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**NAVAL
POSTGRADUATE
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MONTEREY, CALIFORNIA

THESIS

**SOPRANO STATE SUBTERFUGE: MAPPING NORTH
KOREAN ILLICIT NETWORKS**

by

Matthew M. Dobyms, Philip R. Kroll, and Garrett H. Nakazono

December 2018

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SOPRANO STATE SUBTERFUGE: MAPPING NORTH KOREAN ILLICIT NETWORKS

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ABSTRACT

This thesis researches the United States' approach to the illicit networks in the Democratic People's Republic of Korea (DPRK) and, using social network analysis, illuminates characteristics of several networks, thereby providing the U.S. government with options to exert influence over the DPRK regime. As the situation on the Korean Peninsula continues to evolve, it is paramount to look for new approaches that support a peaceful diplomatic resolution or create an advantage over current conditions in anticipation of potential future conflict. The study employs social network analysis of DPRK illicit organizations, networks, and personalities to demonstrate the depth and complexity of the DPRK regime. It shows that while sanctions and international efforts have eroded diplomatic ties in some areas and slowed the regime's weapons proliferation program and its economic sustainment, the sanctions and other efforts have not solved—and will not solve—the problem. Status-quo tactics and penalties are only temporarily and marginally delaying the DPRK's progress in advancing the nuclear weapons and ballistic missile technology. Thus, the United States needs to prepare additional options to preserve its national interests.

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LIST OF ACRONYMS AND ABBREVIATIONS

C4ADS	Center for Advanced Defense Studies
COA	Course of Action
DDC	Dandong Dongyuan Co. Ltd.
DHID	Dandong Hongxiang Industrial Development Co. Ltd
DPRK	Democratic People’s Republic of Korea (North Korea)
HS	Harmonized System (Harmonized Commodity Description and Coding Systems)
IAEA	International Atomic Energy Agency
KJU	Kim Jong-un
KKBC	Korea Kwangson Banking Corporation
km	kilometer
NPT	Non-Proliferation of Nuclear Weapons Treaty
PPM	political process model
PRC	People’s Republic of China
ROK	Republic of Korea (South Korea)
RPG	rocket-propelled grenade
UN	United Nations
UNSC	United Nations Security Council
WMD	weapon of mass destruction

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EXECUTIVE SUMMARY

A. INTRODUCTION AND BACKGROUND

The situation on the Korean Peninsula continues to present issues of strategic significance to the United States, as Washington actively seeks to minimize the nuclear threat that the Democratic People’s Republic of Korea (DPRK) poses. For over 60 years, the DPRK regime has increased its military capabilities and, more recently, developed a ballistic and nuclear program in the face of increasing international sanctions and other diplomatic efforts to promote stability. In addition to establishing methods for internal development and external support for weapons advancement, the Kim regimes have successfully subverted international and U.S. sanctions by creating networks designed to generate revenue to support their strategic goals. The networks of the DPRK regime exploit the covert nature of criminal enterprises and make use of Chinese and Russian cooperation. Activities include currency counterfeiting and drug smuggling facilitated by diplomatic emissaries, government-sanctioned smuggling, weapons trafficking, and foreign labor exportation.

B. PURPOSE

The purpose of this study is to use publicly available information through open-source databases to conduct a social network analysis of DPRK regime networks, identifying basic network structures, critical nodes, and a modus operandi for subverting sanctions and generating revenue. Creating a geospatial map of these networks will help identify vulnerabilities available exploitable by the United States and the international community, both to enhance the effectiveness of current sanctions, as well as to provide further opportunities.

C. METHOD AND DATA

This study uses a database of sanctioned entities identified by the UN and the U.S. Department of the Treasury, focusing on maritime vessels, front companies, and illicit activities that include weapons trafficking and foreign labor. By comparing shipping

entities to other maritime databases (e.g., the Asia-Pacific Port State Control), we mapped locational data to highlight ports of interest, routes, and potential associations with other companies and subsidiaries. The study uses data from the UN Security Council and UN Panel of Experts to analyze the network characteristics of regime-controlled people and companies, in addition to proxies and witting and unwitting business entities that facilitate regime activities.

The researchers limited the scope of the study to those ships identified by the UN or U.S. Department of the Treasury, and entities defined in the UN Panel of Experts report. There are limitations to the study: maritime data in the APPSC is derived from compliance reports; the study did not access specific corporate records, bills of lading, or manifests; and research is limited to data in English only.

D. FINDINGS

For the social network analysis, the study delineates relational categories into ships, organizations, and representatives. It then compares attributes which include location, organizational sector (i.e., commercial, financial, military, shipping, etc.), and ship type. In total, the study illuminates a DPRK regime network consisting of 147 ships, 161 individuals, 432 organizations, and 268 locations, along three different relationships. By comparing the ship-to-organization, organization-to-organization, and representative-to-organization relationships, the study analyzes the network's centralization and density, its tendencies and methods for maintaining connections, and locational data which illuminates facilitation hubs.

We derived the ship-to-organization network from 1,740 ship inspection reports and identified 144 associated ports. While the DPRK regime's shipping network is relatively dispersed and intuitively predominantly uses Russian and Chinese ports, we identified three elsewhere in Southeast Asia that is significant to the network: Manila, Philippines; Haiphong, Vietnam; and Bangkok, Thailand.

The representative-to-organization network analysis yielded locational data for 49 places around the globe. While this network is also fragmented and decentralized, we

identified several representatives that have shared ties with multiple companies, indicating a closer relationship between organizations for coordination and facilitation of material and informational activities. Additionally, we created an indirect, relational system, illustrating a concentration in not only Asia but also Africa and the Middle East. The possible significance of these two regions is the ability to operate with less visibility and in conjunction with nations whose interests are counter to the United States, respectively.

The organization-to-organization network included 75 different locations. Though it is also decentralized and dispersed, the network has a significant eigenvector value. This indicates that there are crucial facilitators or brokers within the network that are associated with the most central organizations. Specifically, out of the 432 organizations, the ten most significant, based on eigenvector score, are financial institutions, likely facilitating interactions between government, shipping, commercial entities, and customers outside the network. Additionally, the analysis shows that many commercial entities maintain close ties with the North Korean military, highlighting the illicit nature with which the DPRK regime subverts international pressure in ways that support its military.

Overall, social network analysis both confirmed widely held beliefs as well as identified areas of interest for potential exploitation. While Chinese and Russian ports are essential, due to proximity and their shared national interests in countering the United States, we illuminated ports in Thailand, Vietnam, and the Philippines that are also significant to the regime, yet out of direct Chinese and Russian control. Financial organizations emerge as the linchpin for the network – facilitating interaction with the DPRK regime and hiding illicit activities. And while the densest concentration of sanctioned individuals has ties with the People’s Republic of China (PRC), the regime’s most efficient links are located in Africa, establishing commercial, construction, and labor contracts. Additionally, the Malaysia-Korea Partners Group has emerged as an organization that seems to have replaced previously sanctioned companies.

E. RECOMMENDATIONS

This study identified basic network structures, relational ties, and critical nodes, enabling us to illuminate the vital characteristics of the DPRK regime’s illicit trade

networks. The characteristics of these networks assist in identifying modus operandi, areas of concentration, vulnerabilities of the network, and gaps in information needed to increase the fidelity of the network and develop strategic options. Moreover, through identifying the characteristics of the regime's networks, we can better understand how to disrupt, counter, or infiltrate them. The DPRK regime is dependent on Russian and Chinese facilitation, which limits U.S. abilities in countering, disrupting or infiltrating networks within these countries. Moreover, any action taken may further complicate, deteriorate, or exacerbate already tenuous relations.

As identified in our research, focusing on areas where the United States and its allies have better access, relationships, and opportunity to counter DPRK regime networks may be the best starting point. Identifying countries in Southeast Asia such as Thailand, the Philippines, and Malaysia, provides the United States with an opportunity to exploit vulnerable DPRK regime networks through continuing bilateral partnerships. Specifically, disrupting the regime's illicit financial system would have broad effects, not just on its cash flow but on the regime's ability to sustain any of its networks designed to subvert international sanctions. The best solution is to create the necessary leverage to starve the regime's illicit procurement networks and to signal to Kim that the continued pursuit of WMD will become cost-prohibitive.

I. INTRODUCTION AND BACKGROUND

Since the armistice of the Korean War in 1953, belligerence and turbulence have marked the North Korean regime's relationship with the United States and South Korea. Typified by bellicose rhetoric, threats of war, renewal of the effort to unite the Korean Peninsula by force, and the emerging threat of nuclear war between the Democratic People's Republic of Korea (DPRK, or North Korea) and the United States, numerous U.S. administrations have repeatedly sought to find a peaceful resolution for the United States and the DPRK, but have met failure. Over time, each U.S. administration has claimed progress, only to find that the Kim regime has continually broken its promises and surreptitiously circumvented sanctions, utilizing illicit networks to support and ensure the regime's survival and ability to advance military weaponry. Thus, the question guiding our research is how can the United States identify illicit networks in Asia to develop flexible policy options against, and exploit weaknesses of, the DPRK?

The DPRK regime continues to threaten the United States and its allies while also destabilizing the Pacific.¹ As it continues to build its military capabilities, especially its ballistic and nuclear programs, the DPRK regime has remained resilient in the face of ever-tightening sanctions.² The regime's pursuit of weapons of mass destruction (WMD) has been "conducted below the threshold of military conflict" with "hostile intent cloaked in actions of deniability."³ Furthermore, the United States, regional, and international diplomatic efforts have done little to deter or compel the authoritarian regime's iron-clasp rule over the country or its pursuit of WMDs.⁴ The diplomatic efforts have limited impact, and military actions are in a constant state of preparation for war.

¹ President of the United States, *National Security Strategy of the United States* (Washington, DC, White House: December 2017).

² Harry Harris, "House Armed Services Committee (HASC) Opening Statement," U.S. Indo-Pacific Command, February 14, 2018, <http://www.pacom.mil/Media/Speeches-Testimony/Article/1442429/house-armed-services-committee-hasc-opening-statement/>.

³ President of the United States, *National Security Strategy*.

⁴ President of the United States.

Over the last several decades, the Kim family has used multiple global illicit networks to support the regime and develop nuclear weaponry. Since 2006, the United Nations (UN) has been placing increasingly tougher sanctions on North Korea, only to see UN resolutions circumvented when the regime “[exploits] global oil supply chains, complicit foreign nationals, offshore company registries, and the international banking.”⁵ The DPRK regime has also prohibited military cooperation projects spanning from Asia to Africa, shared ballistic missile technology, and has used diplomatic missions masquerading as trade representatives to support weapons trafficking.⁶ Commercial and financial institutions around the globe continue to interact with and employ North Korean organizations, lending unwitting support and enabling the DPRK regime to maintain commercial and monetary activities tied to its survivability.⁷ Furthermore, because the regime uses diplomatic officials as couriers, the country’s representatives are not scrutinized closely when traveling internationally.⁸

Unilateral negotiations during the Clinton administration, the six-party talks during the Bush and Obama administrations, and ever-increasing UN sanctions have done little, to prevent illicit DPRK networks from operating, and have supported the advancement of the regime’s national policy. The DPRK regime believes that economic survival is inextricably tied to its nuclear program under the “*Byungjin* policy—the parallel pursuit of nuclear weapons development and economic growth.”⁹ Supported with the *Songun* (military-first) policy derived from the *Juche* (self-reliance) ideology, the DPRK regime maintains a resolute resistance to external influence and pressure impeding its national

⁵ United Nations Security Council, *Final Report of the Panel of Experts Submitted Pursuant to Resolution 2345*, Report S/2018/171 (New York: United Nations, 2017), <https://www.un.org/sc/suborg/en/sanctions/>.

⁶ United Nations Security Council.

⁷ United Nations Security Council.

⁸ United Nations Security Council.

⁹ Benjamin Katzeff Silberstein, “What North Korea’s 2017 Budget Report and 2018 Projections Tell Us about its Economy,” North Korean Economy Watch, April 14, 2016, <http://www.nkeconwatch.com/category/policies/byongjin/>.

policy.¹⁰ The DPRK regime supports its efforts by using illicit networks to evade international efforts surreptitiously, as well as to progress its programs and achieve its national strategy.¹¹ Understanding these networks can be an initial step in countering regime efforts. Furthermore, illuminating networks that operate across North Korean borders (smugglers and defectors) can help the United States influence the conditions that diplomatically “improve options to compel denuclearization” in favor of U.S. and allied objectives.¹² However, under the worst-case scenario of armed conflict, a detailed breakdown of such networks can present additional means through which the United States can support military action.

A. THE PROBLEM AND ITS SIGNIFICANCE

Understanding both the DPRK regime’s illicit networks and other networks that support smuggling or political defection, is essential to countering the regime’s efforts to circumvent sanctions, allowing the United States to develop additional strategies of enforcement, limit the country’s weapons programs, and influence the populous. These networks serve as pathways into and out of the DPRK, both to support and to counter the regime. For decades, the DPRK regime has masked its illicit activities enough to achieve progress in developing nuclear and ballistic capabilities.¹³ Pro-regime networks are increasingly dependent on external companies and transactions to facilitate operations that are fused into global markets, which create a vulnerability: they can be more easily tracked now that they exist as part of a system they do not control.¹⁴ The DPRK regime is also

¹⁰ “Songun Politics,” Democratic People’s Republic of Korea, accessed March 20, 2018, <http://www.korea-dpr.com/songun.html>.

¹¹ Paul Rexton Kan, Bruce E. Bechtol, Jr., and Robert M. Collins, *Criminal Sovereignty: Understanding North Korea’s Illicit International Activities* (Carlisle, PA: U.S. Army War College, Strategic Studies Institute, 2010), <http://ssi.armywarcollege.edu/pdffiles/pub975.pdf>.

¹² President of the United States, *National Security Strategy*.

¹³ David Thompson, “Risky Business: A System-Level Analysis of the North Korean Proliferation Financing System” (report, C4ADS, 2017), <https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/59413c8bebbd1ac3194eafb1/1497447588968/Risky+Business-C4ADS.pdf>.

¹⁴ C4ADS and the Sejong Institute, “The Forex Effect: U.S. Dollars, Overseas Networks, and Illicit North Korean Finance” (report, C4ADS, 2017), <https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/5a3292079140b73f73f92efd/1513263687907/The+Forex+Effect.pdf>.

limited by its ability to find witting accomplices to support its illicit activities.¹⁵ Conversely, globalization and cross-border smuggling have slowly seeded North Koreans with external information and a growing desire for technology, providing the population with glimpses of the world outside the DPRK. This increased cognizance has promoted networks that run counter to regime ideals, stimulating defections and opening pathways into the reclusive nation by way of contraband goods smuggling.

Examining the DPRK regime's illicit smuggling networks may help the United States counter regime efforts through improved sanction enforcement, and the United States and its allies may be able to leverage the smuggling networks in their favor. Although merely eliminating specific illicit networks, companies, or individuals may address external conditions and activities away from the DPRK regime, the true value lies in being able to exploit those entities for development of cross-border and/or DPRK-internal systems.

Expanding our knowledge of the DPRK's support networks not only helps to explain the environment better but also can create conditions that enable policymakers, military commanders, and others to counter or leverage networks to support U.S. policy objectives. Military conflict with the DPRK would likely have prohibitively costly consequences; effectively mapping North Korea networks may not only improve U.S. diplomatic efforts to prevent such a war but can also provide necessary options in support of military intervention. Therefore, increasing our awareness and understanding of networks that affect the regime is of paramount importance to maximize flexibility and defense options for the United States.

B. PURPOSE AND SCOPE

The purpose of this study is to map already-known North Korean illicit networks and reconstruct smuggling networks in and out the DPRK to develop options that will help enforce sanctions or support military action. Social network analysis is the foundation for understanding the greater depth and width of networks throughout Asia and the world. By

¹⁵ C4ADS and the Sejong Institute.

identifying licit and illicit networks, this paper aims to create a holistic snapshot of historical application; using open-source information and secondary sources, the research constructs networks of smuggling mechanisms, black-market networks, front companies, and other organizations that facilitate illegal activities. Social network analysis can increase our ability to monitor, disrupt, or counter malign actors and associated networks as a means to degrade the DPRK Regime's strength, or can help us leverage smuggling networks to enable access to an isolated country and its people. The continuous cycle of sanctions has produced limited results precisely because the regime has been able to conceal the nature and capabilities of its networks.

C. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Criminal activity is a systemic component of DPRK economic strategy; it directly supports internal governance and weapons proliferation and influences geopolitics. The most prominent criminal activity includes counterfeiting U.S. currency and cigarettes, drug production and smuggling, and illegal arms sales.¹⁶ Dubbed as a “Soprano State” by former State Department employee David Asher, DPRK is widely referenced as a mafia state, given its practice of “nationalizing crime.”¹⁷ Moises Naim notes that “In a mafia state, high government officials become integral players in, if not the leaders of, criminal enterprises, and the defense and promotion of those enterprises’ businesses become official priorities.”¹⁸ Correspondingly, the DPRK regime “[dedicates] a portion of its government

¹⁶ Sheena Chestnut, “Illicit Activity and Proliferation: North Korean Smuggling Networks,” *International Security* 32, no. 1 (Summer 2007): 95.

¹⁷ “N. Korea Charged in Counterfeiting of U.S. Currency,” *Washington Times*, December 1, 2005, <https://www.washingtontimes.com/news/2005/dec/1/20051201-103509-5867r/>; “Drugs, Counterfeiting: How North Korea Survives on Proceeds of Crime,” CBC News, December 7, 2017, <http://www.cbc.ca/news/world/north-korea-criminal-empire-drugs-trafficking-1.4435265>; “A North Korean Corleone,” *New York Times*, March 3, 2012, <https://www.nytimes.com/2012/03/04/opinion/sunday/a-north-korean-corleone.html>; Stan Grant, “North Korean Reach Shows There’s No Such Thing as a Civil War Anymore,” ABC News, March 1, 2018, <http://www.abc.net.au/news/2018-03-01/stan-grant-north-korea-syria-pakistan-nuclear-war/9496478>.

¹⁸ Moises Naim, “Mafia States: Organized Crime Takes Office,” *Foreign Affairs*, 91, no. 3 (June 2012): 101.

to carry out illicit international activities in defiance of international law ... to sustain [its] existence and to enable other policies,” thus succinctly fitting the mafia mold.¹⁹

The DPRK regime employs a variety of practices for raising hard currency, deemed imperative for regime survival, given the extensive sanctions. It has conducted bank robberies by way of cyber-attacks, uses (predominantly Chinese) front companies that double as financial representatives, and generates foreign exchange revenue from illicit exports.²⁰ Additionally, the regime frequently utilizes its diplomatic representatives to facilitate distribution of counterfeit dollars, drug smuggling, and the sale and purchase of luxury items.²¹ The Kim regime has effectively maintained totalitarian control over its country not by acquiescing to international coercions but rather by subverting them through the previously described methods and using those funds and goods to bribe supporters and “cultivate elites to stay in power.”²² Despite thirty years of scholars, politicians, and analysts predicting North Korea’s collapse, the Kim regimes have survived “two leadership successions, a devastating famine, and continuous sanctions.”²³ Economists and scholars alike argue that sanctions have failed to inhibit neither the DPRK’s provocative and destabilizing behavior nor its ability to advance its ballistic missile and nuclear weapon capabilities.²⁴ However, others argue that the UN sanctions enacted in 2016, or more pointedly “the targeting of North Korea’s foreign currency accounts,” have begun to pressure Kim Jong-un enough to force negotiations.²⁵ While policymakers increasingly acknowledge the global implications of mafia-state crimes, experts contend that

¹⁹ Kan, Bechtol, and Collins, *Criminal Sovereignty*, 7.

²⁰ C4ADS and the Sejong Institute, “The Forex Effect.”

²¹ Chestnut, “Illicit Activity and Proliferation.”

²² Daniel Byman and Jennifer Lind, “Pyongyang’s Survival Strategy: Tools of Authoritarian Control in North Korea,” *International Security* 35, no. 1 (Summer 2010): 60.

²³ Jong Kun Choi, “The Perils of Strategic Patience with North Korea,” *Washington Quarterly* 38, no. 4 (2015): 58, <https://doi.org/10.1080/0163660X.2015.1125829>.

²⁴ Choi; Marcus Noland, “The (Non) Impact of UN Sanctions on North Korea” (working paper, Peterson Institute for International Economics, December 2008).

²⁵ C4ADS and the Sejong Institute, “The Forex Effect,” 23.

governments are still ill-equipped to combat them effectively.²⁶ However, organizations like C4ADS, a “nonprofit organization dedicated to providing data-driven analysis and evidence-based reporting on global conflict and transnational security issues,” have recently shown the value and promise of open-source data analysis and how it can supplement governmental efforts.²⁷ It is in this vein that we strive to understand and map some of the illicit networks that the DPRK uses to circumvent sanctions and sustain the regime, potentially allowing the U.S. government to address its more significant concern: how the regime continues to acquire the proscribed technology to advance its WMD program.

D. METHODOLOGY

This study focuses on qualitative, open-source information to conduct social network analysis, evaluating the relationships and networks the DPRK regime uses to support and generate revenue as well as the smuggling and criminal networks that have access in and out of North Korea and transit to Southeast Asia. By identifying the basic network structures, relational ties, and key nodes, the social network analysis seeks to expand the network through open-source informational scrapping from online databases.

The first social network analysis chapter begins with sanctioned entities identified by the UN and the U.S. Department of the Treasury, focusing on maritime vessels, front companies, and illicit activities that include weapons trafficking and foreign labor.²⁸ This social network helps geospatially map the network by extrapolating the conditions, actors, and locations conducive to North Korean activities. This shows the depth and reaches of the DPRK regime’s networks on a global and regional scale. Furthermore, the UN Panel of Experts report on North Korean activity provides context from UN member compliance

²⁶ Naim, “Mafia States.”

²⁷ Thompson, “Risky Business, 2.

²⁸ “Work and Mandate,” United Nations Security Council, accessed March 06, 2018, https://www.un.org/sc/suborg/en/sanctions/1718/panel_experts/work_mandate; “North Korea Sanctions,” U.S. Department of the Treasury, accessed March 6, 2018, <https://www.treasury.gov/resource-center/sanctions/Programs/Pages/nkorea.aspx#legal>.

reports that detail the resiliency and resourcefulness of the regime’s efforts.²⁹ The study derived maritime and relational information from multiple maritime databases to further expand upon the locations ships have visited and to explore possible companies or subsidiaries associated with the vessel.³⁰

Using previously identified regime networks—through state-sponsored diplomatic, commercial, and labor channels as well as defector pathways—the study provides a compilation of various networks, drawn from historical references, to identify a composite picture of how the regime’s networks function, how developed they are, and how they operate today, to include regime network techniques, strengths, and vulnerabilities. An additional section examines the locations and size of the regime’s foreign labor practices and weapons trafficking to further expand on the regime’s techniques to generate revenue. By considering the interactions North Korea has with various countries and actors globally, this section further shows how the DPRK regime masks illicit activities, circumvents sanctions and supports regime survival.³¹

Social network analysis also illuminates the breadth, strength, and vulnerabilities of DPRK regime networks. This helps identify gaps where the regime continues to evade sanctions, allowing us to develop options for decision makers across diplomatic and military operations that will pressure the Kim Jong-un—to be employed immediately, or in the event of military conflict.

Leveraging second-hand sourcing and open-source collection, we also construct black-market networks for further analysis, which, to date, has not been compiled in one place. While some information is available, defector networks in the People’s Republic of China (PRC) remain shrouded. Illuminating the transit of defectors and black networks into

²⁹ United Nations Security Council, *Resolution 2345*.

³⁰ Asia-Pacific Port State Control Tokyo Memorandum of Understanding, accessed March 6, 2018, <http://www.tokyo-mou.org>; “Live Map,” MarineTraffic, accessed March 6, 2018, <https://www.marinetraffic.com>; SeaVision, accessed March 6, 2018, <https://seavision.volpe.dot.gov/>.

³¹ Joshua Hunt, “Decoder: North Korea’s Maritime Industry,” *Foreign Policy*, May 4, 2016, <http://foreignpolicy.com/2016/05/04/decoder-north-koreas-maritime-industry-united-nations-sanctions-business-oil/>; Thompson, “Risky Business”; North Korea in the World, accessed March 06, 2018, <https://www.northkoreaintheworld.org/>.

and out of the DPRK, or through mainland PRC, enables a more thorough understanding of routes and activities of DPRK defectors' journeys to freedom. The main crossing points of the Yalu and Tumen Rivers along the northern DPRK border with PRC, and the transition or escape points out of Southeast Asia are known; however, the in-between remains unknown.

E. ROAD MAP

The second chapter of this thesis is a case study on the Center for Advanced Defense Studies' (C4ADS) analysis of publicly available information concerning the DPRK's proliferation financing system. The case study describes how C4ADS highlights the *centralized, limited, and vulnerable* characteristics of the system, and how diligent open source data analysis can support effective sanction enforcement. Chapter 3 follows with our own analysis of open-source data, specifically using social network analysis as a tool. The social network analysis provides a visual representation of relationships between various individuals, companies, financial institutions, shipping organizations, and government entities that have ties to the DPRK regime's illicit activities designed to support proliferation. This chapter builds out four networks based on data drawn from various databases of sanctioned entities, and aggregates them for further analysis. Chapter 4 concludes the thesis, summarizes our findings, and provides recommendations for potential U.S. action as well as further research.

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II. OPEN-SOURCE DATA-ANALYSIS CASE STUDY

The Center for Advanced Defense Studies' (C4ADS) is a nonprofit organization which uses publicly available information to address global security issues. They use modern technologies, such as Palantir, to conduct big data analytics, employing regional, cultural, and language expertise as well as incorporating their own field research to process the data. C4ADS' analysis specializes in the following four focus areas: Transnational Organized Crime, Threat Finance, Proliferation Networks, and Supply Chain Security.³²

The international community has united to administer harsh sanctions to curb the DPRK Regime WMD program. While sanctions and international efforts have slowed the DPRK's illicit activity progression, penalties and policing have not solved—and will not solve—the problem. The United States must arrange flexible options to achieve its national policy. Although the DPRK's ability to operate in the current environment is constrained, it cannot be underestimated. According to open-source research and mapping done in 2016, the DPRK's cross-border “financing and procurement system is *centralized, limited, and vulnerable*, and thus ripe for disruption.”³³ In this chapter, we review the illicit networks the DPRK uses to accomplish its goals despite the international community's intensified sanctions. Knowing what systems are already established gives the United States options to sanction the DPRK further or pursue other non-military options.

Open-source research indicates that the DPRK regime sells weapons to war-torn countries, including chemical weapons,³⁴ develops long-range nuclear weapons, proliferates atomic technology to the Syrian regime, engages in cyber terrorism, and threatens both the United States and South Korea with destruction.³⁵ Identifying and

³²“About Us,” C4ADS, accessed November 9, 2018, <https://c4ads.org/about-us/>.

³³ Thompson, “Risky Business.”

³⁴ Richard Roth, Angela Dewan and Ben Westcott, “North Korea Sending Chemical Weapon Supplies to Syria, UN Report Says,” CNN, accessed November 9, 2018, <https://www.cnn.com/2018/02/27/politics/north-korea-syria-chemical-weapons/index.html>.

³⁵ James Griffiths, “North Korea Flouting Sanctions with Illegal Arms Trade, Report Finds,” CNN, March 1, 2017, <http://www.cnn.com/2017/03/01/asia/north-korea-arms-smuggling/>; “North Korea's Nuclear

mapping illicit networks within the DPRK can offer practical strategies for disrupting and dismantling the lifelines the DPRK regime needs to fund its WMD and ballistic missile programs, providing nonmilitary options to counter the DPRK dilemma.

According to Politifact, the DPRK is considered the fourth most sanctioned country in the world; only Ukraine/Russia, Syria, and Iran have more sanctions as of August 29, 2017.³⁶ In October 2006 the UN “slap[ped] North Korea with trade, travel and other sanctions as punishment for its claimed nuclear weapons test. President Bush described the UN action as a ‘swift and tough’ message that the world is ‘united in our determination to see to it that the Korean Peninsula is nuclear-weapons-free.’”³⁷ In 2009 the DPRK detonated its second underground nuclear test. As a result, the UN imposed new sanctions banning all weapons exports from the DPRK, as well as the importation of everything but small arms. The sanctions called on all members of the international community to stop and search all DPRK ships for weapons. “The U.S. ambassador to the UN, Susan Rice, described the resolution as ‘unprecedented.’ She said that the sanctions regime has “teeth that will bite.””³⁸ Finally, in 2016, the DPRK was “slammed with its toughest sanctions ever in a harsh international reprimand to the rogue state’s repeated nuclear and missile tests.”³⁹ After the DPRK detonated its fifth nuclear test on September 9, 2016 at the Punggye-ri Nuclear Test Site, the UN Security Council voted unanimously for stricter sanctions to limit exports of copper, in addition to the all-vital coal. These recent and most severe penalties are expected to cost the DPRK regime more than \$800 million annually.⁴⁰

³⁶ John Kruzel, “Is North Korea the 4th Most Sanctioned Nation?” PolitiFact, September 27, 2017, <http://www.politifact.com/truth-o-meter/statements/2017/sep/27/cory-gardner/north-korea-4th-most-sanctioned-nation/>.

³⁷ “U.N. Slaps Trade, Travel Sanctions on North Korea,” CNN, October 15, 2006, www.cnn.com/2006/WORLD/asiapcf/10/14/nkorea.sanctions/.

³⁸ Ewen MacAskill, “UN Approves ‘Unprecedented’ Sanctions against North Korea over Nuclear Test,” *Guardian*, June 12, 2009, <https://www.theguardian.com/world/2009/jun/12/un-north-korea-nuclear-sanctions>.

³⁹ MacAskill.

⁴⁰ Eleanor Albert, “What to Know About the Sanctions on North Korea,” Council on Foreign Relations, January 3, 2018, <https://www.cfr.org/background/what-know-about-sanctions-north-korea>.

Nevertheless, these sanctions, specifically designed to curb the proliferation of WMD, have failed. At the end of 2017, for instance, the DPRK had carried out at least six nuclear weapon tests, the last causing a 6.3-magnitude earthquake.⁴¹ The DPRK “claims the device is a hydrogen bomb that could be mounted on an intercontinental missile. A nuclear weapons monitoring group describes the weapon as up to eight times stronger than the bomb dropped on Hiroshima in 1945.”⁴²

As sanctions have increased, so has the regime’s ingenuity in advancing illicit cross-border networks in and out of North Korea, effective in circumventing international sanctions imposed by the UN to further its procurement and advancement of WMDs. Through open-source information, we can identify five illicit networks that fund the regime through cybercrime, military equipment sales, currency counterfeiting, narcotics trafficking, and endangered rhino horn trafficking,⁴³ which advance the DPRK’s regime security and weapons programs. As the international community continues to impose harsher sanctions, the DPRK has successfully increased these networks’ effectiveness, as well as the profits they earn. In fact, since Kim Jong-un (KJU) has assumed power he has prioritized educating DPRK officials about international trade, finance, and transportation.⁴⁴ This in-depth understanding of international trade counters the popular argument that the DPRK is a “hermit kingdom;” the regime has successfully disguised its illegal activities within legal networks.

⁴¹ “North Korea Nuclear Timeline Fast Facts,” CNN, last modified April 3, 2018, www.cnn.com/2013/10/29/world/asia/north-korea-nuclear-timeline---fast-facts/index.html.

⁴² CNN.

⁴³ Jim Finkle, “Cyber Security Firm: More Evidence North Korea Linked to Bangladesh Heist,” Reuters, April 3, 2017, <https://www.reuters.com/article/us-cyber-heist-bangladesh-northkorea/cyber-security-firm-more-evidence-north-korea-linked-to-bangladesh-heist-idUSKBN175214>; James Pearson and Rozanna Latiff, “North Korea Spy Agency Runs Arms Operation out of Malaysia, U.N. Says,” Reuters, February 26, 2017, <https://www.reuters.com/article/us-northkorea-malaysia-arms-insight/north-korea-spy-agency-runs-arms-operation-out-of-malaysia-u-n-says-idUSKBN1650YE>; Julian Ryall, “North Korea May Have Resumed Counterfeiting Operation,” *Telegraph*, June 28, 2016, <http://www.telegraph.co.uk/news/2016/06/28/north-korea-may-have-resumed-counterfeiting-operation/>; “North Korean Drug Ship to Be Sunk,” CNN, March 22, 2006, <http://www.cnn.com/2006/WORLD/asiapcf/03/22/nkorea.pongsu>; Julian Ryall, “North Korean Diplomats Linked to Lucrative Rhino Horn Trade in Africa,” *Telegraph*, July 13, 2016, <http://www.telegraph.co.uk/news/2016/07/13/north-korean-diplomats-linked-to-lucrative-rhino-horn-trade-in-a/>.

⁴⁴ Yojana Sharma, “North Korea: University Opens Students to the World,” University World News, May 9, 2010, <http://www.universityworldnews.com/article.php?story=20100507205720549>.

The nonprofit, data-driven research organization C4ADS found that the DPRK uses three systems of trade.⁴⁵ The first mode is *centralized*. The centralized system uses key DPRK citizens who control large companies to link the country to the rest of the world. The second mode is *limited*. The limited operation identifies PRC-DPRK trade, which is by far the largest market exploited by the DPRK's overseas networks. Open-source research shows that there are a small number of interconnected companies, but these companies account for vast portions of the trade, making them susceptible to exploitation.

A. CENTRALIZED

Due to the DPRK's police-state nature, supreme leader KJU has a small inner circle. Open-source research shows that the *centralized* method is controlled by just a few vital commercial facilitators who act as control nodes for the entire DPRK regime,⁴⁶ using shell and front companies to serve as control nodes on top of additional companies. The UN's bureaucracy and insufficient sanction enforcement measures, along with China's and Russia's unwillingness to abide, have made the DPRK more elusive than anticipated.

For example, Fan Mintian, a Chinese national who C4ADS identifies as a critical node in North Korea's network, is a principal facilitator for illegal international weapons trade with the DPRK, with the proceeds helping fund the DPRK WMD programs. An April 2016 court case referenced Fan's company, V-Star Ships Ltd., as having been investigated for "transporting weapons from Cuba to North Korea. The company was charged with transferring financial assets or resources that may reasonably be used to contribute to the [North Korean] nuclear-related programs, as well as carrying out unlicensed remittances."⁴⁷ In August 2016, the United States monitored Fan and notified Egyptian authorities of a suspicious ship flying Cambodian colors.⁴⁸ Egyptian customs agents seized

⁴⁵ Thompson, "Risky Business."

⁴⁶ Zachary Keck, "Exposed: How North Korea Secretly Funds Its Nuclear Weapons," *The National Interest* (blog), June 16, 2017, <http://nationalinterest.org/blog/the-buzz/exposed-how-north-korea-secretly-funds-its-nuclear-weapons-21198>.

⁴⁷ Thompson, "Risky Business."

⁴⁸ Joby Warrick, "Rockets Bound for Egypt Reveal North Korea's Dark Trade," *Chicago Tribune*, October 1, 2017, <http://www.chicagotribune.com/news/nationworld/ct-north-korea-rockets-egypt-20171001-story.html>.

the vessel and discovered over 30,000 rocket-propelled grenades (RPGs) and 132 tons of weapons in total; all manufactured in North Korea. North Korean RPGs have frequently been found in new war-torn regions like Syria and Lebanon.⁴⁹ The UN concluded, however, this incident was “the largest seizure of ammunition in the history of sanctions against the [DPRK].”⁵⁰

Although this web of shell and front companies is complex, major monetary transactions always go through centralized banking. The DPRK cannot hide the money within its domestic state-run banking system, which means it is traceable. When dealing with dangerous state actors, the adage “follow the money” still applies. In attempts to maintain its illicit networks and hide transactions, the Kim regime has started investing in cryptocurrencies and “gateway firms” based in foreign countries. In fact, due to increased economic sanctions against the DPRK, the regime has become “interested in Bitcoin because of its relative anonymity, since people can buy and use the currency without revealing their true identities.”⁵¹ The gateway firms are vital to the DPRK regime because they facilitate freedom of movement to monitor illicit transactions, along with access to the international financial system. Two foreign (Chinese) firms that the C4ADS singles out are the Liaoning Hongxiang Group and its parent company, Dandong Hongxiang Industrial Development Co. Ltd (DHID).⁵²

⁴⁹ Steve Mollman, “The War in Syria Has Been Great for North Korea,” *Quartz* (blog), April 19, 2017, <https://qz.com/962995/the-war-in-syria-has-been-great-for-north-korea/>

⁵⁰ Joby Warrick, “A North Korean Ship Was Seized off Egypt with a Huge Cache of Weapons Destined for a Surprising Buyer,” *Washington Post*, October 1, 2017, https://www.washingtonpost.com/world/national-security/a-north-korean-ship-was-seized-off-egypt-with-a-huge-cache-of-weapons-destined-for-a-surprising-buyer/2017/10/01/d9a4e06e-a46d-11e7-b14f-f41773cd5a14_story.html?utm_term=.7a85041fd1d3.

⁵¹ Yoochul Kim, “Behind South Korea’s Cryptocurrency Boom,” *MIT Technology Review*, December 7, 2017, <https://www.technologyreview.com/s/609561/behind-south-koreas-cryptocurrency-boom/>.

⁵² Thompson, “Risky Business.”

The Chinese-based DHID, recently subject to U.S. sanctions, has executed over US\$500 million in trade on behalf of, and directly benefitting to, the DPRK regime.⁵³ As a self-described as a large-scale import-export company specializing in China–DPRK trade, DHID facilitated the movement of North Korean goods through Chinese channels. Being a large business on the DPRK–China border, the DHID also played an essential role for the DPRK as a financial intermediary for Korea Kwangson Banking Corporation (KKBC) – an already sanctioned bank.

To distort its links to KKBC and the DHID, the DHID has maintained at least 43 front companies around the world. “Department of Justice documents state that DHID used at least 22 companies to engage in U.S. dollar transactions, moving nearly US\$75 million through the United States’ financial system.”⁵⁴ The DPRK was able to conduct business operations that appeared to originate from “the British Virgin Islands, Seychelles, England, Wales, or Hong Kong.”⁵⁵

Despite steps to hide transactions through the use of front companies, DHID itself proved to be a lynchpin in the process. Repeated use of the same parent company in the DHID and commercial facilitator, Fan Mintian, exposed multiple illicit weapons and banking transactions. This indicated “the limited nature of North Korean overseas networks and thus their potential vulnerability to large-scale disruption through the removal of specific tactical nodes within these networks.”⁵⁶ Because of this, since taking office at the end of 2016, President Trump has started sanctioning China to affect the DPRK indirectly—something the previous administration refused to do. “Washington has decided that pressuring Chinese companies is essentially the only option left, short of a war on the Korean Peninsula,” *Newsweek* reported in July 2017. It remains to be seen whether the current administration’s tactics can efficiently hinder the regime’s agenda.

⁵³ C4ADS and The Asan Institute for Policy Studies, *In China’s Shadow: Exposing North Korean Overseas Networks* (Seoul: The Asan Institute for Policy Studies, 2016), <https://static1.squarespace.com/static/566ef8b4d8af107232d5358a/t/57dfe74acd0f68d629357306/1474291539480/In+China%27s+Shadow.pdf>.

⁵⁴ Thompson, “Risky Business.”

⁵⁵ Thompson.

⁵⁶ Thompson.

B. LIMITED

While the DPRK regime has shown adaptability in the face of harsh international sanctions, its options to maintain economic fluidity are still restricted. Harvard-based North Korea specialist John Park said in an interview with *CNN*, “North Korean overseas networks have been extremely adaptive to the combined pressures of international sanctions, in large part due to their ability to nest and disguise their illicit business within the licit trade.”⁵⁷ This ability is exacerbated by the fact that the state controls all of the DPRK’s major international trading companies. It was inevitable that, as the DPRK became more isolated from the West and international trade partners, it developed a dependence on trade with China. This link gives us an advantage when mapping illicit networks into and out of the DPRK, as “China sent North Korea about \$2.8 billion in exports last year, Chinese customs data show, and Beijing provides up to 90 percent of the country’s energy supplies [including] more than \$100 million in steel, almost \$50 million of fuel oil and tens of millions of dollars’ worth of rice and fertilizer.”⁵⁸ Hidden amongst the trade, the DPRK regime has reportedly exploited the ability to receive Chinese missile components, unmanned aerial vehicle technology, mobile missile launchers, and counterfeit cash.⁵⁹ Coal is, by far, the largest market between the PRC and the DPRK. However, as of February 2016, PRC CCP leadership had suspended the DPRK coal imports for the remainder of the year. The coal ban notwithstanding, trade in other commodities

⁵⁷ Joshua Berlinger and Zachary Cohen, “The Secrets behind Kim Jong Un’s Personal Piggy Bank,” *CNN*, July 20, 2017, <https://www.cnn.com/2017/06/20/politics/north-korea-illicit-money/index.html>.

⁵⁸ “China Can Do More Than Stop Buying Coal to Squeeze Pyongyang,” *Bloomberg*, February 21, 2017, <https://www.bloomberg.com/news/articles/2017-02-21/china-can-do-more-than-stop-buying-coal-to-pressure-north-korea>.

⁵⁹ Joby Warrick, “Salvaged Parts Show Chinese Firms Supplied Key Components for North Korea’s Rocket Program,” *Toronto Star*, April 13, 2017, <https://www.thestar.com/news/world/2017/04/13/salvaged-parts-show-chinese-firms-supplied-key-components-for-north-koreas-rocket-program.html>; “Reports,” United Nations Security Council Subsidiary Organs, accessed February 12, 2018, https://www.un.org/sc/suborg/en/sanctions/1718/panel_experts/reports; James Pearson and Jack Kim, “North Korea Appeared to Use China Truck in its First Claimed ICBM Test,” *Reuters*, July 4, 2017, <https://www.reuters.com/article/us-northkorea-missiles-china-truck/north-korea-appeared-to-use-china-truck-in-its-first-claimed-icbm-test-idUSKBN19P1J3>; Elizabeth Shim, “North Korea Printing Massive Amounts of Fake Chinese Currency, Defectors Say,” *UPI*, June 23, 2016, https://www.upi.com/Top_News/World-News/2016/06/23/North-Korea-printing-massive-amounts-of-fake-Chinese-currency-defectors-say/2891466694503/.

fluctuated, reflecting an otherwise healthy trade relationship.⁶⁰ Furthermore, to continue the export of coal, the DPRK evolved yet again. In January 2018, Reuters reported that the DPRK used the Nakhodka and Kholmsk ports in Russia to facilitate coal exportation to South Korea and Japan. According to a European security official, “Russia’s port of Nakhodka is becoming a transshipping hub for North Korean coal.”⁶¹ However, Thompson notes that a deep analysis of the flow of trade could facilitate isolating aspects of the networks, thereby facilitating sanction enforcement.⁶²

C. VULNERABLE

Because the DPRK has a limited number of companies—and a limited number of people running those companies, the capability to attack a few but affect many is a vulnerability. Likewise, because these entities require the use of legal “trade, transportation, and finance to conduct core business operations, they are also visible and vulnerable to law enforcement action.”⁶³ Although sanctions have significantly restricted the DPRK’s legal trade activity, they have not curtailed the DPRK’s remarkable ability to hide or disguise much of its cross-border trade, and they, therefore, have not achieved the West’s overall strategic goal of preventing another non-Western nuclear power. However, “by monitoring the specific trade flows that [the few DPRK] companies conducts, in addition to analyzing the network structures of firms playing a central role in China-North Korea trade, it may be possible to identify signals of illicit activity.”⁶⁴ Signals of illicit activity are almost always trade in the form of weapons and, in the case of the DPRK, missile parts.

⁶⁰ Simon Denyer, “China Bans North Korean Iron, Lead, Coal Imports as Part of U.N. Sanctions,” *Washington Post*, August 14, 2017, https://www.washingtonpost.com/world/china-bans-north-korea-iron-lead-coal-imports-as-part-of-un-sanctions/2017/08/14/a0ce4cb0-80ca-11e7-82a4-920da1aeb507_story.html?utm_term=.2c02a03f9025.

⁶¹ “Exclusive: Despite sanctions, North Korea exported coal to South, Japan via Russia – intelligence sources,” Reuters, January 26, 2018, <https://www.reuters.com/article/us-northkorea-missiles-coal-russia/exclusive-despite-sanctions-north-korea-exported-coal-to-south-and-japan-via-russia-intelligence-sources-idUSKBN1FE35N>.

⁶² Thompson, “Risky Business.”

⁶³ Thompson.

⁶⁴ Thompson, 22.

To accurately track international trade, we can take advantage of the Harmonized Commodity Description and Coding Systems, introduced in 1988 and globally accepted as “an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes.”⁶⁵ Through this system, all internationally traded goods can be tracked and sanctions, when applicable, can be enforced.

Table 1. Harmonized System Product Codes and Descriptions⁶⁶

Code	Description
9306.90	Bombs, grenades, torpedoes, mines, missiles and similar munitions of war and parts thereof
9014.20	Instruments and appliances for aeronautical or space navigation (other than compasses)
8802.60	Spacecraft (including satellites) and suborbital and spacecraft launch vehicles
8803.90	Parts for 8802.60
8526.10	Radar
8412.10	Reaction engines other than turbo-jets
8411.11	Turbo-jets: Of a thrust not exceeding 25 kN
8526.91	Radio navigational aid apparatus
8463.90	Other machine-tools for working metal or cermet's, without removing material
6815.10	Non-electrical articles of graphite or other carbon
2825.10	Hydrazine and hydroxylamine and their inorganic salts
3801.10	Artificial graphite
3801.90	Preparations based on graphite or other carbon in the form of blocks, plates or other semimanufactures

⁶⁵ “Harmonized Commodity Description and Coding Systems (HS),” UN Trade Statistics, accessed February 20, 2018, <https://unstats.un.org/unsd/tradekb/Knowledgebase/50018/Harmonized-Commodity-Description-and-Coding-Systems-HS>.

⁶⁶ Adapted from Anna R. Schechter et al., “Did Owner of Million-Dollar U.S. Home Help North Korea Evade Sanctions?” NBC News, August 22, 2017, <https://www.nbcnews.com/news/north-korea/did-owner-million-dollar-u-s-home-help-north-korea-n794921>.

According to the C4ADS, the single most significant trader of dual-use equipment is the Dandong Dongyuan Co. Ltd. (DDC), a general-purpose international trading company that sells automobiles, machinery, natural resources, and household products to North Korea, the Democratic Republic of the Congo, and the United States. Although specific shipments could be targeted and likely sanctioned, it would be better to map the illicit network in which the particular shipment operates to find weaknesses that can be exploited. What is most important about the DDC, however, is that, according to the Chinese business registry, a single majority shareholder, named Sun Sidong, owns 97 percent of the company. Sun is a Chinese national who also owns the “Jieshun Shipping Limited, a company that, according to Equasis shipping records, was the owner of the *Jie Shun* from April 14, 2012, to August 10, 2014.”⁶⁷ However, when the Egyptians captured the *Jie Shun* carrying the illegal RPGs hidden on board, Vast Win Trading Limited out of Hong Kong, owned it.

It should be noted, however, that “Mr. Sun is also listed as the president of a company based in the United States.”⁶⁸ This gives Sun freedom to operate in and around the United States and its allies without any apparent ties to PRC–DPRK business ventures. By investigating the companies associated with Sun, the C4ADS was able to identify links between Sun’s network and the Dandong Zhicheng Metallic Materiel Co. Ltd. Although it is not yet possible to prove Sun’s illegal cooperation with the DPRK, this link demonstrates that the DPRK’s trade network is much more intertwined with licit and illicit entities than is readily apparent. Ultimately, this singularity within the DPRK shows vulnerabilities that can be mapped and used as leverage to deter the DPRK from furthering its WMD program.

D. KEY TAKEAWAYS

To curb the DPRK’s illicit networks, it is essential to understand that the DPRK regime has spent decades trying to develop illicit finances. While international sanctions against the DPRK have encouraged the regime to push harder for nuclear proliferation,

⁶⁷ Equasis, accessed February 20, 2018, <http://www.equasis.org/EquasisWeb/public/HomePage>.

⁶⁸ Thompson, “Risky Business.”

C4ADS points out that effective enforcement can still result in significant progress, as highlighted by the actions taken against Dandong Hongxiang in 2016. The indictment and forfeiture action were examples of the United States' ability to impact "multiple networks across multiple countries simultaneously, removing key functions such as individuals or entities specialized in illicit finance and procurement, who cannot be easily replaced."⁶⁹ Moreover, C4ADS demonstrates that due to the centralized and limited nature of the DPRK regime's illicit networks, we can illuminate them and expose their vulnerability to exploitation through diligent open-source analysis.

⁶⁹ Thompson, "Risky Business."

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III. USING SOCIAL NETWORK ANALYSIS TO ILLUMINATE DARK NETWORKS

Illuminating the North Korean dark network focuses on identifying those actors in the network, using social network analysis (SNA) to better understand the structural and relational ties between actors in the network, and identify locations where North Korea conducts procurement and proliferation activities to support the regime. By developing a macro-level look at the North Korean network, we can better identify, differentiate, locate and prioritize between harder-to-reach central actors and peripheral actors that are accessible and vulnerable to disruption. Additional examination of the network using SNA helps to identify conducive conditions that support illicit network relationships, economic opportunity, mobility, and accessibility. SNA helps us visualize North Korea on a global level, leading to possible regional approaches that will pressure or disrupt the Kim regime to leverage conditions in favor of UN and U.S. efforts.

A quick and simple approach to SNA requires understanding key terminology. SNA involves detecting and interpreting patterns of social ties among actors.⁷⁰ In SNA, an ‘actor’ includes “individuals, organizations, communities, nations, etcetera that are involved in social relations.”⁷¹ By understanding the relationship within a network and between actors, the network and its actors can be better understood in terms of importance and functionality. Social network analysis conducted on the North Korean network focuses on identifying actors’ centrality (indications of power) within the network. Using the four main centrality measures within our research, the North Korean network can be understood using degree centrality (well-connected), eigenvector centrality (strong influence),

⁷⁰ Stanley Wasserman and Katherine Faust. *Social Network Analysis: Methods and Applications Reprint*. New York: Cambridge University Press, 1999.

⁷¹ Sean F Everton. *Disrupting Dark Networks*. New York, NY: Cambridge University Press, 2012.

closeness centrality (fast access to information/material), and betweenness centrality (facilitator/collaborator).⁷²

Using these centrality measures helps analyze social networks to better understand the power and position of actors in a network. Since North Korean efforts focus on acquiring and proliferating materials, technology, and weapons of mass destruction, this network is a good example of a dark network. Dark networks are “covert and illegal networks that purposefully try to hide their existence and activities.”⁷³ The North Korean network spans continents and must be understood from a macro-level. Understanding the network as a whole allows us to develop a methodology in determining what actions can be taken to disrupt the network’s activities. Furthermore, parts of the network essentially remain protected in areas where actions can cause further international issues or conflict (e.g. China, Russia, and North Korea). While coercion can be leveraged, those actions tend to come with a higher cost, diplomatically, but also come with less likelihood of success. Hence, if those actors most central to the network are hardest to affect or cannot be targeted directly, those actors on the periphery of the network that are susceptible must be identified and located. At a macro-level, the data acquired in our research allows us to identify and locate areas to focus on North Korean shipping, international companies, and diplomats/businessmen.

A. DATASET DESCRIPTION AND FRAMEWORK

Ultimately, this analysis focuses on presenting the DPRK regime’s illicit network structure, identifying those entities central to the regime’s operations, identifying external entities most vulnerable to disruption outside North Korea, and extrapolating where, how, and why the regime can circumvent sanctions and sustain itself. We derived information

⁷² *Degree centrality* measure refers to actors with a high number of ties, meaning the actor is well-known and connected. *Eigenvector centrality* refers to actors with high number of ties to highly centralized actors, meaning the actor has strong social capital or influence. *Betweenness centrality* measure refers to actors that are on the shortest geodesic distance (think seven-degrees of Kevin Bacon) between two actors in a network, meaning the actor is a facilitator, collaborator of information or materials. *Closeness centrality* measures refers to actors that are closer to all other actors than others in the network, meaning the actor has fast access to information or materials.

⁷³H. Brinton Milward and Jörg Raab. “Dark Networks as Organizational Problems: Elements of a Theory 1.” *International Public Management Journal*, no. 3 (September 1, 2006): 333–360.

about the regime’s illicit activities network from an extensive collection of second-hand, open-source data from the UNSC and UN Panel of Experts, and U.S. Department of the Treasury reports and sanctions database.⁷⁴ These databases compile compliance reports from UN member states around the globe that identify current North Korean personnel, businesses, shipping information, and government dealings. This compilation of data provides a new and unique opportunity to understand the DPRK regime’s covert activities, which operate under the guise of legitimate business activities.

We also use additional maritime and relational information from multiple maritime databases to expand upon locations that ships have visited and determined which companies or subsidiaries associated with the vessels.⁷⁵ Specifically, the Asia-Pacific Port State Control (APPSC) database is the primary source for correlating maritime vessel traffic, controlling companies, and determining which ports serve as central facilitation hubs.⁷⁶ The APPSC database allows us to associate known ports that sanctioned North Korean ships have visited with their parent companies. Confirming North Korean maritime traffic is based on ship-inspection reports conducted by national port-control authorities in each country, which are filed and maintained in an open-source database in Japan, and publicly accessible. Businesses and nations use this database to track the safety of maritime vessels and assess possible risks each ship may pose to day-to-day port operations. These inspection reports provide evidence of North Korean ships being present at locations in the Pacific by an independent third party. By verifying past sanctioned vessels, we can examine where, how, and why North Korean ships conducted business. Correlating the presence of North Korean companies and vessels at ports allows us to illustrate the areas that North Korea principally relies on to continue business activities and generate revenue for the

⁷⁴ United Nations Security Council, *Final Report of the Panel of Experts Submitted Pursuant to Resolution 2276 (2016)*, S/2017/150 (New York: United Nations, 2017), www.securitycouncilreport.org/atf/cf/%7b65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7d/s_2017_150.pdf; U.S. Department of the Treasury, “North Korea Sanctions.”

⁷⁵ “Live Map,” MarineTraffic, accessed March 6, 2018, <https://www.marinetraffic.com/>; SeaVision, accessed March 6, 2018, <https://seavision.volpe.dot.gov/>; ShipSpotting, accessed March 6, 2018, www.shipspotting.com/.

⁷⁶ Asia-Pacific Port State Control Tokyo Memorandum of Understanding, accessed March 6, 2018, <http://www.tokyo-mou.org>.

regime. Additionally, various news reports corroborate North Korean ship movements, though these constitute a smaller portion of the dataset. These sources expand outside the Asia–Pacific area and include known incidents that expose DPRK regime actions.

The SNA research conducted is limited to the U.N. Panel of Experts reports and U.S. Department of the Treasury sanctioning lists, which detail the people, ships, and companies North Korea controls, coordinates, and works with, along with non-regime-controlled entities (e.g., proxies, and witting and unwitting business) that either coordinate or facilitate regime activities. Therefore, any person, organization, or ship identified by the U.N. or U.S. Department of the Treasury is included in this project. These entities have either been sanctioned or are under suspicion of nefarious activities.

Further investigation is possible to identify and understand the subsidiaries, parent companies, and business transactions through various global business databases; however, this project is limited to describing those already identified. Further investigation is needed to explain the regime network more thoroughly, but obstacles include access to specific corporate records, bills of lading, cargo manifests, inter-port transfer of goods records, and national databases, as well as language barriers.

1. Relational Definitions

We established three relational ties to analyze: ship-to-organization (two-mode), organization-to-organization (one-mode), and representative-to-organization (two-mode).⁷⁷ The following definitions describe these aspects.

Ship: A water-going vessel for transporting people or goods.

Organization: An administrative and functional system that controls the execution of activities dealing with materials and communications, employs people, conducts financial relations, and ensures logistical sustainment of activities. For this project,

⁷⁷ Here one-mode data refers to relational networks where all actors in the network are similar. That is to say, a network comprised of only people is a one-mode network, as is a network of only companies. A two-mode network refers to a network that is comprised of different actors. An example of this would be a network that includes ships and organizations, where a ship is an individual actor, but a company (while still counted as one actor in the network) is made up of many people, companies, relationships, etc.

organizations include commercial businesses, national agencies, and governments, as many of the North Korean companies are state-owned, controlled, and operated. State-owned and operated companies are knowingly involved in executing operations as directed and transferring funds back to the North Korean regime.

Representative: An individual who is conducting or receiving, or otherwise involved in, internal and external communications through some medium between entities that agree to, broker for, facilitate, or obfuscate illicit business activities on behalf of entities tied to the North Korean regime and business practices.

2. Relational Attributes

Location: The physical place (city and nation) worldwide (applies to ships, organizations, and representatives).

Organizational Sector: The role, function, and/or area in which *both* individuals and organizations primarily operate (applies to organizations and representatives only):

- Commercial
- Construction
- Financial
- Government
- Manufacturing
- Military
- Service/labor
- Shipping

Ship Type: The design and configuration utilized to serve a specific functional maritime shipping use (applies to ships only):

- Bulk carrier
- Chemical tanker
- General cargo/multipurpose

- Oil tanker
- Other—special activities
- Refrigerated cargo
- Unknown

B. THE DPRK REGIME’S RESOURCING NETWORK

The North Korean network is comprised of 432 actors that have been separated into three different relational networks for analysis, which were then aggregated into a one-mode network for analysis. Analyzing 1,257 ties, North Korean activities were separated into three relationships: ship-to-organization, organization-to-organization, and representative-to-organization. At the center of each relational network are the organizations. The organizations are common-to-all networks being analyzed and enable us to aggregate all the networks together to conduct a final one-mode analysis of the North Korean network. Each link is distinct in that we can separate it for network analysis, but one can also combine the links to explore the regime’s network in more detail.

First, drawing the network helps to show its topographic features to understand centralization and density. Second, manipulating visual characteristics, such as changing the color and size of nodes and ties, help correlate the attributes and display summation of the relations, enabling us to visualize each respective relationship further. Third, by collapsing the network and examining clustering and subgroups, we can also derive the network’s tendencies and how the regime appears to maintain interactions and connections. Lastly, folding representative-to-organization and ship-to-company networks by locational data help us identify those locations that serve as main facilitation hubs (wittingly or unwittingly). It is not enough to understand how the network is structured; we must also understand how and where it operates. By identifying the structure of the network, we can better understand how each network works and what to look for; and by identifying locational data, we can know where to look. This mapping will be a significant consideration in developing strategies in line with the U.S. national policy to continue the “maximum pressure” campaign and increase leverage against the DPRK regime.

1. Ship-to-Organization Network

The ship-to-organization network is composed of 147 ships and 432 organizations, including locational data of 144 Asian ports from 1,740 ship inspection reports. The network level measures and visual illustration (see Figure 1) indicate that this relational network is highly fragmented (0.93), is dispersed (low-density score of 0.008), and is decentralized (low-degree centralization of 0.013). Since maritime vessels are registered to companies and operate commercially, it is reasonable that no central or parent company runs all these shipping companies. The focal point is understanding ship-to-shipping company association and understanding where ships and companies operate. Of note are the ships sharing ties with multiple companies, indicating a closer relationship between companies and commercial activities. We display the key players within the ship-to-organization network in Table 2.

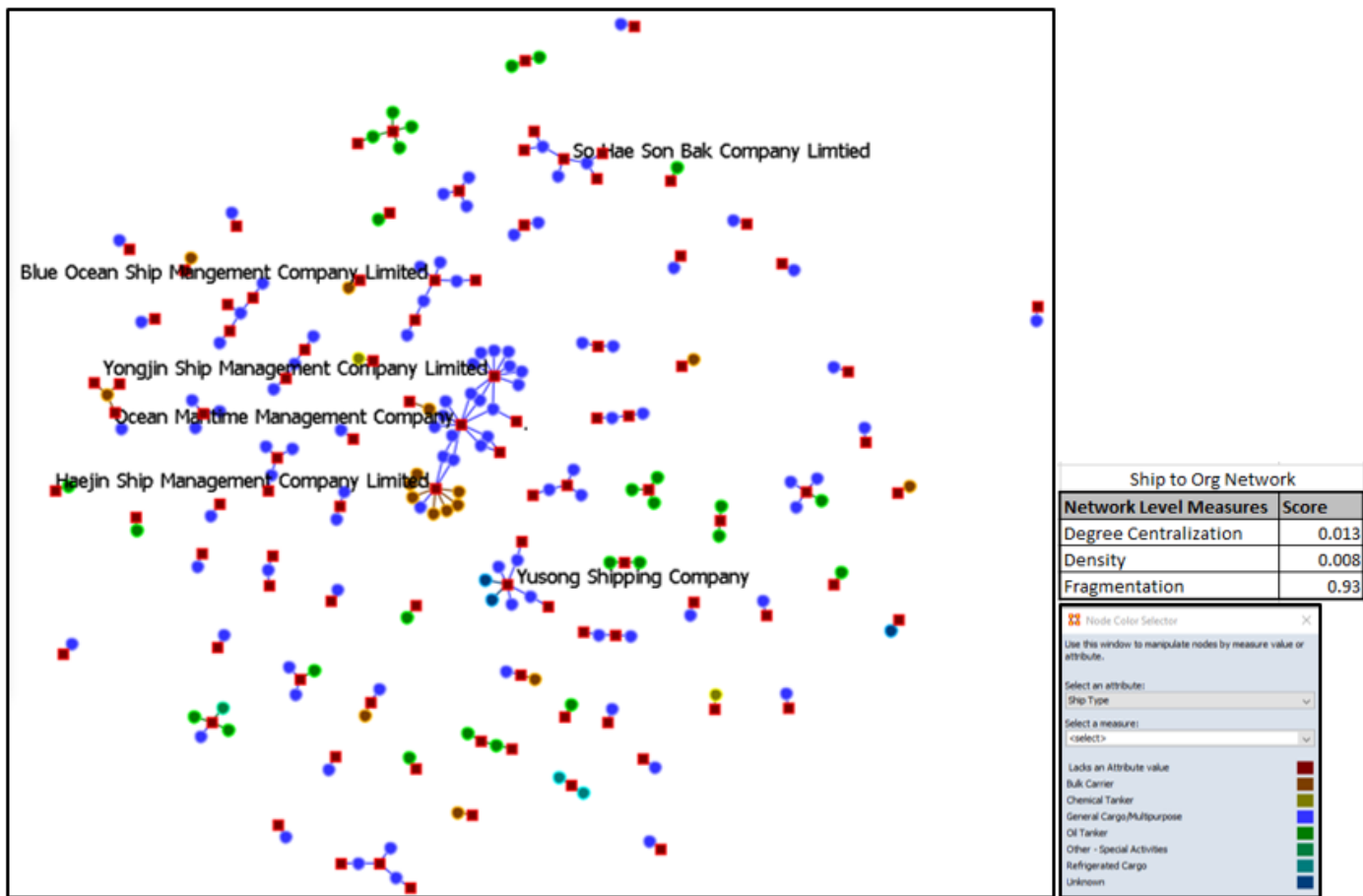


Figure 1. The DPRK Regime's Ship-to-Organization Network (Folded Network Based on Locational Attribute)⁷⁸

⁷⁸ Adapted from sources referenced in Chapter III.

Table 2. UCINET Ship-to-Organization Network Multi-Measure Analysis Results⁷⁹

Rank	Degree		Closeness (ARD)		Eigenvector		Betweenness	
	Organization	Value	Organization	Value	Organization	Value	Organization	Value
1	Ocean Maritime Management Company	0.012	Ocean Maritime Management Company	0.012	So Hae Son Bak Company Limited	0.788		
2	So Hae Son Bak Company Limited	0.009	So Hae Son Bak Company Limited	0.009	Sea Bridge International Shipping Limited	0.308		
3	Yongjin Ship Management Company Limited	0.005	Tae Dong Gang Sonbak Company Limited	0.008	Am Nok Gang Management Company Limited	0.308		
4	Sea Bridge International Shipping Limited	0.005	Yongjin Ship Management Company Limited	0.007	Korea Suhyang Shipping Company Limited	0.308		
5	Am Nok Gang Management Company Limited	0.005	Am Nok Gang Management Company Limited	0.007	Paek Ma Gang Shipping Company Limited	0.308		
6	Korea Suhyang Shipping Company Limited	0.005	Korea Suhyang Shipping Company Limited	0.007				
7	Paek Ma Gang Shipping Company Limited	0.005	Paek Ma Gang Shipping Company Limited	0.007				
8	Korea Marine & Industrial Trading Company	0.005	Haejin Ship Management Company Limited	0.007				
9	Yusong Shipping Company	0.005	Korea Samilpo Shipping Company	0.007				
10	Hai Shen Shipping Company Limited	0.005	Mirae Shipping Company Limited	0.007				

**limited eigenvector and no betweenness based on the fragmented system.

⁷⁹ Adapted from sources referenced in Chapter III.

After folding the network and utilizing locational attribute data, we created an indirect, relational network. By fusing 147 different ships and locational data of 1,740 ship inspection reports at various ports throughout Asia, a locational-relational network presents an interface that can provide a geospatial understanding of where North Korean ships' activity is most substantial. This locational network illustrates indirect ties between 144 different ports in countries where ships and parent companies conduct business and transit (see Figure 2).

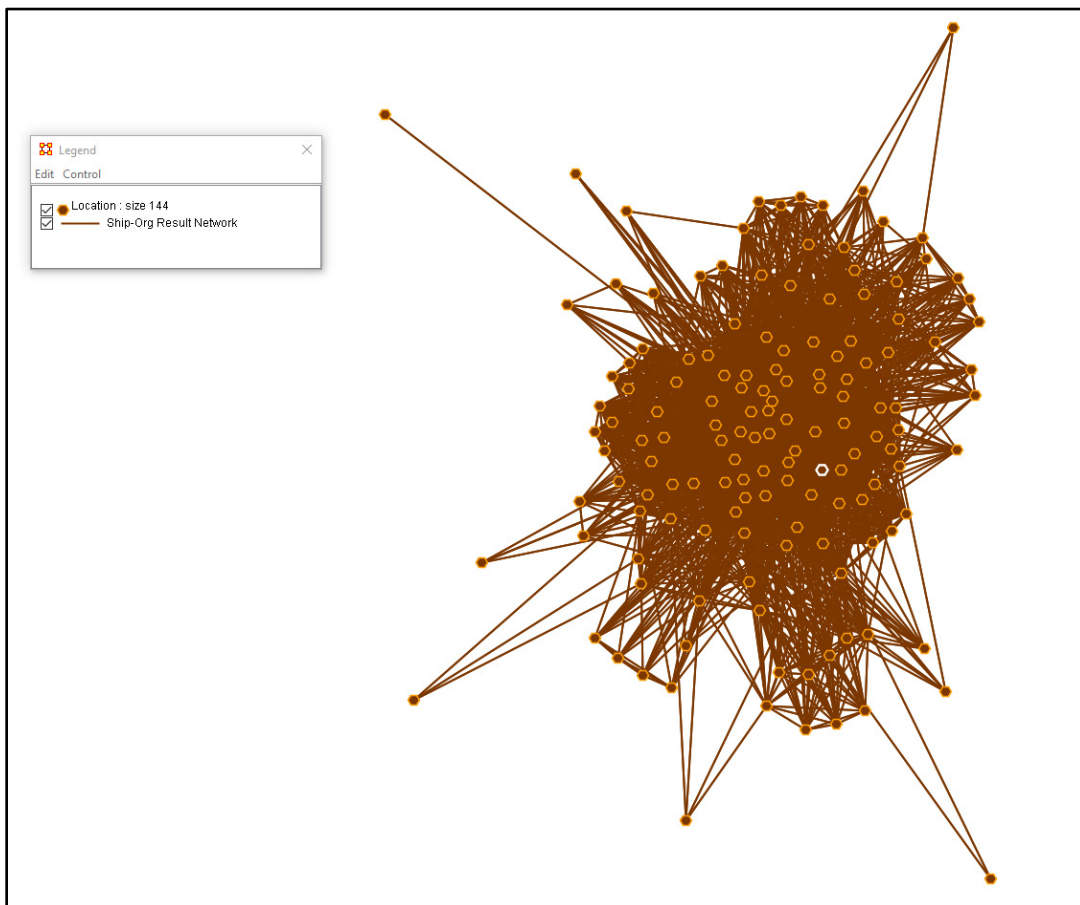


Figure 2. The DPRK Regime's Ship-to-Organization Network (Folded Network Based on Locational Attribute)⁸⁰

⁸⁰ Adapted from sources referenced in Chapter III.

Extrapolating the results, we develop a better understanding by shrinking the network based on the weight of ties (i.e., more activity or presence between ports). Ultimately, we see that the DPRK regime's illicit maritime network is dispersed and operates throughout the Asia–Pacific region. Rather than just accepting over 144 locations, we can develop a better strategy if we not only focus on those areas with the highest activity of North Korean ships, but also correlate expected ship traffic through more significant shipping corridors. Furthermore, by visualizing those locations with the highest activity, one can orient strategies directly against North Korea, as well as indirectly against third parties outside North Korea, including central and peripheral nodes, which we discuss later.

The network shown in Figure 3 illustrates three main subgroups, with the densest concentration in the PRC and Russia. Japan and South Korea are also prominent nodes in this network. The data range includes years 2000–2017 when open trading still took place between the nations before UN sanctions. Understanding that shipping traffic is directed to delivery locations, we evaluated hub centrality (instead of eigenvector centrality) to help identify those locations with the most prominent activity. Nakhodka, Vladivostok, Slavyanka and Vostochny, Russia, are within 85 miles (140 kilometers [km]) of one another and between 180–380 miles (290–610 km) away from the main eastern North Korean ports of Wonsan and Chongjin—compared to Yantai, Dalian, Rizhao, Jinzhou, and Yinkou, PRC, which are between 200–430 miles (320–680 km) away from the central western North Korean port of Nampo.

As expected, the majority of shipping has taken place through Russian and Chinese ports. The remaining ports of southern coastal PRC are logically based on the access to the significant trading market. Of note, however, is the presence of three larger ports outside of the PRC and Russia: Manila, Philippines; Haiphong, Vietnam; and Bangkok, Thailand. These ports are essential and analyzed further in the conclusions and recommendations section.

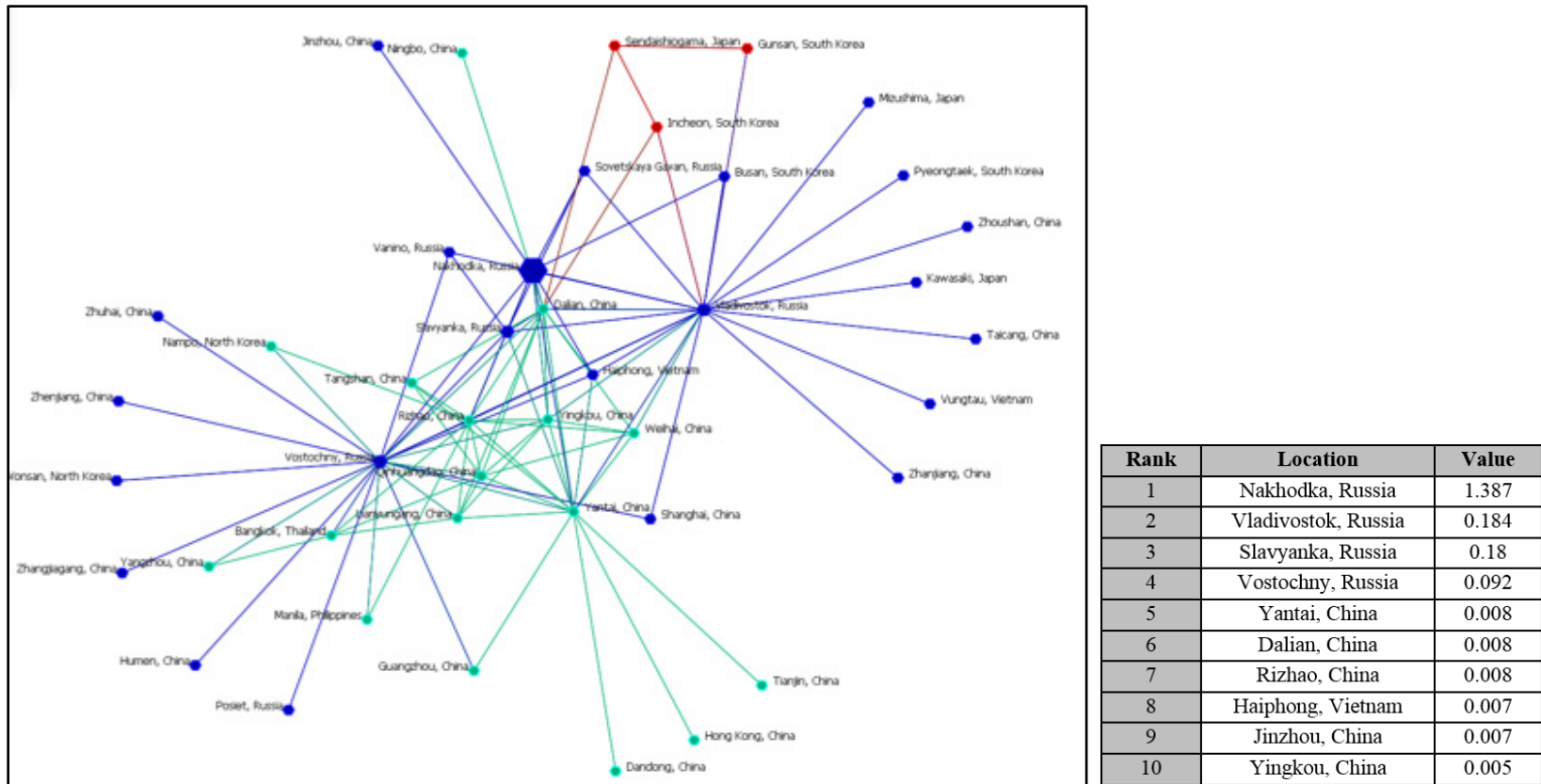


Figure 3. The DPRK Regime’s Ship-to-Location Network (Weighted Links—50+, Color by Newman, Size by Hub Centrality)⁸¹

⁸¹ Adapted from sources referenced in Chapter III.

2. Representative-to-Organization Network

The representative-to-organization network includes 161 individuals and 432 organizations, including data of 49 locations around the globe. The network level measures and visual illustration (see Figure 4) indicate that this relational network is similar to the ship-to-organization relational network and is highly fragmented (0.865), is dispersed (low-density score of 0.091), and is decentralized (low-degree centralization of 0.099). Due to the fragmentation, we could derive the degree and closeness centrality, but due to the lack of ties between entities, could not determine the remaining centrality scores.

We identified the majority of the individuals as North Korean nationals, including diplomats and representatives of national agencies (see Table 3). Most notably, several organizations have a more substantial number of representatives spread throughout Asia, Africa, and the Middle East, highlighting the importance of understanding their organizational ties and *where* they operate. Representatives have shared ties with multiple companies, indicating a closer relationship between organizations for coordination and facilitation of materiel and informational activities. Due to the network's fragmentation, it is not conducive to determining the relational ties between actors; however, the locational data allow us to derive and infer relations based on shared representatives and companies.

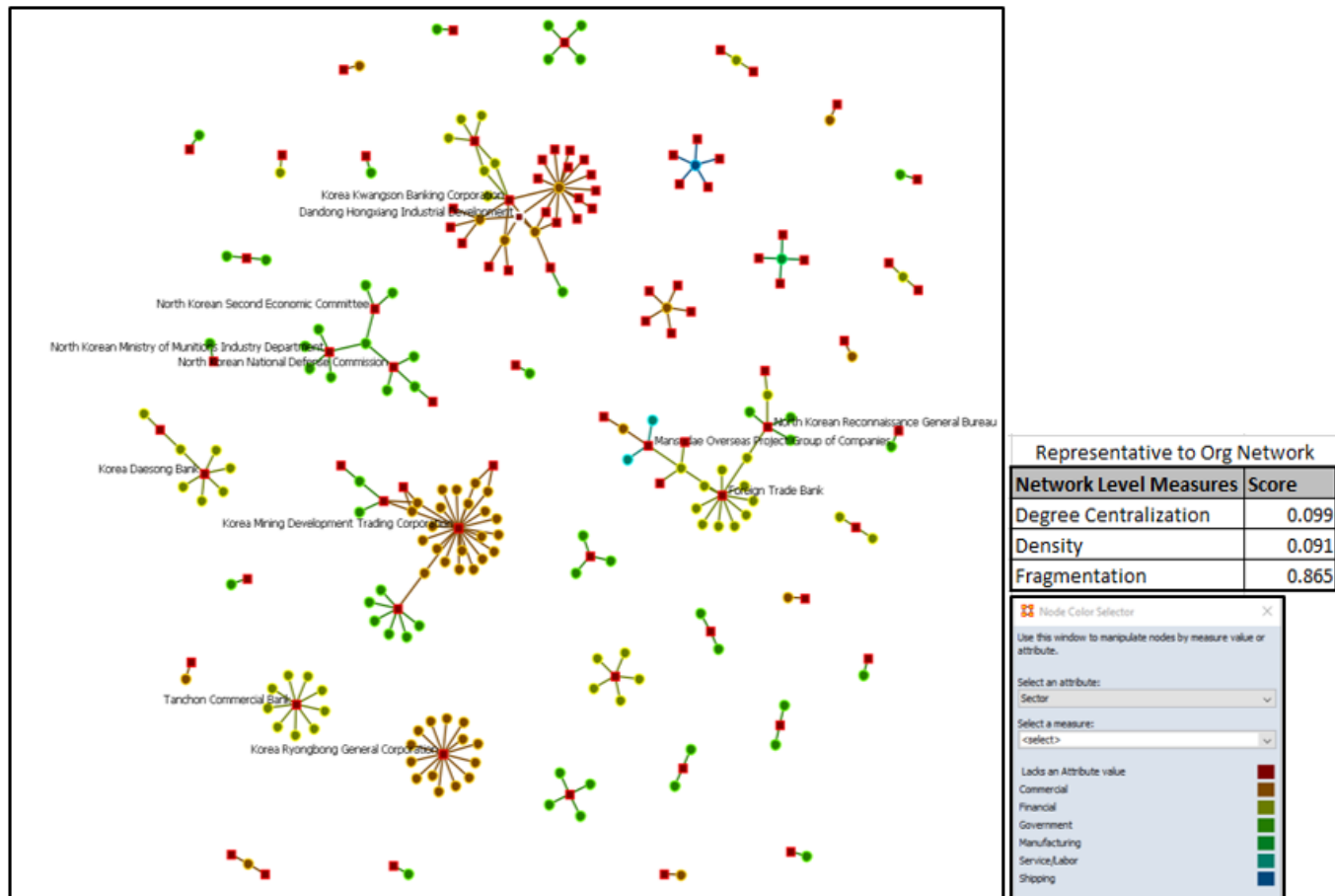


Figure 4. The DPRK Regime's Representative-to-Organization Network (Colored by Attribute, Isolates Hidden)⁸²

⁸² Adapted from sources referenced in Chapter III.

Table 3. UCINET Representative-to-Organization Network Multi-Measure Analysis Results⁸³

Rank	Degree		Closeness (ARD)		Eigenvector		Betweenness	
	Organization	Value	Organization	Value	Organization	Value	Organization	Value
1	Korea Kwangson Banking Corporation	0.049	Korea Kwangson Banking Corporation	0.049				
2	Dandong Hongxiang Industrial Development	0.047	Dandong Hongxiang Industrial Development	0.048				
3	Best Famous	0.035	Best Famous	0.042				
4	Blue Sea Business Company	0.033	Blue Sea Business Company	0.041				
5	Carbuncle Company Limited	0.033	Carbuncle Company Limited	0.041				
6	Deep Wealth	0.033	Deep Wealth	0.041				
7	Fully Max Trading	0.033	Fully Max Trading	0.041				
8	Go Tech Investments	0.033	Go Tech Investments	0.041				
9	Hong Kong Hugo Development Limited	0.033	Hong Kong Hugo Development Limited	0.041				
10	Hong Kong Win Dragon Development	0.033	Hong Kong Win Dragon Development	0.041				

**no eigenvector and betweenness based on the fragmented network.

⁸³ Adapted from sources referenced in Chapter III.

Next, we were able to create an indirect, relational system. The fused relational-geospatial network shown in Figure 5 illustrates a concentration in Asia, Africa, and the Middle East. This network demonstrates indirect ties between nations, insofar as the representatives and their respective organizations conduct business, possibly illustrating a concerted effort in these specific locations for as of yet unknown reasons. It appears logical that representatives in Asia have ease of mobility and close access to markets and North Korea. Those representatives in the Middle East may be working to sell weapons and technology to nation states, as the DPRK regime has done with Iran and Syria.⁷³ Furthermore, those representatives located in Africa may be looking to open low-level operations in markets not highly sought after, as a means to maintain low visibility and generate business.

Much like the ship-to-organization network, understanding where representatives are operating helps develop potential strategies directly oriented toward North Korea, but also indirectly on third parties (people, companies, and nations).

⁷³ Bruce E. Bechtol, Jr., “North Korea’s Illegal Weapons Trade: The Proliferation Threat From Pyongyang,” *Foreign Affairs*, June 6, 2018, <https://www.foreignaffairs.com/articles/north-korea/2018-06-06/north-koreas-illegal-weapons-trade>.

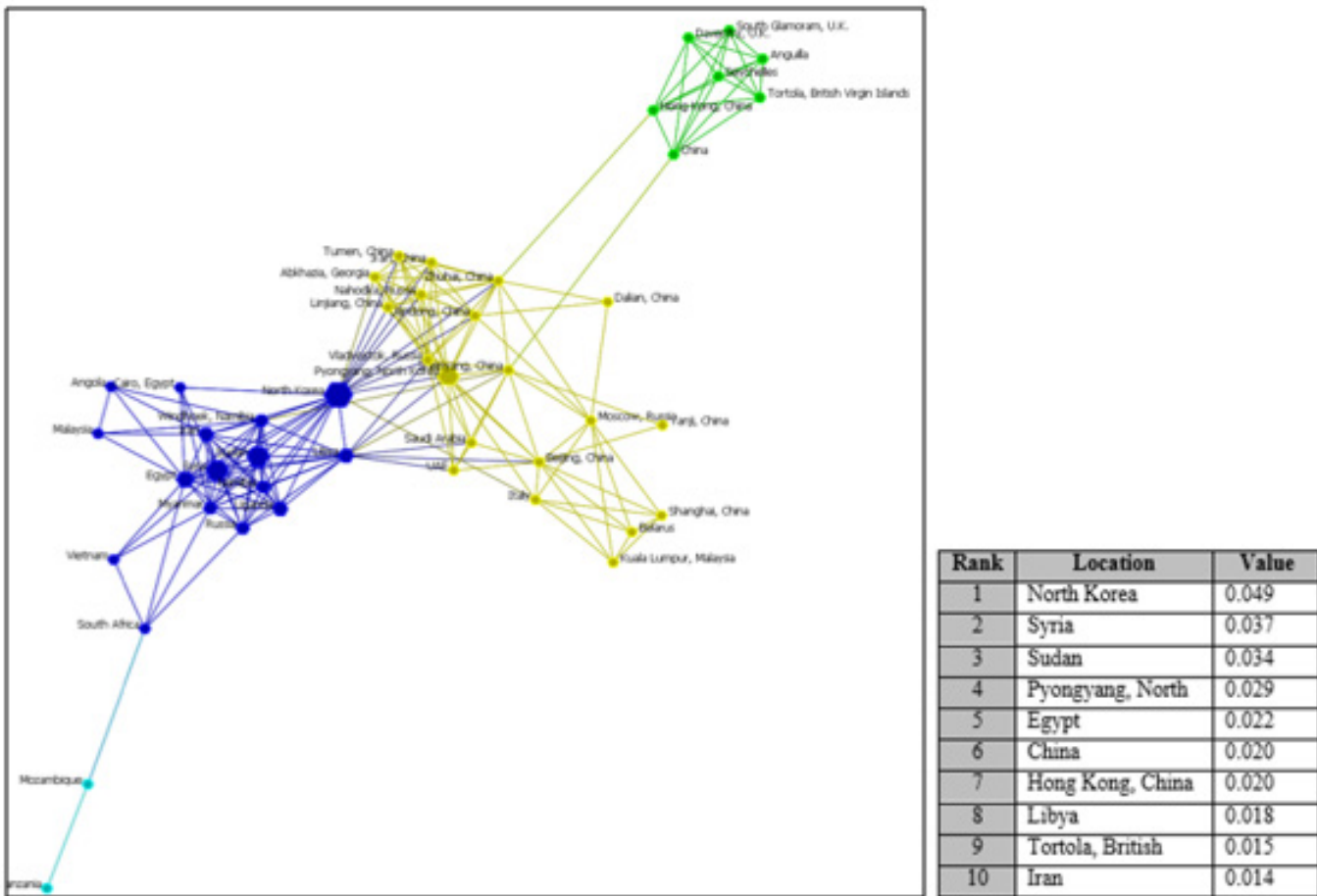


Figure 5. The DPRK Regime's Representative-to-Location Network (Color by Newman, Size by Hub, Weighted Link -1+)⁸⁴

⁸⁴ Adapted from sources referenced in Chapter III.

3. Organization-to-Organization Network

The organization-to-organization network contains 432 actors, including locational data of 75 locations around the globe. This network does possess isolates (those actors without ties to other actors in the network) but is not as heavily fragmented (0.343) as the shipping or representative networks. The network level measures illustrate that the network is decentralized (degree centralization of 0.010) and dispersed (low-density score of 0.004); however, the eigenvector value is significant, indicating that crucial facilitators or brokers are located within the network next to those most central organizations (see Figure 6).

By running centrality scores, those entities with the most significant amount of centrality and prestige emerge, as shown in Table 4.

A striking characteristic of this network is the type of organizations that have the highest eigenvector scores. Out of 432 organizations, the top 10 nodes regarding eigenvector scores are financial organizations (see Table 4). The organization-to-organization network illustrates how the network appears to operate and its reliance on financial organizations. This means that financial organizations, while a lower percentage of the overall number of organizations within the network, serve as major facilitators.

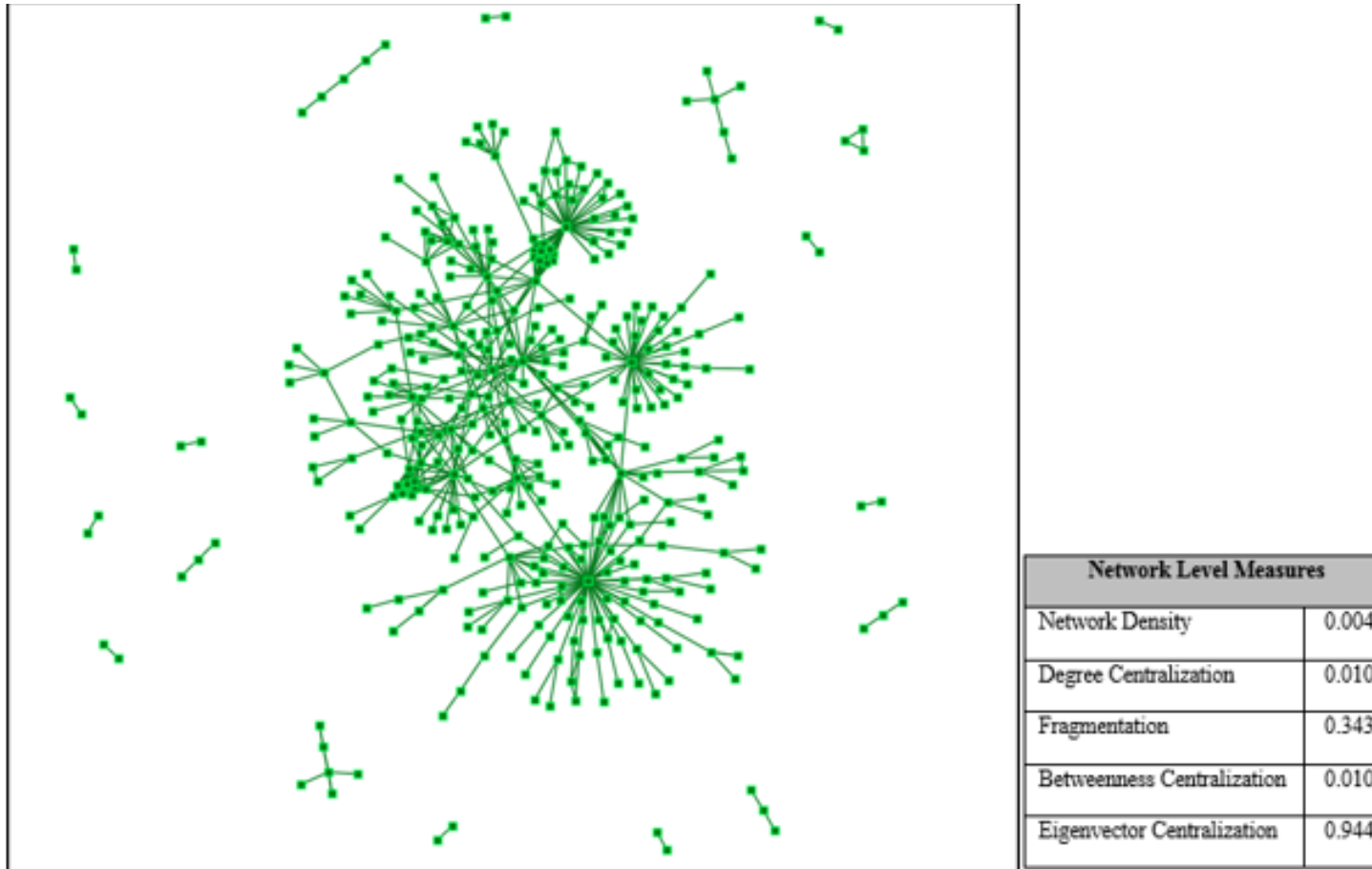


Figure 6. The DPRK Regime's Organization-to-Organization Network (Sociogram)⁸⁵

⁸⁵ Adapted from sources referenced in Chapter III.

Table 4. UCINET Organization-to-Organization Network Multi-Measure Analysis Results⁸⁶

Rank	Degree		Closeness (ARD)		Eigenvector		Betweenness	
	Organization	Value	Organization	Value	Organization	Value	Organization	Value
1	North Korean Maritime Administration	0.122	North Korean Maritime Administration	0.329	Central Bank of North Korea	0.932	North Korean Maritime Administration	0.248
2	Dandong Hongxiang Industrial Development	0.096	Malaysia-Korea Partners Group	0.323	Daedong Credit Bank	0.418	Malaysia-Korea Partners Group	0.185
3	Malaysia-Korea Partners Group	0.082	Korea Kwangson Banking Corporation	0.309	Bank of Eastland	0.360	Ocean Maritime Management Company	0.138
4	Korea Mining Development trading Company	0.062	Korea Mining Development Trading Company	0.308	Tanchon Commercial Bank	0.360	North Korean Ministry of External Economy	0.129
5	North Korean Government	0.049	Green Pine Association Company	0.303	Ilsim International Bank	0.308	Dandong Hongxiang Industrial Development	0.119
6	Korea Kwangson Banking Corporation	0.047	Daedong Credit Bank	0.298	Ryugyong Commercial Bank	0.307	Korea Mining Development trading Company	0.115
7	Daedong Credit Bank	0.042	Ocean Maritime Management Company	0.297	Foreign Trade Bank	0.305	Korea Kwangson Banking Corporation	0.111
8	Green Pine Association Company	0.040	North Korean Ministry of External Economy	0.293	Cheil Credit Bank	0.295	Green Pine Association Company	0.101
9	North Korea Central Military Commission	0.037	North Korean Reconnaissance General Bureau	0.285	Daesong Bank	0.295	North Korean Government	0.095
10	North Korean Ministry of the People's Armed	0.037	North Korean Government	0.282	Korea Kumgang Group Bank	0.242	Daedong Credit Bank	0.094

⁸⁶ Adapted from sources referenced in Chapter III.

a. *Eigenvector Centrality (Influencers)*

These institutions (shown in Figure 7) are essential within the network, as they are centrally located and connected to the most important organizations. The banks act as the funnel through which business transactions are developed and maintained, likely serving as facilitators between companies and the North Korean government.

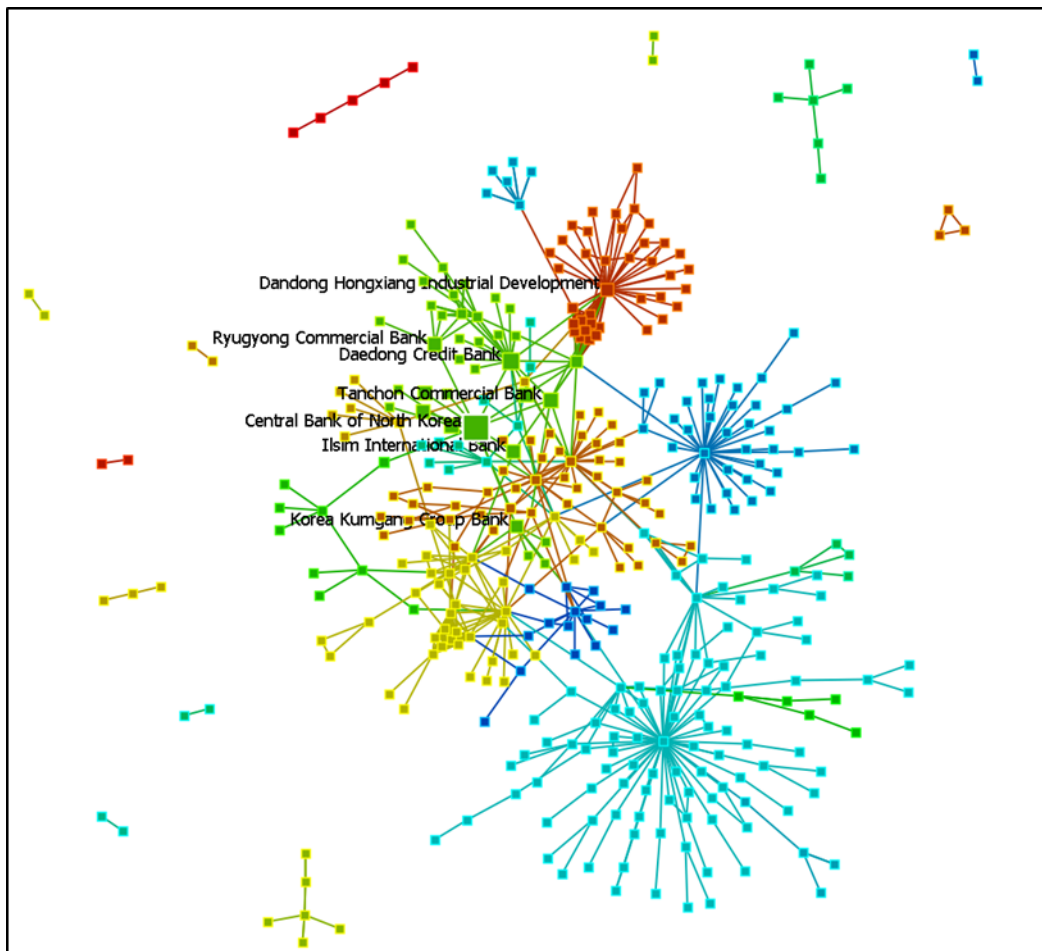


Figure 7. Organization-to-Organization Network (Color by Newman Group, Size by Eigenvector)⁸⁷

⁸⁷ Adapted from sources referenced in Chapter III.

b. Total Degree Centrality (Most Connections)

The key nodes are a mix of government, financial, and commercial entities, with a more substantial number being government based (North Korean Ministries, Dandong Hongxiang Industrial Development, Malaysia-Korea Partners Group, etc.).

c. Betweenness Centrality (Facilitator/Collaborator)

These key nodes occupy essential locations in the network and appear to be more prominent in the commercial sector, which makes sense because they act as interlocutors with customers (Korea Mining Development Trading Company, Ocean Maritime Management Company, Mansudae Oversea Projects, etc.).

d. Closeness Centrality (Fast Access to Information & Materials)

These key nodes are most closely located to all nodes in the network and appear to be North Korean government-related ministries and agencies, and a few banks and commercial entities (North Korean Maritime Administration, Malaysia-Korea Partners Group, Korea Mining Development Trading Company, and Korea Kwangson Banking Corporation).

e. Collapsed Network and Functional Areas

Using organization-to-organization network centrality measures, vital actors can be identified in the network. However, to further understand the nature of the network, the network can be collapsed into sectors, such as shipping, financial, government, and commercial. By identifying the functional areas, the collapsed network helps show how the network functions and how organizations are distributed within the network to ensure balance and diversification.

In the collapsed North Korean organization-to-organization network (see Figure 8), financial organizations are a smaller percentage of the total organizations but are centrally located to facilitate all interactions between government, shipping, commercial entities, and customers outside the network (annotated by “None”). Additionally, commercial entities maintain ties most closely with construction, service/labor, and military entities.

While the link between commercial, development, and service/labor organizations seems natural, the relationship with military organizations is interesting. Business entities are located between the government and the military, which could mean that commercial organizations facilitate movement of personnel, equipment, and resources in coordination with the government and support of the North Korean military. This is logical since North Korea is an authoritarian regime and the government owns all companies. The visualization of this network by functional sectors underscores the illicit nature of activities, which utilize commercial entities to facilitate the North Korean government's illicit activities in support of its military. Shipping and commercial organizations appear to have a more significant role in operating and promoting illegal government activities. Given the isolated location of North Korea, shipping is more extensive and most expedient method to support procurement and proliferation.

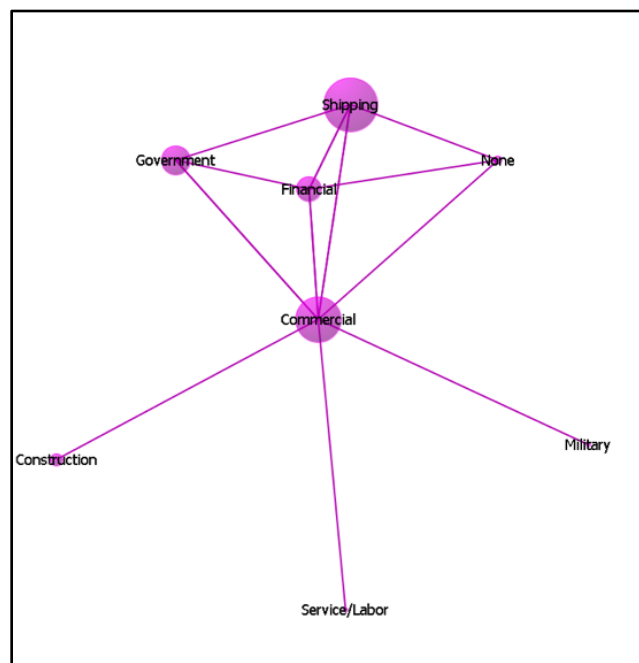


Figure 8. The DPRK Regime's Organization-to-Organization Collapsed Network (Size by the Sum of Organizational Sectors)⁸⁸

⁸⁸ Adapted from sources referenced in Chapter III.

4. Aggregate DPRK Regime Network

The aggregate DPRK regime network continues to display a decentralized (low degree of centralization 0.068) and sparse (low-density score of 0.005) network according to network level measures and visualization. This seems natural; it enables adaptation, flexibility, and resiliency within the network. The amount of betweenness (0.077) and closeness (0.002) are low scores, which further shows the decentralized nature of the network. However, the eigenvector score (0.422) indicates that while the network is decentralized as a whole, those within the network are well known to one another. This may relate to the quality of the network and how it approaches and protects operations. Despite the network's decentralized nature, it appears to have a high level of ties between central nodes. Perhaps this is a method of using multiple and redundant organizations to allow diversification within the network, serving as a means of lowering a profile through many organizations instead of relying on just one. This enables recoverability: if one central organization is removed or disrupted, it is quickly replaced by another, making the overall network more resilient.

In the aggregate North Korean network, shown in Figure 9, the various centrality measures (See Table 5) of the organizations reveal that some are more important to the network, but are not involved in all actions. This variance appears to show diversification of the organizations within the network, which could be by design to ensure network resiliency, capability, and viability. Moreover, the complication this creates is that many of the central organizations are national agencies in the North Korean government, raising the risk of retaliation against the United States, should Washington choose to act against any of those organizations.

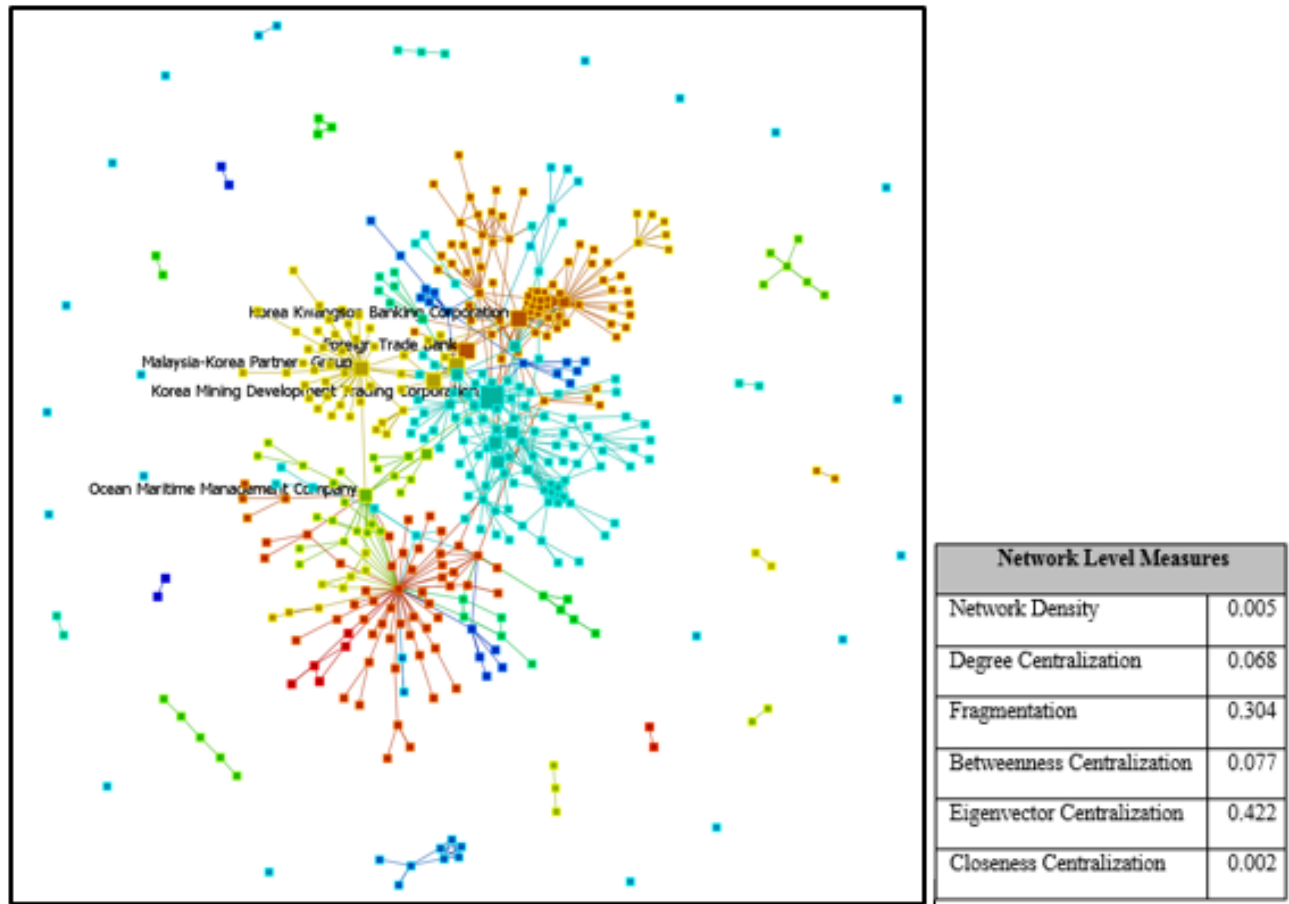


Figure 9. Aggregate DPRK Regime Network (One-Mode, Color by Newman, Size by Betweenness)⁸⁹

⁸⁹ Adapted from sources referenced in Chapter III.

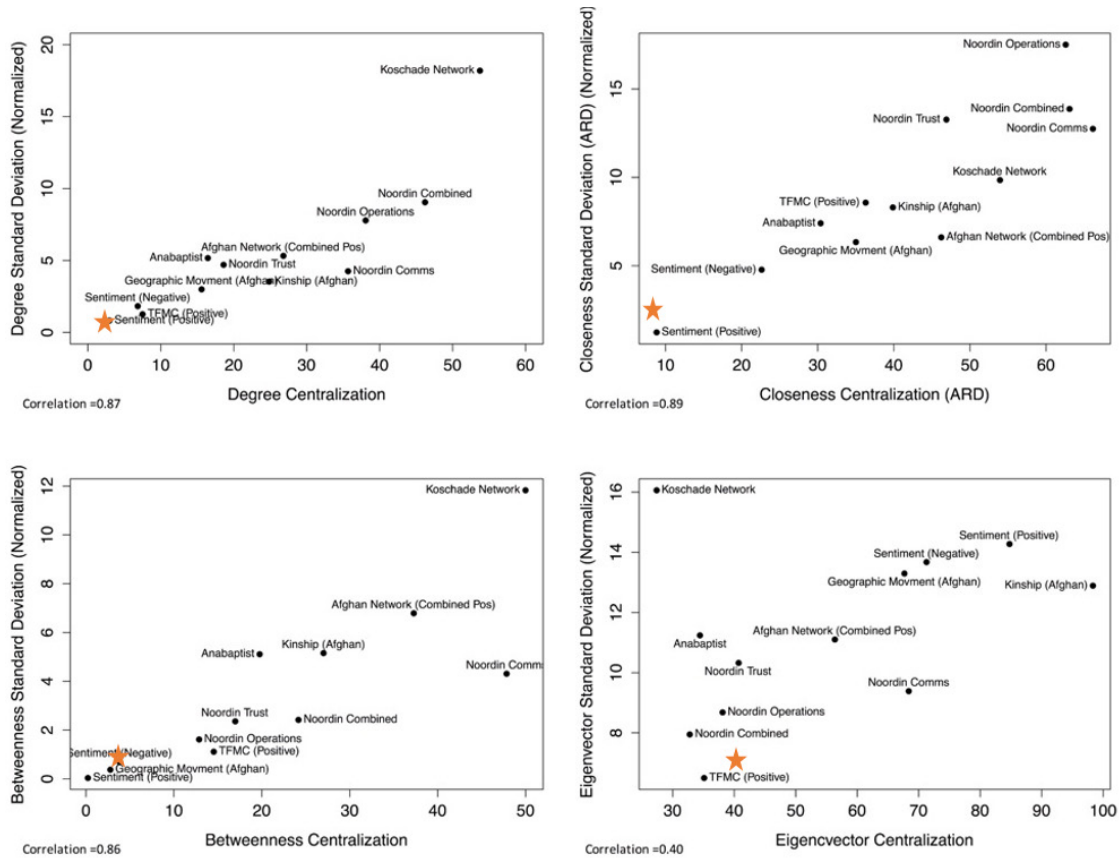
Table 5. UCINET Aggregate Network Multi-Measure Analysis Results⁹⁰

Rank	Degree		Closeness (ARD)		Eigenvector		Betweenness	
	Organization	Value	Organization	Value	Organization	Value	Organization	Value
1	Dandong Honxiang Industrial Development	0.073	North Korean Ministry of External Economy	0.213	Dandong Honxiang Industrial Development	0.437	Korea Mining Development trading Company	0.078
2	Korea Kwangson Banking Corporation	0.064	North Korean Maritime Administration	0.207	Korea Kwangson Banking Corporation	0.410	Korea Kwangson Banking Corporation	0.045
3	North Korean Maritime Administration	0.060	North Korean Government	0.202	Blue Sea Business Company	0.346	Mansudae Overseas Project Architectural	0.042
4	Korea Mining Development Trading Corporati	0.046	Korea Mining Development Trading Corporat	0.165	Success Target Group	0.345	Mansudae Overseas Project Group of Compa	0.036
5	Malaysia-Korea Partners Group	0.042	Dandong Honxiang Industrial Development	0.167	Hong Kong Hugo Development Limited	0.343	Malaysia-Korea Partners Group	0.034
6	Success Target Group	0.036	Korea Kwangson Banking Corporation	0.157	Hong Kong Win Dragon Development	0.344	Foreign Trade Bank	0.029
7	Best Famous Trading	0.035	North Korean National Defense Commission	0.144	Nation Good Limited	0.345	North Korean National Defense Commission	0.027
8	Blue Sea Business Company	0.035	North Korean Ministry of the People's Armed	0.144	Sheen Fair Trading	0.346	North Korean State Affairs	0.027
9	Carbuncle Company Limited	0.035	Green Pine Association Company	0.140	Carbuncles Company Limited	0.347	North Korean State Affairs Commission	0.026
10	Fully Max Trading	0.034	North Korean Reconnaissance General Burea	0.136	Best Famous Trading	0.339	Ocean Maritime Management Company	0.026

⁹⁰ Adapted from sources referenced in Chapter III.

5. Network Comparisons

The DPRK network, when compared to other dark networks (see Figure 10), is profoundly decentralized. This illustrates why the network is a dark network, as it remains focused on money laundering, drug smuggling, weapons trafficking, and proliferation activities. The highest level of secrecy is necessary to utilize various conduits to conduct illicit activities. Moreover, some businesses involved with North Korean money are legitimate businesses that are unwitting facilitators to illegal activity. This dark network is well established and managed. As UN sanctions continue—along with awareness about DPRK regime actions—illicit activities in this network will be strained.



DPRK Regime network annotated by an orange star

Figure 10. Dark Network Centrality Comparison⁹¹

The DPRK regime network is an excellent example of a dark network that conducts illegal and covert activities. The analysis shows a highly decentralized, dispersed network, which appears to adapt to changing conditions well despite the sanctioning of key organizations and people. While the Kim regime retains an ability to control its people and resources, it takes time to recover the capabilities it loses and has difficulty starting new ventures under increasing awareness. What is interesting to see is that after more well-known organizations like Dandong Honxiang Industrial Development and Korea Mining Development Trading Corporation were targeted effectively with sanctions, a similar-style

⁹¹ Adapted from: Daniel Cunningham, Sean Everton, and Philip Murphy. *Understanding Dark Networks: A Strategic Framework for the Use of Social Network Analysis*. Lanham, MD: Rowman & Littlefield, 2016. pg. 95.

organization (Malaysia Korea Partners Group) emerged. The expectation should be that while the network is mapped out, new elements continue to develop and some organizations are likely operating that have not been identified.

6. Network Conclusions

The social network analysis provides a snapshot of the North Korean illicit network and indicates where and how the network operates.

a. Shipping Networks

- DPRK regime shipping practices are dependent on Chinese and Russian ports because of proximity, access, ease of front company creation, and lax regulations and law enforcement.
 - Analysis: Sensitive diplomatic relations with the PRC and Russia make disruption of North Korean shipping limited to a monitor-report-sanction-punish cycle through the UN.
- *Highest activity:* Nakhodka, Vladivostok, Vostochny, Russia.
- *Ports of interest:* Bangkok, Thailand; Haiphong, Vietnam; Manila, Philippines.
- Identifying heavy-use ports allows us to also identify shipping lanes for monitoring, disruption, and/or interdiction if needed.

b. Organizational Networks

- The North Korean government controls front companies to facilitate illicit activity through shipping, financial, and commercial sectors.
- Financial institutions constitute a smaller percentage of the network but are most central to network effectiveness and facilitation (larger nodes indicate a higher role in the network).

- Financial institutions facilitate and obfuscate business activities through laundering, brokers, and front companies.
- c. Representative Networks*
- North Korean representatives utilize official positions to serve in dual roles as diplomats and commercial business brokers to facilitate illicit activities.
 - Areas of greatest concentration are Asia, Africa, and the Middle East, with dispersed locations globally.
 - *Heaviest concentration:* the PRC promotes, coordinates, and moves materiel and goods into and out of the region.
 - *Most efficient:* In Africa, a few agents cover multiple countries and establish numerous national contracts for commercial, construction, and labor activities.
 - *Continuing relationships of concern:* Syria, Iran, Myanmar.
 - *Emerging organization:* Kuala Lumpur, Malaysia (Malaysia-Korea Partners Group).

C. CONCLUSION

This chapter produced a more narrowed view of the DPRK regime network, as well as its points of vulnerability, although additional research is warranted—to provide better clarity for scrutinizing nations and companies. This research illustrates where, how, and why the DPRK Regime’s networks have operated based on social network analysis. The network is decentralized, diversified, and dispersed throughout Asia, with global reach through front companies.

Until the international community can act in a concerted and synchronized manner, the regime’s illicit networks will continue to operate. These networks will find ways to insulate themselves from international monitoring and scrutiny but still must rely on

credible and legitimate business practices to generate revenue. Continued pressure and collective resolve are essential to compete with the regime's resiliency. The focus needs to be on pressuring PRC to enforce sanctions, continuing to track and monitor North Korean ships with national and international collection systems, and increasing joint-international working relationships to be positioned to further track, map, disrupt, and prevent the regime's illicit activities whenever and wherever possible. The DPRK regime's networks *are* vulnerable. We need more eyes to mine the data to counter the illegal activities scrupulously.

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IV. CONCLUSION

By identifying the basic network structures, relational ties, and critical nodes, social network analysis enabled us to illuminate the vital characteristics of the DPRK regime's illicit trade networks. Illuminating characteristics of North Korean networks assists in identifying modus operandi, areas of concentration, vulnerabilities of the network, and gaps in information. Moreover, through identifying the characteristics of the North Korean networks, we can better understand how to disrupt, counter, or infiltrate the networks. To combat a diversified North Korean network, U.S. efforts should also be comprehensively interagency, focusing on coordination and collaboration.

Since North Korean networks operate in civilian sectors, and not often in combat environments, exclusive utilization of military assets or units against North Korean networks will produce limited results. Outside of a combat environment, the application of military elements against 'civilian business' (whether associated with the North Korean military or not) requires interagency and international assistance, but also the authority. The approach that will generate and achieve the best results is operating in conjunction with other agencies, departments and international partners, under their authorities, to target, disrupt, or infiltrate the networks. The additional sensitivity that North Korean networks present is that these networks are diversified and diffused into diplomatic, legal, economic, and law enforcement areas of national, regional, and global politics. Furthermore, since North Korean companies are tethered to various front companies which are widespread (predominately located in the PRC) and in areas outside military operational areas, any U.S. military involvement will require support and coordination with other U.S. agencies.

Conducting social network analysis of sanctioned entities, various maritime vessels, front companies, and illicit activities including weapons trafficking and foreign labor utilized by the North Korean regime, assists in narrowing areas of concentration and dependence. While North Korea maintains a widespread global network, the regime remains dependent on the PRC and Russia (witting and unwitting) as facilitators in enabling revenue generation or mechanisms through which to obscure illicit activities. This

limits U.S. abilities in countering, disrupting or infiltrating networks within these countries. Moreover, any action taken may further complicate, deteriorate, or exacerbate already tenuous relations. This appears a harder approach in countering North Korean efforts. Another consideration is narrowing our focus on those areas outside of Chinese and Russian control. As identified in our research, focusing on areas where the United States and its allies have better access, relationships, and the opportunity to counter North Korean networks may be the best starting point.

Identifying countries such as Thailand, the Philippines, and Malaysia in Southeast Asia provides the United States with an opportunity to exploit vulnerable North Korean networks through continuing bilateral partnerships. Absent the protection North Korean networks are provided by operating in PRC and Russia, they continue to develop and spread throughout Southeast Asia. While operating or masquerading as a legitimate business, the regime's networks are vulnerable to any number of efforts to counter, track, disrupt, or infiltrate. The greatest difficulty is identifying the businesses that are likely operating but remain unknown to intelligence collection efforts. To further understand the extent of the network and the reach it has, the network requires additional illumination. As the United States and U.N. level sanctions against North Korea, the regime adapts and morphs into new businesses turning U.S. efforts into a game of whack-a-mole, perpetuating already existent efforts and allowing the regime more time to continue progressing its illicit trafficking, proliferation and procurement, and revenue generation activities.

North Korean adaptation demonstrates a capacity that not only enables illicit networks but adds to the potency of their anonymity when the regime includes its cyber capabilities. North Korea is exporting high-skill labor in the form of technical and cyber support personnel as a means of both generating revenue (paying significantly high per capita than manual labor) and expanding North Korean cyber capability, further obscuring its location and hiding globally as high skilled tech support.⁹² Taking these new developments and applying them to the social network analysis infers a capacity that the

⁹² Arterburn, Jason. "Dispatched: Mapping Overseas Labor in North Korea's Proliferation Finance System." C4ADS. Accessed September 25, 2018. <https://c4ads.org/reports/>.

DPRK regime is adept at avoiding detection, resilient in reconstituting capabilities, and facilitating procurement in ways that challenge the United States collective national effort. The emerging use of high-skilled labor adds an increased level of sophistication to regime efforts to generate revenue and provide cyber capabilities that can be utilized unilaterally or in conjunction with various North Korean network efforts globally.

When trying to slow down the procurement and proliferation of WMDs by the DPRK through illicit funding, it is essential to understand that the DPRK regime has spent decades becoming covert and has perfected an illicit funding scheme that has allowed the regime to survive in spite of external sanctions. Given the rate of its ballistic missile and WMD technology development, it appears international sanctions against the DPRK only encourage the regime to push harder for nuclear advancement. Furthermore, the DPRK is motivated to stall using hopeful negotiations through which to buy time to either advance, take their operations further underground or wait out the political system in the United States to provide an administration less aggressive.

In conclusion, the best strategy to prevent the DPRK from further refining and expanding its nuclear weapons program is perhaps to illuminate and leverage their illicit networks against them. Not through military defeat can the west dismantle a regime that has existed for 70 years with little Western influence. Targeting multiple financial institutions across the North Korean network simultaneously will more effectively disrupt essential nodes and capabilities, slowing network procurement, limiting activity, and prolonging network recoverability. The best solution is to have the necessary leverage to starve the regime's illicit procurement networks and to signal to Kim that the continued pursuit of WMD will become too cost-prohibitive. The application of network analysis provides context as to the breadth, strength, and vulnerabilities of DPRK networks. Understanding the strengths and weaknesses of networks that support the DPRK allows for additional options for policy decision makers across diplomatic and military operations.

Ultimately, the United States needs to keep pursuing those North Korean entities that are known about, further develop the knowledge-gaps through collection efforts, increase efforts with partner nations, ensure better integration and interoperability among U.S. departments and agencies, and forgo unilateral-agency efforts. It requires a

collaborative effort from multiple levels and amongst the numerous agencies already pursuing North Korea. The social network analysis conducted herein provides a macro-level snapshot of the DPRK regime's networks and their activities. It requires a collective and concerted effort to counter them.

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