (3.9%) showed that they lacked knowledge about the technologies in use, 2.0% mentioned other tools not captured in the questionnaire.

Furthermore, the respondents were asked to indicate other AI-powered surveillance technologies they considered applicable in the control of oil theft in their areas but were not captured in the questionnaire, and their opinion are presented in table 1:

Table 1: Respondents' opinion on AI surveillance technologies used in oil theft control in their communities

Response Options	Response Analysis	
	Frequency	Percent
Drones (Unmanned Aerial Vehicles)	166	23.7%
CCTV cameras	140	21.4%
Satellite monitoring systems	173	15.4%
Motion sensors or ground-based detectors	120	10.7%
Security patrols using advanced monitoring equipment	169	15.1%
Not Sure	101	9.0%
Other	53	4.7%
Total	922	100.0%

Field Survey, 2025.

Table 1 identified several AI-powered surveillance technologies used in controlling oil theft in the study area. The most frequently selected AI enabled technologies were drones or unmanned aerial vehicles (23.7%) and CCTV cameras (21.4%). Satellite monitoring systems (15.4%) and security patrols equipped with advanced monitoring devices (15.1%) were also commonly reported. Motion sensors or ground-based detectors accounted for 10.7% response. In addition, 9.0% of the respondents indicated that they were not sure which AI enabled technologies were in use, while 4.7% cited other forms of surveillance devices. These results suggest that aerial and visual surveillance technologies, particularly drones and CCTV were the most widely recognized by respondents, while ground-based or less visible technologies appear to be less frequently reported. These findings suggest that oil theft detection and control efforts in Warri Southwest rely on a mix of advanced AI surveillance technologies and community-driven intelligence systems.

In addition to the quantitative results, IDIs evidence corroborates survey patterns. Interviewees in the security sector demonstrated familiarity with AI technologies. For instance, one interviewee expressed his opinion as follows;

“We have what is called CIC, Combat Information Center. It is a hybrid AI enabled technology.. Inside the CIC, you will be able to see far inside the ship. It has area location tracker...satellite...tracking the whole environment. There’s also what is called IFF on board bigger ships. IFF means International Friend or Foe. If it is a ship that come to take our oil, the Nigeria Navy ship that has that IFF will send signal of that IFF, eh, identification of friend or foe. Once that thing goes to the ship and there was no respond, then the Nigeria Navy ship will know that, uh, that vessel is not a

friendly vessel. Thereby, now from there, they can send the gun boat or patrol boat, Nigeria Navy patrol boats to the area to go and arrest the vessel” (Naval Officer, Male, 36, Kurutie, Delta State).

This aligns with the survey’s mention of AI satellite imagery and remote sensing (14.5%). Similarly, the transcripts reinforced the importance of drones, the single most frequently reported tool in the survey (18.3%). As one interviewee noted thus;

“The use of CCTV and drones to secure oil pipeline instead of using human security have been useful. You know that the world has gone digital, um ... Most oil-producing countries are using CCTVs, and drones to secure their oil pipelines. So the use of AI hybrid technology facilitates the emergence of optimal security, and protection in oil pipeline because you don't need to be there to strike at the individuals who engage on this. You can track and strike from the control centre” (DSS Personnel, Male, 40, Okporoza, Warri Southwest LGA).

This submission reflects both the drone category and the 14.6% citing CCTV-style monitoring systems. To another interviewee, this is what he had to say;

“AI video recording cameras can be useful... or government should give us drones... we think if they (drones) hover around this area, the people disturbing us and stealing our oil will be afraid. You will not see them again” (Civil Defense Officer, Female, 40, Kurutie, Warri Southwest LGA).

This submission again validates the strong emphasis on aerial surveillance in the quantitative findings. Beyond AI high-tech tools, the thematic data also highlights community-based intelligence and measures, resonating with the 14.8% who identified community-reporting strategies. The Vigilante leader who is one of the interviewees said;

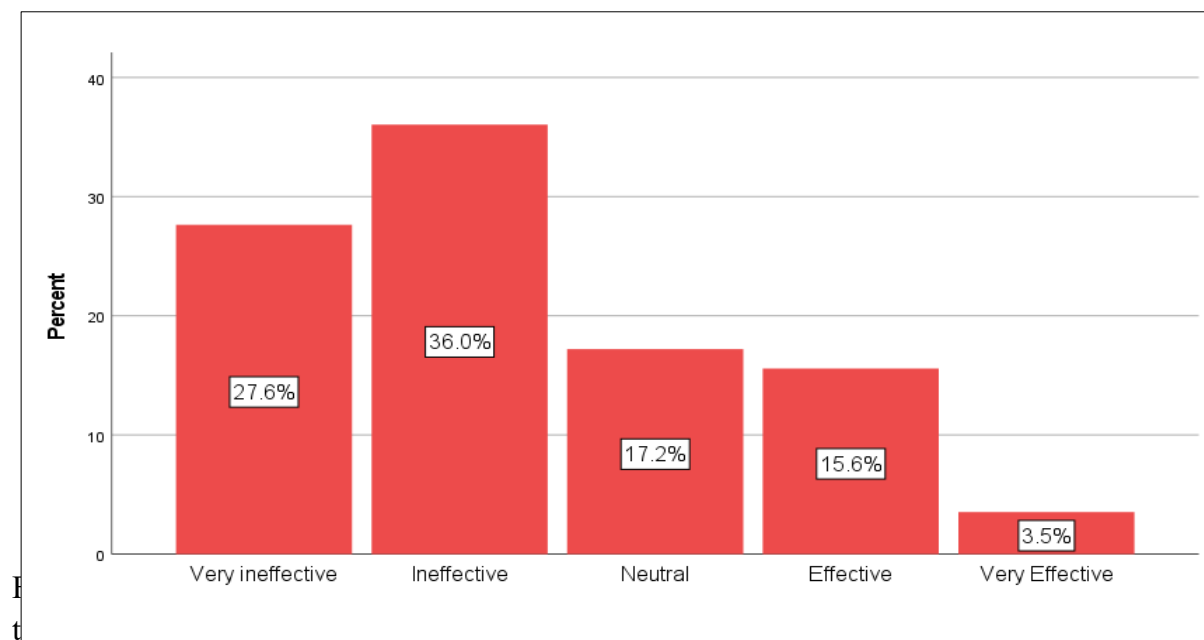
“If these AI technologies you are talking about are made available to us, they will need to teach us, train us on how to carry and use them. We are ready to use technology to deal with this problem” (Vigilante Member, Male, 50, Okporoza, Warri Southwest LGA).

This submission emphasizes the readiness and willingness of local actors in adopting AI technological systems to tackle the problem of oil theft in Warri Southwest. In summary, the quantitative and qualitative findings converge on the conclusion that the detection and control of oil theft in Warri Southwest relies on AI hybrid technologies, such as drones, satellites, and

CCTV for real-time surveillance, alongside community-based mechanisms that provide local knowledge and rapid reporting. This triangulation underscores the role of both formal security infrastructures and grassroots involvement in addressing oil theft. These findings align with Wizer and Wali (2020) who reported that satellite systems, CCTV and other digital instruments were AI-aided devices used in monitoring oil theft in Niger Delta region.

Analysis of Objective Three

The effectiveness of AI enabled communication technologies in the control of oil theft in Warri Southwest LGA was examined. In doing this, the respondents were asked to make their assessment on the effectiveness level of the devices and their opinions are presented in figure 3;



Field Survey, 2025.

Figure 3 shows mixed views regarding the effectiveness of AI enabled communication technologies in the control of oil theft in Warri Southwest LGA. The result reveals that majority of the respondents (36.0%) perceived these technologies as ineffective, and 27.6% also considered them to be very ineffective. In contrast, only 15.6% considered them effective, while a smaller fraction (3.5%) reported that they are very effective. This suggests that less than one-fifth of the overall respondents considered the devices to be effective. However, 17.2% of the respondents expressed a neutral position, implying lack of knowledge. In summary, the findings suggests that negative perceptions outweighed positive assessments, implying that most respondents were skeptical of the effectiveness of AI enabled communication technologies in addressing oil theft in their communities.

The qualitative data provide nuance insight to the survey results. While the interviewees acknowledged the potential of technology, they expressed skepticism about its current effectiveness, aligning with the respondents who rated it ineffective. For example, one interviewee considered AI enabled technologies to be having great usefulness, but expressed some reservations in their limitations:

“The technologies are good, and very, very effective in addressing oil theft, but you can hardly catch these guys if you don’t have intelligence report” **(DSS Personnel, Male, 40, Okporoza, Warri Southwest LGA).**

This submission reflects the survey’s minority (15.6%) who gave positive evaluations, while also highlighting the conditional nature of their perceived effectiveness. Another interviewee who is a member of Civil Society Organization (CSO) expressed her dissatisfaction in the effectiveness of the available technologies as follows:

“We need more technologies...the ones available here are obsolete...if the federal government can add more, it would help” **(Civil Society Member, Female, 38, Kurutie, Warri Southwest LGA).**

This submission points to the ineffectiveness of the technologies due to acute shortage and poor institutional presence in oil-producing communities. Similarly, a vigilante leader emphasized the perceived inefficiency of the AI enabled technological tools due to neglect and breakdowns. He was quoted as saying;

“Technology is good, but they hardly bring new ones to this place. Even the available ones are not in good condition and some have spoilt long ago” **(Vigilante Member, Male, 50, Okporonza, Warri Southwest LGA).**

This underscores both logistical failures and the consequences of poor maintenance culture, leading to inefficiency to technological tools in detecting and controlling oil theft in the area. The challenge was further reinforced by State security actors who stressed inefficiency of AI technological tools due to the mismatch between their capacities and the sophistication of the tools. One of the interviewees recounted thus:

“We have been trying to use them...but no proper training, no support... how can we operate them without proper training on how to use them? I must say we are struggling to use the technologies due to lack of training and support” **(Civil Defense Officer, Female, 40, Kurutie, Warri Southwest LGA).**

These perspectives reinforce why respondents overwhelmingly perceive AI technologies as ineffective: even where systems exist, they are underfunded, unevenly deployed, or not accompanied by sufficient training for local actors. Taken together, the quantitative and qualitative evidence converge to show that while surveillance technologies are recognized and seen as potentially useful, their current implementation is inadequate, leaving communities skeptical of their actual impact. However, it is important to note that the strong majority perception of the ineffectiveness is not a rejection of the technologies, but a reflection of gaps in resourcing, deployment, and integration with community-based security efforts. This finding slightly corroborates that of Adelowo and Oladele (2022) who noted that AI-powered devices are effective in combating oil theft.

Test of Hypothesis

There is a significant positive relationship between respondents' occupational group and their awareness of AI enabled technological tools for detecting oil theft in Warri Southwest LGA. In testing this hypothesis, the respondents' occupational group and their awareness of AI enabled technological tools for detecting oil theft were cross-tabulated, and tested using multi-nominal logistic regression. The result is presented in table 2;

Table2: Model fit statistics for multinomial logistic regression predicting awareness of oil theft detection technologies by occupation

Statistic	Value	Df	P
Model χ^2 (Final vs. Intercept Only)	3.817	12	.987
-2 Log Likelihood (Final)	65.892	–	–
Cox & Snell R^2	.004	–	–
Nagelkerke R^2	.004	–	–
McFadden R^2	.002	–	–

Field Survey, 2025

A multinomial logistic regression was conducted to assess whether occupational positions of the respondents predicted their awareness of oil theft detection using AI enabled technologies. The overall model was not statistically significant, $\chi^2(12) = 3.817$, $p = .987$, with a Nagelkerke R^2 of .004, indicating negligible explanatory power. No occupational category significantly predicted awareness of oil theft detection using AI enabled technologies when compared to the reference group ("Not Sure"). In other words, respondents' awareness of AI technological tools for detecting oil theft did not differ in any meaningful way across occupational groups. This suggests that knowledge of such technologies is relatively uniform across employment categories, regardless of whether respondents were unemployed, farmers, artisans, civil servants, traders, or in other forms of work.

The hypothesized association between occupational group and awareness of AI enabled technologies used in detecting oil theft turned to be untrue. This implies that people within the selected communities in Warri Southwest had similar levels of awareness about the technologies employed in detecting oil theft within their communities, irrespective of their occupational roles. Therefore, this paper submits that there is no significant positive relationship between respondents' occupational group and their awareness of AI enabled technological tools for detecting oil theft in Warri Southwest LGA.

Conclusion and Recommendations

It is acknowledgeable that the respondents align with the fact that AI-powered technologies are essential in curbing oil theft in their area. The accuracy in analysis, precision and swift response of AI in tracking, dictating and responding to oil thievery cannot be overemphasized. However, the lack of adequate awareness, and training on how to deploy or use these technologies were the major constraints. When adequately addressed and synergized with the host communities control strategies, the phenomenon of oil theft in the Warri Southwest in particular and the Niger Delta region in general will be drastically curtailed. Therefore, this paper concludes that the application of technologies is sacrosanct in curbing oil theft, especially when blended with indigenous knowledge and synergy. Therefore, the following recommendations are made for policy direction;

1. There is need for intensified awareness in the communities. It is not something that the State security operatives should be aware of at the detriment of the natives. Carrying the people along will help create synergy between residents and State actors in the fight against oil theft in Warri Southwest LGA..
2. There is need for security agencies to deploy round-the-clock AI thermal drone surveillance technologies, focusing on high-risk pipelines and creeks during peak operating hours. Real-time surveillance should be linked with community vigilante reporting systems for prompt detection and deterrence.
3. There should be creation of State-level Oil Security Technology Hubs to train local technicians for maintenance of surveillance systems, and integrate community reporting platforms into the national monitoring dashboards. This will enhance sustained functionality, efficiency, and promote local ownership of anti-theft AI enabled technologies.

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