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THESIS

THE SEMI-SUBMERSIBLE NETWORK

by

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December 2012

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ABSTRACT

This is a qualitative and quantitative study of the semi-submersible network operating out of the southwestern portion of Colombia. This study combines both of these aspects to provide strategic options for kinetic, non-kinetic, and a combination of both measures for commanders to use to disrupt or destroy this network.

Empirical historical data provide the qualitative information essential to understanding the present-day situation. The quantitative data are a combination of geo-spatial analysis, link analysis, social network analysis, and temporal analysis. Together, these paint a picture of the main source of revenue for the FARC. Open-source intelligence was used for all of the analysis which, when combined with other forms of intelligence, may illuminate the network and portray it in a new light.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR   Area of Responsibility

COLMIL   Colombian Military

DoD   Department of Defense
DSP   Democratic Security and Defense Policy

ELN   National Liberation Army (a small leftist guerilla group with ties to Cuba)

FARC   Fuerzas Armadas Revolucionarias de Colombia
FSV   Fully Submerged Vehicle

GDP   Gross Domestic Product
GN   Girvan-Newman
GPS   Global Positioning System

INDEPAZ   Institute for Peace and Development

MANPADS   Man Portable Air Defense Systems

NGO   Non-Governmental Organization
NSA   Non-State Actors

SNA   Social Network Analysis

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I.   INTRODUCTION

A.   BACKGROUND

The FARC (Fuerzas Armadas Revolucionarias de Colombia) is one of the most enduring insurgency networks that exist in the history of Latin America. This adaptive network continues to evolve despite the significant gains made by the Colombian government over the last 10 years. The network consists of more than 8,000 fighters and is supported by an even larger network of popular and Bolivarian militias.[1] The purpose of the FARC is to establish a Marxist-Leninist government in Colombia that would address the economic grievances of those excluded by the current political system.[2] This terrorist group is comprised of high- and mid-level leaders with strong ideological foundations who are committed to leading a revolution by force, if necessary, to change the political and economic system of Colombia. The FARC has relied on criminal activities, and primarily drug trafficking operations, to fund its insurgency.[3] Countries, such as Venezuela, Argentina, Ecuador, and Nicaragua, support these efforts and consider the FARC a legitimate insurgency with genuine political grievances, whereas INTERPOL, the United States, Canada, and the European Union consider the FARC a terrorist organization.[4] Despite the gains made by Colombia's security forces in decreasing the network from 19,000 estimated fighters in 2002 to 8,000 today, the FARC continues to remain a persistent and formidable threat.

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[1] U.S. State Department, "Background Note: Colombia," July 13, 2011, http://www.state.gov/r/pa/ei/bgn/35754.htm.

[2] Cristina C. Lucena, "Who Are the FARC?" *Pontificia Universidad Javeriana*, n.d., http://www.colombiasoyyousa.org/quienes-son-las-farc.html.

[3] U.S. State Department, "Background Note: Colombia."

[4] U.S. Library of Congress, Congressional Research Service, *Latin America Terrorism Issues*, by Mark P. Sullivan, CRS Report RL21049 (Washington, DC: Office of Congressional Information and Publishing, February 23, 2011), 2.

As a peasant insurgency that began as a small network in 1964, the FARC network did not require many financial resources to operate, but as it continued to grow, it realized that it needed to increase its financial resources to accomplish its strategic objective. Consequently, the FARC made some key financial decisions on how to fund its operations. It turned to drug trafficking to fund its expansion.

The authors' fundamental assumption in this thesis is that a key component of an effective counterinsurgency plan is an attack on an insurgency's financial network, which in this case, is the FARC's drug network. Drug trafficking operations primarily fund the FARC's political and military activities, which seek to undermine the democratically elected government of Colombia. Disruption of the FARC's financial network would severely hamper its capacity to recruit, pay the salaries of its fighters, and fund the progression of its ideology abroad. Furthermore, evidence gathered from computer files belonging to former FARC Secretariat Raul Reyes suggests that the network has attempted to buy political support from Ecuador and Venezuela by funding certain presidential candidates during election campaigns and by supporting key government leaders.[5] Thus, undermining the FARC's financial resources would reduce its ability to promote its ideology abroad through social media, the Internet, and influential leftist intellectuals.[6]

Greater access to capital also allows the FARC to purchase new weaponry, such as Man Portable Air Defense Systems (MANPADS), which could strategically affect the nature of the conflict.[7] In 2005, the FARC had the opportunity to buy MANPADS from China but could not obtain the financial resources in time, and as a result, was unable to purchase them.[8] One of the reasons for Colombia's recent military successes against the FARC is its ability to move and mass forces quickly by using helicopters to gain a

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[5] "The FARC Files: Venezuela, Ecuador and the Secret Archive of Raul Reyes," *International Institute for Strategic Studies*, May 2011, 32.

[6] Mario Escobar (Lieutenant Colonel,Colombian Naval Infantry), in discussion with Major Armando Hernandez (U.S. Army), March 8, 2012.

[7] "The FARC Files: Venezuela, Ecuador and the Secret Archive of Raul Reyes," 32.

[8] "The FARC Files: Venezuela, Ecuador and the Secret Archive of Raul Reyes," 32.

tactical advantage.[9] Attaining MANPADS would have significantly improved the FARC's military capacity and perhaps negated the Colombian Military's (COLMIL) mobility advantage. Although it was previously unsuccessful in the acquisition of MANPADS, with the right amount of financial resources, the FARC is likely to try again. Successfully attacking the FARC financial network could possibly disrupt its entire network and increase prospects for peace.

To understand the FARC's resilience and capacity to profit from the drug trade, the locus of its semi-submersible operations is first identified. Figure 1 illustrates (highlighted in red) the location of the semi-submersible network along the Pacific coast.

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[9] Robert Haddick, "Colombia Can Teach Afghanistan (and the United States) How to Win," *Air and Space Power Journal* XXIV, no. 2 AFRP 10-1 (Summer 2010) http://www.airpower.maxwell.af.mil/airchronicles/apj/apj10/sum10/08haddick.html.
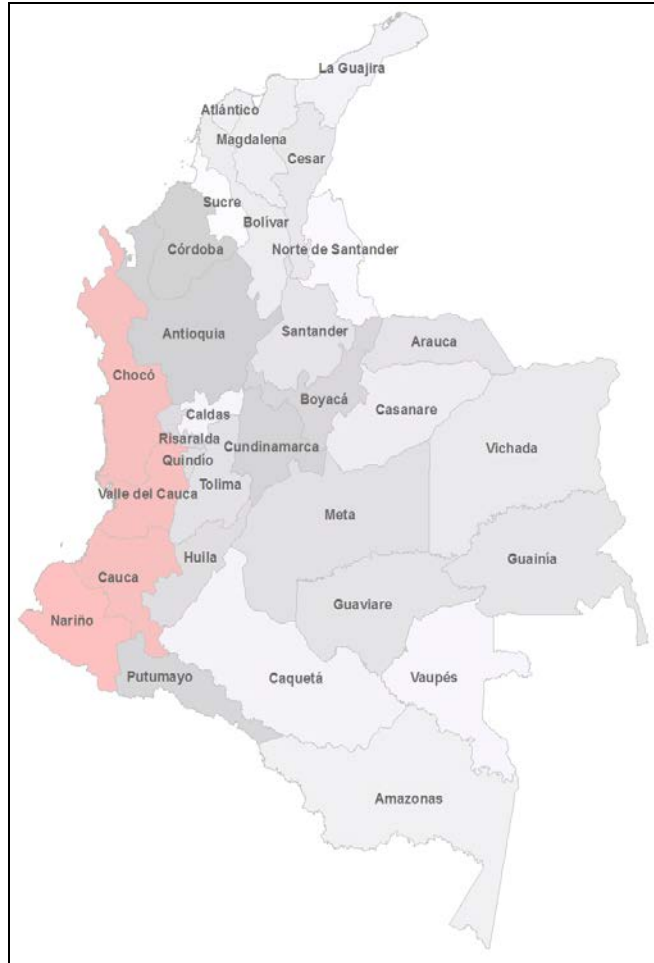
Figure 1.   Pacific region of Colombia affected by the semi-submersibles[10]

This thesis takes a deeper dive into the Colombia's Pacific coast where the FARC helped create a network of FARC units, criminal gangs, and the National Liberation Army (a small leftist guerilla group with ties to Cuba) (ELN) designed to profit from the trafficking of cocaine. The key feature of this network is its use of semi-submersibles for coca export. Semi-submersibles are crafts capable of moving in water with or without self-propulsion, including platforms, whose properties allow partial or total immersion.[11] Figure 2 illustrates the semi-submersible network in the Pacific. Each dot on the map represents the location of FARC and criminal organizations that comprise the semi-

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[10] This map was created in ARCGIS, the highlighted red area is the focus of this thesis.

[11] Congress of Colombia, "Law 1311 of 2009," *Official Journal No. 47.405*, July 9, 2009, http://www.secretariasenado.gov.co/senado/basedoc/ley/2009/ley_1311_2009.html.

submersible network composed of the following major organizations: the Joint Western Command (FARC), the Jose Mari Cordoba Block (FARC), the Rastrojos Criminal Gang, the Renacer Criminal Gang, the Machos Criminal Gang, the Urabeños Criminal Gang, and the ELN. Table 1 summarizes the sub-organizations that comprise the network, which are the organizations within the network closely involved with drug trafficking and semi-submersible operations. Analyzing how to disrupt this drug trafficking network would illustrate how other sub-organizations could be disrupted as well since they have similar designs and structure.[12]

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[12]"International Global Terrorism: Its Links with Illicit Drugs Illustrated by the IRA and Other Groups in Colombia," *Hearing Before the House Committee on International Relations*, April 24, 2003, http://commdocs.house.gov/committees/intlrel/hfa78947.000/hfa78947_0f.htm.
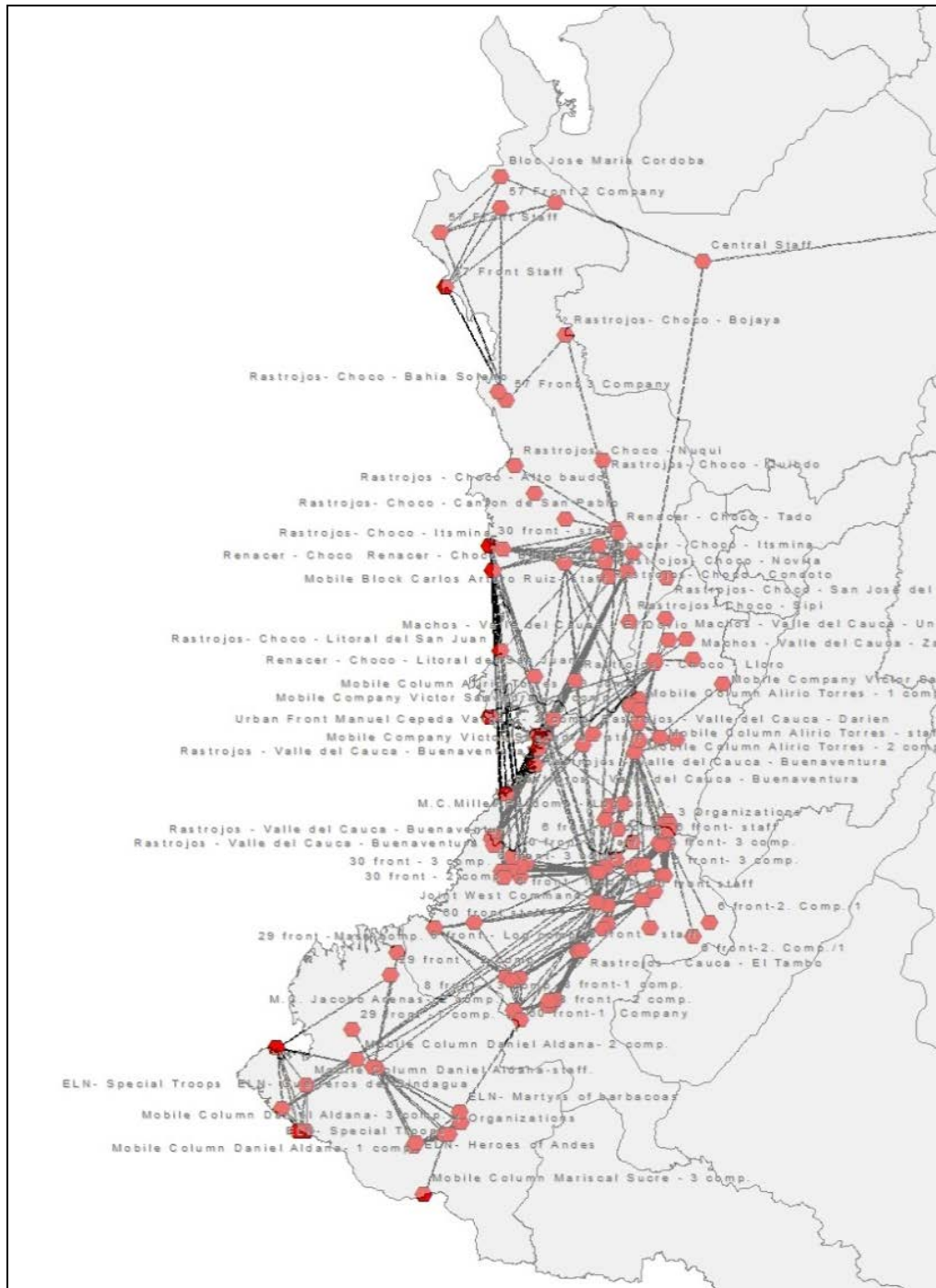
Figure 2.   Map illustrates the location of FARC and Criminal organizations that
comprise the semi-submersible network in the Pacific[13]

[13] These data were comprised through the use of ORA and exporting the data into ARCGIS. The data show the overall connection of the entire network, in essence, this is a sociogram layered on top of a map, and each node is geo-located based on open source data.

Organization	Units
Joint West Command FARC	6th Front, 8th Front, 29th Front, 30th Front, 60th Front, Mobile Block Carlos Arturo Ruiz (Mobile Column Libardo Garcia, Mobile Column Miller Perdomo, Mobile Column Alirio Torres, Mobile Column Gabriel Galvis), Mobile Column Daniel Aldana, Urban Front Manuel Cepeda Vargas, Mobile Column Jacobo Arenas, Mobile Column Mariscal Sucre, Mobile Company Victor Saavedra, Political Company Ambrosio Gonzalez.
Jose Maria Cordoba Block FARC	57th Front.
Rastrojos Criminal Gang	<u>Rastrojos Choco</u>[14] (Rastrojos Alto Baudo, Rastrojos Bojaya, Rastrojos Canton de San Pablo, Rastrojos Condoto, Rastrojos Istmina, Rastrojos Litoral de San Juan, Rastrojos Novita, Rastrojos Nuqui, Rastrojos Quibdo, Rastrojos San Jose del Palmar, Rastrojos Sipi, Rastrojos Tado[15]) <u>Rastrojos Valle del Cauca</u> (Rastrojos Bolivar, Rastrojos Buenaventura, Rastrojos Cali, Rastrojos Darien, Rastrojos Jamundi[16]) <u>Rastrojos Cauca</u> (Rastrojos Buenos Aires, Rastrojos Cajibio, Rastrojos El Tambo, Rastrojos Jambalo, Rastrojos Lopez de Micay, Rastrojos Morales, Rastrojos Santander de Quilichao, Rastrojos Suarez, Rastrojos Timbiqui, Rastrojos Villa Rica[17]) <u>Rastrojos Nariño</u>. (Rastrojos Barbacoas, Rastrojos El Charco, Rastrojos Francisco Pizarro, Rastrojos La Tola, Rastrojos Magui, Rastrojos Mosquera, Rastrojos Olaya Herrera, Rastrojos Roberto Payan, Rastrojos Santa Barbara, Rastrojos Tumaco[18])
Renacer Criminal Gang	<u>Renacer Choco</u> (Renacer Bajo Baudo, Renacer Istmina, Renacer Litoral del San Juan, Renacer Tado.)
Machos Criminal Gang	<u>Machos Valle del Cauca</u> (Machos Bolivar, Machos Bolivar El Dovio, Machos Union, Machos Versalles, Machos Zarzal.
Urabeños Criminal Gang	<u>Urabeños Choco</u> (Urabeños Alto Baudo, Urabeños Bajo Baudo, Urabeños El Carmen, Urabeños Istmina, Urabeños Lloro, Urabeños Medio Atrato, Urabeños Medio Baudo, Urabeños Nuqui, Urabeños Quibdo, Urabeños Rio Sucio)
National Liberation Army–ELN. (communist insurgency)	Company Guerreros del Sindagua, Company Heroes of Andes, Company Martyrs of Barbacoas, Company Jose Luis Cabrales, Company Special Troops.

Table 1.   Depicts the overall semi-submersible network operating in the Pacific region as seen in Figure 2.

[14] Choco, Valle del Cauca, Cauca, and Nariño are departments (states).

[15] Choco municipalities (counties): Alto Baudo, Bajo Baudo, Bojaya, Canton de San Pablo, Condoto, El Carmen, Istmina, Litoral de San Juan, Lloro, Medio Atrato, Medio Baudo, Novita, Nuqui, Quibdo, Rio Sucio, San Jose del Palmar, Sipi, Tado.

[16] Valle del Cauca municipalities (counties): Bolivar, Buenaventura, Cali, Darien, El Dovio, Jamundi, Union, Versalles, and Zarzal.

[17] Cauca municipalities (counties): Buenos Aires, Cajibio, El Tambo, Jambalo, Lopez de Micay, Morales, Santander de Quilichao, Suarez, Timbiqui, and Villa Rica.

[18] Nariño municipalities (counties): Barbacoas, El Charco, Francisco Pizarro, La Tola, Magui, Mosquera, Olaya Herrera, Roberto Payan, Santa Barbara, and Tumaco.

Colombia's southwest Pacific region is also significant due to its financial importance for the drug trafficking operations. This area alone generates more than 65% of the FARC's financial resources. Although the FARC has historically used other criminal networks, such as the Rastrojos, to transport its cocaine, two recent semi-submersible seizures suggest that the FARC is beginning to build its own semi-submersibles or underwater vehicles.[19] While semi-submersibles do not represent the most common vehicle for transporting cocaine out of Colombia into Central and North America, their technology could be exploited and used by the FARC to transport weapons, ammunitions, and other illicit goods. With its large payload capacity and ability to remain increasingly undetected in the water, the semi-submersible is the ideal vehicle to carry illicit goods over large distances.[20]

Data on recent semi-submersible seizures suggests that most of these underwater vehicles are being built in the Southwest Pacific region. The South Pacific area shown is formed by the departments (states) of Valle del Cauca, Cauca, and Nariño. The area is crossed by numerous rivers (Figure 3) flowing from the eastern range (right side of the map) to the sea with few roads serving as lines of communication. Many small towns have formed along the rivers. The semi-submersibles have been found along the coastal regions concealed amongst the mangroves. The map also displays the seizure locations of the semi-submersibles discovered through open source research, as well as military bases, river towns, and the very small road network. This map shows numerous semi-submersibles captured along this coastline.

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[19] "Hallan Sumergible de las FARC con sistemas por satélite e informáticos," *Semana*, September 26, 2011, http://www.semana.com/nacion/hallan-sumergible-farc-sistemas-satelite-informaticos/164832-3.aspx.

[20] Rear Admiral Charles Michel, "Hearing on Border Security Threats to the Homeland: DHS's Response to Innovate Tactics and Techniques," June 19, 2012.
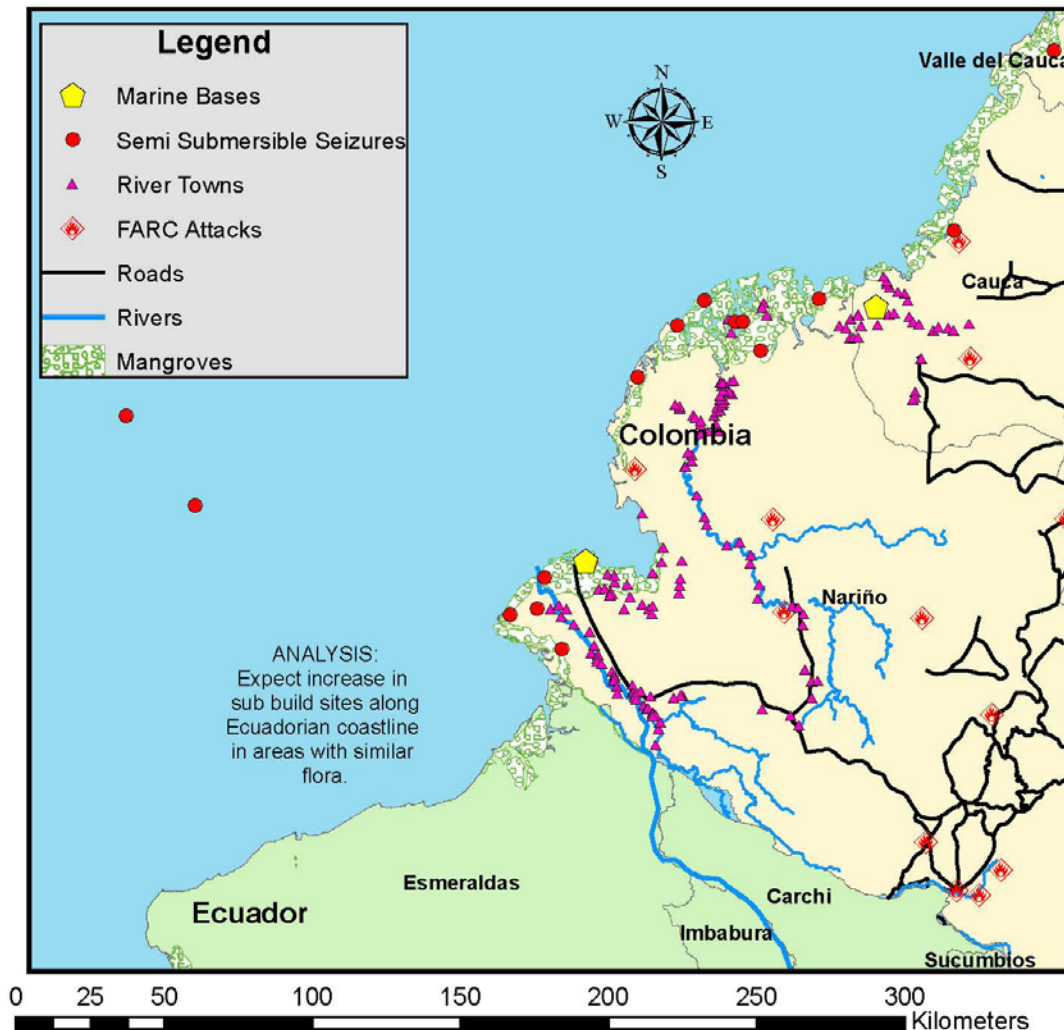
Figure 3.   Semi-submersible seizures along the Pacific coast[21]

The implications of these semi-submersibles range far beyond Colombia's borders. As U.S. Vice President Joe Biden told Congress in July 2009, they are more than a financial threat; they pose a security threat to the United States.[22] Vice Admiral Joseph Nimmich, Joint Interagency Task Force Commander, concurred noting that if "[one] can carry 10 tons of cocaine, [it] can carry 10 tons of anything."[23] Thus, besides the benefits of disrupting the FARC's semisubmersible network and its financial returns, an

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[21] This map was created for this thesis using open source data exclusively in ARCGIS.

[22] David Kushner, "Drug Sub-Culture," *The New York Times*, April 23, 2009.

[23] Kushner, "Drug Sub-Culture."

9

additional payoff exists in preventing submersibles and their cargo—either material or personnel—from entering the United States and threatening its security.

Additionally, recent evidence suggests that semi-submersible technology can be exploited by terrorist organizations, such as Hezbollah, which could conduct attacks on behalf of Iran inside the United States. According to former U.S. Ambassador to the Organization of American States, Roger F. Noriega, the danger to U.S. homeland security is increasing due to the growing presence of Hezbollah, Iran's proxy Army, in Latin America and Mexico.[24] In April 2009, Jamal Yousef, who was a former member of the Syrian military and Hezbollah agent, was arrested in New York for a weapons smuggling operation. Military weapons stolen from U.S. deployed forces in Iraq were sent to Mexico, where they were sold to the FARC in exchange for "drugs that were brought to the U.S. via Mexican drug cartels."[25] In addition to Yousef's arrest in 2009, Hezbollah leader Jameel Nasr was arrested in July 2010 at the border city of Tijuana, Mexico, for establishing a terrorist network in South America. Nasr's objective was to build a terrorist network consisting of Mexican nationals with ties to Lebanon to attack Israeli and Western targets.[26] These two high-profile arrests illustrate Iran's efforts to increase its terrorist network in the Western Hemisphere. More disconcerting, however, is that Hezbollah has links with the FARC network, and could use semi-submersible technology to conduct terrorist attacks in the United States. The link between FARC and other criminal and terrorist networks thus opens up the potential for the exploitation of semi-submersible technology to smuggle a weapon of mass destruction inside the United States.

B.   THESIS PURPOSE

The purpose of this thesis is to identify strategic options for disrupting the FARC drug trafficking network in the South Pacific region of Colombia. The Pacific is a central

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[24] Roger F. Noriega, "Hezbollah in Latin America: Implications for U.S. Homeland Security," *U.S. House of Representatives Written Hearing*, July 7, 2011, http://homeland.house.gov/sites/homeland.house.gov/files/Testimony%20Noriega.pdf.

[25] Noriega, "Hezbollah in Latin America: Implications for U.S. Homeland Security."

[26] Noriega, "Hezbollah in Latin America: Implications for U.S. Homeland Security."

location for the design and construction of semi-submersibles. Disruptions of this semi-submersible network would be a major blow to the FARC's logistics network, and undercut its ability to transport and sell cocaine, and ultimately, finance its insurgency against Colombia.

C.   STRUCTURE OF THE THESIS

Chapter I—This chapter describes the FARC Criminal Network in the Pacific.

Chapter II—This chapter provides a brief history of the FARC since 1964 and its growth over time, and more specifically, on the criminal network in the Pacific. It also details the evolution of the semi-submersible network, which recent evidence suggests is enabling the FARC to expand its drug logistics and transportation network.

Chapter III—This chapter describes the thesis methodology. It opens with an overview of how the data was collected and why only open source data was chosen for this study. Next, it introduces the software package (Palantir) that enabled the structuring and preparing of the data used in this thesis's analysis. Further, it outlines the primary methods used in this study—social network analysis (SNA) and use of ORA, UCINET, and NETDRAW software packages to conduct the analysis. It also explains the advantages of using SNA to tease out strategic options to disrupt the FARC drug network. The analysis is conducted at the organizational level of analysis—the network data consist of ties between organizations (both FARC and criminal) involved in the semi-submersible logistics network in the Pacific.

Chapter IV—This chapter analyzes the semi-submersible network by using visual analytics and social network analysis methodologies.

Chapter V—This chapter identifies strategic options to disrupt the FARC drug network in the Pacific area and provides a comparison and recommendation for which strategy to implement.

Chapter VI—This chapter summarizes and concludes thesis. It also offers insight gained from using visual analytics and SNA as a method to develop strategic options for disrupting terrorist networks.

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II. HISTORY

A. INTRODUCTION

This chapter provides an overview of the FARC's network structure and its history. Since the objective is to develop recommended strategies for targeting the semi-submersible network in the Pacific region, it also describes the evolution of semi-submersibles and how the FARC is using them to transport cocaine. To understand the FARC's use of semi-submersibles, it is necessary to understand the onset of the insurgency and the reason it infiltrated every aspect of the drug trade.

B. THE FARC ORGANIZATION STRUCTURE: CENTRALIZED AT THE STRATEGIC LEVEL, DECENTRALIZED AT THE TACTICAL LEVEL

The FARC is a large, complex network with ties ranging from the drug cartels in Mexico and criminal organizations within Colombia, to terrorist organizations in Spain (see Figure 4). Its ideological sphere of influence is extensive throughout Latin America, and its political objectives are supported by Cuba, Venezuela, Nicaragua, and Bolivia.[27] Despite being labeled a terrorist organization, the FARC is still recognized as a legitimate insurgency by numerous countries in the region.

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[27] Paul E. Saskiewicz, "The Revolutionary Armed Forces of Colombia—People's Army (FARC-EP): Marxist Leninist Insurgency or Criminal Enterprise" (master's thesis, Naval Postgraduate School, 2005), 30.

Figure 4.   In addition to its well-documented ties with criminal networks, such as Los Rastrojos, Los Zetas, and the Sinaloa Cartel, open source reporting suggests that the FARC has ties with other terrorist networks to include Al Qaeda, Hezbollah, ETA and Sendero Luminoso (Link diagram was produced by Rick Galeano and Mario Escobar with Palantir software using open source data).[28]

The FARC has long been characterized by a hierarchical structure and is led by two decision-making bodies: the Secretariat and the Central Staff.[29] The Secretariat, which is composed of seven full members and two deputies, oversees the Central Staff. The Central Staff is responsible for adjusting strategic plans and appointing members of the Secretariat, as well as commanders for the staffs of the Blocs and Fronts, all of which are the military components of the FARC.[30] The Blocs are composed of the Eastern, the

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[28] Hugh Bronstein, "Colombia Rebels, al Qaeda in 'Unholy' Drug Alliance," January 4, 2010, http://www.reuters.com/article/2010/01/04/us-drugs-colombia-qaeda-interview-idUKTRE6034L920100104.

[29] International Crisis Group, "Ending Colombia's FARC Conflict: Dealing the Right Card," Latin America Report N° 30, 3, March 26, 2009, http://www.crisisgroup.org/en/regions/latin-america-caribbean/andes/colombia/030-ending-colombias-farc-conflict-dealing-the-right-card.aspx.

[30] International Crisis Group, "Ending Colombia's FARC Conflict: Dealing the Right Card," 3.

Joint Western Command, Southern, Central, Middle Magdalena, Caribbean, and Jose Maria Cordoba.[31] Each of these Blocs/Commands contains a number of Fronts, Mobile Companies or Mobile Columns that average "300 to 600 combatants per unit."[32] The focus of this study is on the Joint Western Command as highlighted in Figure 5.
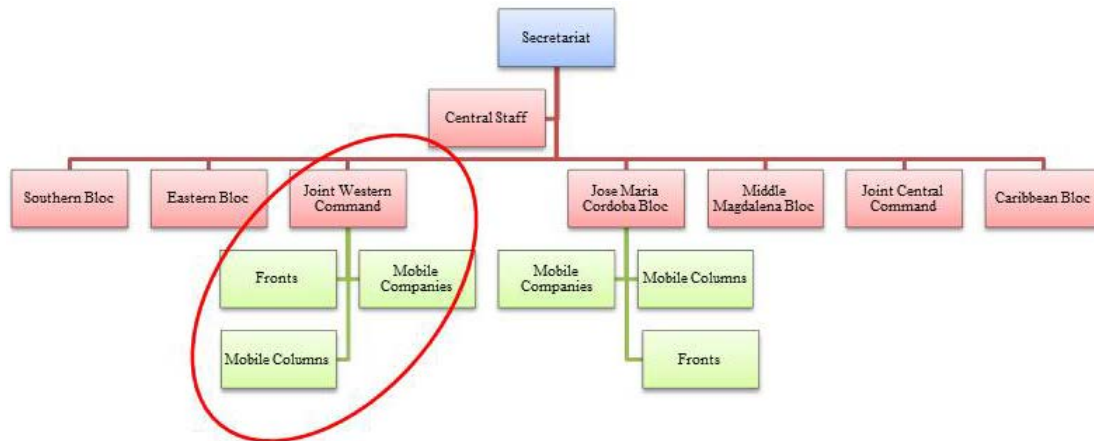
Figure 5.   Hierarchical layout of the FARC structure. All of the blocs and commands have the same structure[33]

This configuration is very similar to the way military organizations are organized with regard to divisions, brigades, battalions, and companies. The FARC's organizational structure has proven to be resilient as it is designed to function even after senior leaders are killed or infiltrated by Colombian security forces. As demonstrated by the November 4, 2011 killing of Alfonso Cano, the Commander in Chief and ideological leader of the FARC, the terrorist group continued to function by immediately naming Rodrigo Londoño, also known as Timochenko, as its new leader.[34] Although the killing of Cano by the Colombian military represented a significant setback for the FARC, the

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[31] Semana.com, "Cual es la situatcion presente de la Farc?" n.d., http://www.semana.com/wf_multimedia.aspx?idmlt=601.

[32] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise."

[33] Semana.com, "Cual es la situatcion presente de la Farc?"

[34] Adriaan Alselma, "Colombian Army Kills FARC Leader Alfonso Cano," *Colombia Reports*, November 4, 2011, http://colombiareports.com/colombia-news/news/20226-colombian-army-kills-farc-leader-alfonso-cano-reports.html.

organization has not lost its capacity to operate.[35] The next section of this chapter provides the history of the FARC and overview of how it became involved in the drug trade.

C.   "LA VIOLENCIA" AND GUERRILLAS

The FARC began as a small guerilla group interested in advancing the rights of landless peasants in a remote region of Tolima, where very little government infrastructure, presence, or control, existed.[36] To understand the inception of the FARC, it is necessary to understand Colombia's history and the formation of various guerilla networks in the late 1940s as a result of La Violencia (1949–1958). This tumultuous time period was an outbreak of violence between the liberals and conservatives, which resulted in the deaths of over 200,000 Colombians.[37] The original guerrilla networks that formed as a result of La Violencia period, however, did not have an ideological purpose but rather aimed to address the grievances of disaffected populations (see Figure 6) for the formation of guerrillas from 1949–1964. Most were located in the Tolima, Caqueta, and Meta departments. The same can be said about the original FARC network since it was not ideologically driven when it first solidified in the early 1960s. The FARC, however, became more ideologically driven when Colombia's Communist Party adopted the network in 1966 as its armed component (see Figure 7 for a temporal representation of the FARC's history).[38]

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[35] Simon Romero, "Colombian Rebels Still Dangerous Despite Leader's Death," *New York Times*, November 5, 2011, http://www.nytimes.com/2011/11/06/world/americas/alfonso-cano-dead-but-farc-dangerous-analysts-say.html.

[36] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)," n.d., https://janes.ihs.com.libproxy.nps.edu/CustomPages/Janes/DisplayPage.aspx?DocType=Reference&ItemId=+++1320752&Pubabbrev=JWIT.

[37] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[38] "The FARC Files: Venezuela, Ecuador and the Secret Archive of Raul Reyes," 24.
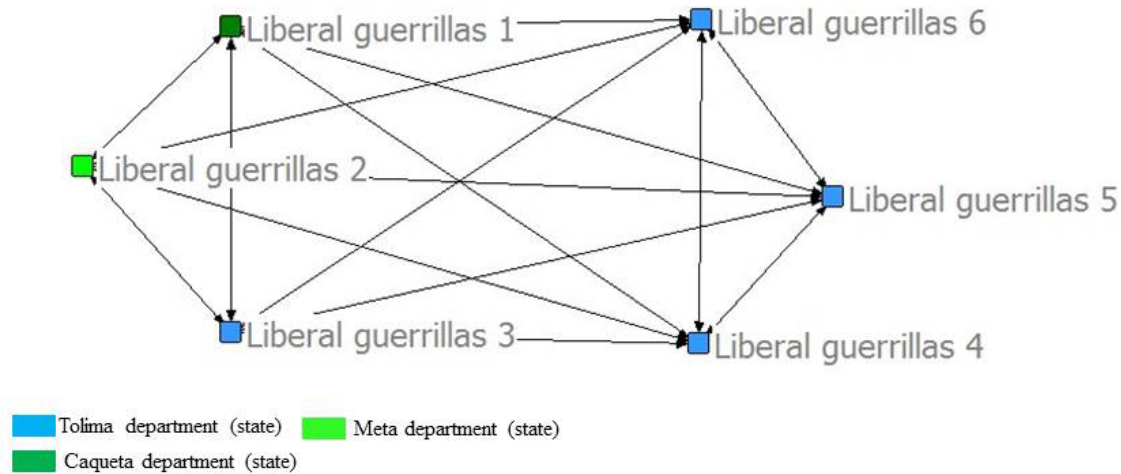
Figure 6.   FARC beginning structure from 1949–1964[39]
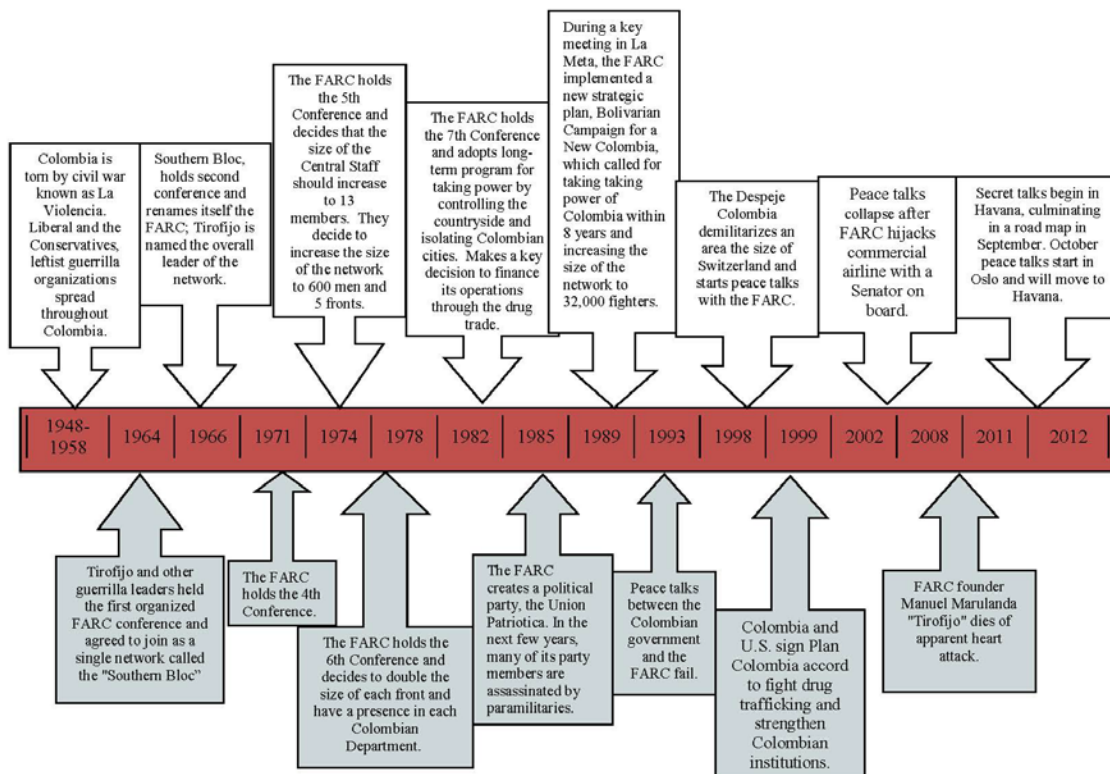
Figure 7.   Graphical representation of the FARC's history[40]

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[39] This network represents a mesh of guerrillas with no leader in different areas of Colombia. From 1949–1964, various left wing guerrilla groups formed in the Tolima, Meta and Caqueta departments as a result of La Violencia. (Network created by LTC Mario Escobar).

[40] Graph created by Rick Galeano using open sources.

D.   THE BEGINNING OF THE FARC

A guerrilla group called the Marquetalia Self-Defense Movement and led by Pedro Antonio Marin, also known as "Tirofijo," operated deliberately to address grievances of landless peasants.[41] Tirofijo declared Marquetalia, Tolima, an independent republic in 1960. In an effort to destroy leftist guerrillas who were declaring independent republics within the country, the Colombian military conducted the "Marquetalia Operation," which defeated Tirofijo's small network and recovered territory claimed by the guerrillas.[42] Despite the tactical defeat, Tirofijo and his leaders managed to escape government capture. Soon thereafter, Tirofijo and other guerrilla leaders held the first organized FARC conference at the end of 1964 and agreed to consolidate into a single network called the "Southern Bloc."[43] On May 5, 1966, the Southern Bloc, which was comprised of 350 men, held its 2nd Conference[44] at which the network named itself the FARC (Fuerzas Armadas Revolucionarias de Colombia) while designating Tirofijo the prevailing leader of the network (see Figure 7).[45]

According to the FARC, the military's attack on Marquetalia compelled them to execute an armed struggle against the Colombian government. At this point, the network developed its purpose with greater clarity since its mission aimed to end the political, economic inequality of Colombia, while preventing continued U.S. intervention by establishing a Marxist-Leninist, Bolivarian state.[46] During the third conference, the network realized its need to expand to achieve its political goal of establishing a new Colombia that would change the economic system to address the grievances of the disaffected.[47] As result, the Central Staff created new fronts and established programs to

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[41] Richard Gott, *Guerrilla Movements in Latin America* (London: Thomas Nelson & Sons, 2008), 234.

[42] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[43] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[44] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[45] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[46] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[47] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

indoctrinate the masses on the ideals of the organization to gain the required popular support. In 1966, the Colombian Communist Party adopted the FARC as its armed component of the organization.[48]

E.   THE FARC CONFERENCES

The FARC held its 4th, 5th, and 6th conferences in 1971, 1974, and 1978, respectively, with the purpose of expanding the network and outlining its strategic goals. It realized that it needed to increase in size to achieve its strategic goal of assuming power of Colombia. By the 5th Conference, the size of the Central Staff increased to 13 members, with the FARC network consisting of 600 men and 5 Fronts.[49] During the 6th Conference, the FARC decided to double the size of each Front to establish an armed presence in each department of Colombia.[50] By the end of 1978, the FARC network consisted of 1,200 fighters and 14 fronts (See Figure 8).[51]

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[48] "The FARC Files: Venezuela, Ecuador and the Secret Archive of Raul Reyes," 24.

[49] Carlos A. Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" (master's thesis, Naval Postgraduate School, 2010), 14.

[50] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 16.

[51] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 16.
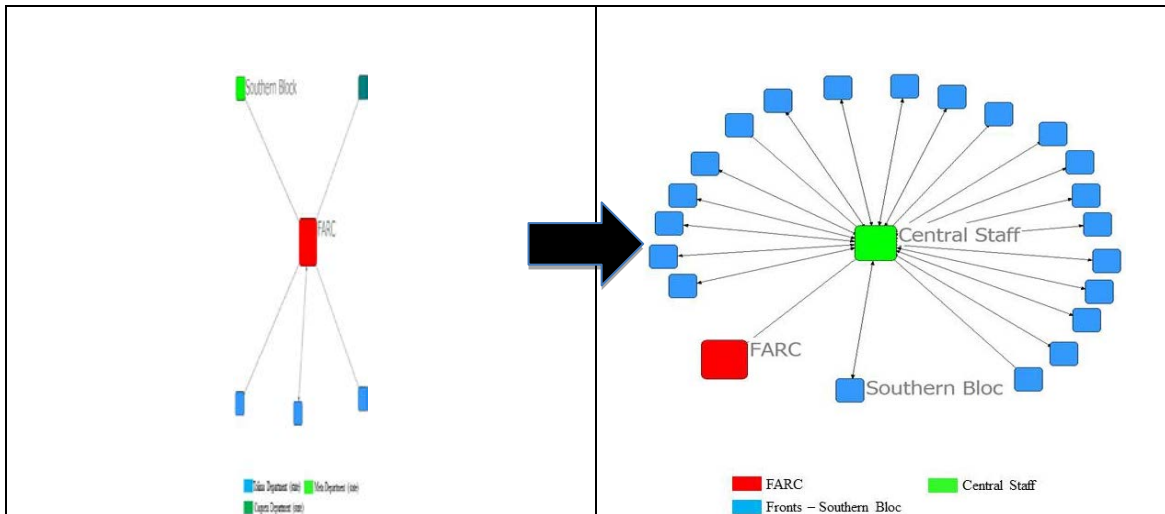
Figure 8.   FARC structure from FARC structure from 1966–1978[52]

Since the network more than doubled its size in a period of less than four years, the FARC required more substantial financial resources to sustain its operations. Given that it operated without the help of external support from other left-wing governments (for example, Cuba preferred the ELN over the FARC), the FARC relied on extortions of wealthy companies within Colombia and kidnappings to fund its activities.[53]

The 7th Conference of 1982 is considered one of the most important. The FARC intended for a strategy that would address the existing social struggles of the nation. Its aim was to tie the armed revolutionary activities of the countryside to the insurrectional activities of the major cities, which would, in turn, lead to its desired end state of taking power of Colombia by force.[54] The 7th Conference was also where the FARC made the key decision that would expand its financial resources through the drug trade.[55] The FARC realized that it needed greater military capacity to fund large-scale military

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[52] In the second conference of 1966, the Southern Bloc names itself the FARC and designates Tirofijo as its leader. By the end of 1974, the size of the Central Staff consisted of 13 members, and the network increased in size to five fronts, 600 men. The FARC continued to evolve and more than doubled in size by 1978 to 1,200 fighters.

[53] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 16.

[54] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 16.

[55] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 16.

operations against the Colombian government.[56] As a result from its key decision to profit from the drug trade, the FARC began to tax transactions between the buyers and the coca growers while providing protection to airfields and drug labs.[57] By the end of 1993, the FARC expanded the network of 8,000 fighters and become involved in all aspects of the drug trade, which allowed it to increase its financial resources significantly (See Figure 9).[58]
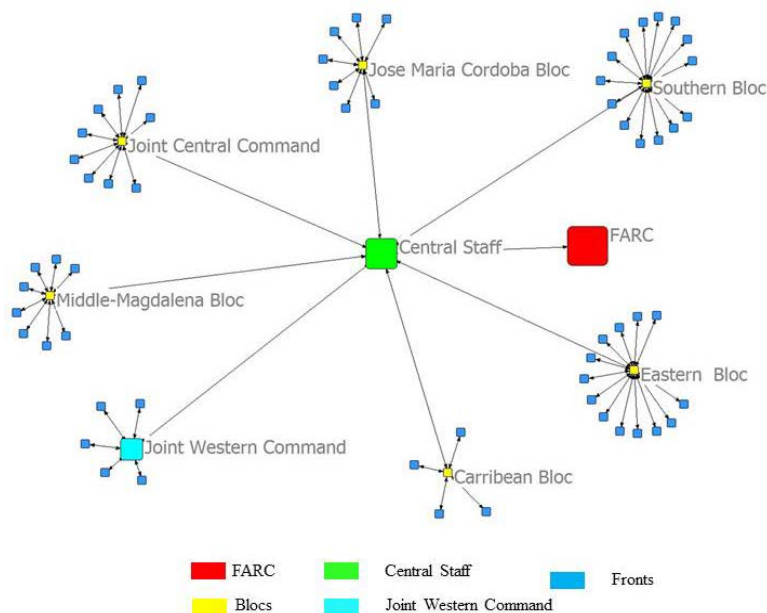
Figure 9.   By the end of 1993, the FARC expanded to a network of 8,000 fighters

F.   NEW STRATEGIC PLAN: BOLIVARIAN CAMPAIGN FOR A NEW COLOMBIA

Another pivotal event in the history of the FARC was a May 10, 1989 meeting in La Meta, at which key FARC leaders established a strategic plan called the "Bolivarian

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[56] International Crisis Group, "Ending Colombia's FARC Conflict: Dealing the Right Card," 3.

[57] David L. DeAtley, "Illicit Drug Funding: The Surprising Systemic Similarities Between the FARC and the Taliban," (master's thesis, School of Advanced Military Studies, United States Army Command and General Staff College, Fort Leavenworth, Kansas, AY2010), 17, http://www.dtic.mil/dtic/tr/fulltext/u2/a525726.pdf.

[58] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 17.

Campaign for a New Colombia."[59] The FARC's new offensive strategic plan stipulated taking power of Colombia within eight years.[60] To achieve this objective, the FARC planned to increase the size of its network to 80 fronts and 32,000 fighters, which would require $200 million to support its sustainment.[61] The plan required launching major, coordinated offensives against important city targets that included Bogotá, in which 16,000 fighters would wage irregular warfare, whereas the other 16,000 would be used to overrun military bases and major population centers.[62] If the offensive failed, the FARC would fall back to predetermined positions to plan a second offensive, while assigned units would be responsible for inciting mass-based insurrections.[63]

In addition to the key meeting of 1989, Bolivarian and regular militias were created the same year to assist the network, mobilize political support, and achieve its objective of assuming power of Colombia.[64] Bolivarian militias, which were more politically indoctrinated than regular militias, participated in combat during portions of the year whereas regular militiamen did not.[65] By 1996, the FARC demonstrated that it had entered the mobile warfare stage, and it had reached a military strength of over 11,000 fighters.[66] From 1996–1998, with more significant sources of revenue as a result of the drug trade, the FARC achieved numerous military successes and was capable of

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[59] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 41.

[60] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 29.

[61] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 29.

[62] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 21.

[63] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 20.

[64] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 20.

[65] Saskiewicz, "The Revolutionary Armed Forces of Colombia–People's Army (FARC-EP): Marxist-Leninist Insurgency or Criminal Enterprise?" 20.

[66] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

launching large-scale offensive operations. In one attack in 1998, the FARC's Eastern Bloc seized the state capital city of Mitu in Vaupes with a force of 1,500 fighters.[67]

FARC military victories from 1996 to 1998 convinced 65% of the population that it would eventually assume power of Colombia; the Colombian military was demoralized.[68] The following FARC victories in the late 1990s illustrate how effective it had become at combating the Colombian military.

- August 1996: The six Southern Bloc fronts attacked an army base in Putumayo. The military base surrendered, and the combat engagement resulted in 54 soldiers killed, 17 wounded, and 60 kidnapped.[69]

- December 1997: 300 guerrillas from the Southern Bloc killed 22 soldiers in Nariño.[70]

- March 1998: 400 guerrillas from Southern Bloc annihilated the elite 3rd Mobile Brigade in Southern Caquetá, which resulted in 65 soldiers killed and 43 kidnapped.[71]

- August 1998: 500 guerrillas from Eastern Bloc killed 30 soldiers and kidnapped 100 in Guaviare.[72]

- November 1998: 1,500 guerrillas from Eastern Bloc seized Mitu, capital city of the state of Vaupes and 37 soldiers were killed, and 61 kidnapped.[73]

G.   THE ERA OF THE "DESPEJE" (1998–2002)

The FARC military victories from 1996 to 1998 increased the pressure on the Colombian government to negotiate for peace. With the FARC negotiating from a position of strength, it demanded access to a demilitarized zone in exchange for peace

[67] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 21.

[68] Max Boot, "The Colombian Miracle," *The Weekly Standard*, December 14, 2009, http://www.weeklystandard.com/Content/Public/Articles/000/000/017/301nyrut.asp.

[69] Angela Rabasa and Peter Chalk, *Colombian Labyrinth, The Synergy of Drugs and Insurgency and Its Implications for Regional Stability* (RAND Corporation, 2001), 42.

[70] Rabasa and Chalk, *Colombian Labyrinth, The Synergy of Drugs and Insurgency and Its Implications for Regional Stability*, 42.

[71] Rabasa and Chalk, *Colombian Labyrinth, The Synergy of Drugs and Insurgency and Its Implications for Regional Stability*, 42.

[72] Rabasa and Chalk, *Colombian Labyrinth, The Synergy of Drugs and Insurgency and Its Implications for Regional Stability*, 42.

[73] Rabasa and Chalk, *Colombian Labyrinth, The Synergy of Drugs and Insurgency and Its Implications for Regional Stability*, 42.

talks.[74] Colombian President Andres Pastrana acquiesced and granted the FARC network the "Depeje," a safe haven within Colombia as large as the country of Switzerland.[75] With this large area under its control, the FARC was able to increase its military capacity and turn its territory into a "drug depot."[76] By the end of 2002, the FARC expanded to a force of 17,000 fighters, which is the largest it has ever been (see Figure 10).[77]
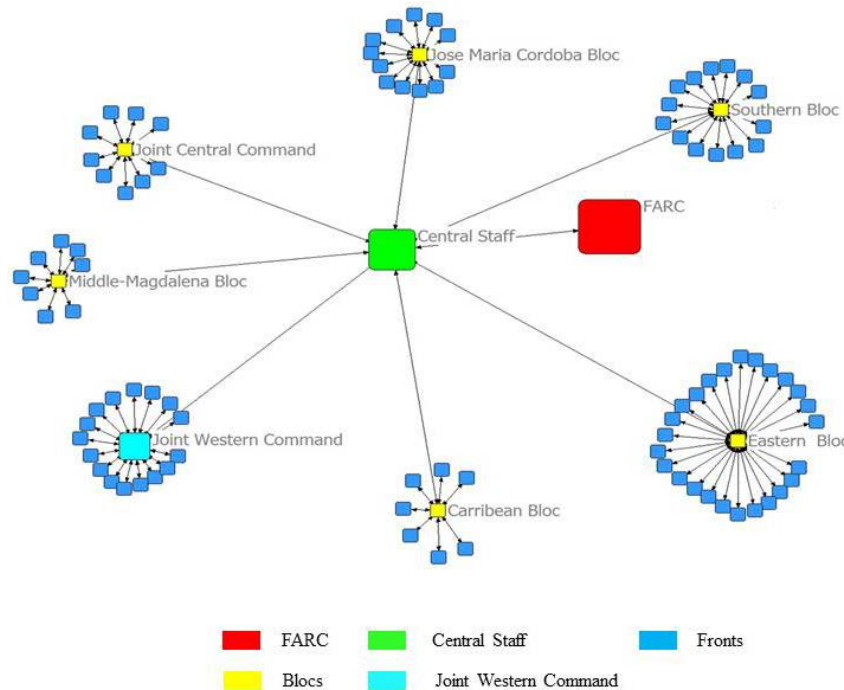
Figure 10.   FARC structure from 1994–2008[78]

The FARC network was able to eliminate the middle-brokers of the drug trade, and thus, undertook a more direct role in the production and distribution of cocaine by forcing farmers to grow coca and then sell it to FARC commanders for processing.[79]

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[74] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 17.

[75] Padilla, "The FARC and Hugo Chavez: Is Contemporary Venezuela a Threat to Colombia?" 17.

[76] International Crisis Group, "War and Drugs in Colombia," Latin America Report N° 11, 22, January 27, 2005, http://www.crisisgroup.org/en/regions/latin-america-caribbean/andes/colombia/011-war-and-drugs-in-colombia.aspx.

[77] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[78] The FARC grew to 66 Fronts and 17,000 fighters by 2002.

[79] International Crisis Group, "War and Drugs in Colombia," 22.

Greater FARC activity in the drug trade in the late 1990s also corresponded with the decline of the Medellín and Cali cartels. As the Colombian government was dismantling these large drug trafficking cartels, the FARC was filling this void and expanding their role in criminal operations.[80] By 2005, it was estimated that 65 of the FARC's 110 operating units were involved in the cultivation and distribution of cocaine.[81]

In February 2002, Pastrana terminated the peace process since the FARC demonstrated that it was not interested in pursuing a peaceful end to the conflict but rather in increasing its military capacity to take power by force.[82] The "Despeje" enabled the FARC to expand its military capacity and prepare a final offensive against Bogotá and other cities.[83] Pastrana's decision to terminate the peace talks also coincided with the U.S. decision to label the FARC a terrorist network following the attacks of 9/11. The European Union followed the U.S. decision, and on June 17, 2002, the FARC was added to its list of foreign terrorist organizations.

H. COLOMBIA'S GOVERNMENT TURNS THE TIDE AGAINST THE FARC

When President Alvaro Uribe Velez was elected as the new President of Colombia, he unveiled a new security initiative called the Democratic Security and Defense Policy (DSP) in June 2003.[84] His new policy directive was aimed at defeating the FARC network by restoring government control in all areas of Colombia while strengthening the military and the National Police.[85] Colombia increased defense spending to 4.5% of its gross domestic product (GDP) while imposing a war tax to fund the war effort.[86] The modernization of the Colombian military in combination with U.S. military aid created stronger, more capable security institutions, which, in turn, caused an

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[80] International Crisis Group, "War and Drugs in Colombia," 22.

[81] International Crisis Group, "War and Drugs in Colombia," 22.

[82] Pastrana ends peace process in 2002.

[83] Despeje allows FARC to increase military capacity and threaten the cities.

[84] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[85] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

[86] Jane's Information Group, "Fuerzas Armadas de Colombia (FARC)."

immediate impact against the FARC and turned the tide in favor of Colombia's government. By the end of his second term in office, President Uribe's successful counterinsurgency plan effectively reduced the size of the FARC network from 18,000 to 8,000 fighters, while killing and capturing many of its key leaders that included Raul Reyes.[87] Consequently, Colombia's security gains against the FARC boosted economic growth and an increase of confidence in the government's ability to defeat the FARC network. By the end of 2010, the FARC had less than 2% support of the population whereas President Uribe enjoyed overwhelming support.[88]

Immediately after assuming Colombia's Presidency, President Juan Manuel Santos continued Uribe's aggressive counterinsurgency strategy, which resulted in the killing of Mono Jojoy in September 2010, and Alfonso Cano in November 2011.[89] In addition to continuing an aggressive counterinsurgency against the FARC, Santos restored diplomatic relations with Venezuela and hosted the summit of the Americas in April 2012.[90] Under his leadership, Colombia has also signed a free trade agreement with the European Union.[91] He has also begun exploratory peace talks with the FARC network.[92] Due to the recent successes against the FARC, Colombia's government is in a strong position to negotiate a peace settlement that would result in a peace agreement favorable to the Santos administration. However, despite the counter-drug and counterterrorism gains by the Colombian National Police and military, the FARC continues to profit from drug trafficking operations through alliances with other criminal organizations and has assumed responsibility over key components of the drug trafficking trade. With a force of 8,000 fighters and estimated yearly revenues of $100 million to $1

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[87] Boot, "The Colombian Miracle," *The Weekly Standard*.

[88] BBC News, "Profile: Alvaro Uribe Velez," March 29, 2010, http://news.bbc.co.uk/2/hi/americas/3214685.stm.

[89] Dan Fastenberg, "Colombia's Leader Celebrates a Counterinsurgency Success," *Time*, September 28, 2010, http://www.time.com/time/world/article/0,8599,2021881,00.html.

[90] Al Jazeera, "Leaders Gather for Americas Summit," April 4, 2012, http://www.aljazeera.com/news/americas/2012/04/20124142424595176.html.

[91] CCTV, "Colombia Peru Sign FTA with the EU," June 27, 2012, http://english.cntv.cn/program/newsupdate/20120627/101856.shtml.

[92] CNN, "Colombia, FARC Rebels to Start Peace Talks in Norway," October 17, 2012, http://www.cnn.com/2012/10/17/world/americas/colombia-farc-peace-talks/index.html.

billion a year from the drug trade, the FARC continues to remain a formidable foe (See Figure 11 for a temporal representation of drug trafficking operations).[93]
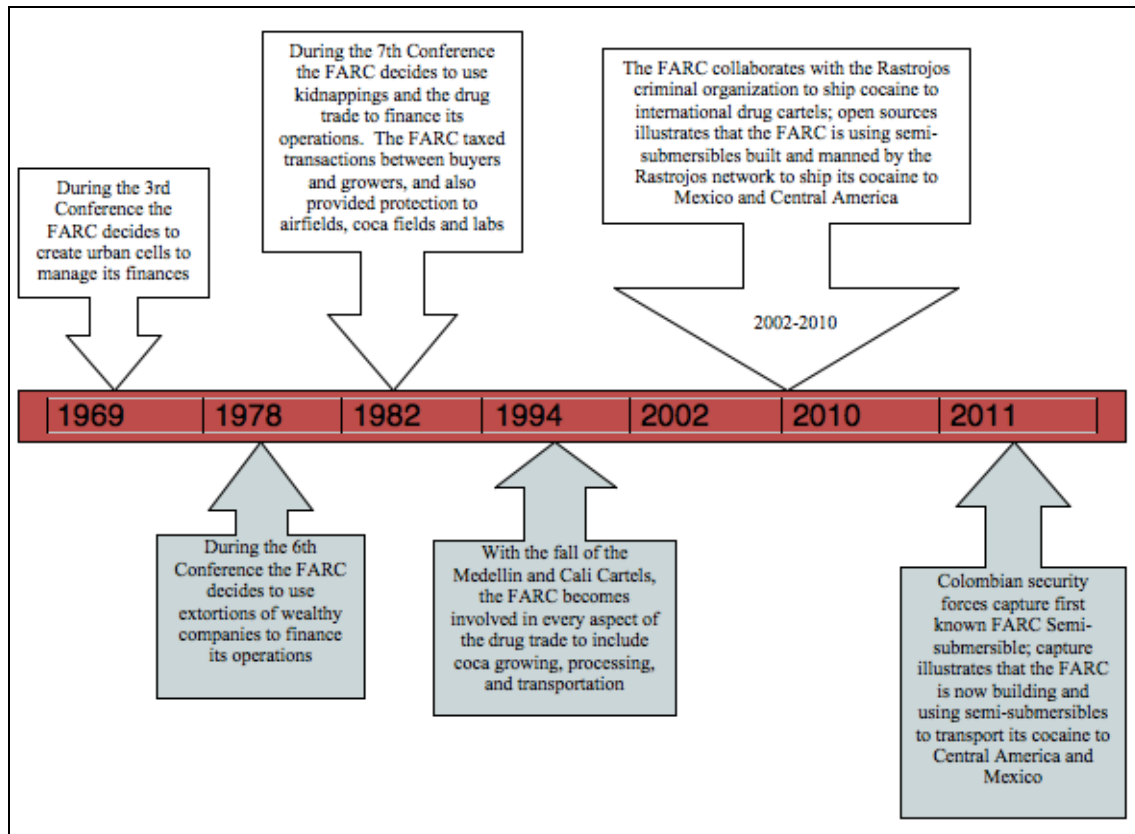
Figure 11.   FARC drug trafficking operations from 1969–2011

I.   HISTORY OF SEMI-SUBMERSIBLES

The semi-submersible represents the evolution of how cocaine is transported out of Colombia. Although cocaine is predominantly transported out of western Colombia with fast boats, the first seizure of a semi-submersible in 1993 represented a change in the way cocaine is being transported (see Figure 12). Drug traffickers became interested in this new transportation technology because these underwater vehicles are difficult to detect and can carry a large payload with very little logistical support. In 1995, a Russian citizen was arrested in Miami for trying to sell an old soviet submarine to Colombian

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[93] Michael Freeman, Lecture, Naval Postgraduate School, Monterey, CA, May 15, 2012.

cartels. Later in 2000, Colombian police found a half-built semi-submersible in Bogotá, which also included Russian documents for designing the underwater vehicle. This partially constructed semi-submersible was 100 feet long and capable of carrying more than 200 tons of cocaine. Although they cost less than $1 million to make, a single trip can generate more than $100 million in profits for drug traffickers.
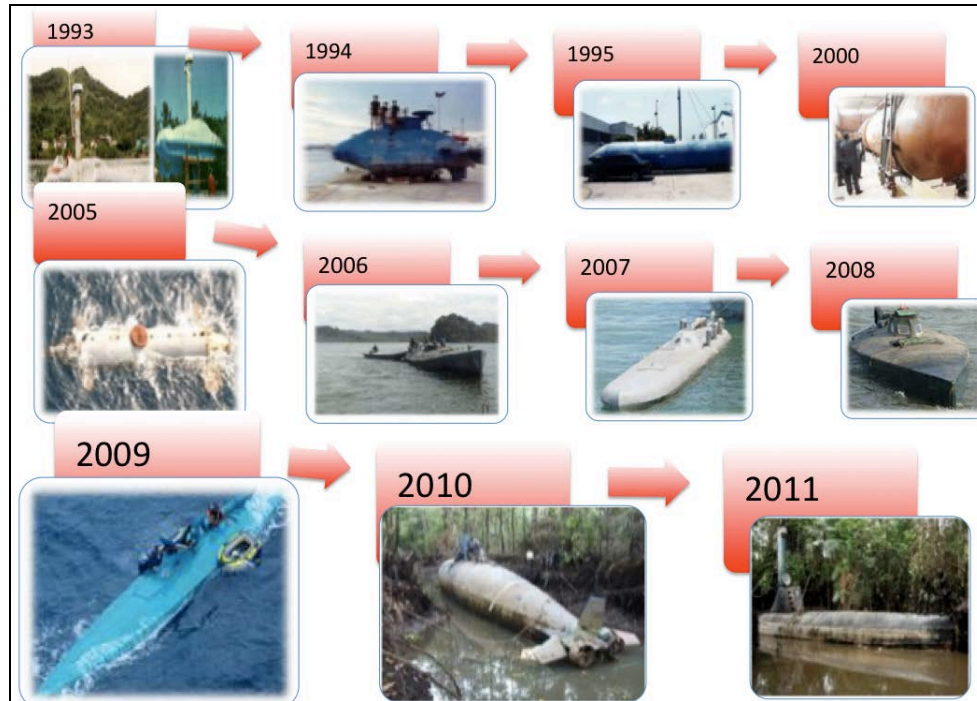
Figure 12.   Evolution of the semi-submersible

According to Rear Admiral Joe Nimmich, Director of JIATF-South, more semi-submersibles were built after 2006 because Pakistani and Sri Lankan submarine experts provided Colombian criminals the expertise. With this new knowledge, Colombian cartels have been able to build semi-submersibles quickly, stealthily, cheaply, and with readily available materials deep in the jungle. To avoid detection, workers will spend 15 to 20 days under the protection of thick canopy jungle to build these vehicles by hand from start to finish. A recent seizure in 2011 in the remote region of Timbiqui, Colombia, illustrates that these cocaine transporters are being built so that they can travel fully submerged underwater, just like a submarine. This particular vehicle was built by the

FARC's Joint Western Command, which represents a new capability for this terror network. The captured fully submerged vehicle (FSV) had sophisticated Global Positioning System (GPS) navigation and was built primarily with fiberglass construction. The shape of the submarine and the materials used to build them, also allows them to have a low radar signature, which further complicates their detection. Furthermore, since they are usually painted black, trying to identify them by air makes it virtually impossible. With the newer semi-submersibles using lead pipes in their construction, they have become more difficult to detect using infrared since they are producing a low heat signature (Table 2 represents a semi-submersible classification chart).[94] Finding these semi-submersibles in the water is difficult since none was interdicted in 2011. Due to their increasing sophistication and capacity to remain undetected at sea, a greater possibility exists of finding the semi-submersibles on land before they deploy on their mission.

Smuggling Submarines, Torpedoes & Semi-submersibles Classification System						
Type	Classification	Propulsion	Cost	Number	Dive Control	Stealth
Type 1-A	Submarine	Self propulsion	Millions	Rare	65 feet to over 300 feet	Excellent
Type 1-B	Towed torpedo	Towed	Simple and cheap	Several	Depth set then towed	Moderate
Type 1-C*	Torpedo robotic autonomous	Electric	$500,000	One	Set by software	Excellent
Type 1-D*	Torpedo robotic remote controlled	Electric	$500,000	One	Runs just below surface	Moderate-excellent
Type 2	Semi-submersible	Self propulsion	Complex and expensive	Only few captured	Ballasting down to lower its surface profile	Moderate to excellent control over its running depth but not fully submerging
Type 3	Low-profile vessels	Self propulsion	$250,000- 500,000	Many captured	Boat designed to run awash	Moderate minimize radar cross-section

Table 2.   Semi-submersible classification chart (JIATF-SOUTH)

J.   THE FARC'S JOINT WESTERN COMMAND NETWORK AND SEMI-SUBMERSIBLES

The Joint Western Command has been responsible for most of the FARC's semi-submersible operations in the Pacific region. Although it is one of the smallest blocs within the FARC network, it is responsible for 65% of the FARC's revenues. The Joint

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[94] Kushner, "Drug Sub Culture."

Western Command has always used criminal networks, such as Los Rastrojos, to transport its cocaine to drug cartels in Central America and Mexico. Although Los Rastrojos continues to be the dominant actor in the cocaine-shipping network, evidence suggests that that Joint Western Command is now building its own semi-submersibles to increase its profit margin in the drug trade.[95] Semi-submersible activity is concentrated along the coastal region from Tumaco in the south and moves north toward Buenaventura. Consisting of a large number of river systems that drain into the Pacific Ocean, this area is a prime location for semi-submersible operations. These river systems also contain vast mangroves that make traversing this terrain difficult while providing camouflage from the height of the mangroves. These mangroves then inhibit the detection of semi-submersible operations. In addition to the vegetation advantages provided by the Pacific region, drug traffickers also prefer the calmer and less-traveled waters of the Pacific Ocean to the Caribbean Ocean for shipping illicit goods. Pacific shorelines of Central America and Mexico are also better suited for illicit trafficking because they are less populated, which makes detection even more difficult. Due to the advantages provided by the Pacific Ocean and the favorable geography of Colombia's western coast for drug trafficking, this study is focused on disrupting the semi-submersible network in the Pacific. The following chapter describes the methodology for analyzing the semi-submersible network.

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[95] FARC Semi-submersible seizure.

III. METHODOLOGY

A. INTRODUCTION

This chapter describes how the authors collected, structured, and analyzed data for the purpose of developing strategies to disrupt the semi-submersible network that funds the insurgency against the Colombian government. As noted in Chapter I, successfully attacking the semi-submersible network has the additional benefit of checking the proliferation of semi-submersible technology, which other terrorist networks could use for attacks.

Past semi-submersible seizures indicate a greater success on land rather than at sea. Once semi-submersibles make it to the sea, they become almost impossible to find and interdict. Thus, it is assumed that semi-submersible operations can be hampered best by targeting the organizations that build, employ, and deploy them. To illuminate potential targeted organizations, this study first identified where most semi-submersible seizures are occurring. In the last 10 years, most have occurred in Colombia's southwest Pacific region (see Figure 3, Chapter I). In addition, semi-submersible operations are increasing in Colombia's northwest region due to the favorable concealment provided by coastal mangrove vegetation and the close proximity to Panama, as well as along Colombia's Caribbean coast. Nevertheless, this study focuses on the FARC and criminal organizations in Colombia's Pacific region since most semi-submersible seizures have occurred in this area. This chapter describes the data collection, data structuring, data metrics and analysis, and briefly touches on the strategic options for disruption of the semi-submersible network, which is expanded upon in Chapter V).

B. DATA COLLECTION

In gathering data on the semi-submersible network, it is assumed that the FARC, the ELN, and criminal organizations involved in the drug trade are also part of the semi-submersible network. Most of the information on the FARC's Joint Western Command

and location of its fronts and mobile companies comes from the Semana.com website.[96] *Semana*, one of Colombia's largest news magazines, produces a web page on the FARC that provides a detailed description of the terror group's history, sub-organizations, and their operational locations. In addition a report assembled by the Institute for Peace and Development (INDEPAZ), which is a Colombian non-governmental organization (NGO) that studies Colombia's internal conflict,[97] proved to be crucial in the building of the database because it identifies the criminal organizations involved in the Pacific drug trade and their specific locations. As noted in Chapter I, analysis of open source information found that the semi-submersible network is primarily comprised of various fronts and mobile companies within the FARC's Joint Western Command, subgroups from the ELN, and various criminal networks, such Los Rastrojos, Urabeños, Renacer, and Los Machos. Data were also drawn from Colombian government and news websites.

For example, data culled from press releases of the Colombian military and news articles published by Colombian and Mexican news organizations helped identify links between the FARC, Colombian criminal organizations, Mexican drug cartels, and semi-submersibles. Many of these articles originated from Caracol, La Policiaca, Milenio, La Nación, Notimex, El Tiempo, CNN Mexico, and El Universal. Newspapers from Costa Rica and El Salvador, such as El Faro and La Gente, also provide important information on links between the FARC, Colombian criminal organizations, and Mexican drug cartels. Finally, the Colombia's Navy website was an invaluable source for identifying the location of semi-submersible seizures in the last 10 years. It also provided information on the deployment of Marine organizations throughout the Pacific region, which enabled the authors to conduct a temporal analysis of the network and an assessment of the military operations against the semi-submersible network.

Data compiled from all these sources yielded a semi-submersible database composed of 149 organizations. These organizations are composed of sub-organizations within the FARC, ELN, and the major criminal organizations. Table 3 illustrates the list of sources used to code and build the semi-submersible network database.

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[96] "Cual es la situatcion presente de la Farc?" *Semana*.

[97] Indepaz, "¿Quienes somos?, n.d., http://www.indepaz.org.co/?page_id=2.

Source	Web Link
1. La Policiaca	1. http://www.lapoliciaca.com/nota-roja/ven-division-de-farc-y-carteles-mexicanos/
2. Caracol	2. a. http://www.caracol.com.co/noticias/judicial/alias-oliver-solarte-era-el-contacto-de-las-farc-con-carteles-mexicanos-revela-presidente-santos/20110315/nota/1439851.aspx
	b. http://www.caracol.com.co/noticias/judicial/golpes-a-la-farc-y-los-rastrojos-en-el-valle-del-cauca/20120825/nota/1750022.aspx
	c. http://www.noticiascaracol.com/nacion/video-241393-sumergible-de-farc-fue-incautado-autoridades
3. State Department	3 http://www.state.gov/p/inl/narc/rewards/133311.htm
4. Milenio	4. a. http://www.milenio.com/cdb/doc/noticias2011/a171a1241e5a048787f20d8c8e71b801
	b. http://www.rlp.com.ni/noticias/5442
5. Colombia Reports	5. http://colombiareports.com/colombia-news/news/11604-farc-mexican-cartel-middlemen-captured-in-colombia.html
6. La Nacion	6. http://www.lanacion.com.co/2010/09/01/capturados-socios-de-capo-mexicano/
7. El Tiempo	7. a. http://www.eltiempo.com/archivo/documento/CMS-5441687
	b. http://www.eltiempo.com/justicia/ARTICULO-WEB-NEW_NOTA_INTERIOR-10149344.html
	c. http://www.eltiempo.com/Multimedia/galeria_fotos/colombia2/cae-otro-sumergible-de-las-farc_10440824-5
8. Colombian Govt.	8. http://wsp.presidencia.gov.co/Prensa/2010/Octubre/Paginas/20101006_01.aspx
9. La Gente	9. http://www.elfaro.net/es/201104/internacionales/3900/
10. El Faro	10. http://www.elfaro.net/es/201104/internacionales/3900/
11. Guerra Contra El Narco	11. http://guerracontraelnarco.blogspot.com/2011/06/revelan-nexo-de-integrante-de-farc-con.html
12. Notimex	12. http://www.vanguardia.com.mx/revelannexosdejefedelasfarcconelcarteldesinaloa-1034757.html
13. El Universal	13. http://www.eluniversal.com.mx/nacion/183921.html
14. CNN Mexico	14. http://mexico.cnn.com/mundo/2010/09/01/las-farc-y-los-carteles-mexicanos-cultivan-anos-de-relacion
15. Informador.com.mx	15. http://www.informador.com.mx/mexico/2010/212845/6/capturan-a-presunto-sustituto-de-el-vicentillo.htm
16. El Espectador	16. http://www.elespectador.com/noticias/judicial/articulo-340613-hallan-poderoso-arsenal-de-farc-y-los-rastrojos
17. RCN Radio	17. http://www.rcnradio.com/noticias/editor/las-farc-y-los-rastrojos-serian-autores-del-a-134286
18. Semana	18. a. http://www.semana.com/nacion/cinco-hombres-fueron-asesinados-tumaco-narino/179997-3.aspx
	b. http://www.semana.com/nacion/cinco-muertos-deja-incursion-antioquia/178278-3.aspx
	c. http://www.semana.com/nacion/estrategia-militar-atentados-tumaco-villa-rica-miranda/171459-3.aspx
	d. http://www.semana.com/nacion/hallan-sumergible-farc-sistemas-satelite-informaticos/164832-3.aspx
19. BBC	19. http://www.bbc.co.uk/news/world-latin-america-16864379
20. El Pais	20. http://www.elpais.com.co/elpais/judicial/noticias/en-operacion-troya-detienen-21-personas-y-decomisan-150-granadas
21. CNP Website	21. http://oasportal.policia.gov.co/portal/pls/portal/JOHN.NOTICIAS_NUEVAS_DETALLADAS.SHOW?p_arg_names=identificador&p_arg_values319140
22. Col. Govt. Magazine	22. http://www.revistagobierno.com/portal/index.php/politica/conflicto-y-justicia/6594-operacion-troya-pacifico-un-exito
23. Zonacero.info	23. http://zonacero.info/index.php?option=com_content&view=article&id=14633:operacion-troya-pacifico-caen-9-colaboradores-de-los-comba&catid=78:judiciales&Itemid=153
24. El Colombiano	24. http://www.elcolombiano.com/BancoConocimiento/A/arranco_troya__contra_bacrim_en_el_pacifico/arranco_troya__contra_bacrim_en_el_pacifico.asp
25. ABC	25. http://www.abc.com.py/internacionales/colombia-incautan-sumergible-de-las-farc-usado-para-transportar-drogas-311758.html
26. El Nuevo Siglo	26. http://www.elnuevosiglo.com.co/articulos/10-2011-narco-submarinos-una-%E2%80%98flota%E2%80%99-invisible.html
27. Mangroves (ARCGIS)	27. http://datadownload.unep-wcmc.org/?dataset=mangrove1997
28. Rivers (ARCGIS)	28. http://www.arcgis.com/home/item.html?id=f27ea84f6d3943689ba7fcbe7f3a8d02
29. Road (ARCGIS)	29. http://www.arcgis.com/home/item.html?id=f27ea84f6d3943689ba7fcbe7f3a8d0
30. Colombia (ARCGIS)	30. http://www.arcgis.com/home/item.html?id=f27ea84f6d3943689ba7fcbe7f3a8d02
31. Unit locations (ARCGIS)	31. http://www.armada.mil.co/?idcategoria=537838.
32. Location of semi-submersible seizures	32. a. http://www.armada.mil.co/index.php?sI=&idcategoria=5&cadena_buscar=sumergibles&titulo=
	b. http://www.armada.mil.co/search/node/semisumergibles
33. FARC Website	33. www.anncol.info
34. Colombian Navy	34. http://www.armada.mil.co
35. Joint Western Command Organizations and Locations	35. http://www.semana.com/wf_multimedia.aspx?idmlt=601
36. List of Criminal Organizations and Locations	36. a. http://www.semana.com/documents/Doc-2153_2011323.pdf
	b. http://www.semana.com/multimedia-nacion/farc-bacrim-eln-radiografia-del-conflicto/4743.aspx

Table 3. List of sources for the semi-submersible network database

C. LIMITATIONS OF DATA COLLECTION

Open source data have their limitations. Improperly identified or included nodes and links can dramatically affect the results of the analysis. This type of study also requires multi-lingual experts to collect and translate the available documentation. Without these expert skills, data collection is severely hampered. Given these and other limitations in the analysis noted below, the results of this study *should be viewed as tentative rather than definitive*. As such, it offers suggestions for further study rather than conclusive recommendations for action. Other data sources combined with additional analyses are needed to build a comprehensive understanding of the semi-submersible network.[98] This research illustrates how a network could be disrupted, but it does not assume, given the limitations of the data, how the semi-submersible network should be disrupted.

D. DATA STRUCTURING AND SOFTWARE

The second step in this analysis is data structuring. The Palantir software package was used for this step given the ease with which it could import, code, and structure the documents enumerated above.[99] It also can export these data into the other software packages used in this study: ORA, UCINET, and NetDraw.[100]

E. VISUAL ANALYTICS WITH PALANTIR

Palantir is also used to analyze the data visually. Visual analytics is "the science of analytical reasoning facilitated by interactive visual interfaces."[101] The goal of this step is to synthesize and decipher available open source data, which is often ambiguous, conflicting, and dynamic, for discovering data trends and patterns. Palantir makes it possible to conduct link analysis on the open-source unstructured and structured data and

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[98] Sean Everton, *Disrupting Dark Networks* (New York: Cambridge Universtiy Press, 2012), 37.

[99] Palantir, "About," n.d., http://www.palantir.com/about/.

[100] Casos, "*ORA," n.d., http://www.casos.cs.cmu.edu/projects/ora/; UCINET Software, "Home," n.d., https://sites.google.com/site/ucinetsoftware/home; S. P. Borgatti, *NetDraw Software for Network Visualization* (Lexington, KY: Analytic Technologies, 2002.)

[101] Nancy Roberts, "DA 3610 Visual Analytics," *Class Sylyabus*, 2011.

show connections between and among actors, organizations, and semi-submersibles. It also allows the visualization of temporal and geospatial patterns within the semi-submersible network to specify where the organizations are in the network at different points in time.

F.   VISUAL ANALYTICS WITH SOCIAL NETWORK ANALYSIS

SNA is the next step, and two software packages, UCINET and ORA, are central to this effort. SNA is able to dive deeper into the FARC and the criminal organizations involved in semi-submersible operations. A network is defined as a series of connections between two or more actors, which in this case, are organizations. Rather than treating actors are "independent automons," SNA assumes that the pattern of ties in which actors are embedded impacts how they behave.[102]

Once the 149 semi-submersible organizations in the semi-submersible network were identified, the authors created three one-mode networks based on the type of tie between the actors. The first network, the "member of" network, is composed of organizations that have organizational ties to other organizations within the network. In this network all FARC organizations and its sub-unit organizations in the Pacific are connected. In addition, every Rastrojos organization and its sub-organizations are connected. The second network, the "collaborates with" network, maps the collaboration ties between the FARC and criminal organizations. By using current news reports, the authors identified which FARC and criminal organizations are collaborating with one another to profit from the drug trade. In addition, they also assumed that FARC and criminal organizations operating at the same location are collaborating with one another as long as no evidence to the contrary exists (e.g., evidence indicating they are fighting with one another). The third network, the "enemy of network," maps FARC and criminal organizations fighting for control of the drug trade that are tied to each other.

A fourth network was created that mapped the ties between towns and organizations. In particular, it connects the FARC and criminal organizations operating in

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[102] Everton, *Disrupting Dark Networks*, 2.

the towns in which they operate. This network was transformed from a two mode to a one mode to stack the overall network. Once these four networks were created, they were combined in UCINET to create an overall semi-submersible network.

G.   SOCIAL NETWORK AND ANALYSIS

When conducting SNA, one of the first steps of analysis is to understand the network's topography, or its structure.[103] The topography of the aggregated semi-submersible network, previously described as a stacked network, explains the following metrics: size, density, and clustering coefficient. Size refers to the number of nodes or agents located in the network. In this case, the network includes 149 organizations. The second measure of topography is density, which is a measure of cohesion and is equal to the ratio of actual ties to the number of possible ties.[104] More connected networks would have higher density scores or a higher cohesion, whereas lesser-connected networks would have lower scores.[105] Clustering coefficient is the third measure used and is similar to density in that it provides insight on the degree of clustering, or tendency to form tight-knit groups amongst actors. A close, secretive network like the Ku Klux Klan, for example, would have a high clustering coefficient since the network is very cohesive.

Centrality is the next set of measures used in the analysis of the semi-submersible network. It helps identify the most important actors within the network.[106] Since the network analysis is conducted at the organizational level of analysis, it is possible to identify the most central organizations using four centrality measures.[107] Degree centrality counts the number of ties each actor has[108] and can identify well-known or popular actors in the network. A second centrality measure is betweenness, which

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[103] Everton, *Disrupting Dark Networks*, 7.

[104] Everton, *Disrupting Dark Networks*, 11.

[105] Although the density metric is useful, it has its limitations since this density score is sensitive to the size of the network. Larger networks have lower density scores than smaller networks; this metric should only be used when comparing networks of similar size.

[106] Stanley Wasserman and Katherine Faust, *Social Network Analysis (Structural Analysis in the Social Sciences* (New York, NY: Cambridge University Press, 2012), Kindle Edition.

[107] Degree centrality, betweenness centrality, eigenvector centrality, and closeness centrality.

[108] Everton, *Disrupting Dark Networks*, 12.

measures the extent to which an actor lies on the shortest path between all actors in a network.[109] Actors with high betweenness centrality are in a position to control the spread of information through the network because they lie in a position of brokerage between other actors.[110] A third measure is eigenvector centrality; it is similar to degree centrality except that it assumes that ties to central actors are more important than ties to peripheral actors.[111] It measures how connected an actor is to other well-connected actors. The fourth centrality measure is closeness, which measures how close on average each actor is to all other actors in the network and may indicate the speed with which an actor can reach other actors in the network.

Key player analysis is used in additional to the centrality analysis.[112] One family of key player algorithms identifies the set of actors that best fragments the network when removed. Another set of algorithms identifies the set of actors that can be targeted to diffuse information most efficiently through a network. These algorithms can be useful when it is too difficult to remove actors within by force. For example, organizations identified for non-kinetic targeting can be attacked with information campaigns to create misinformation, mistrust, fear, or disillusionment within the network.[113]

Finally, the analysis also identifies brokers. Brokers are key nodes, or actors, within the network that are in a position to control the flow of information. Similarly, bridges are the ties that span the gaps in a network. In Figure 13, the ties that connect node 15 with nodes 6, 8, and 9 (large circles) would be considered bridges, and the nodes are the brokers.[114] When brokers in the semi-submersible network are removed, the end result is fragmentation or disconnection of the network.

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[109] Everton, *Disrupting Dark Networks*, 13.

[110] Wouter de Nooy, Andrej Mrvar, and Vladimir Batagelj, *Exploratory Social Network Analysis with Pajek* (New York: Cambridge University Press, 2011), 150.

[111] Everton, *Disrupting Dark Networks*, 13.

[112] Stephen P. Borgatti, "The Key Player Problem," *Social Science Research Network*, 1, September 21, 2002, http://ssrn.com/abstract=1149843 or http://dx.doi.org/10.2139/ssrn.1149843.

[113] Dan Cunningham et al., *Brokers and Key Players in the Internationalization of the FARC* (Monterey, CA: Naval Postgraduate School, 2012), 18.

[114] Everton, *Disrupting Dark Networks*, 234.
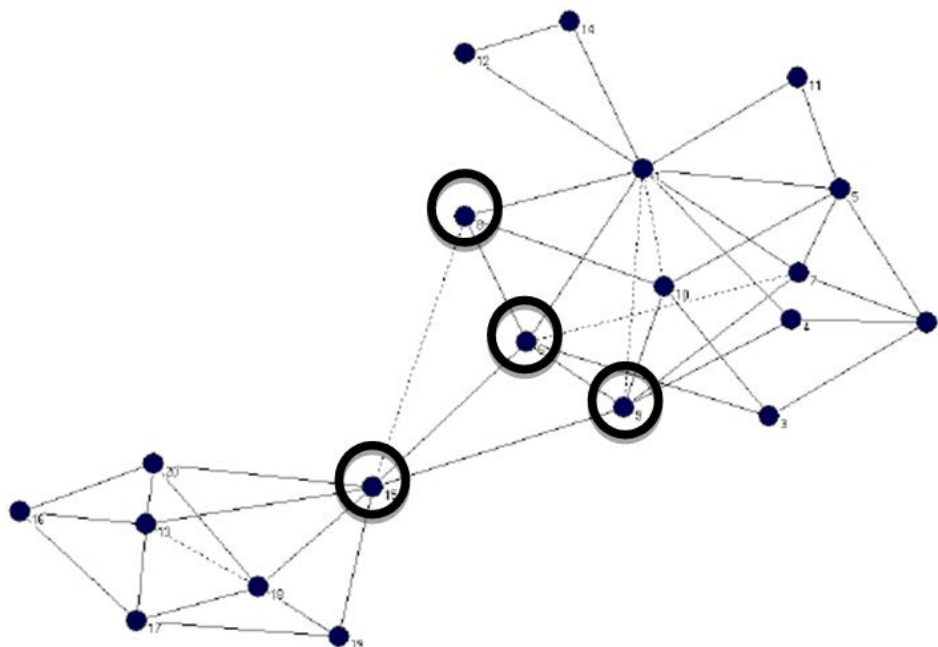
Figure 13.   The edges between actor 15 and actors 6, 8, and 9 are considered bridges while the four actors are considered brokers.[115]

H.   STRATEGIC OPTIONS

Strategic options for disrupting a network can be kinetic or non-kinetic. Colombia has demonstrated an impressive adeptness at conducting kinetic operations. In the last 10 years, its aggressive counterinsurgency strategy has killed or captured many of FARC's top leaders and decimated many organizations within the network. Despite the gains made against the FARC, the threat of semi-submersibles continues to exist. Therefore, with evidence suggesting the FARC is using semi-submersibles to transport cocaine to Central America and Mexico, this thesis explores alternatives to disrupting the semi-submersible network. Some of these options are kinetic; others are non-kinetic. Based on a decision matrix outlined in Chapter V, the authors identify one option that has in their view, greater advantages compared to the other two examined. As noted previously, their results and the recommendations that follow are only suggestions until a more comprehensive data set can be developed and analyzed.

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[115] Everton, *Disrupting Dark Networks*, 6.

IV. ANALYSIS AND RESULTS

A. INTRODUCTION

The difficulty of finding and interdicting semi-submersibles in the open seas requires targeting the FARC and criminal organizations in Colombia's Pacific region that build and employ them for transporting drugs. By using the methodologies of visual analytics and SNA, the purpose of this chapter is to illuminate the organizations within the semi-submersible network to target. First, visual analytics are employed to conduct geospatial, temporal, and link analyses on the network. Results derived from visual analytics then inform the SNA of the semi-submersible network. Together, these two methodologies make it possible to identify those organizations that if weakened or removed have the greatest potential for disrupting semi-submersible operations in Colombia's Pacific region.

B. GEOSPATIAL AND TEMPORAL ANALYSIS

Visual analytics, specifically geospatial analysis of the semi-submersible network, can help pinpoint areas for targeting. Historically, semi-submersible operations have occurred in the South Pacific area of Colombia since most seizures have occurred in that location.[116] This area is an important drug-trafficking corridor for the FARC since it raises 65% of its revenues through drug trafficking. In addition, 70% of all cocaine entering the United States comes from Colombia's Pacific coast.[117] Recognizing the significance of the region for drug-trafficking operations, Colombia has increased its military presence in that area. The map in Figure 14 illustrates the locations of semi-submersible seizures that have occurred in the last five years.

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[116] Mario Escobar, Lieutenant Colonel (Colombian Naval Infantry), interview with Major Rick Galeano (U.S. Army), December 1, 2011.

[117] Hannah Stone, "Colombia: Cauca Violence due to FARC Under Pressure," May 24, 2011, http://www.insightcrime.org/news-analysis/colombia-cauca-violence-due-to-farc-under-pressure.
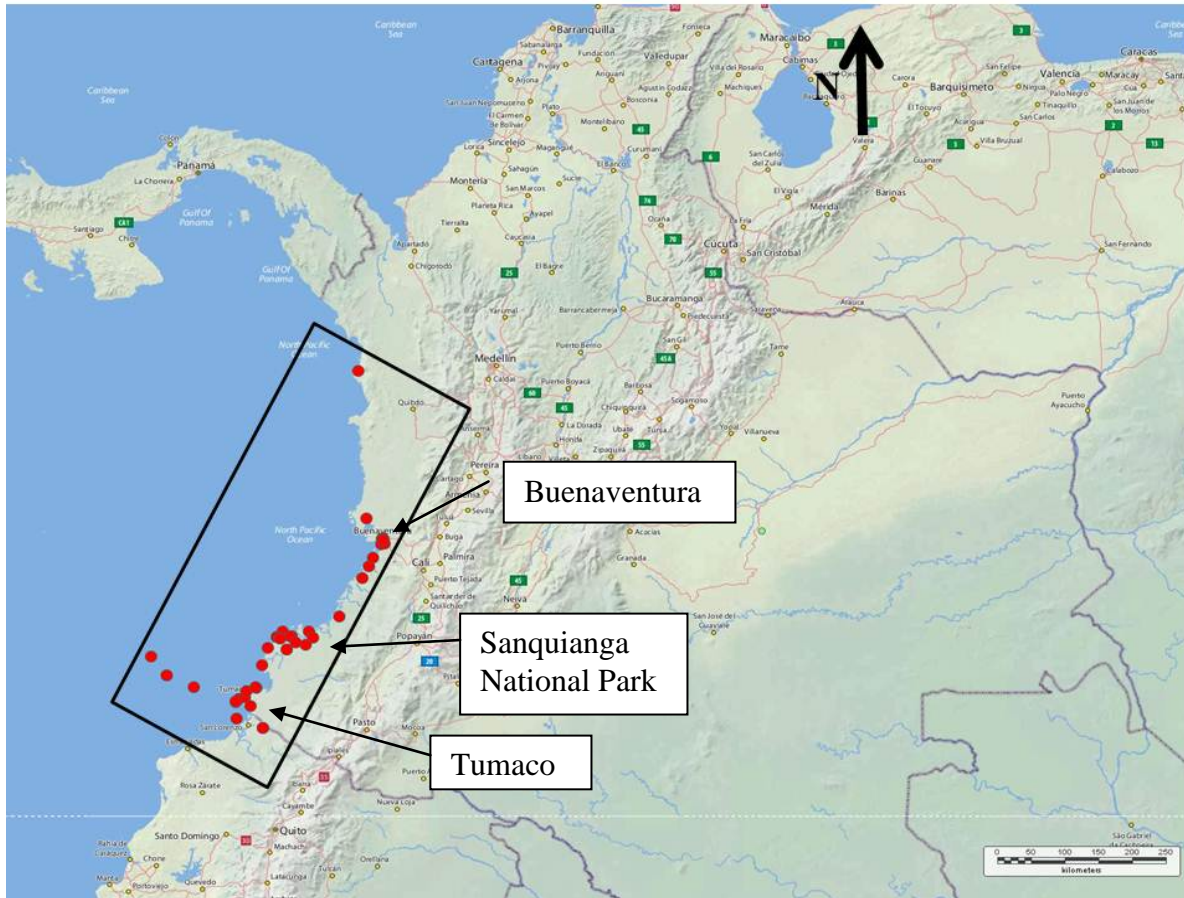
Figure 14.   Semi-submersible seizures in the Pacific 2007–2011

As Figure 14 indicates, semi-submersible activity is concentrated along the coastal region from Tumaco in the south and moves north towards Sanquianga National Park and Buenaventura. Since this area contains a large numbers of river systems and estuaries that drain into the Pacific Ocean, it has become a prime location for semi-submersible operations. Typically, semi-submersibles are built close to the ocean in these river systems underneath mangrove vegetation. Building semi-submersible sites close to the ocean is a prerequisite because, upon completion, these underwater vehicles will travel downstream to the estuaries and begin their voyage into the Pacific Ocean. Since semi-submersibles are built in remote areas inaccessible from roads, these rivers serve as highways that transport the materials required for building. In addition, vast mangroves cover these river systems that make traversing the terrain difficult for the following two reasons. First, the daily tidal fluctuations limit and prohibit access via boat. Secondly, the

height of the mangroves camouflages semi-submersible operations. The following map (Figure 15) shows how mangrove vegetation extends from Ecuador to Panama. The combination of the vegetation, river systems, and close proximity to the sea, makes the Pacific coastline an ideal location for semi-submersible operations.
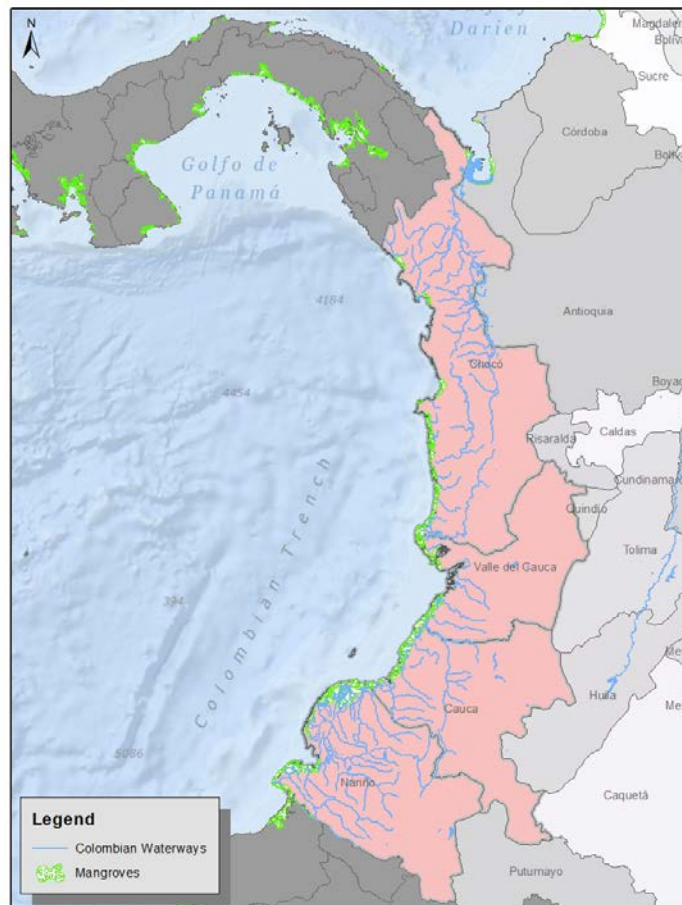
Figure 15.   Map illustrates the mangrove vegetation in Colombia's Pacific region. Mangrove vegetation extends from northern Ecuador to Panama.

Despite the favorable mangrove vegetation along Colombia's Pacific coast and the extensive river systems that drain into the ocean, most semi-submersible seizures have occurred between the cities of Tumaco and Buenaventura, as illustrated in the following semi-submersible heat map (Figure 16). Close proximity to these two large population centers makes sense given the logistics required to construct these underwater

vehicles. They require fiberglass material and engine and vehicle components for their construction. In addition, an estimated workforce of 20 people, all of whom need shelter, are more likely to be found in a population center rather than in remote areas.
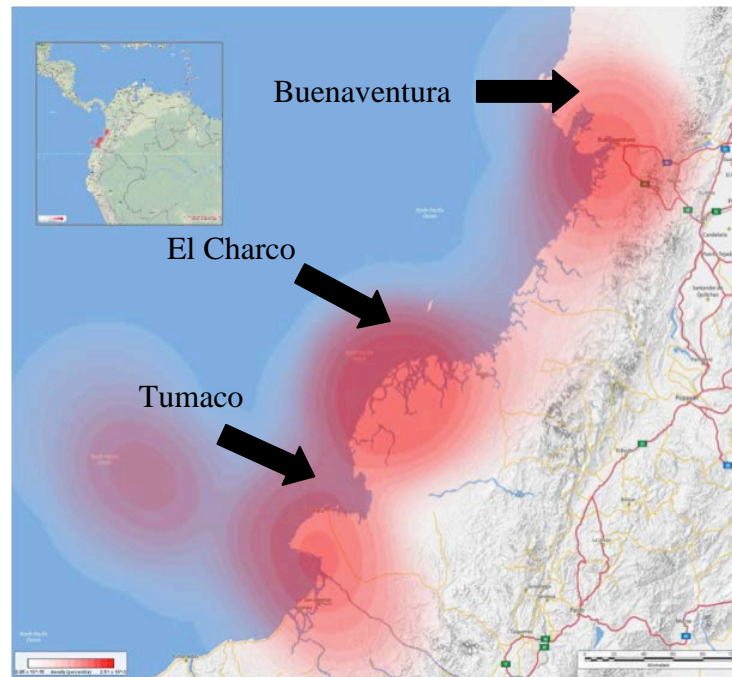
Figure 16. Heat map demonstrates where most semi-submersible seizures are occurring. Most semi-submersible seizures are occurring near Tumaco, El Charco, and Buenaventura.

Using data published by *Jane's Defense* website, FARC attacks were plotted from 2002–2007 to identify areas within the Pacific region of greatest FARC activity. As illustrated in Figure 17, attacks from 2000–2002 occurred primarily closer inland, near the city of Cali. The areas colored red reflect a high density of FARC attacks, whereas those colored blue represent a smaller number of FARC activities. Figure 18 plots FARC attacks from 2003–2005, and illustrates that during this time FARC activities increased in Buenaventura. The increased activities could also suggest that this terror group is increasing its drug trafficking and semi-submersible operations in this city.
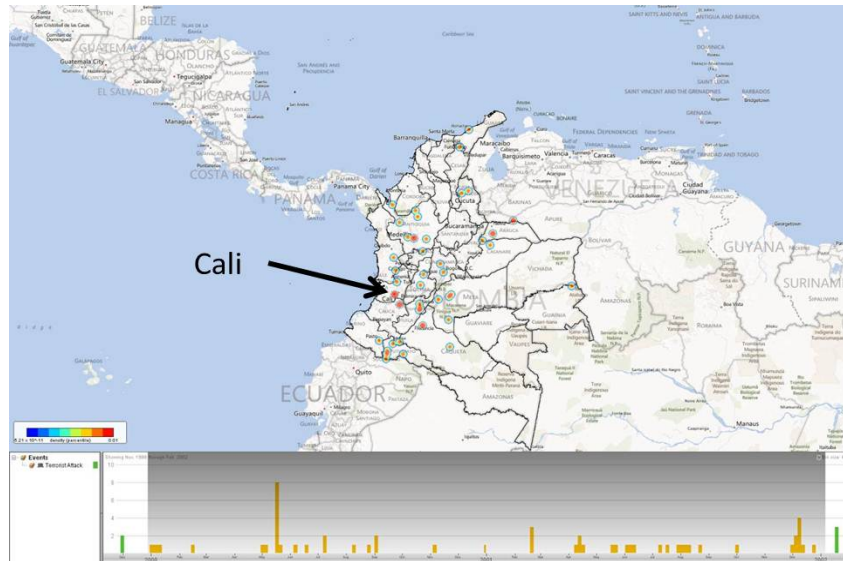
Figure 17.　Colored areas represent FARC attacks. Areas in red represent a high density of FARC incidents, whereas the areas in blue represent a lower concentration of activities. From 2000–2002, FARC activities primarily focused towards the interior of the country.

Figure 18.　From 2003–2005, diagram indicates that FARC activities are increasing Buenaventura

Figure 19, which plots FARC activities from 2005–2007, reveals that the FARC has increased its activities in both Tumaco, Buenaventura, and also in the northern part of the Pacific, near the border with Panama. Greater FARC activity in these two cities

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suggests that the FARC considers these two urban centers important to its drug trafficking operations, whereas its activities near Panama suggest that this area is important for the insurgency. Although past semi-submersible seizures confirm that most have been built by criminal organizations, such as Los Rastrojos, two recent seizures of FARC semi-submersibles in Timbiqui and Buenaventura demonstrate that this terror group is now an active player in semi-submersible operations. More importantly, the FARC's semi-submersible operations in the area and its increasing activities in Tumaco and Buenaventura point to the strategic importance of this region. Due to the geographic location of these two cities, the rivers, and the mangrove vegetation along the coast, this area appears to be strategically advantageous to both the FARC and criminal organizations that operate in the region.
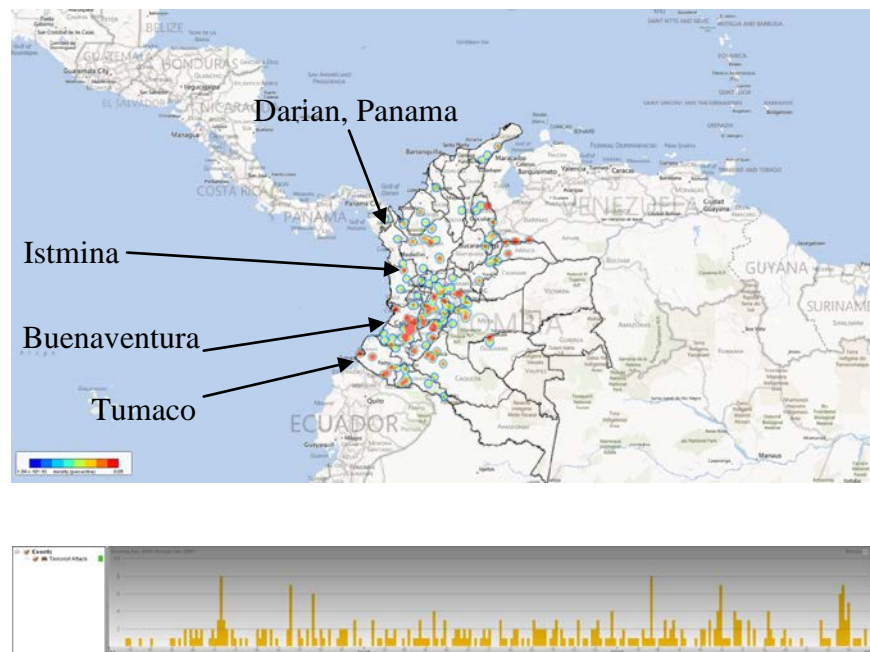
Figure 19.   From 2005–2007, diagram indicates that FARC activities are increasing Buenaventura, Tumaco, Istmina, and Darian (Panama)

The Colombian military has not underestimated the strategic value of the Southwest Pacific region to FARC drug trafficking operations. Beginning in 2003, Colombia has increased its military presence in the area by permanently deploying marine units to disrupt FARC and cocaine trafficking activities by stationing six battalions in the areas of Buenaventura and Tumaco (see Figure 20).[118]
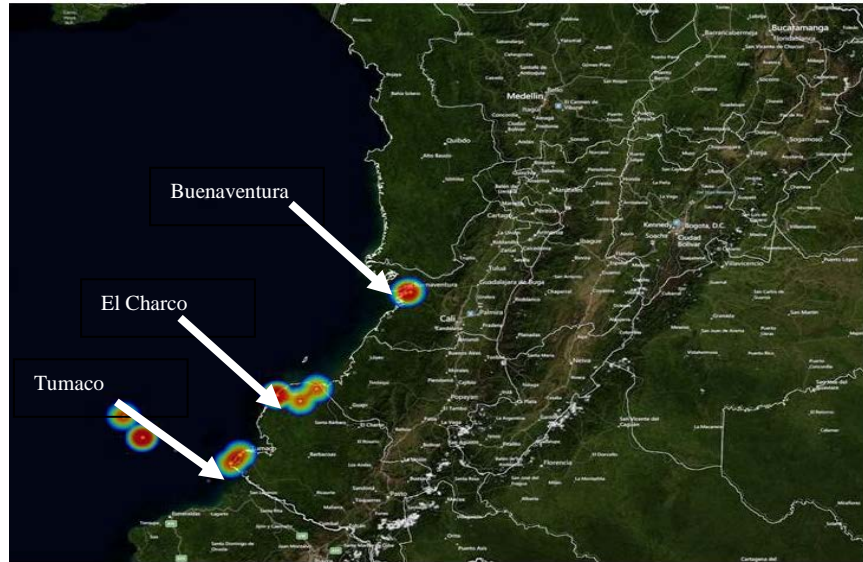
Figure 20.   Map illustrates semi-submersible seizures from 2003–2008 conducted by the Pacific Coast Guard and Riverine Brigade #2[119]

Figure 21 illustrates the increase of security forces' seizures in two cities that have resulted in the capture of 31 semi-submersibles. As a consequence of the military's pressure, criminal organizations have begun to expand their operations to the north towards Panama and the south towards Ecuador (see Figure 22).

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[118] Mario Escobar, Lieutenant Colonel (Colombian Naval Infantry), interview with Naval Postgraduate School, Monterey, CA, December 1, 2011.

[119] The increased seizures are no doubt due to the deployment of Colombian Marines to this area.
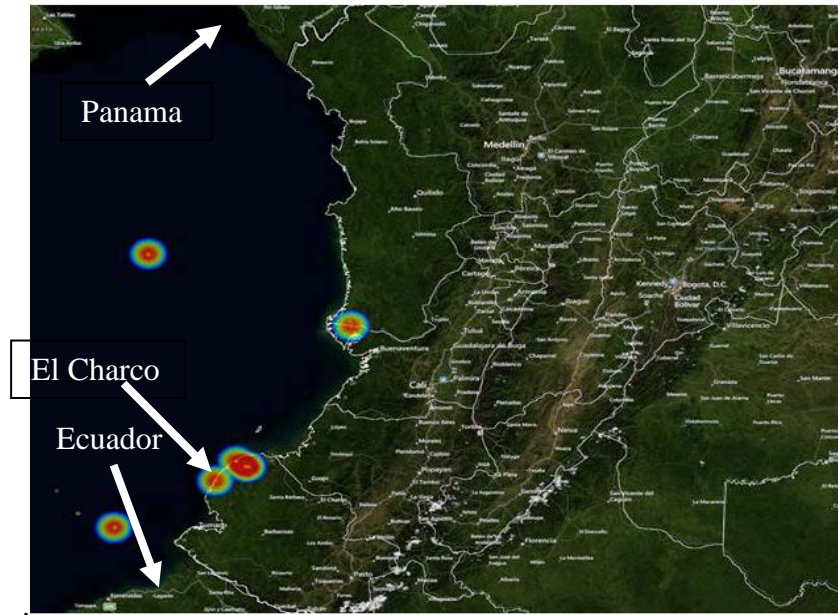
Figure 21.   Map illustrates semi-submersible seizures from 2009–2010 conducted by the U.S. Coast Guard, Colombian Coast Guard, and Riverine Brigade #2
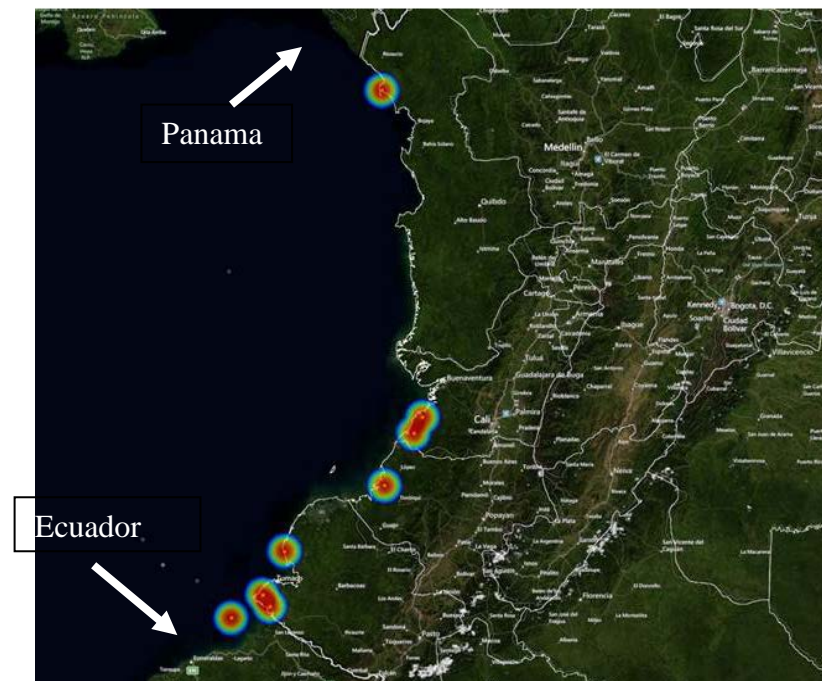
Figure 22.   Map illustrates semi-submersible seizures from 2011–2012 conducted by the Riverine Brigade #2 and Riverine Brigade #4. Presence of Colombia's security forces is likely causing semi-submersible operations to expand to the north (Panama) and the south (Ecuador)

C.   LINK ANALYSIS

From 2011 news reports, evidence was discovered that the 57th Front is increasing its ties with Mexican drug trafficking networks and filling the vacuum left by the Guajira drug cartel operating in Northern Ecuador. The 48th Front also associates with key players of the semi-submersible network (See Figure 23). Although it has always been tied with the 30th Front in the southwest, the Rastrojos criminal organization is now forming ties with the 48th Front, which suggests that FARC semi-submersible operations may begin to occur south of Colombia's border in Ecuador. The terrain is compatible with this expansion since the mangrove vegetation also extends to the northwest part of the Ecuadorian coastline (refer back to Figure 15). In addition, since the Rastrojos criminal organization is originally from this area of Ecuador, a partnership with the 48th Front makes geographic sense.
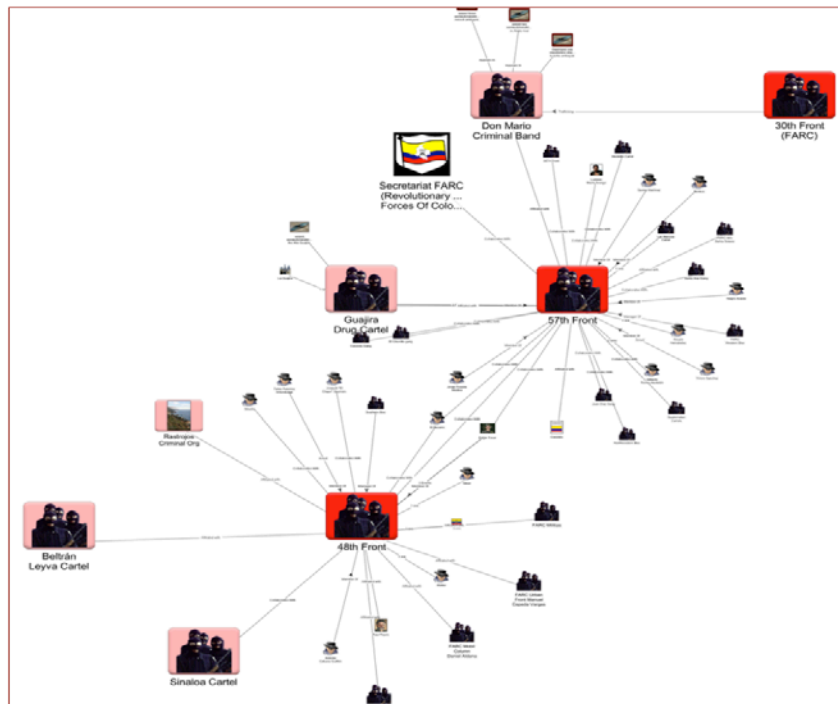
Figure 23.   Link analysis demonstrates that the FARC's 57th Front (near Panama) is increasing drug trafficking activities in the Colombia's northwest Pacific region. Drug trafficking activities from the 48th Front and Rastrojos Criminal Organization are also increasing in Ecuador as well.

D.   SUMMARY OF GEOSPATIAL, TEMPORAL, AND LINK ANALYSES

The analyses of semi-submersible operations have illuminated areas in the Pacific region that deserve attention. The geospatial and temporal analyses converge on the cities of Tumaco and Buenaventura, which are becoming more central to the FARC's drug trafficking activities. The FARC's presence in these areas has increased in the last seven years, which points to a strategic shift in the area of responsibility (AOR). In addition, in the last year, two FARC semi-submersibles have been seized in this part of the region that suggests that FARC business expansion includes cocaine transportation and semi-submersible construction.

The increased number of semi-submersible seizures in the area has likely precipitated expansion of semi-submersible operations in the north and the south. More specifically, geospatial and link analysis of the 57th Front (see Figure 23), which operates in the northern region close to Panama in an area that also favors semi-submersible operations, reinforces the view that semi-submersible operations are moving into more hospitable terrain. Figure 23 also suggests expansion into southern Ecuador since ties between the Rastrojos criminal organization and the 48th Front are also increasing. The link analysis, which was constructed by using recent news reports, is supported by a January 2009 news article by *El País,* which reported that Colombian intelligence has proof of the 48th Front allying itself with the Rastrojos criminal organization in Ecuador.[120] Due to the favorable vegetation, geography, and reduced presence of security forces from Panama and Ecuador, it is likely that semi-submersible operations are expanding along the Pacific coastline.

E.   SOCIAL NETWORK ANALYSIS

Although the author's visual analytic examination of the data proved invaluable for pinpointing the location of FARC and criminal groups, their movement through time, and their linkages, social network analysis makes it possible to take a much closer look

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[120] Colprensa, "Cae red de narcos associate con las Farc," *El País*, January 2009, http://historico.elpais.com.co/paisonline/notas/Enero162009/jud1.html.

into the data to explore the relational patterns of the network. Their ultimate goal in this section is to identify targeting options that have the greatest potential to disrupt the semi-submersible network.

F. SOCIAL NETWORK ANALYSIS—SIZE AND GENERAL CHARACTERISTICS

The SNA analysis begins with open-source data on 149 FARC and criminal organizations involved in drug-trafficking operations that operate in close proximity to submersible seizures. Figure 24 depicts the locations of the 149 organizations located in the Pacific region. As it illustrates, the nodes within the semi-submersible network are represented by various FARC Fronts, Mobile Columns, and sub-organizations that work for the ELN, Rastrojos, Renacer, Los Machos, and Urabenos. The semi-submersible network in Figure 25 was produced using ORA, which visually demonstrates that the FARC's Joint Western Command and the Rastrojos criminal organizations are central in the semi-submersible network. Other organizations depicted as important include the following: Rastrojos-Narino, Rastrojos-Cauca, Rastrojos-Choco, Rastrojos-Valle del Cauca, Machos-Valle del Cauca, Renacer-Choco, Urabenos-Grupo Choco; Renacer-Choco, and Mobile Block Carlos Arturo Ruiz-Staff.
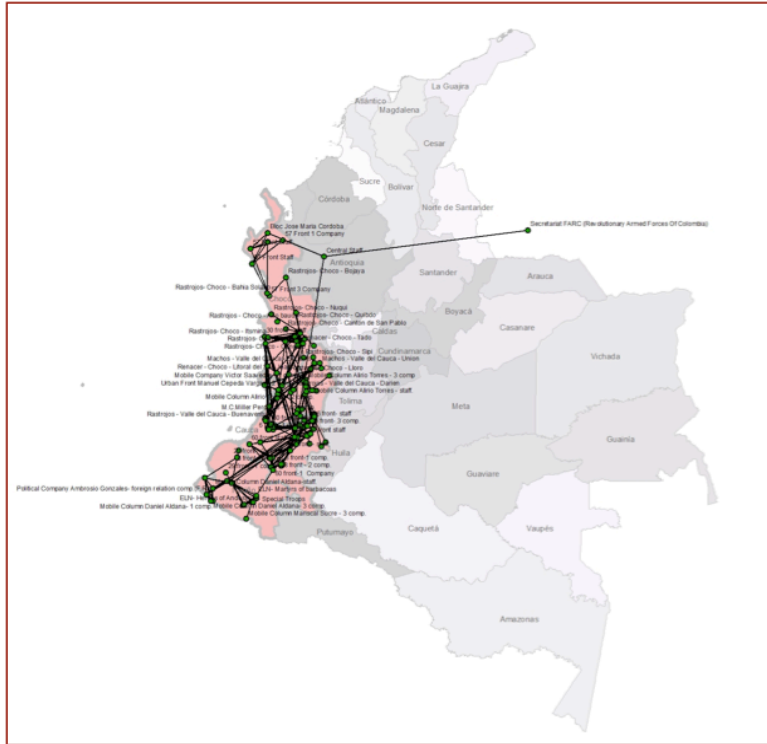
Figure 24. Locations of the FARC and criminal organizations comprising the semi-submersible network. Diagram was produced using ORA and ARCGIS.
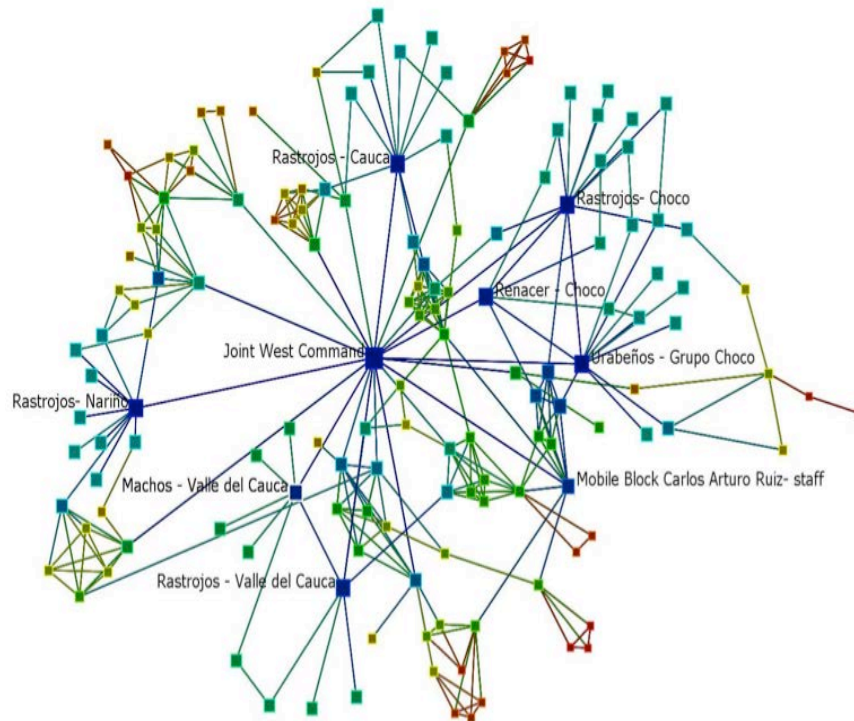
Figure 25.   This figure represents an illustration of the mapped semi-submersible network. The figure was developed using ORA SNA software.

G.   SOCIAL NETWORK ANALYSIS—CENTRALIZATION

Centralization analysis of the semi-submersible network reveals a balance between centralization and decentralization (see Table 4). The network's high betweenness centralization score (.738) indicates that in certain respects the network is very centralized. In this case, the network revolves around a broker in a position to control the flow of resources through the network, in particular, the FARC's Joint Western Command, which is not surprising since the FARC has a formal organizational structure that operates with the purpose of achieving its political objectives. Whereas (for example) the Rastrojos criminal organizations is much more decentralized (see Figure 25) because its primary purpose is to profit from the drug trade. Furthermore, since building semi-submersibles requires a significant investment, the involvement of higher-level organizations is unsurprising because of the need for numerous support organzations.

51

ORGANIZATION	Betweenness Standard Deviation	Betweenness Centralization	Concept	Closeness Standard Deviation	Closeness Centralization	Concept	Degree Standard Deviation	Degree Centralization	Concept	Eigenvector Standard Deviation	Eigenvector Centralization	Concept
SEMI-SUBMERSIBLE NETWORK	0.067	0.738	Centralized	0.03	0.238	Decentralized	0.021	0.107	Decentralized	0.1	0.444	Middle
SUBNETWORK 11	0	0	Decentralized	0	0	Decentralized	0	0	Decentralized	0	0	Decentralized
SUBNETWORK 10	0.149	0.4	Middle	0.131	0.5	Middle	0.249	0.4	Middle	0.174	0.155	Decentralized
SUBNETWORK 9	0.253	0.698	Middle	0.106	0.599	Middle	0.179	0.556	Middle	0.188	0.565	Middle
SUBNETWORK 8	0.172	0.716	Centralized	0.119	0.526	Middle	0.219	0.417	Middle	0.22	0.644	Middle
SUBNETWORK 7	0.172	0.592	Middle	0.119	0.607	Middle	0.219	0.436	Middle	0.22	0.255	Decentralized
SUBNETWORK 6	0.164	0.638	Centralized	0.095	0.585	Middle	0.14	0.445	Middle	0.151	0.314	Decentralized
SUBNETWORK 5	0.126	0.366	Decentralized	0.059	0.232	Decentralized	0.135	0.164	Decentralized	0.245	0.355	Decentralized
SUBNETWORK 4	0.18	0.687	Centralized	0.08	0.519	Middle	0.154	0.404	Middle	0.239	0.397	Decentralized
SUBNETWORK 3	0.156	0.48	Middle	0.094	0.498	Middle	0.135	0.417	Middle	0.18	0.467	Middle
SUBNETWORK 2	0.14	0.553	Middle	0.079	0.412	Middle	0.113	0.228	Decentralized	0.212	0.355	Decentralized
SUBNETWORK 1	0.163	0.582	Middle	0.079	0.516	Middle	0.122	0.448	Middle	0.157	0.536	Middle

Table 4.   This table represents the centralization scores for both the overall semi-submersible network and its 11 most important subgroups. The subgroups were identified by using the Girvan-Newman analysis.[121]

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[121] Dan Cunningham provided assistance with calculating the semi-submersible network centralization scores.

The network's low closeness (.238) and degree (.107) centralization scores indicate that the overall network is decentralized along other dimensions (see Table 4). which makes sense since too much centralization would probably hamper the network's ability to generate a profit in drug trafficking and semi-submersible operations since hierarchical organizations tend to be less efficient as decentralized organizations when operating in rapidly changing environments. Decision making in hierarchical organizations is deliberate and passes through several steps of approval before decisions are actually made.[122] As a result, they can be cumbersome, time-consuming, and inefficient when decisions have to be made quickly, such as in drug trafficking operations. It appears that the FARC recognized the limitations of its hierarchical design and structured itself so that while strategic decisions are made from the top, military and criminal operations are made at the tactical level. When examining the semi-submersible network, it is likely that a centralized-decentralized balance is required since semi-submersibles necessitate a substantial investment from high-level organizations, but decentralized control is essential for maximum performance of the network.

To verify that the network is indeed decentralized at the lower level, a subgroup centralization analysis was conducted. By conducting a Girvan-Newman (GN) analysis, the authors identified the 11 most important subgroups in the semi-submersible network. Once identified, they conducted a centralization analysis on each of the subgroups and found that some of the subgroups are more decentralized than others (see Table 4). Since the centralization scores at the subgroup level range from being centralized to decentralized, these findings also support that the network is both hierarchical and heterarchical. The lower-level organizations within the network must have the flexibility to make decisions and seize opportunities to profit from the drug trade. The environment is dynamic, and since the drug trade is so profitable, it is common to find low-level FARC organizations collaborating with criminal organizations to maximize revenues. Likewise, if lower organizations are unable to cooperate to increase earnings, fighting between FARC and criminal organizations will result since they will compete for profits.

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[122] Frank Ostroff, *The Horizontal Organization* (New York, NY: Oxford University Press), 4.

Due to the network's efficiency and capacity to generate large profits, the semi-submersible network appears to operate between the two extremes since the network displays both formal and informal characteristics.

As a final test, the authors collapsed (shrunk, simplified) the network in which all the organizations in each of the subgroups are replaced by a single node representing that subgroup.[123] "This type of analysis is something [analysts] choose to do when [they] are interested in examining the pattern of ties between types of actors rather than the pattern of ties between the actors themselves… [because it can help] illuminate patterns that [are] note detectable at the 'street level view,' so to speak."[124] Figure 26 presents the collapsed network composed of the 11 subgroups. More importantly, centralization analysis of the collapsed network indicates a relatively high level of centralization across all measures of centralization (see Table 5): degree -.590, centralization -.529, closeness -.706, and eigenvector -.420. These scores lend further empirical evidence that the network has both centralized and decentralized aspects to it.
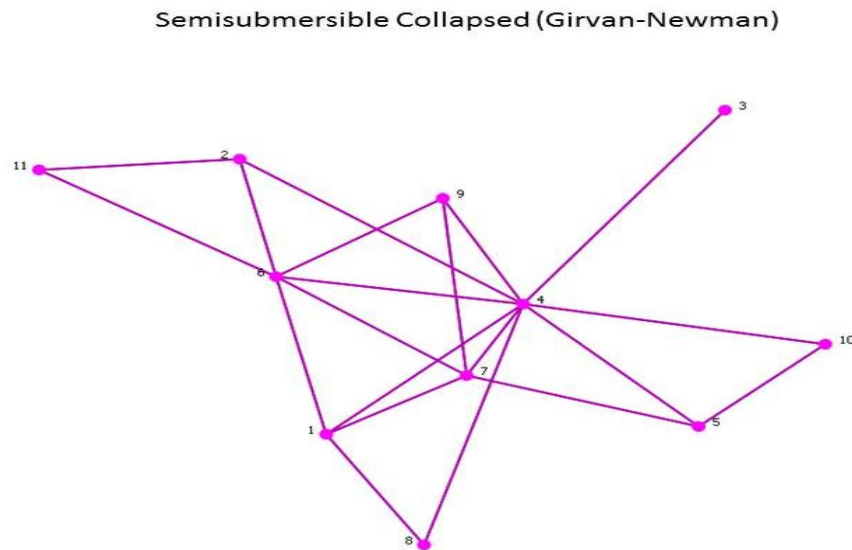
Figure 26.   Collapsed Girvan-Newman Subgroups of semi-submersible network

[123] de Nooy, Mrvar, and Batagelj, *Exploratory Social Network Analysis with Pajek* , 46–47.

[124] Everton. *Disrupting Dark Networks*, 125.

Centralization	Scores
Degree	.590
Betweenness	.529
Closeness	.706
Eigenvector	.420

Table 5.   This table represents the centralization scores for both the overall semi-submersible network and its 11 most important subgroups. The subgroups were identified by using the Girvan-Newman analysis.[125]

H.   SOCIAL NETWORK ANALYSIS—CENTRALITY

To illuminate the important lower-level units in the semi-submersible network, the authors calculated various measures of centrality. Developing an effective targeting list requires identifying the principal lower-level organizations since targeting a high-level organization is difficult since they have numerous security rings protecting them and their primary leadership often resides in other countries. A more easily targeted lower-level organization can be a tactical unit, such as a company from the FARC or ELN. Knowing which lower-level organizations to remove from the network or target for misinformation campaigns will result in the best outcome when attacking semi-submersible operations.

Table 6 lists the top 15 organizations in terms of degree, closeness, betweenness, and eigenvector centrality. The higher-level organizations with the top centrality measures included the following: The Joint Western Command (ranked #1 in degree, betweenness, and closeness scores, ranked #9 in Eigenvector score), Rastrojos-Narino (ranked #2 in betweenness and closeness), Rastrojos-Choco (ranked #5 in betweenness and #4 in closeness), Rastrojos-Cauca (ranked #3 in betweenness and #5 in closeness), M. C. Miller Perdomo Staff (ranked #2 in degree and eigenvector), the 30th Front Staff (ranked #3 in degree and #1 in eigenvector), and Urabeños-Grupo Choco (ranked #4 in betweenness and #3 in closeness). As demonstrated by their high centrality scores, the

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[125] Dan Cunningham provided assistance with collapsing the GN Network and calculating its centralization scores.

Joint Western Command and the Rastrojos criminal organization are crucial players in the semi-submersible network. These findings also support the link and geospatial analysis conducted using the visual analytics methodology.

However, illuminating the important lower-level organizations in the semi-submersible network requires a closer analysis. Thus, lower-level organizations that ranked in the top 30 in more than one centrality measure were identified and are highlighted in gray in Table 6.

DEGREE			BETWEENNESS			CLOSENESS			EIGENVECTOR		
RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE
1	JOINT WEST COMMAND	0.056	1	JOINT WEST COMMAND	0.761	1	JOINT WEST COMMAND	51.015	1	30TH FRONT - STAFF	0.555
2	M.C. MILLER PERDOMO - STAFF	0.044	2	RASTROJOS -NARIÑO	0.241	2	RASTROJOS - NARIÑO	36.07	2	M.C. MILLER PERDOMO- STAFF	0.539
3	30TH FRONT - STAFF	0.037	3	RASTROJOS - CAUCA	0.226	3	URABEÑOS - GRUPO CHOCO	35.816	3	M.C. MILLER PERDOMO - 3RD COMP.	0.504
4	8TH FRONT - STAFF	0.035	4	URABEÑOS - GRUPO CHOCO	0.167	4	RASTROJOS - CHOCO	35.689	4	30TH FRONT - MASS COMP.	0.461
5	ELN - SPECIAL TROOPS	0.034	5	RASTROJOS - CHOCO	0.155	5	RASTROJOS - CAUCA	35.188	5	30TH FRONT – 3RD COMP.	0.461
6	MOBILE BLOCK CARLOS ARTURO RUIZ - STAFF	0.034	6	RASTROJOS - VALLE DEL CAUCA	0.122	6	RENACER - CHOCO	34.693	6	30TH FRONT – 2RD COMP.	0.461
7	URBAN FRONT MANUEL CEPEDA VARGAS - STAFF	0.032	7	MOBILE BLOCK CARLOS ARTURO RUIZ - STAFF	0.106	7	RASTROJOS - VALLE DEL CAUCA	34.084	7	30TH FRONT – 1ST COMP.	0.461
8	M.C. MILLER PERDOMO- 3RD COMP.	0.03	8	MOBILE COMPANY VICTOR SAAVEDRA – STAFF	0.104	8	MACHOS - VALLE DEL CAUCA	33.014	8	RASTROJOS - CAUCA - LOPEZ DE MICAY	0.433
9	29TH FRONT - STAFF	0.03	9	MACHOS - VALLE DEL CAUCA	0.067	9	MOBILE BLOCK CARLOS ARTURO RUIZ - STAFF	25.037	9	JOINT WEST COMMAND	0.133
10	MOBILE COLUMN LIBARDO GARCIA - STAFF.	0.03	10	RASTROJOS -NARIÑO – BARBACOAS	0.066	10	URABEÑOS - GRUPO CHOCO - ITSMINA	24.223	10	RASTROJOS - CAUCA – SUAREZ	0.133
11	6TH FRONT- STAFF	0.029	11	RENACER - CHOCO	0.054	11	RASTROJOS- CHOCO - ITSMINA	24.046	11	MOBILE BLOCK CARLOS ARTURO RUIZ - STAFF	0.115
12	60TH FRONT STAFF	0.029	12	60TH FRONT STAFF	0.053	12	RENACER - CHOCO - ITSMINA	23.431	12	M.C.MILLER PERDOMO – 1ST COMP.	0.088
13	MOBILE COLUMN DANIEL ALDANA - STAFF.	0.029	13	URABEÑOS - GRUPO CHOCO - RIO SUCIO	0.052	13	RASTROJOS - NARIÑO - BARBACOAS	23.085	13	M.C.MILLER PERDOMO - LOG COMP.	0.071
14	POLITICAL COMPANY AMBROSIO GONZALES - STAFF	0.027	14	RASTROJOS - CAUCA - LOPEZ DE MICAY	0.05	14	RASTROJOS - CAUCA - LOPEZ DE MICAY	22.574	14	RASTROJOS- CHOCO – CONDOTO	0.07
15	8TH FRONT – 2ND COMP.	0.027	15	29TH FRONT - STAFF, RASTROJOS – BUENAVENTURA	0.047	15	MOBILE COMPANY VICTOR SAAVEDRA - STAFF	22.155	15	M.C. MILLER PERDOMO - 2ND COMP.	0.069
16	8TH FRONT – 3RD COMP.	0.027	16	RASTROJOS - VALLE DEL CAUCA - BUENAVENTURA	0.047	16	6 FRONT- STAFF	22.072	16	8 FRONT - STAFF	0.06
17	8 FRONT - LOG COMP.	0.027	17	MOBILE COLUMN MARISCAL SUCRE - STAFF.	0.045	17	RASTROJOS- NARIÑO - TUMACO	21.989	17	URBAN FRONT MANUEL CEPEDA VARGAS - STAFF	0.059
18	MOBILE COLUMN MARISCAL SUCRE - STAFF.	0.027	18	RASTROJOS - CAUCA - EL TAMBO	0.042	18	POLITICAL COMPANY AMBROSIO GONZALES- STAFF	21.907	18	MOBILE COLUMN LIBARDO GARCIA - STAFF.	0.049
19	30TH FRONT – 2ND COMP.	0.025	19	MOBILE COLUMN GABRIEL GALVIS - STAFF.	0.042	19	URABEÑOS - GRUPO CHOCO - RIO SUCIO	21.907	19	RASTROJOS - CAUCA	0.047
20	30TH RONT – 1ST COMP.	0.025	20	RASTROJOS-NARIÑO - TUMACO	0.04	20	RASTROJOS - CAUCA - SUAREZ	21.742	20	8 FRONT - 2 COMP.	0.041
21	30TH FRONT - MASS COMP.	0.025	21	ELN- SPECIAL TROOPS	0.039	21	RASTROJOS- CHOCO - CONDOTO	21.742	21	8 FRONT - 3 COMP.	0.041
22	30TH FRONT – 3RD COMP.	0.025	22	MOBILE COLUMN LIBARDO GARCIA - STAFF.	0.035	22	RASTROJOS - VALLE DEL CAUCA - BUENAVENTURA	21.66	22	8 FRONT - LOG COMP.	0.041
23	MOBILE COLUMN ALIRIO TORRES - STAFF.	0.025	23	POLITICAL COMPANY AMBROSIO GONZALES- STAFF	0.034	23	RASTROJOS - CAUCA - EL TAMBO	21.578	23	RASTROJOS - VALLE DEL CAUCA - BUENAVENTURA	0.037
24	RASTROJOS - CAUCA - LOPEZ DE MICAY	0.025	24	MOBILE COLUMN ALIRIO TORRES - STAFF.	0.03	24	RASTROJOS- NARIÑO - EL CHARCO	21.497	24	MOBILE COLUMN LIBARDO GARCIA- 1 COMP.	0.037
25	MOBILE COMPANY VICTOR SAAVEDRA - STAFF	0.024	25	57 FRONT STAFF	0.028	25	RASTROJOS - CAUCA - TIMBIQUI	21.416	25	MOBILE COLUMN LIBARDO GARCIA- 2 COMP.	0.037
26	RASTROJOS- CHOCO	0.024	26	CENTRAL STAFF	0.026	26	RASTROJOS- CHOCO - BOJAYA	21.335	26	6 FRONT- STAFF	0.032
27	POLITICAL COMPANY AMBROSIO GONZALES- MASS COMP.	0.022	27	M.C. JACOBO ARENAS- STAFF	0.024	27	RASTROJOS- NARIÑO - MAGUI	21.335	27	URBAN FRONT MANUEL CEPEDA VARGAS - 1 COMP.	0.032
28	MOBILE COLUMN GABRIEL GALVIS - STAFF.	0.022	28	M.C. MILLER PERDOMO- STAFF	0.021	28	RASTROJOS- NARIÑO - ROBERTO PAYAN	21.335	28	URBAN FRONT MANUEL CEPEDA VARGAS - 2 COMP.	0.032

DEGREE			BETWEENNESS			CLOSENESS			EIGENVECTOR		
RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE	RANK	ORGANIZATION	SCORE
29	RASTROJOS - VALLE DEL CAUCA - BUENAVENTURA	0.022	29	6 FRONT- STAFF	0.021	29	RASTROJOS- NARIÑO - FRANCISCO PIZARRO	21.173	29	URBAN FRONT MANUEL CEPEDA VARGAS - LOG.COMP.	0.032
30	6TH FRONT – 3RD COMP.	0.02	30	URBAN FRONT MANUEL CEPEDA VARGAS - STAFF	0.018	30	RASTROJOS- NARIÑO - LA TOLA	21.173	30	RASTROJOS- CHOCO - ITSMINA	0.032

Table 6.   Top lower-level organizations with highest centrality scores are shaded grey. Results were calculated using ORA SNA software.

I. SOCIAL NETWORK ANALYSIS—KEY PLAYER

To identify additional lower-level organizations for targeting, Borgatti's key player algorithms were used. As noted in the previous chapter, one key player algorithm identifies the organizations to remove for fragmenting the network, whereas the other determines the organizations best for diffusing misinformation. When this analysis was used to identify which top 15 organizations to target, the fragmentation algorithm identified one low level organization (Political Company Ambrosio Gonzales-foreign relation comp.), whereas the algorithm for diffusing information identified three (6th Front-1st Comp., ELN Special Troops, and M. C. Jacobo Arenas-2nd Company). Table 7 presents the results of the key player analysis.

Key Player Analysis Organizations to Remove from the Semi-Submersible Network	Key Player Analysis Organizations to Spread Misinformation Through the Semi-Submersible Network
Organization	Organization
M.C. Miller Perdomo-Staff	57th Front-Staff
M.C. Jacobo Arenas-Staff	6th Front -1st Comp.
Mobile Column Alirio Torres-Staff	M.C. Miller Perdomo-Staff
Mobile Column Victor Saavedra Staff	M.C. Jacobo Arenas-2 comp.
Political Company Ambrosio Gonzales- foreign relation comp. (F.R.C.)	ELN- Special Troops
29th Front-Staff	Mobile Company Victor Saavedra-Staff
Mobile Column Gabriel Galvis-Staff	Mobile Column Libardo Garcia-Staff
Mobile Column Libardo Garcia-Staff	Central Staff
Joint Western Command	Machos-Valle del Cauca
Rastrojos-Cauca	Rastrojos-Cauca
Rastrojos-Choco	Rastrojos-Choco
Rastrojos-Nariño	Rastrojos-Nariño
Rastrojos-Valle del Cauca	Rastrojos-Valle del Cauca
Renacer-Choco	Renacer-Choco
Urabeños-Grupo Choco	Urabeño-Grupo Choco

Table 7. Top lower-level organizations with highest key player scores

J.   SOCIAL NETWORK ANALYSIS—RESULTS

ELN special troops, which had not been illuminated by previous analyses, scored high in terms of degree (ranked #5) and betweenness centrality (ranked #21) (see Table 6). In addition, key player analysis determined that the ELN Special Troops should be targeted for the spreading of misinformation (see Table 7). The ELN Special Troops importance is also demonstrated by its key geographic location since it operates in Colombia's densest coca growing area in the Southwest Pacific (see Figure 27). Since the ELN ranked high along a number of different dimensions, the authors concluded that this lower-level organization is one of the most important in the semi-submersible network.

Mapa 2. Distribución regional según la permanencia del cultivo de coca, 2001-2011
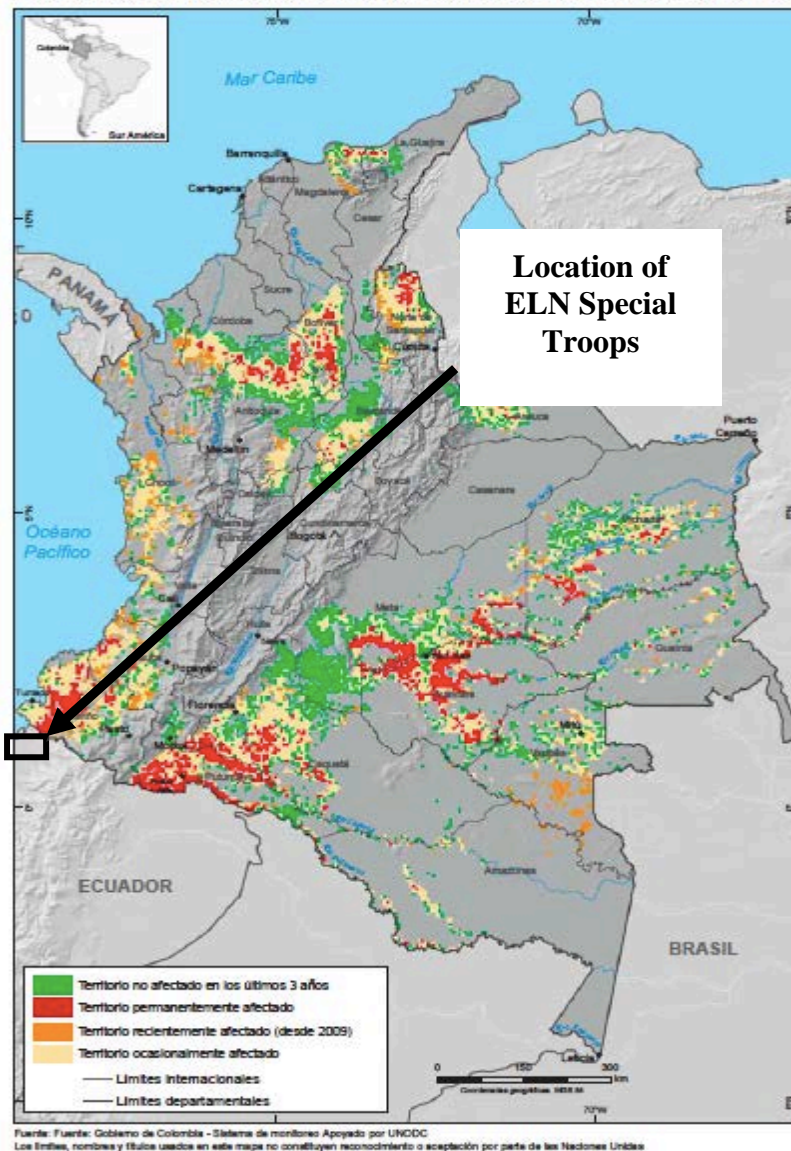
Figure 27.   Location of where the ELN Special Troops operate, which is one of the
most important coca-growing regions of southwest Colombia[126]

Another important criminal organization is the Rastrojos Valle-del Cauca-
Buenaventura. Not only did it rank high in terms of degree (29), betweenness (16), and
closeness centrality (22), numerous semi-submersibles have been seized near the city of
Buenaventura. Another lower-level criminal organization not identified previously is the

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[126] UN Office on Drugs and Crime, "World Drug Report 2011," 2011,
http://www.unodc.org/unodc/en/data-and-analysis/WDR-2011.html.

Rastrojos-Cauca-Lopez de Micay organization. Like the Rastrojos Valle-del Cauca-Buenaventura, this organization ranked high in terms of degree (#24), betweenness (#14), closeness (#14), and eigenvector (#8), and it operates in the vicinity between Buenaventura and Sanguianga National Park, which are prime locations for semi-submersible operations.

The 2nd and 3rd companies of the FARC's 30th front, which operate in the same area as Los Rastrojos-Cauca-Lopez de Micay, were also identified as important low-level organizations in the semi-submersible network. The 2nd Company ranked high in terms of degree (19) and eigenvector centrality (6), as did the 3rd Company (degree = 22, eigenvector = 5). Due to their high centrality scores and key geographic location, these companies appear to be two of the FARC's most critical units in the semi-submersible network.

K.   RECOMMENDED TARGETING LIST

Table 8 lists the most important lower-level organizations in the semi-submersible network illuminated using SNA methodology and should be targeted to attack submersible operations effectively. Table 9 identifies the towns in which these lower-level organizations operate.

Rank	Organization
1	Rastrojos, Lopez de Micay
2	Rastrojos, Buenaventura
3	ELN Special Troops
4	30th Front-Mass Comp.
5	30th Front-2nd Comp.
6	30th Front-3rd Comp.

Table 8.   This table represents the optimum list of organizations to target. The SNA methodology illuminated the most important lower—level organization in the semi-submersible network.

Important Geographic Towns For Semi-Submersible Operations
1. Lopez de Micay
2. Buenaventura
3. Guachavez

Table 9.   Important geographic towns in the semi-submersible network

The following chapter provides strategic recommendations of attack methods on the most important lower-level organizations in the semi-submersible network for decision makers to consider.

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V.   RECOMMENDED STRATEGIC OPTIONS

A.   INTRODUCTION

The purpose of the previous chapter was to identify which semi-submersible organizations to target to produce the greatest effect in disrupting the network. Geospatial analysis enabled the identification of geographic locations and patterns, and SNA generated a target list in line with the results obtained using visual analytic techniques. Indeed, the combined use of visual analytics and SNA was instrumental in illuminating six of the most important organizations and three of the key towns in the semi-submersible network.

The aim of this chapter is to identify three strategic options and to recommend one that appears to have a greater likelihood of undermining the submersible organizational network. To achieve this objective, the semi-submersible network on the design continuum was first located to identify which of the organizations among those selected are better candidates for targeting. Secondly, three options for targeting, explore their advantages and disadvantages are described, and then ultimately, one is recommended to the Colombian government for implementation.

B.   NETWORK DESIGN CONTINUUM

Understanding where a network fits in the design continuum can assist decision makers in developing and implementing strategies to attack the network. As mentioned in Chapter IV, networks that are either too centralized (hierarchical) or too decentralized (heterarchical) tend not to perform as efficiently or effectively as those that operate in the middle of the network design continuum.

In the case of the semi-submersible network, two tendencies are found that appear to counterbalance each other. The centralizing tendency is likely to come from the need to manage investment risks and protect profits. Building a semi-submersible is a substantial financial investment that can cost up to $1 million. It is reasonable to assume that a few organizations rather than the entire network would manage and direct these investment decisions. The high centralization scores (refer to Chapter IV for network

centralization scores) of the FARC's Joint Western Command and the Rastrojos criminal organization support this view. Indeed, it would appear that the semi-submersible network has adopted the lead organization network governance mode as illustrated in Figure 28 to manage its investments and financial decisions.
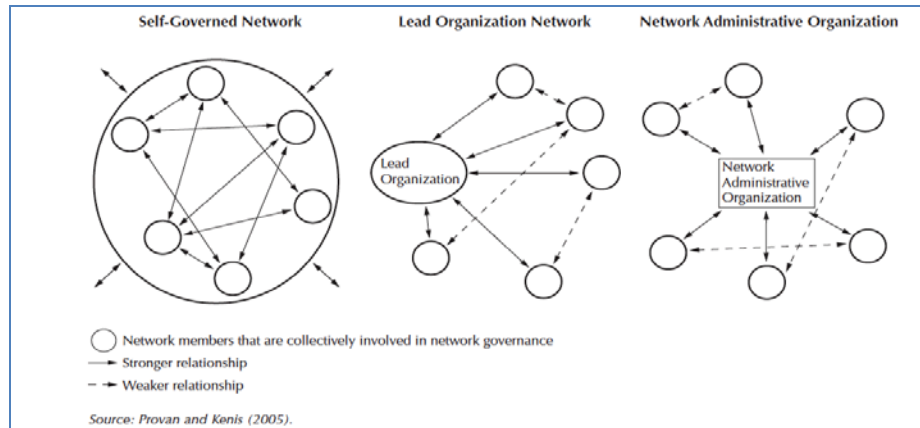
Figure 28.   The semi-submersible network has adopted a lead organization network in its management design[127]

To counterbalance this centralization, the network appears to decentralize some of its decisions. Although the data does not allow the tracking of specific decisions, the variation among the sub groups in terms of their centralization and decentralization metrics suggests decentralization is co-occurring with centralization. Therefore, it is not unreasonable to assume that the semi-submersible network has positioned itself (either deliberately or inadvertently) in the mid-range of the design continuum (see Figure 29) to gain the advantages of both centralization and decentralization.

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[127] H. Brinton Milward and Keith G. Provan, "A Manager's Guide to Choosing and Using Collaborative Networks," *Networks and Partnerships Series*, 23, 2006, https://cle.nps.edu/access/content/group/101aef4f-9165-4e68-9db8-34431533dbe5/Course_Documents/Milward%20and%20Provan%20Managers%20Guide.pdf.
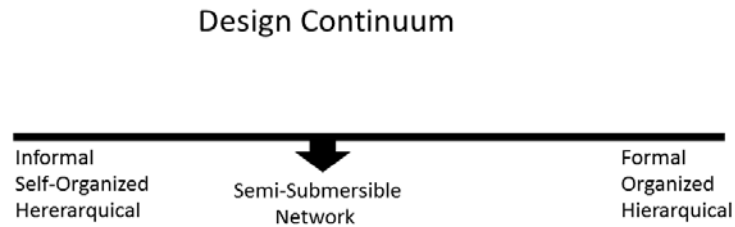
Design Continuum

Figure 29.   The semi-submersible network appears to operate in the middle of the network design continuum[128]

In summary, the authors speculate that the FARC's Joint Western Command and the Rastrojos criminal organization are serving as key decision makers that oversee the semi-submersible investments and protect the network's profits. Other organizations in the network appear to retain decision authority over issues less strategic in nature, most likely operational and tactical decisions that enable the network to be adaptive and flexible at the local levels. The implications for this division of labor and the positioning of the semi-submersible on the design continuum are addressed in the next section.

C.   TARGETING THE NETWORK

Chapter IV provided a useful process for mapping the semi-submersible network and illuminating a subset of organizations for targeting. Based on centrality measures from the SNA analysis, Colombia would more than likely prioritize its security resources against the FARC's Joint Western Command and the Rastrojos criminal organization. Both organizations are important for different reasons. The FARC fights to assume power in Colombia and the Rastrojos criminal business fights to maximize profits from the drug trade. Both employ violence in the pursuit of semi-submersible operations[129] to achieve their ends.

However, based on the author's analysis in Chapter IV, it is recommended that the government focus on targeting lower-level organizations for the following reasons. First, high-level organizations are more difficult to attack. Targeting the Joint Western

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[128] Nancy Roberts, "MN4123: Organizing and Planning in Complex Networks," (lecture, Naval Postgraduate School, Monterey, CA, September 17, 2012).

[129] "Nariño se desangra," n.d., *Semana*, http://m.semana.com/conflicto-armado/narino-desangra/123419-3.aspx.

Command, for example, is difficult because the leadership is protected by numerous security rings and also resides in other countries, such as Ecuador and Venezuela. Colombian security forces killed Former Secretariat member Raul Reyes, for example, in Ecuador in 2008, and Ivan Marquez, the second highest-ranking leader of the FARC, openly resides in Venezuela.[130] Similar to the FARC, evidence also suggests that high-level leaders of the Rastrojos criminal organization also reside in other countries since its former leader, Diego Perez Henao, was captured in Venezuela earlier this year.[131]

Secondly, it appears to be more difficult for the FARC and criminal organizations to replace trustworthy mid-level leaders than it is to replace high-level leaders. Despite Henao's capture, Rastrojos criminal operations in Colombia continue uninterrupted. The FARC's organizational structure is also resilient and designed to function even after senior leaders are killed or infiltrated by Colombian security forces. As demonstrated by the November 4, 2011 killing of Alfonso Cano, the Commander in Chief and ideological leader of the FARC, the terrorist group continued to function by immediately naming Rodrigo Londoño, also known as Timochenko, as its new leader.[132] Although the killing of Cano by the Colombian military represented a significant setback for the FARC, this terror group has not lost its capacity to operate because the organization has a pool of trained and trustworthy replacements ready to assume high-level positions whenever important leaders are killed or captured.[133]

Consequently, the authors believe that targeting key organizations among the FARC Fronts, or lower-level organizations, has a higher probability of disrupting operations. Supporting evidence derives from the FARC leaders' concern about mid-level corruption in the ranks due to the large amount of revenue generated by the drug trade. In 2009, for example, the previous FARC leader Mono Jojoy, wrote that the economic crisis

[130] Wradio News, "Demobilized Says Ivan Marquez and 'Timoshenko' Are in Venezuela," December 22, 2011, http://www.wradio.com.co/noticias/actualidad/desmovilizada-asegura-que-ivan-marquez-y-timochenko-estan-en-venezuela/20111222/nota/1596031.aspx.

[131] El Tiempo, "Rastrojos Leader Was Hiding in Venezuela Farm," June 3, 2012, http://www.eltiempo.com/justicia/ARTICULO-WEB-NEW_NOTA_INTERIOR-11919984.html.

[132] Alselma, "Colombian Army Kills FARC Leader Alfonso Cano."

[133] Romero, "Colombian Rebels Still Dangerous Despite Leader's Death."

facing the FARC was a result of the lack of discipline, commitment, and financial corruption among the rebels.[134] Soon after the death of "Mono Jojoy" on September 23, 2010, at least three other high-ranking guerrillas within the FARC's 44th Front, which operates in the Meta Department, deserted, and stole over $950,000, which reinforces the concerns of the now deceased leader.[135] Demobilized reports from former members of the 44th Front further confirm Mono Jojoy's fears that the FARC is having difficulty finding trustworthy mid-level organizational commanders who can run its highly profitable drug trafficking enterprise.

Thus, the authors recommend that six lower-level organizations be targeted: Rastrojos-Lopez de Micay (Lopez de Micay), Rastrojos-Buenaventura (Buenaventura), ELN Special Troops (Guachavez), 30th Front-Mass Company (Lopez de Micay), 30th Front-2nd Company (Lopez de Micay), and the 30th Front-3rd Company (Lopez de Micay) (see Table 10).

Organizations
RASTROJOS, LOPEZ DE MICAY—LOPEZ DE MICAY
RASTROJOS, BUENAVENTURA—BUENAVENTURA
ELN SPECIAL TROOPS—GUACHAVEZ
30th FRONT MASS COMPANY—LOPEZ DE MICAY
30th FRONT 2nd COMPANY—LOPEZ DE MICAY
30th FRONT 3rd COMPANY—LOPEZ DE MICAY

Table 10.   The top six organizations for targeting identified in Chapter IV

When security forces attack these organizations, they can either use kinetic, non-kinetic, or a combination of the two of actions. A kinetic action is defined as an aggressive measure that uses force to either kill or capture members or supporters of a group.[136] To measure the effectiveness of kinetic operations, the number of enemy

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[134] U.S. House, Committee on International Relations, *International Global Terrorism: Its Links with Illicit Drugs Illustrated by the IRA and Other Groups in Colombia: Hearing Before the House Committee on International Relations*, 107th Cong., 2nd sess., April 24, 2002, http://commdocs.house.gov/committees/intlrel/hfa78947.000/hfa78947_0f.htm.

[135] Manuela Kueher, "Rebel Leaders Steal Money from the FARC," *Colombia Reports*, December 2, 2011, http://colombiareports.com/colombia-news/news/13230-suspicion-among-the-farc.html.

[136] Everton, *Disrupting Dark Networks*, 31.

fighters killed or captured is typically counted. Non-kinetic action uses "non-coercive means to counter networks and impair [their] will to fight."[137] Non-kinetic courses of action rely on information operations to create deception, misinformation, disillusion, or mistrust within the network that to causes an implosion from within.

D.   KINETIC OPERATIONS AGAINST THE FARC

During the last 10 years, Colombia has demonstrated an impressive adeptness at conducting kinetic operations. Colombia's aggressive counterinsurgency strategy, which has relied primarily on kinetic operations, has killed or captured many of FARC's top leaders and decimated many of its organizations. Unfortunately, terrorist groups like the FARC are resilient; they often survive the deaths of their key leaders despite lethal targeting.[138] In addition, kinetic targeting can backfire and produce more terrorists as it did when one killing inspired an additional 10 terrorists to join the network.[139] Therefore, despite the gains made by Colombia's aggressive kinetic strategy, the FARC continues to be a threat to Colombia's security, especially its estimated drug rafficking income of $100 million to $1 billion a year.[140]

E.   NON-KINETIC OPERATIONS AGAINST THE FARC & ELN

Colombia's security forces have implemented an effective non-kinetic campaign to target members of insurgent organizations. Since 2002, Colombia's demobilization program has successfully demobilized over 15,000 FARC, ELN, and other paramilitary fighters.[141] Although non-kinetic operations are less expensive to implement, their intended effects often require time and patience before they can be realized. Despite the

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[137] Everton, *Disrupting Dark Networks*, 31.

[138] Elespectador.com, "'Alfonso Cano' y 19 cabecillas de Farc han sido neutralizados en un año," September 5, 2012, http://www.elespectador.com/noticias/judicial/articulo-372819-alfonso-cano-y-19-cabecillas-de-farc-han-sido-neutralizados-un-a.

[139] Everton, *Disrupting Dark Networks*, 31.

[140] U.S. State Department, "Background Note: Colombia."

[141] Agencia Colombiana para la Reintegración, "Desmovilization," n.d., http://www.reintegración.gov.co/Es/proceso_ddr/Paginas/desmovilizacion.aspx.

large number of demobilized fighters during the last 10 years, the FARC and other criminal groups continue to be a threat to Colombia's peace and stability.

F. COMBINED OPERATIONS

Colombia's military battalions (Army and Marines) have proven adept at combining psychological and kinetic force when conducting offensive operations. Attacks against FARC and ELN guerillas usually include instructions on how to demobilize via radio and leaflets at the same time that kinetic force is being applied. The combined use of kinetic and non-kinetic operations by Colombia's military has proven effective in the past and resulted in a high number of demobilized fighters.

Combined operations between the police and the military also have proven successful at the strategic and operational levels as in the case of the successful targeting of Raul Reyes and Mono Jojoy. A possible extension of current policy would be to increase interaction between military and police units at the tactical level. Police have the responsibility for targeting criminal organizations, such as the Rastrojos, and the military has responsibility for killing and capturing the FARC terrorists. Since the semi-submersible network involves both criminal and terrorist activities, it would a reasonable next step to increase the coordination between the two to facilitate intelligence sharing and targeting. More effective targeting in turn would likely reduce the threat to civilian populations who need to be protected and encouraged to supply information about criminal and terrorist activity.

G. TARGETING OPTIONS

The goal of this section is to identify three strategic options to target the semi-submersible network. These options are then compared and contrasted based on the set of criteria outlined as follows. Application of these criteria to the three options makes it possible to identify one targeting strategy whose benefits outweigh is costs, and thus, has a greater probability of success based on the data analyzed.

1. Focused Strategy

Drawing on the social network and geospatial analysis in Chapter IV, the focused strategy calls for police and military units to target the ELN, one of the most important low-level organizations in the semi-submersible network. The organization operates in the densest coca-growing region area of southwest Colombia. Destroying it would disable the network's ability to produce cocaine and generate profits.

2. Geospatial Strategy

The second strategy, based on the analysis in Chapter IV, calls for Colombia's military and police forces to conduct combined kinetic and non-kinetic operations against the Rastrojos Lopez de Micay, 30th Front Mass Company, 30th Front 2nd Company, and the 30th Front 3rd Company. These four organizations have close proximity to semi-submersible seizures (Lopez de Micay)[142] and are co-located so they would be easier to target at the same time. The collaboration between the Rastrojos Lopez de Micay network and the FARC's 30th Front also can be exploited with a misinformation campaign designed to create mistrust between these low-level organizations. Selected targeting to give the appearance that Rastrojos members are killing members of the FARC's 30th Front also has the potential to rupture the business ties between these two groups that could help to undermine semi-submersible operations.

3. Combined Strategy

The third strategy combines military and police forces to hit all six of recommended targets at the same time with a combination of kinetic and non-kinetic operations. Guachavez (ELN), Buenaventura (Rastrojos), and Lopez de Micay (Rastrojos, FARC's 30th Front Companies) could be attacked with a misinformation campaign to create mistrust between criminal groups and guerilla organizations like the FARC and the ELN while at the same time the police and military units could apply kinetic force. Although these attacks would require extensive coordination between the

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[142] Lopez de Micay is the closest urban area to the Sanquianga National Park, and such, support elements would come from this town via boat. Sanquianga National Park is a very isolated area along the pacific coast. The only avenues of approach are via air or water.

military since the FARC and ELN represent military targets, and the Rastrojos represents police targets, this operation, if successfully executed, has the potential to effect semi-submersible operations severely.

H.   CRITERIA

To identify a preferred strategy, a decision matrix was developed based on five criteria: intelligence requirements, personnel requirements, coordination requirements, resource requirements, and level of risk. Intelligence requirements refer to the information needed to know about the enemy. From a scale of 1-5, a high score of 5 would mean that extensive intelligence is required to be successful whereas a score of 1 would mean that less intelligence would be required. A combined strategy receives a high score of 5 since more intelligence would be required to target six organizations at the same time in three different locations (see Table 10). A focused strategy would require less intelligence to be successful since only the ELN is targeted in one geographic location. It therefore receives a score of 3.

The second criterion is personnel requirements, defined as the number of police, military or Special Forces soldiers needed to attack a target successfully. The higher the score between 1 to 5, the more personnel needed for accomplishing the mission. Since a focused strategy is only attacking one target (the ELN) in one geographic location, this option scores the lowest in personnel requirements with a rating of 3. The combined strategy scores the highest (5) because it would require the most forces.

Coordination, the third criterion, refers to the level of interaction needed between the police and the military to accomplish the mission. For example, the focused strategy that targets the ELN has minimal coordination requirements because it is primarily a military target, although intelligence sharing with the police would be useful since the ELN is collaborating and coordinating with other criminal organizations that profit from the drug trade. Since less coordination is required between police and military to effectively execute this option, a lower score of 1 was assigned. On the other hand, the combined strategy would be awarded a score of 5 given its high coordination requirements between the police and the military.

Resource requirements are the fourth criterion. It is defined as the level of funding, weapons, training, and equipment needed to accomplish the mission. A higher number (from 1 to 5) means that more resources are required for mission accomplishment. Thus, the focused strategy, requiring the least amount of resources, receives the lowest score (1) and the combined strategy receives the highest (5).

Risk is the fifth criterion. It is defined as the potential for failure given the complexity of the strategy. the combined strategy is considered the riskiest because with so many people, with so many resource requirements, with so many geospatially dispersed targets to hit at the same time, the potential for something going wrong is much more likely than just attacking one organization (focused strategy). Since the combined strategy is considered the riskiest, it had the highest score (5) and was followed by the geospatial (4) and the focused strategies (3).

I. COMPARISON OF STRATEGIC OPTIONS—DECISION MATRIX

Table 11 is the decision matrix that identifies the recommended strategy based on the sum of its scores across all criteria. The highest score identifies the option that requires the most number of troops, the greater number of resources, the highest level of coordination, and therefore, has the lowest probability of success.

Criteria (5= high. 1 = low)	Options		
	Focused Strategy	Geospatial Strategy	Multi-Task Strategy
Intelligence	3	4	5
Personnel	3	4	5
Coordination	3	4	5
Resources	3	4	5
Risk	3	4	5
Final sum	15	20	25

Table 11.   Decision matrix to identify the best strategic option

J.   RECOMMENDED OPTION

Based on the above criteria and a score of 15, the focused strategy has the least risk and requires fewer resources to execute. If successful, a combination of kinetic and non-kinetic actions against ELN Special Troops would be expected to have a large impact on the semi-submersible network's capacity to produce cocaine. In contrast, the combined strategy would be the most difficult to execute because it targets all six organizations in three geographic locations at the same time using both police and military forces. If Colombia were to pursue this strategy, it would have the potential to yield the best results, but tackling an operation of this magnitude would require full mobilization of troops and could potentially impact local populations where operations are being conducted. Choice of a preferred strategy ultimately boils down to the level of risk the government wants to assume and the resource it wants to allocate to the effort.

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VI.   CONCLUSION

A.   INTRODUCTION

The FARC has been in existence since 1964, evolving from a peasant uprising of a few hundred individuals to a large, business-like structure of more than 20,000 individuals. One of its latest technologies has been the development of semi-submersibles to carry drugs from South American to Central and North America. Recent data on semi-submersible seizures suggest that most of the underwater vehicles are being built in the Southwest Pacific region although activities are expanding into Ecuador and Panama as Colombia's security forces intensify pressure against the FARC and criminal organizations involved in the semi-submersible network.

The purpose of this study has been to identify strategic options to disrupt the semi-submersible network in the Pacific region of Colombia. This area is a central location for the design and construction of semi-submersibles and checking their growth and development would undercut the FARC's ability to transport and sell cocaine, which would ultimately affect its capacity to finance its insurgency. In addition, effectively attacking the network would deny non-state actors (NSAs) access to semi-submersible technology and use of these underwater vehicles to carry weapons of mass destruction to the U.S. homeland.

B.   SUMMARY OF METHODOLOGY AND ITS LIMITATIONS

This research relies on open source data much of which had to be translated from Spanish into English to analyze the relationships in the semi-submersible network. Classified data were not included, and consequently, central nodes and important links within the network may not be properly identified or may be missing, which can dramatically affect the results. Given these restrictions, these results should be viewed as tentative rather than definitive. Instead of recommendations for action, future studies are requested that combine both classified and open-source data to provide a fuller articulation of the semi-submersible network.

The geospatial, temporal, link and social network analyses were powerful tools that made it possible to illuminate the semi-submersible network and locate the areas of semi-submersible operations. As evidenced in Chapter IV, with these methods, it was possible to identify six of the network's most important lower-level organizations and two of its most central organizations—the FARC's Joint Western Command and the Rastrojos criminal organization. The increased knowledge gained from conducting this analysis was instrumental in developing options to attack the semi-submersible network.

C.   STRATEGIC OPTIONS

Of the 149 organizations in the semi-submersible network, six surfaced as the most important lower-level organizations. They are listed in Table 12.

Organizations
RASTROJOS, LOPEZ DE MICAY—LOPEZ DE MICAY
RASTROJOS, BUENAVENTURA—BUENAVENTURA
ELN SPECIAL TROOPS—GUACHAVEZ
30th FRONT MASS COMPANY—LOPEZ DE MICAY
30th FRONT 2nd COMPANY—LOPEZ DE MICAY
30th FRONT 3nd COMPANY—LOPEZ DE MICAY

Table 12.   The most important lower-level organizations

From this targeted list, three strategic options were developed for disruption: a focused strategy, a geospatial strategy, and a combined strategy as described in Chapter V. A decision matrix was then created to compare and contrast the options based on a set of criteria. This analysis pointed to the focused strategy that targeted the ELN Special Troops in Guachavez at the tactical level as having the least costs and the least risk. In contrast, the combined strategy had the most costs and highest risk since it calls for attacking all six organizations with combined police and military intelligence and operation efforts at the tactical level. All three strategies have merit, but ultimately, they depend on what levels of risk command authority is willing to accept and level of resources they are able to commit.

D.   RECOMMENDATIONS FOR FOLLOW-ON RESEARCH

The authors have recommended the integration of classified and open-source data as an important next step in building out the semi-submersible data set. Classified data from organizations, such as the Colombian Ministry of Defense,[143] the Joint Interagency Task Force-South, as well as Special Operations Command South, located in Key West and Miami, respectively, are likely sources. Beyond calling for a more comprehensive study of the semi-submersible network, and offering these tentative recommendations for targeting the FARC's operations, the authors strongly recommend others consider adopting the research process they have followed. It is their hope that the process used to collect, code, structure, and analyze data and develop strategic options for action, will serve as a guide for others who want to counter terror and criminal networks that threaten their stability and peace.

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[143] Similar to the U.S. Department of Defense (DoD), this agency is responsible for both the military and police forces in Colombia.

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