Exploring Potential Uses of Geographic Information Systems and Predictive Analysis in AML/CTF Investigations

CAMS-FCI
Whitepaper

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Executive Statement:

In 2014 the Islamic State of Iraq and Syria (ISIS) emerged as a new and disturbing player in the field of terrorism. This organization, which seemingly sprang from nowhere, was actually born out of the marginalization of Sunni Muslims under Iraq’s Maliki regime and the failed inspirations of the terrorist organization Al-Qaeda in the Land of the Two Rivers (AQI). Unlike other terrorist organizations, ISIS has strived since its foundation to be independent of outside wealth. It immediately sought to develop and maintain physical control over land, resources and people. A prime example of ISIS’ drive for financial independence can be seen in the 2006 discovery of analyst Aaron Zelin. Zelin unearthed a map which detailed ISIS’ plan to capture the oil fields in Iraq and Syria.

While the sale of oil is a major source of funding for the group, other sources include ISIS’ ability to tax those unfortunate enough to live in its newly captured territory, the sale of women and slaves, and the sale of antiquities. Since its rise, ISIS has gone on to utilize these resources as a method of increasing its revenue stream. This standalone approach to terrorism financing has since inspired other organizations. For instance, in March 2015 Nigeria’s Boko Haram swore allegiance to ISIS, and in July 2015 senior members of Somalia’s al-Shabaab met to discuss a similar move towards alliance.

While these groups are operating in vastly different regions of the world, one element remains constant for their continued “success:” financing. For these organizations to conduct their operations they must have access to funds and the ability to move said funds. This basic need does not vary based on the source of capital—whether an organization’s coffers are filled by donors living abroad, the sale of narcotics, oil, taxation, or the sale of sex slaves as brides to militants. While this basic economic need remains constant, what can be observed as changing is the level of commitment nations provide in their willingness to stop the flow of these funds. The commitment of countries to fight terrorist financing (TF) and money laundering (ML) to cut the legs out from under organizations such as ISIS, Boko Haram and al-Shabaab varies across the globe. This difference in willingness to fight ML/TF is also greatly affected by geopolitical factors, such as political stability, poverty rates and infrastructure.

financial institutions (FIs) are in unique position to help stem the tide of illicit flows. Larger institutions are able to act as the financial backers of other FIs and are thus able to observe funds as they flow from one client account to another. From this vantage point, these banks are able to note increases in activity at their client banks’ branches, and note suspicious transactions conducted at the personal and business levels. Smaller retail banks also have a role in this fight. The retail bank tellers have an intimate relationship with their clients; they are able to note unusual behavior, and even more rapidly identify suspicious transactional spikes in client accounts. With these abilities come responsibilities. The U.S. government along with ordinary citizens have begun holding FIs accountable for turning a blind eye, or failing to conduct customer due diligence (CDD), which could have prevented an attack or the arming of terrorists. Freeman v. HSBC acts as a key example of this. In this suit, relatives of those killed during terrorist attacks are seeking retribution from the world’s largest FIs—HSBC, Credit Suisse, Barclays, Standard Chartered, and Royal Bank of Scotland. While Freeman v. HSBC is ongoing, on August 18th, 2015, a judge in Brooklyn, NY, sided with 310 plaintiffs against Arab Bank. This marks the first time that a bank was held liable for violating the U.S. Anti-Terrorism Act.

There can be no doubt that banks should be held accountable if they are found complicit or wilfully negligent in financing terror. Banks and governments would be well-served to find risks before terrorist have gained the capital to finance an attack. This paper will seek to utilize geographic information systems (GIS) along with predictive analysis (PA) software to attempt to determine which FIs are the most at risk to exposure of illicit finance. The systems utilized for this will be ESRI’s ArcGIS 10.2 and Signature Analyst made available through Pennsylvania State University and DigitalGlobe. Using ISIS’ methodologies as a lens, these systems will be utilized to attempt to unveil FIs at risk to an influx of funding from: ISIS in Turkey, Jordan, and Iran, Boko Haram in Nigeria, Chad, Cameroon, and Niger, and al-Shabaab in Somalia, Kenya and Ethiopia.

Defining GIS and its Growth in AML Investigations:

Defining exactly what constitutes GIS can be a difficult issue. For the purposes of simplicity it is best to view GIS as tool the same way one could view a map as tool used to answer questions. Whereas traditional maps strive to give a specific set of information for a given area—such as the terrain levels for a national park—GIS allows for multiple maps to be laid on top of each other. GIS is adjustable and customizable according to the problem or task at hand. A terrain map could be integrated into a map showing known bear populations. Furthermore, data from various sources could be gathered and moved from an excel spreadsheet to a geographical format. For example, surveys from hikers could be added to the previously mentioned terrain and bear maps to create a complete picture of hazardous areas.

The versatility that GIS achieves through the integration of data from spreadsheets and other digital files makes it an incredibly valuable tool to analysts. A trained GIS specialist is able to create maps that are capable of describing amazingly complex problems and the space these problems occupy with an impressive level of detail. As any tool or system used by analysts, the production of GIS products is rarely the end of a workflow, it requires an analytical mind-set to determine what the results are actually showing and what new data may be required for future analysis.

Discussions centered on the efforts of GIS, AML/CTF have increased in volume over the past decade. In 2006, the U.S. Postal Service (USPS) began utilizing GIS to develop a system to generate alerts. The USPS system developed detection scenarios to pinpoint and alert analysts of an increased suspicious use of postal orders within a given region. This allowed for a post office manager monitoring up to 10 districts to link unusual transactions to data on individuals and geographic locations in hopes of revealing potential criminal trends.

In 2009, the Association of Certified Anti-Money Laundering Specialists (ACAMS) reported that FIs could advance their illicit finance detection efforts by focusing on two key areas: optimizing information management and employing cyber analytic methodologies. ACAMS includes link analysis, geospatial analysis and PA as components of a broader cyber analysis effort.\(^8\)

In 2014, Marc Parker, PhD, correctly noted in his thesis that the larger criticism of the use of social media analytics, as part of CTF investigations, was that it was not being used in coordination with other tools such as GIS, and financial intelligence systems.\(^9\) From this it can be inferred that the complete potential of GIS is not being realized if it is not being utilized with other systems as well.

Assessing Current AML Policy Frameworks through GIS

An analysis of current AML initiatives is warranted to assess the ability of GIS to create a general understanding of which jurisdictions are more likely to house vulnerable or complicit FIs. Below a map of FATF membership demonstrates how GIS could be utilized to create a product that shows a world of stark contrast. FATF is a “policymaking body” comprised of and regulated by voluntary members. The rules of this body have been established by the ministries or departments within said member states.\(^10\) While understanding which nations have agreed to membership does aid in realizing the broader ML threat, it fails to capture what laws may also be in place to aid AML/CTF efforts.

To the bottom left an assessment created by the U.S. Department of State shows the breakdown of various AML laws and regulations enacted by each country. As described above, GIS can be utilized to convert this table into a map, and then layer the data set created from it, onto FATF membership.

To accomplish this layering, an equal numerical weight has been given to 20 different categories of illicit finance law as deemed important by the U.S. Department of State and to FATF membership. The value of -1 for laws enacted and membership, 1 for failure to enact said laws and lack of membership. The overall risk weight is equal to the sum. By comparison, this analysis aids in creating a more layered perceptive of the complexities that underlie the regulation and prosecution of ML than FATF membership would alone.

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These efforts can be seen to the right. Again, while this GIS product is helpful, it seems further analysis could be conducted to create a complete understanding. The effort conducted so far has only demonstrated FATF membership and the ability of nations to enact laws that the U.S. State Department has deemed important. As this image demonstrates, this creates a product with a clear slant in favor of Western Countries.

To develop a complete assessment of AML laws and the geopolitical space they regulate, data was gathered from the World Bank’s World Governance Indicator (WGI) Project and the World Bank’s Ease of Doing Business (EODB) rankings. To complete this analysis, the scores of six WGI factors and the overall EODB ranks were
given a weight equal to their value. This data was then layered on top of the previously gathered U.S. Department of State and FATF data. This effort is depicted in the image below. As this image demonstrates, when poverty, quality of life, corruption and access to the political system are taken into account, the true complexity of AML/CTF efforts becomes more apparent.

### Defining PA and Exploring its use in AML Investigations

While the above effort provides a visual reference for this complex situation, it does not provide information as to which nations are likely to see an increase in ML or TF activity.

Like GIS, the use of predictive analytics has expanded as the ability for companies, governmental agencies and non-government organizations (NGOs)—to capture massive amounts of data—has increased. As GIS should be viewed as a tool in an analyst’s tool belt, and the same can be said for PA. The authors of *Effective Counterterrorism and the Limited Role of Predictive Data Mining*, argue that PA is an element of data mining, rather than an unconnected outlier. For them data mining is:

> “[T]he use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data sets.” These tools can include statistical models [and] mathematical algorithms...Consequently, data mining consists of more than collecting and managing data, it also includes analysis and prediction.”

In 2014, Tom Davenport of the *Harvard Business Review* stated a little more plainly, “No one has the ability to capture and analyze data from the future. However, there is a way to predict the future using data from the past.” According to Davenport, there are three barriers to businesses aptly utilizing PA. These barriers are first, quality data, second the ability to correlate the data using the correct statistical methodology (which will typically be regression analysis), and third the ability to identify the correct assumptions based off of the data and scenario at hand as well as the ability to recognize when the time has come to change or alter these assumptions.

Jonas and Harper go on to argue that PA is not an effective means to prevent terrorist attacks. They claim that this is due to the lack of data. As there are only a “few” terrorist attacks per year, attempts to draw conclusions on these attacks produce false positives. As the old programming adage goes: garbage in, garbage out. While this view might hold true for actual terrorist attacks, it fails to appreciate the vast number of transactions being conducted by those seeking to fund terror through “clean” funds, or launder illicit funds so that it may be utilized by terrorist organizations. In 2014, it was estimated that ISIS was netting as much as $1 million a day and would clear upwards of $200 million in a single year. With this incredibly large data set and increasingly available information about the methodologies of ISIS, it can be argued that the probability of predicting where terror financiers are likely to operate and which FIs are at the greatest risk is significantly higher than predicting the next target or attack. This holds even truer if PA is treated as a single tool to be used in collaboration with others, such as GIS. Finally, if it is possible predict and prevent the flow of TF, this would in effect stem the tide of terrorist acts themselves. This would in effect make attempting to predict the relatively “few” terrorist acts conducted every year too retroactive.

DigitalGlobe’s signature analyst (SA) has been utilized for the use of this report. Briefly stated, this program combines PA with geospatial information. This allows an analyst to bear in mind that the events that are modelled must have a limited distribution (as they are all occurring in physical space). SA utilizes the occurrences being modelled in correlation with the factors that could limit or restrict this distribution. These factors could be: easily defined infrastructure, such as roads, rail and ports, socioeconomic factors such as

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14 Clarke, Colin P. p. 154.
poverty rates or birth rates, and natural occurring phenomenon, such as topography, watershed, and land use.\textsuperscript{15}

It is important to note that SA does not utilize a geographic profiling method. An example of this would be the least resistance model, which is frequently used to demonstrate that a violent crime is committed close to the criminals’ home or workplace. This semi-subjective methodology detracts from larger efforts to include inductively produced geographic data. The purpose of imperially driven, predictive and geographical analysis is not to determine where events are likely occurring, but rather where they are likely to occur in the future.\textsuperscript{16}

The image to the left demonstrates the use of SA. In order to develop an effective baseline for PA to function, an estimate annual outflow of laundered money was needed. While concrete data would be preferred, this simply is not possible. Amongst law enforcement, NGOs and academia there is a very active debate as to how much in illicit funds is floating out in the world economy. The root of this discord can be traced to the lack of criminals reporting how much they earn. Some estimate that there is at least $1.5 trillion laundered every year. John Walker, CEO of Crime Trends and Analysis, estimates the total is closer to $2.85 trillion per year.\textsuperscript{17}

Walker’s model is based along the same lines utilized by the 1998 report of the UN Office of Drug and Crime. Walker insists that his model is more accurate as it has been produced without the concern of upsetting member nation’s sensibilities.\textsuperscript{18} Utilizing the findings Walker has made available for top 10 national sources of illicit money outflows, coupled with the data made available in the 2013 report on illicit funds in the developing world by Global Financial Integrity, a table was created which contained a near complete estimate of dirty money outflows. As this methodology left some countries with data missing, the average flow of $112.08 billion was divided by the national GDPP for 2012. This resulted in a total outflow of $2.33 trillion. This methodology still allowed for 10 nations to have incomplete data due to their GDPP being lower than $112.08 billion. The remaining $518 billion was divided by 10 to create 51.8 billion. This number has been utilized to avoid an outflow of zero.

To further provide information to be utilized during the PA calculations, data was gathered from the UN Human Development Reports.\textsuperscript{19} This dataset was further enhanced through FATF membership information, the World Bank’s WGI and EODB Datasets, as well as the U.S. Department of State’s AML Assessment. The result is 126 fields of data for 189 countries. See the attached tables for a complete listing of the data included.

\textsuperscript{16} ibid.
\textsuperscript{18} ibid.
\textsuperscript{19} UN Human Development Reports. 2014 Human Development Trends by Indicator. N.p.: UNITED NATIONS DEVELOPMENT PROGRAMME, 2014. .xls.
Finally, geographic factors such as population, rail networks and population centers have been listed as factors. All of these elements are weighted against the events of annual ML outflows. The result is a product which further pinpoints areas within nations where ML or TF are likely to occur.

As with GIS products, PA is simply a tool. To understand the value of a PA/GIS product, further effort is required. The above image demonstrates that regions that are likely to see an increase of ML/TF activity are not necessarily ones that have been identified as having the best ML/TF protection or the highest quality of life. Scandinavia acts as a prime example. This region’s proximity to Russia and Eastern Europe has likely influenced the outcome of this model. While the overall ML/TF activity of this region might be low in comparison to Iraq and Mexico, the factors outlined above lead to an indication that there may be an increase in activity.

This model further demonstrates that population size is not the only factor when determining expected ML activity increases. Comparisons of the Australian Outback vs. the African Sahara, and Miami vs. New York City, both act as examples of this.

Example Cases: ISIS, al-Shabaab and Boko Haram.

ISIS

There can be no doubt that halting the financing of terror is difficult, let alone predicting it. In his paper, Defeating the Islamic State: A Financial-Military Strategy, Paul Kan outlines the difficulty defeating ISIS’ financial capabilities. ISIS is financed through a variety of illicit finance means, such as extortion, smuggled oil, kidnapping and the sale of antiquities. Kan argues that these methods, and therefore ISIS, do not rely solely on moving funds through the international financial system.  

While at first glance this argument seems to put a halt on investigating ISIS’ funds, there are components of funding schemes used by these “stand-alone” terrorist organizations that are open to the net of financial surveillance. The sale of narcotics and smuggled oil, and the use of shell companies all have financial signifiers. When these “red flags” are properly screened, they provide clues as the source of funds. GIS can be used to enhance these signals, assisting analysts in determining if transactions are merely unusual or are truly suspicious.

Furthermore, most “traditional” terrorist organizations, such as the IRA and FARC, fill the power structure left vacant by the previous regime. As the Syrian government ceded territory, it also released control of its corrupt forms of fund raising.  

ISIS does not have the resources to smuggle oil, drugs and slaves into and out of “its” territories and conduct its war. To facilitate these fund raising goals, ISIS uses practices that would be familiar to the mafia. Those who swear allegiance to ISIS are granted protection in exchange of a tax, a tithe, or as it is called in Arabic, a ‘zakat.’

A large network of ISIS commanders and smuggling operations have also benefited from the protracted wars in the region. The very factors that have allowed ISIS to rise to power have only acted to further entrench local knowledge of illicit trade routes. This has led to the development of a vast network of smugglers. As Under Secretary for Terrorism and Financial Intelligence David S. Cohen has commented, “after extracting the oil, [ISIS] sells it to smugglers who, in turn, transport the oil outside of [ISIS’s] strongholds. These smugglers move oil in a variety of ways, from relatively sizeable tankers to smaller containers.” Moreover, it has been documented that ISIS sells the oil at a steeply discounted price of $20 to $35 a barrel. When ISIS seizes control of oil refineries, it keeps the technical workers and labourers, replacing only the top management with its own people.

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20 Kan, Paul Rexton, Defeating the Islamic State: A Financial-Military Strategy
21 Ibid.
22 Clark, Colin P. p. 154.
24 Clark, Colin P. p. 159.
In all of these above mentioned cases, extortion, illicit drug trafficking and oil smuggling, GIS could be utilized to enhance financial crime investigations. For example, when smuggling oil from Iraq or Syria into Turkey or Iran, said smugglers must pass through military and customs check points. While it can be assumed that a great amount of oil may pass through undetected, some vehicles must be searched. If this oil is still able to pass into a new jurisdiction, this implies bribery. Thus, the practices of know your customer (KYC) or in some cases know your customer’s customer (KYCC) utilized by FIs to detect unusual client behavior may be able to spot a suspicious increase in the accounts of a border guard or customs official.

The image to the right illustrates an example of GIS being employed to assist in developing a risk-based approach to monitoring bank accounts of customs officials. Here a 10 mile buffer has been created surrounding known border crossing locations between Syria and Turkey. Furthermore, this image shows bank locations made available through simple Google searches. With this information, coupled with client on boarding information, a financial crimes analyst would be able to quickly identify which accounts pose the greatest risk to illicit finance. In the case of recently disposed oil refinery management, KYC and GIS again could
be utilized to highlight accounts that demonstrate a significant decrease in activity. The image to the left demonstrates this.

**Boko Haram**

In 2015 alone, al-Shabaab launched 11 attacks killing an estimated 285 people and Boko Haram has launched 21 attacks killing an estimated 974 people. Both of these groups have been operating for some time and have continually shifted allegiances.

Al-Shabaab’s rise is due largely to the historically failed state status of Somalia. Al-Shabaab once possessed a firm grasp on Mogadishu and major portions of the Somali country side. As African Union military attacks against al-Shabaab have intensified, the group has begun to push its way into Kenya, which houses a significant Somali tribal population. According to the 2009 Kenyan census, there are nearly 2.4 million ethnic Somalis living in Kenya. In 2003, a rift formed in al-Shabaab, with younger members seeking to create an Islamic State which held the “greater Somalia.” Image 9 demonstrates the illicit finance risk posed to Kenyan banks if al-Shabaab continues to push into the Kenyan Interior.

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25 See works cited for source information on al-Shabaab and Boko Haram attacks.
Like ISIS, al-Shabaab has proven a willingness to utilize both extortion and control of natural resources, such as coal and sugar, to fund their objectives. By some estimates al-Shabaab has been able to raise hundreds of thousands per day in contraband smuggling. In 2003, there was an estimated $7.8 to $10 billion in transnational crime associated with the illegal exploitation and exportation of protected wildlife.\(^{29}\) If al-Shabaab is willing to follow the example of ISIS and exploit all resources it has available, game reserves in the area could be threatened. The image below demonstrates the proximity of al-Shabaab territory and national parks and wildlife preserves in the region.

Like ISIS and al-Shabaab, Boko Haram has shown no qualms against encroaching into territory outside of its nation of origin, Nigeria. The image below demonstrates risks posed by this group in Cameroon. This group’s most infamous activity comes in the form of kidnapping and mass murder.\(^{30}\) Boko Haram continually harasses small and rural villages, pillaging, raping and burning as they see fit to refill their coffers. The chaos in nearby Libya has allowed Boko Haram to purchase military vehicles, thus extending their reach.\(^{31}\) Since its allegiance with ISIS, a shift to territorial control has begun to take place. Like ISIS, this African “Caliphate” excises taxes on its “citizens,” in addition to towns now vulnerable to its expanding reach. Boko Haram also has access to wildlife reserves, adding to potential contraband. A final source of revenue for this terrorist organization could be oil. In December 2014, this ISIS affiliate issued threats against oil pipelines and workers. While the oil fields in Nigeria are a significant distance from its “heartland,” these types of threats should be taken seriously.\(^{32}\) The image below also illustrates the risk Boko Haram has on the local banking and oil industries.

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It seems within reason that the same funding methodologies utilized by ISIS would be used by al-Shabaab and Boko Haram. As fighting is the primary function of these groups, other smaller bands of smugglers and human traffickers are likely to do the bulk of the work in exchange for a tax or fee. As with ISIS, this would likely be done through the trade of liquid assets. That is through the trade of vehicles, arms, gold and cash wherever possible.

Reports have surfaced that indicate that like ISIS, Boko Haram has utilized trade routes that run north from the Borno, Nigeria State capital to Lake Chad. This is a well-known trafficking route for diesel, textile, cigarettes and counterfeit drugs. While the violent extremist group is not directly involved in the trade, they are likely taxing those willing to engage in these acts. Nigeria has taken steps to prevent cross border movement of funds. This crackdown will likely push funds raised in Nigeria or its Northwestern neighbors into shell companies established in countries with lax AML/CTF controls. As with ISIS, attempts to restrict this movement would benefit from the identification accounts and locations with an increased likelihood of bribery or kickbacks.

PA Use for Analysis of Boko Haram and ISIS

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In an attempt to move from the mere identification of locations currently at risk of ML/TF activity, PA was utilized to create a more surgical analysis. This effort can be seen in the image below. Here, an assessment of FIs in Turkey, which are likely to see an increase of funds, originated by ISIS’ activity. Here more localized factors such as banks, markets and fuelling stations have been incorporated. This image has been created through the use of manually created ML transactions. These transactions were created with typical ML typologies in mind. The banks selected for this effort were selected exclusively for their proximity of the Turkish-Syrian Border.

This model demonstrates the importance of rail and road networks to those conducting illicit activity. While roads were removed from this image for the purpose of clarity, a clear band of probable increase can be seen stretching towards Istanbul. Smaller rail networks connecting other cities also show a high likelihood of increased ML/TF transactions. This image further illustrates the ability of GIS/PA to describe which regions within Turkey will likely see an increase in ML/TF. The development of this type of forward looking intelligence product allows senior management to anticipate where there risk-based approach should be leaning.

In an effort to further understand the capabilities GIS/PA hold, a broader view was taken. The image below demonstrates a review of all of the factors and ML transactions used above and such factors as lands held by Turkish, Somali and Nigerian minorities. Additional geographic factors for this model include road ways and 200 random banks in the effected nations. As this image demonstrates, the result is quite different from that of efforts that did not utilize any PA algorithms. While it would have been ideal to push this model out to a broader area, computing power restricted the output. The results of these efforts, however, do show potential risks for FIs in not only the neighboring nations, but also the wider regions. It should be highlighted that this image was created using illicit flows in banks in Turkey. The impressive abilities of GIS/PA are further evident when this limited input is taken into consideration along with the highlighted band of potential ML/TF activity running along roadways north from Nigeria into and through Chad. This band runs precisely along currently exploited routes of illicit trade. With these factors in mind, this model helps to demonstrate that PA/GIS efforts are capable of expanding currently understood threats into areas that have not yet been evaluated.
Finally, the image below demonstrates the capabilities of SA to be exported to Google Earth. This image demonstrates the more precise abilities of GIS/PA analysis. Here, an analyst is able to zero in on at-risk institutions near street level. While this display shows entire cities colored or assigned the same risk level, a FI conducting research on their own specific branches would likely see much more refined and less uniform results. This type of analysis could be of particular use if FIs with multiple branch locations within a certain city are attempting to determine where groups are likely to strike next. This type of analysis could be further used to aid senior management with creating a more risked-based approach to teller or branch manager training programs.
Conclusion

In a 2013 speech, Jenifer Shasky Calvery, Director of the Financial Crimes Enforcement Network (FinCEN), gave a speech in which she described the emerging PA capabilities of FinCEN. According to Shasky Calvery, this ability was aiding her organization in its ability to predict where money laundering crimes are likely to take place.\(^\text{34}\)

With the ability to conduct PA, it should be kept in mind that this application is still simply a tool. It is not an “easy button” or even a simple “plug and play” technology. It takes data inputs that have been considered and well thought out. Proper PA will always depend on, quality data, the ability to conduct advance regression analysis, and the ability correctly identify which assumptions are hindering and advancing investigations. Even after ensuring that these barriers to quality work are taken into consideration, in-depth research must continue to ensure that this tool does not become a mechanism for realizing self-fulfilling prophesies. The question must be asked: “If a financial institution begins looking harder into certain areas for patterns of illicit activity, are illicit transactions that are found due to an actual increase or heightened vigilance?”

These tools when utilized correctly can be used to aid in determining which accounts, branches and regions are likely to be affected by factors on the ground and could soon present an increased risk. With this knowledge, analysts can shift their focus to particular accounts with greater confidence, and senior decision-makers can assess if their current risk-based approaches require adjustment.

Finally, there is still a great deal of responsibility in the hands of the analyst. Keeping the audience of an intelligence product of this sort in mind is critical. Data manipulation through GIS could be quite easy. Exaggeration of information through coloration, scope, scale and perspective could all be utilized in ways designed to influence a desired outcome. Given that GIS and map making are unlikely to be the bread and butter of many senior decision makers at financial institutions, or even many government agencies and NGOs, it is of vital importance that an analyst utilizing these systems avoids the pitfall of lying through maps.

Research into the use of PA in combination with GIS for the express purpose of AML/CTF investigations failed to produce results. While it is clear that FIs and government agencies have an interest in their investigative and intelligence methodologies from public view, the lack of readily available information regarding the emergence of a combination of these techniques suggests that they are currently underutilized. GIS and PA are powerful tools, and in the hands of a trained and capable analyst they have the potential to greatly enhance investigations and possibly direct policy. This could easily lead to fewer illicit transactions authorized by banks, increased reporting of illicit

activity and a decrease of terrorist financing. The end goal of all these efforts would be reduced risk to financial institutions and the reduction of terrorism.

**Image Sources**


**Data Sources**

**Shapefiles**

**African Locations and Shapefiles**


**Other Shapefile or Geographic Info**


**Ethnic Group Geographic Locations, Kurds, Nigeria, Somalis**


**Illicit Financial Flows Estimations**


**Works Cited**


Kan, Paul Rexton. Defeating the Islamic State: A Financial-Military Strategy


