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Corrupt networks in the Indonesian forestry sector

Politics and pulp in Pelalawan, Riau

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In Indonesia, the persistence of illegal logging has long been attributed to corrupt networks involving powerful brokers, private sector entrepreneurs, and local political heads. But how do these networks function, who participates in them, and whose interests do they serve? We apply social network analysis to map a corrupt network that operated in Pelalawan, Riau province, to study how such networks are constructed and how they might ultimately be disrupted.

Main points

- Social network analysis (SNA) is a valuable tool in the fight against forestry corruption. It sheds light on how corrupt networks function and highlights otherwise unobservable patterns and actors.
- SNA was applied to map a corrupt network that operated in Pelalawan district, Riau province, Indonesia, centred around the district head, who was later convicted on corruption charges, and his right-hand man.
- In the Pelalawan scheme, pulpwood capitalists developed vertically integrated timber suppliers through fictitiously ‘independent’ shell companies. The case shows that corrupt networks cannot be understood apart from the political economy dynamics of the society and sector where they operate.
- Forestry corruption networks have large numbers of actors, organised in clusters of association with unevenly distributed gains. State actors hold monopoly control over key resources, but these networks are dominated by private sector forestry actors, whose role needs to be better understood.
- Indonesian anti-corruption investigators have rightly targeted the major architects of corruption. However, SNA highlights the importance of the many enablers of corrupt activity, who typically escape prosecution. This points to the need for a system of corporate sanctions beyond criminal prosecution.
- Corrupt money circulates beyond its immediate beneficiaries, but investigators rarely pursue this money trail beyond first- or second-tier transactions. Following the trail of dirty money is critical to understanding who benefits from corrupt activities and holding them to account.
- Anti-corruption agencies, law enforcement, and donors should consider providing support for the opening up of legal archives to seed collaborations between academia and law enforcement. These could spearhead new innovations in anti-corruption efforts, though it should be kept in mind that results may be subject to data bias.

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Illegal logging in Indonesia: persistent despite prosecutions

Indonesia has some of the fastest rates of deforestation in the world, and no part of the country is more affected than the province of Riau. Between 2000 and 2018, over 4 million hectares of Riau's tree cover was logged, with fully half of that total consisting of low-lying virgin peatland. A 2015 report published by the Indonesian Corruption Eradication Commission (*Komisi Pemberantasan Korupsi*, or KPK) estimated that between 2003 and 2014, over 630 million cubic metres of logged timber went unreported to the Indonesian government. Much of it came from Riau.

The problem of deforestation in Indonesia is often seen as one of inadequate law enforcement.¹ Yet illegal logging has persisted in the face of aggressive anti-corruption strategies at the preventive and prosecutorial levels. Since its establishment in 2004, the KPK has prosecuted over 27 cases of forestry-related corruption, convicting prominent individuals from the private and state sectors. However, this work has slowed notably, and few would argue that the sector is now corruption-free.

A rich literature on corruption and deforestation in Indonesia has drawn on qualitative and ethnographic data to argue that illegal logging is driven by informal local networks of public and private actors.² Under President Suharto's New Order, a military authoritarian regime that lasted from 1966 to 1998, forestry corruption accelerated. Corrupt networks involving forest field officers and local forestry officials, timber entrepreneurs and brokers, army personnel, village and customary law leaders, and pioneer agriculturalists operated in evident defiance of Jakarta's territorial claims over the forest.³ After the fall of Suharto's New Order, Indonesia embarked upon an ambitious 'big bang' decentralisation programme that saw key authorities devolved to the district level. A new elected political post was created to head each district, known as the regent (*bupati*).⁴

1. Tacconi, Rodrigues, and Maryudi 2019.

2. McCarthy 2000, 2002; Potter and Badcock 2001.

3. McCarthy 2000.

4. Indonesia has three levels of local government. The highest tier consists of 34 provinces. These are subdivided into regencies (*kabupaten*), generally referred to in the English-language literature as 'districts.' Regencies in turn are divided into districts (*kecamatan*), generally referred to in the literature as 'subdistricts.' This Issue is mainly concerned with the first and second levels, which I refer to as provinces and districts, respectively. I use the terms regent and district head interchangeably.

The role of the regent has often been celebrated as an important democratic reform that increases government responsiveness and accountability. However, the introduction of competitive electoral systems at the local level has also served to intensify deforestation. Scholars have argued that illegal logging networks have reconfigured around the political authority of the regent, who is able to guarantee private sector land and forestry interests in exchange for campaign support.⁵ Once elected, the regent appoints a cohort of corrupt administrators willing to manufacture licences and permissions for campaign donors. These networks appear pervasive and resilient in the face of electoral change – a system of oligarchical, predatory interests with deep roots at the local level.⁶

But in a literature ‘fascinated by networks’,⁷ the concept of the network itself is often presented as self-evident.⁸ Descriptions have been skimpy on details. Who exactly associates in these networks? How do they function? Are gains evenly spread? Are regents truly at the apex of networks, or are they just participants within them? What explains the networks’ resilience over time and in the face of law enforcement?

Social network analysis (SNA) offers a different way of coming at these questions, one that investigates corrupt forestry networks through an analytical framework rooted in graph theory. Network analysis interrogates the structural properties of networks by mapping the dyadic relations between actors. As such, SNA offers an important means by which to evaluate, analyse, and compare networks – a first step in understanding how they operate and, ultimately, how they can be disrupted.

This U4 Issue explores the value and limitations of SNA in the study of corrupt forestry networks by analysing the successful conviction of a district head whose corrupt scheme accelerated deforestation in Riau. Tengku Azmun Jaafar – henceforth, TAJ – was the regent of Riau’s new district of Pelalawan. In 2009, he was convicted on charges of self-enrichment, abuse of power, and violation of national forestry regulations and sentenced to 11 years in prison.⁹ TAJ had orchestrated a plan in which logging licences for plantation forests were improperly issued to 15 pulpwood companies, enabling them to log virgin rainforest and supply timber products to the

5. Aspinall and Sukmajati 2016; Aspinall and Berenschot 2019; Burgess et al. 2012.

6. Hadiz 2010.

7. Ward, Stovel, and Sacks 2011.

8. Keller 2016.

9. TAJ appealed his conviction at the High Court in October 2008. While the High Court ultimately dropped the primary charges of corrupt self-enrichment, the penalties for his secondary offenses actually extended his jail sentence to 16 years. In his subsequent appeal to the Supreme Court, in August 2009, this sentence was revised back to 11 years. Throughout the appeal process, the Rp 500 million fine and Rp 12 billion in restitution to the state were maintained.

local pulp industry. The investigation of TAJ was important to the KPK's pursuit of corrupt forestry networks because it netted five other prominent state actors for their roles in a series of crimes that TAJ's first sentencing judge described as 'collectively' enacted. They included then Riau governor Rusli Zainal; two regents of neighbouring districts, Arwin AS and Burhanuddin Husin; and two former heads of the Riau provincial forestry office, Syuhada Tasman and Asral Rachman.

For the analysis, TAJ's investigative files held at the Indonesian Corruption Eradication Commission were hand-coded into a dataset of corrupt interactions. Unlike most criminal networks, this corruption network involved a huge number of actors, who operated with remarkable visibility and only minimal concern for detection, emphasising their impunity. I show that while investigators were correct to pursue TAJ and provincial forestry heads, power and influence over the network also resided with less visible actors, including pulp sector barons and their enablers. I suggest that corrupt networks cannot be understood apart from political economy dynamics that are historically and geographically specific – and always evolving. As a case in point, TAJ's scheme represented the incipient formation of a system of entrenched fraud and corruption by which pulpwood capitalists developed vertically integrated timber suppliers through fictitiously 'independent' shell companies.¹⁰ Despite the analytical limitations of SNA, this method presents new opportunities for insight into networked corruption.

Social network analysis in the study of corruption

SNA understands social systems as structures built by relations or ties between actors, or nodes. Ties themselves are varied in nature. They can be constituted through affection, kinship, work, community, or ideological affiliation, and they can be reinforced by material and informational transactions. But discrete ties between individual nodes also combine to form a broader pattern of relations among actors, organisations, or groups that shapes the overall functioning of the network.¹¹ Network structure is also constituted through *paths*, which are the real or potential sequences of nodes through which goods such as information and resources are routed. Networks can be ego-centric, that is, they can represent the ties and nodes linked to a given node, the 'ego'; or they can be network-centric, representing the sum total of nodes and all of their relationships. Drilling down on data allows for analytical specificity about the

10. Koalisi Anti Mafia Hutan 2018.

11. Begley, Khatri, and Tsang 2010.

meaning and measurement of these underlying connections. By quantifying and analysing relations through different metrics, SNA scholars can produce characteristics of a distinct network and enable networks to be differentiated, defined, or compared.¹²

Network analysis can reveal hidden patterns of corrupt activity

Political scientists have often gravitated towards centrality – the power metric – as a way of understanding which nodes exert the most influence over the network. But centrality can be captured in distinct ways, each of which needs to be carefully considered in the context of networked corruption. Cunningham, Everton, and Murphy argue that the analysis of power can be grouped into three main categories: frequency-based measures, distance-based measures, and path-based measures.¹³ Frequency-based measures include *degree centrality*, which measures the number of ties a node has; it is assumed that the node with the greatest number of ties exerts the most power. *PageRank* measures the number of incoming ties a node has, a potential measure of prestige. *Eigenvector centrality* – the ‘popularity measure’ – measures the ‘weight’ of ties by centrality. That is, nodes with a high eigenvector centrality are connected to nodes who are themselves well connected.¹⁴ Distance-based measures include closeness centrality, or simply put, the closeness of each node to every other node. *Betweenness centrality*, a path-based measure, measures the importance of a node to the shortest paths on the network. In other words, betweenness captures a person’s ‘brokerage’ role in allowing resources or information to flow from one part of the network to another.

Over the past two decades, SNA has moved from being a tool primarily of sociology and organisational science to kindling a rich literature on the study of dark or criminal networks. These are ‘covert and illegal networks ... that seek to operate in the dark by concealing their activities from authorities’.¹⁵ Much of this literature studies criminal, terrorist, and smuggler groups to understand how network structures enable groups to function in an environment presumed hostile and rife with possibility for detection. Network-oriented studies of corruption have a thin but growing presence in the literature. Corrupt networks are presumed to share the same ‘survival challenges’ of secrecy, maximum extraction, and avoidance of law enforcement that characterise criminal networks,¹⁶ and tend to be portrayed in this literature as a subset of criminal networks rather than on their own terms.

12. Borgatti, Everett, and Johnson 2018, 11.

13. 2016, 144–45.

14. Borgatti, Everett, and Johnson 2018, 194.

15. Cunningham, Everton, and Murphy 2016, xvii.

16. Jancsics and Jávör 2012, 91.

This approach has drawbacks. Not only does it erase important distinctions by lumping corruption together with criminality, but the dominant theoretical approach in SNA is to treat crime and law breaking in liberal-normative terms. That is, corruption and crime are understood as violations of laws designed to prevent harm and uphold the moral principles of the community. Actors commit crimes for rational-utilitarian or opportunistic motives to maximise their own interests. This position ignores critical or class-based understandings of the law, and particularly law enforcement, as the contested and dynamic expression of the interests of specific social groups. In the latter approach, corruption is understood as an expression of relations of social power, embedded within evolving, geographically and historically resonant socioeconomic structures.

Corrupt networks must be understood through a political economy lens

Crisis in Riau's political economy of pulp and paper

Located some 900 kilometres from Jakarta, the Indonesian capital, Riau has rich natural endowment in timber, including large swathes of low-lying peat forest, as well as some of the world's largest onshore oilfields. These resources have long earned this 'lucky province' an outsized role in bankrolling national development plans. Under President Suharto's 32-year New Order, forest products, primarily hardwood timber, were second only to petroleum as a source of gross national product.¹⁷

National control of Indonesian forests was enabled by the 1967 Basic Forestry Law. With the country's economy on the verge of collapse, the law provided the New Order with the foundations for a log export economy that could generate capital investment and foreign exchange earnings.¹⁸ Forest concessions (*hak pengelolaan hutan*, or HPH licences) to log and export timber were handed out to President Suharto's family and cronies, giving the country's political, private, and military elites unprecedented control of Indonesia's outer forested islands. This system ruthlessly suppressed labour movements, indigenous groups with subsistence livelihoods, the agrarian poor, and environmental activists.¹⁹ It also oversaw the growth of an illegal timber economy

17. Potter and Badcock 2001.

18. Barr et al. 2006, 11.

19. Human Rights Watch 2003; Potter and Badcock 2004.

equivalent in value to its legal counterpart. By the late 1970s, Indonesia was the world's biggest supplier of mixed tropical hardwood.²⁰

In the aftermath of the 1982 oil boom, the New Order regime's strategy for economic development shifted from an import substitution economy to an export-promoting one. In forestry, this meant moving away from hardwood exports to producing manufactured wood products, including plywood, pulp, and paper. Technocrats in government hoped the sector would eventually surpass oil in export earnings and generate rural employment.²¹ However, development of this industry came to be dominated by two close cronies of President Suharto: Eka Tjipta Widjaja, founder of the Sinar Mas group, and Sukanto Tanto, owner of Raja Garuda Mas.²²

Sinar Mas entered the pulp sector with small mills in West Java and South Sumatra. It eventually opened its first Riau-based pulp mill in Perawang, operating under the trading name PT Indah Kiat Pulp and Paper (PT IKPP). In 1987, Sinar Mas's competitor Raja Garuda Mas opened a pulp mill in Porsea, North Sumatra, on land confiscated from the local community. This land conflict generated huge community opposition to the pulp company. As a result, Raja Garuda Mas diverted away from Porsea and accelerated its investments in Pangkalan Kerinci, Riau, operating as PT Riau Andalan Pulp and Paper (PT RAPP).²³

Growth in pulp and paper was financed through domestic and international investment. The Indonesian government, anxious to promote the pulp industry, allocated over 4.5 million hectares of forest land for staged clear felling and the establishment of plantations of fast-growing hardwood, typically acacia. This entailed the creation of a new industrial plantation licence (HTI or *hutan tanaman industri*). Under the Ministry of Environment and Forestry's regulations, HTI licence holders were permitted to clear the existing land of timber in order to establish acacia timber plantations for pulp. The idea was that this reserve of timber would provide a 'bridging supply' of wood to the pulp mills until the plantations were fully operational.

The HTI licences allowed the pulp industry to access wood supplies at below stumpage value,²⁴ paying minimal reforestation fees and royalties per tonne. The central government also privileged the pulp industry by providing numerous capital subsidies, including borrower-negotiated loans from state-owned banks, allocations from off-

20. Barr 2001; Potter and Badcock 2001; Obidzinski and Kusters 2015.

21. Thee 2009.

22. In 2009, Raja Garuda Mas changed its name to Royal Golden Eagle.

23. Thee 2009.

24. Stumpage value is calculated according to the market value of the timber (or stump) on the land.

budget pools of finance, and favourable tax deductions.²⁵ Generous fiscal depreciation schemes on mills financed their upgrade and expansion. In addition, the deregulation of the banking sector in the 1990s was a boon to the developing pulp sector. Intended to support emerging domestic industries, financial liberalisation provided pulp companies with myriad opportunities for cheap money. Moreover, as parent companies Sinar Mas and Raja Garuda Mas moved into the banking sector, they purchased banks and drained them of capital to finance their new pulp operations, with the tacit approval of national elites.²⁶

International capital also played a significant role in the sector's growth. In 1993, Raja Garuda Mas consolidated its pulp holdings under Asia Pacific Resources International Holdings Limited (APRIL), an incorporated holding company based in Singapore. The next year, Sinar Mas Group similarly established Asia Pulp and Paper (APP) as a holding company for its pulp interests.²⁷ From Singapore, APRIL and APP were better able to attract international investment, marketing themselves as multinational corporations rather than as domestic conglomerates. US bond markets alone lent APP over US \$7 billion,²⁸ excited by projections of unmet Chinese demand and by operating costs that were 20%–30% lower than those of APP's European and North American competitors.²⁹ Chinese state banks were also a major source of finance, particularly after the 1997 Asian financial crisis, transforming APP from a bit player into the world's biggest producer of pulp.³⁰

25. Barr 2001.

26. Barr 2001.

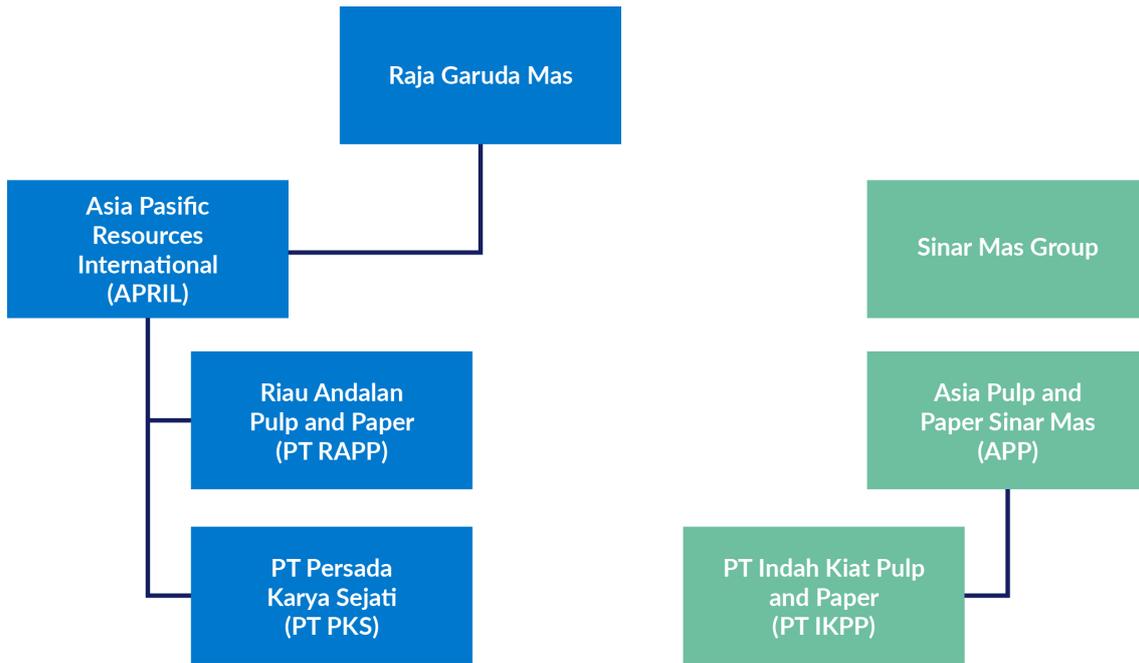
27. According to its website, APRIL is a member of the Royal Golden Eagle (RGE) group. Other website material explicitly mentions RGE as the 'parent' company of APRIL. In contrast, as of October 2019, Sinar Mas Group rejects claims that it is the parent company of APP Sinar Mas. These shifts highlight the complex and changing legal structures of Indonesia's pulp companies. See Figure 1.

28. All dollar amounts in this report are US dollars.

29. Barr 2001.

30. Zeng and Eastin 2011.

Figure 1. Pulp conglomerates and their parent companies in Riau province, Indonesia



Note: PT RAPP and PT IKPP have numerous subsidiaries that, for purposes of clarity, are not shown here.

Buffered from market forces, in a climate of easy finance and low-cost timber concessions, APP and APRIL were ‘motivated to invest large amounts of capital in high-risk projects’.³¹ For both groups, appetite for risk led to the construction of giant pulp mills, the largest of their kind in Asia Pacific, both housed in Riau. PT IKPP’s Perawang mill was upgraded for vertical integration, linking large-scale pulp processing with affiliated paper production facilities. In 1995, APRIL, operating under PT RAPP, unveiled its own integrated mega-mill in Pangkalan Kerinci, just 100 kilometres away. By 2001, with a second production line in operation, PT RAPP transformed the Pangkalan Kerinci mill into the largest pulp mill in the world. APRIL and APP argued that by operating at scale, the mills offered protection from the cyclical fluctuations of the pulp commodity market. However, scale at these proportions also meant astronomical operational costs. In 2001, Barr estimated that running the Riau mega-mills in Perawang and Pangkalan Kerinci cost an estimated \$1 billion per year.³² This meant that the mills would only meet their financial obligations if they functioned continuously at near capacity.

Running at scale required access to a proportionate supply of wood. Integrated pulp and paper manufacture relies on the long-fibre found in wood-based pulp, as opposed to recycled paper or straw-based fibre.³³ Mills of this kind are heavily dependent on virgin

31. Barr 2001, 81.

32. 2001, 80.

33. Zeng and Eastin 2011.

timber. The national forestry department's new industrial plantation (HTI) concessions sought to anticipate pulp demand by converting millions of hectares of forest into areas zoned for timber plantations. But by 2001, little headway had been made on establishing acacia plantations. Certainly, there were exogenous challenges. Early plantations were beset by pests, weeds, poor soil, and issues with ongoing site maintenance.³⁴ The Asian financial crisis of 1997–98 brought both conglomerates to near collapse, amplifying calls from the minister of forestry to shut down bankrupt forestry companies.³⁵ Supply was further narrowed by the 1997–98 fires that destroyed tens of thousands of hectares of Riau forest.

But to a much greater extent, the deficit in plantation wood was a product of wanton neglect. Neither APP nor APRIL had kept to their plantation schedule, sometimes planting less than a third of the volume proposed.³⁶ Barr argues that this negligence was due to the sheer volume of HTI concessions on offer. With 4.5 million hectares available, companies reasoned that it was easier and cheaper to log existing mixed tropical hardwood on plantation sites than to set about the onerous task of establishing the acacia plantations.³⁷ By 2001 it was apparent that the plantation deficits of the 1990s, coupled with the great leaps both companies had made in pulp processing, meant that the industry would be lucky to achieve its sustainability targets by 2010, let alone by 2004 as the Ministry of Environment and Forestry anticipated. This problem was notably worse for PT RAPP than for PT IKPP, whose partnership with PT Arara Abadi, a Sinar Mas subsidiary, had achieved closer to 60% of the targets.³⁸

In the midst of a full-blown, self-induced 'timber crisis,' the pulp industry turned to local logging companies to make up supply. Barr³⁹ estimates that up to 30%–40% of wood supply to plywood processors came brokered through third-party suppliers. But the post-Suharto years were marked by voracious demand for mixed tropical wood in rival ply, woodchip, and sawmill industries, not to mention a vast illegal smuggling trade that shipped virgin logs overseas. Supply to the mills needed to be negotiated through an expensive chain of roving brokers, fixers, chainsaw operators, cottage-industry sawmills, locally stationed police and military, and desperate villagers illegally sourcing wood from outside the designated concession areas.⁴⁰ These third-party providers were expensive and the supply uncertain, leaving the pulp mills, and in

34. Barr 2001.

35. Barr 2006.

36. Potter and Badcock (2001) observe that the average shortfall between planned and actual plantings throughout the 1990s was 43.4%.

37. Barr 2001, 64.

38. Barr 2001.

39. 2001.

40. Potter and Badcock 2001, 22.

particular PT RAPP, heavily reliant on ‘unsustainable and, in many cases, illegal sources of fiber ... obtained through the clear cutting of natural forests’.⁴¹

Licensing deforestation: Pelalawan’s corrupt pulp network

The pivotal role of TAJ emerges in this early structural crisis in the supply of pulp. The new district of Pelalawan, which he headed, was hewn from the sprawling Kampar district. Residents of Pelalawan, unlike the rest of Kampar, had annual incomes that ranked as some of the lowest in the country, despite the royalty rents generated for Kampar from log production. For the people of Pelalawan, Indonesia’s 1999 ‘big bang decentralisation’ glittered with the promise of fair distribution to be administered by a home-grown leader and bureaucracy. In March 2001, the regent’s office was created and staffed by an appointed interim candidate who died just ten days into the job. Into these inauspicious shoes stepped the former head of the Kampar District Planning Bureau (*Bappenda*), Tengku Azmun Jaafar, a ‘local-born son’ appointed district head. In his new post, TAJ oversaw the establishment of 15 new district-level government agencies, including a new district forestry office whose head the *bupati* was entitled to select.

Initially the national government indicated that district forestry offices would have the power to administer forestry services, including most licensing and permits. In 2001, Jakarta granted governors and district heads the authority to issue industrial logging licences for timber plantations (IUPHHK-HTI or IUPHHK-HT)⁴² for very small parcels of land under a certain acreage. However, by February 2002, the central forestry department had backtracked on decentralisation, reasserting central authority and declaring local authority to issue IUPHHK-HTI licences null and void. In a context of muddled law making, regional euphoria, and district-level grandstanding, Indonesia’s new governors and regents simply ignored the forestry ministry’s demands, fraudulently

41. Barr 2001, 60.

42. IUPHHK-HTI (*Izin usaha pemanfaatan hasil hutan kayu hutan tanaman industri*) stands for Commercial Forest Concession Licence for Industrial Plantations. It is effectively a licence to establish and use plantation timber. The IUPHHK-HT licence is essentially the same.

issuing permits based on now-obsolete regulatory authorities.⁴³ The effect was a ‘bonanza of forest felling’.^{44, 45}

In this environment of legal uncertainty, TAJ exploited his role as regent to hand out logging licences to 15 companies, including seven under his control. Integral to the scheme was TAJ’s right-hand man, Budi Surlani, a mid-ranking bureaucrat in the Pelalawan district forestry office. The circumstances of Surlani’s turn from TAJ confidant to KPK whistle-blower are unclear. However, according to Surlani, he first became acquainted with TAJ during TAJ’s early days as regent and was quickly recruited to service the regent’s plot. To TAJ, Surlani was a bridge to PT RAPP general manager Rosman,⁴⁶ whom Surlani knew through his position as ‘coordinator’ between the district forestry department and PT RAPP, providing oversight of the logs that entered the pulp processing facility. Surlani assisted TAJ in establishing six timber plantation companies and identified one (PT Madukoro) for acquisition. These companies had no capital or asset base, employees, or operational history: effectively, they were shell companies.⁴⁷

Pulp barons used shell companies to secure a cheap, illegal timber supply

As Table 1 shows, a number of the companies’ nominated directors and commissioners were drawn from TAJ’s own kinship ties. They included the regent’s cousin and driver,

43. The struggle to recentralise Indonesia’s forestry licensing is evident in the proliferation of regulatory instruments issued from Jakarta. On 21 February 2002, the forestry minister issued a decree (Keputusan Menteri Kehutanan 541/KPTS-II/2002) stating that the central government had revoked the authority of the governors, district heads, and mayors to issue IUPHHK-HT licences. This was reinforced by regulation No. 34 issued on 8 June 2002. On 18 January 2005, Minister of Forestry M. S. Kaban again produced a decree (Peraturan Menteri Kehutanan No. P.03/Menhut-II/2005), the Guide to Verifying IUPHHK for Virgin Forest and Industrial Forest, which was issued to governors, district heads, and mayors. This was followed up by Circular No. S.26/Menhut-VII/2005, which emphasised that the central government had revoked the local officials’ ability to issue HT permits in the regulatory instrument dated 2002. These regulatory dynamics illustrate the prolonged struggle between centre and periphery over forest authority that occurred in the period of TAJ’s activity.

44. Potter and Badcock 2001, 38.

45. Riau’s experience is by no means unique. Between 2000 and 2008 on Kalimantan, Sulawesi, Papua, and Sumatra, the number of new districts nearly doubled, from 189 to 312. Burgess et al. found that with each new district, rates of deforestation on Indonesia’s main forest islands increased overall by 8.2% (2012, 1710).

46. Hambali, Testimony in Anti-Corruption Court at Jakarta District Court decision 06/PID.B/TPK/2008/PN.JKT.PST, pp. 496.

47. A shell company is a non-trading company, which is used as a vehicle for various financial manoeuvres, illicit purposes, or which is kept dormant for future use in some other capacity. Shell companies are usually incorporated in a jurisdiction in which it has no physical presence and is unaffiliated with a regulated group. <https://www.u4.no/terms#shell-companies>.

Muhammad Faisal (N4); his brother, Tengku Lukman Jaafar (N13); as well as his wife, daughter, and household help.⁴⁸ However, other directors were linked to powerful bureaucrats in the Pelalawan district and Riau province forestry departments. These directors included Budi Surlani (N2); district forestry official Hambali (N6); Andri Yama Putra (N9), a provincial forestry bureaucrat; federal level bureaucrat and wife to local Pelalawan official (N3); her friend, Margareta (N8); and the wife of a one-time head of the Pelalawan forestry department (N12). These individuals essentially compose TAJ's 'trust network',⁴⁹ a concept common to traditional studies of organised crime. None of these individuals were ever prosecuted by the KPK for their role in the scheme.

Table 1. Companies in receipt of fraudulent HTI licences in the TAJ case

No.	Company name	First named directorship	Supplier/affiliated to	Estimated hectares
1.	CV Bhakti Praja Muli	Tengku Lukman Jaafar (N13) N31	Acquired by PT RAPP in 2006 Said Eddy (N14)	5,800 ha
2.	CV Tuah Negeri	Muhammad Faisal (N4) Budi Surlani (N2)	Acquired by PT RAPP in 2003 Said Eddy (N14)	1,500 ha
3.	CV Harapan Jaya	N10 Hambali (N6)	PT RAPP supplier agreement	4,800 ha
4.	CV Putri Lindung Bulan	Muhammad Faisal (N4)	Acquired by PT RAPP in 2003 Said Eddy (N14)	2,500 ha
5.	CV Alam Lestari	Budi Surlani (N2) N3 Margareta (N8)	Acquired by PT RAPP in 2003–4 Said Eddy (N14) Muller Tampubolon (N64)	3,300 ha
6.	PT Madukoro	Andri Yama Putra (N9) Budi Surlani (N2) Margareta (N8) Budi Sutanto (N7)	PT RAPP supplier agreement	15,000 ha
7.	CV Mutiara Lestari	Azuar (N11) N141 N136 N12	Acquired by PT RAPP in 2003 Said Eddy (N14)	4,000 ha
8.	PT Merbau Pelalawan Lestari	N23 N115	PT RAPP supplier	5,590 ha

48. Each actor was assigned an identifying number in the dataset. In the text and in Table 1, they are referred to by number with a preceding 'N' (e.g., N1, N2, N3). The case attracted a lot of media and NGO attention, generating online reporting. Actors who have already been named in this coverage in association with the corruption case have been named outright. Actors whose involvement with the case was not named in public are identified in this paper by their identifying number.

49. Everton 2012.

No.	Company name	First named directorship	Supplier/affiliated to	Estimated hectares
		N25		
9.	PT Selaras Abadi Utama	N114 N24 N150	PT RAPP supplier	13,600 ha
10.	PT Rimba Mutiara Permai	Sho Erwin (N15) N117	PT RAPP supplier	7,275 ha
11.	PT Mitra Tani Nusa Sejati	Sho Erwin (N15) N117	PT RAPP supplier	7,300 ha
12.	PT Uniseraya	Supendi (N18) N72	PT RAPP supplier	35,000 ha
13.	PT Triomas FDI	Supendi (N18) N125	PT RAPP supplier	9,625 ha
14.	PT Satria Perkasa Agung	Dominicus (N21) Didi Harsa (N20)	PT IKPP supplier	12,000 ha
15.	PT Mitra Hutani Jaya	Didi Harsa (N20) Agus Wahyudi (N22)	PT IKPP supplier	10,000 ha

Note: PT RAPP is linked directly or indirectly to 13 of the 15 companies in receipt of fraudulent IUPHHK-HT licences in the TAJ case. Orange denotes companies established by TAJ. Existing pulp companies supplying PT RAPP are in green. Blue companies are suppliers to PT IKPP, a subsidiary of Asia Pulp and Paper. This table was compiled by aggregating sources found in the verdict (Central Jakarta District Court decision 06/PID.B/TPK/2008/PN.JKT.PST).

The central basis of TAJ's conviction was abuse of authority and bribery. The court accepted that he had approved IUPHHK-HT licences to 15 companies for concessions on plantation forests in return for bribes. These licences were submitted to the Pelalawan district forestry department and reviewed by the Riau provincial forestry department, which then issued its recommendations to the regent. Although technically the licences should have been reviewed by the Riau governor and the forestry minister in Jakarta, documentation associated with the first phase of issuing the licence, unlike the second, was not sent to either office. The licences permitted a range of wood exploitation activities on plantation land, including logging and establishing plantations. However, aerial surveillance by KPK investigators established that the companies had pulped hectares of virgin forests outside of the concession area, valued at 1.2 trillion rupiah (Rp) or approximately \$128 million.⁵⁰

Among the companies to receive IUPHHK-HT licences were the seven affiliated with TAJ. In his testimony to the KPK, Surlani states that the regent's intention was never to actually operationalise the companies, but to use them as a vehicle to obtain the HT licences and then sell those licences and, ultimately, the companies to pulp processor PT

50. KPK (2015). The state came to this calculation by totalling the value of timber logged by companies in possession of the fraudulent licences issued by TAJ. The dollar-rupiah exchange rates were based on estimates for 1 January 2008.

RAPP.⁵¹ As TAJ's right-hand man, it fell to Surlani to falsify documentation for the applications, including the field survey data, company financial and taxation records, and environmental impact and feasibility studies. The costs associated with producing these documents, including bribes to TAJ and to the district and provincial forestry departments, were borne primarily by PT RAPP and its subsidiary PT Persada Karya Sejati (PT PKS) (see Figure 1). This early involvement implies that the pulp giant was involved in the scheme from its inception, though this assumption was never confirmed by Surlani or TAJ, nor was the question posed in interrogation. As part of this scheme, eight other companies received fraudulent licences. These were established third-party timber supply companies, six holding contractual agreements with PT RAPP and two affiliated to its competitor, PT IKPP.

Between 2003 and 2004, PT RAPP acquired five of TAJ's pulp supply companies, installing senior management from PT RAPP, or PT RAPP subsidiary PT PKS, as company directors.⁵² PT RAPP established working agreements to supply pulp to the remaining two of TAJ's companies. Notably, the two companies selected for supply agreements rather than takeover were those with directors from district and provincial forestry departments (see Table 1). By 2004, all but two of the 15 pulp supply companies involved in TAJ's corrupt network were effectively selling wood products to PT RAPP's pulp processing mill.

This scheme saw over Rp 7 billion (\$6.3 million) in corrupt payments shovelled into TAJ's personal bank accounts. Substantial sums were also transferred in cash or cheque from PT RAPP/PT PKS to Budi Surlani, and to a lesser extent to other individuals in TAJ's trust circle. According to his witness statement, Surlani used the money for three main purposes: to bribe individuals in the district and provincial forestry agencies; to cover the costs of running TAJ's shell companies; and to pay costs associated with TAJ's 2006 bid for re-election.⁵³ The latter included donations to local power brokers in the Golkar political party, funds to support travel, small amounts to sporting clubs, cultural groups, and mosques, and payoffs to editors of the local media. TAJ's verdict indicates that his total gain from the scheme – that is, funds directly transferred to TAJ in addition to sums transferred to his inner circle – was estimated at Rp 19 billion (\$21 million).

51. Budi Surlani, witness statement in Anti-Corruption Court at Central Jakarta District Court decision 06/PID.B/TPK/2008/PN.JKT.PST, pp. 527-539.

52. A number of the directors are listed as senior management for PT PKS, rather than for PT RAPP. Like PT RAPP, PT PKS is under the holding company APRIL. However, PT PKS and PT RAPP share common managerial, legal, and accountancy staff. In 2004, PT PKS was also under the general management of Rosman.

53. Budi Surlani, witness statement in Anti-Corruption Court at Central Jakarta District Court decision 06/PID.B/TPK/2008/PN.JKT.PST, pp. 527-539.

Prosecuting networked corruption

In December 2007, just a year into his second elected term, TAJ was arrested by the KPK and prosecuted on corruption charges related to abuse of authority and bribery between 2001 and 2007.⁵⁴ Budi Surlani's decision to blow the whistle on this scheme provided the basis for the KPK's prosecution. In his first trial, TAJ was sentenced to a 12-year prison term⁵⁵ for fraudulently issuing licences.⁵⁶ This sentence included a fine of Rp 500 million and an order to pay the state Rp 12.3 billion (\$11.1 million) in restitution costs, sustained by the Supreme Court after TAJ's appeal.

Nonetheless, in the verdict, the first sentencing judge was clear that TAJ's crimes were carried out 'collectively.' The anti-corruption court at the Central Jakarta District Court cited licences and associate permits approved by successive heads of the Pelalawan forestry department, namely Bambang Pudji Suroto (N26), Tengku Zuhelmi (N27), and Edi Suriandi (N28), as well as by Riau forestry heads Syuhada Tasman (N44), Burhanuddin Husin (N47), Asral Rachman (N45), and Sudirno (N48), and by Riau's own newly elected governor, Rusli Zainal (N46).⁵⁷ The judge failed to mention, however, the number of directors and commissioners associated with the Pelalawan and Riau forestry departments who benefited directly or through family members (N12 and N26), suggesting that ties within the corrupt network were more tightly intertwined than the sentencing judge publicly acknowledged. In his defence, TAJ's lawyers argued strenuously that he had been a victim of conspiracy, set up by a shadowy network of corrupt public and private actors.

While Tasman (N44), Husin (N47), Rachman (N45), and Zainal (N46) were subsequently convicted on lesser corruption charges between 2009 and 2012, other officials named in the verdict and associated with the scheme were not tried. The court also found that the general manager of PT RAPP, Rosman (N118), was a key member of this corrupt network. However, he absconded during the investigation, so the information about his involvement was limited to witness testimony and evidence of payments. None of the directors of the 15 pulp supply companies were tried for their involvement in obtaining the fraudulent HT licences. PT IKPP and their affiliates were

54. Anti-Corruption Law (UU. 31/1999), Article 2, verse 1, and Article 3.

55. See Anti-Corruption Court at Central Jakarta District Court decision 06/PID.B/TPK/2008/PN.JKT.PST, pp. 527-539. TAJ appealed his sentence; however, in 2009 the Supreme Court upheld his original sentence with only minor changes. See Supreme Court decision 736K/Pid.Sus/2009.

56. Part of his wrongdoing included circulating two documents that outlined procedures for obtaining a wood exploitation licence that contradicted standing regulations issued by the ministry.

57. See also Schuette (2020).

not investigated at all. Subsequent calls by local environmental activists to the ministry to retract the fraudulent licences of the pulp supply companies were ignored.⁵⁸

Using legal archives to dissect corrupt networks

If corruption is ‘networked,’ as the sentencing judge concluded, then how did this network effectively function, and whose interests did it serve? A first step in social network analysis is identifying a rich tranche of data that can provide qualitative detail on relations between different nodes – that is, actors – in the network. Given the secrecy of these relationships and the fact that the actors themselves are unreliable narrators when it comes to their own activities, researchers have often drawn on law enforcement documentation to log the interactions between nodes that are critical to network analysis. However, one potential obstacle to robust results is the ‘target effect,’ whereby the pursuit of prosecution of one or more individuals distorts a more fulsome view of the network. Recent research in this field suggests that combining multiple legal datasets provides greater insight into the workings of the whole criminal network.⁵⁹

Analysis revealed a corrupt network with over 200 actors

For the purposes of this study, I used the *berita acara pemeriksaan* (BAP), or criminal investigation report, to document nodes in the network and their interactions. These data were not just difficult to access and in a format that meant they were not digitally searchable;⁶⁰ they were also huge in size, with the BAP running well over 2,000 pages. This study draws node and tie data from the list of received evidence gathered by investigators. These data detailed node interactions – in the form of a financial receipt or a letter – in a way that did not rely on actors to narrate their own relationships. The data were combined with the interrogation files of TAJ and Budi Surlani and targeted reading of the interrogation files of other named witnesses, which frequently documented meetings or financial exchanges.

These two datasets yielded a total of 201 individual nodes, 92 organisational or company nodes, and 919 interactions between these nodes from September 2000 through December 2007. These interactions were coded by type, including financial

58. See also Schuette (2020).

59. Malm and Bichler 2011.

60. Schuette 2020.

interactions, phone calls, letters of agreement, informal meetings, and official correspondence, with the latter making up the vast bulk of the dataset. In addition to this, select witness testimonies, TAJ's own interrogation files, newspaper reports, and NGO reporting from Eyes on the Forest were used to gather qualitative insights.⁶¹ Alongside this dataset, as much qualitative information as possible was gathered about each individual node, with a focus on job history. It's important to remember that not every actor cited in the dataset was involved in wrongdoing and not every interaction mapped in this process was illegal. Indeed many interactions could be considered normal, official interactions in the process of procuring what was ultimately an illegal license.

For the analysis, a network was constructed using an igraph package in R, a programming language.⁶² The network was defined by all actors (nodes) identified in the investigation, while the network ties consisted of all written, verbal, kinship, and financial transactions occurring between one actor and another (directional ties). Informal meetings between two or more actors were defined as bi-directional ties. Standard centrality measures were applied to each actor in the network, including total degree, closeness, node betweenness, edge betweenness, PageRank, and eigenvector centrality.⁶³ Eigenvector centrality identifies actors who have a large number of in-bound links to other actors who themselves have many links; in this way it assesses second-order linkages as well. Hence, an actor who has few connections but whose connections are themselves well connected will score high on the eigenvalue centrality measure. Subsequently, a hierarchical clustering of the actors was applied to the full network to highlight sub-networks centred around possible key actors.⁶⁴

Methodological challenges

The dataset displayed a number of limitations. For one, the data are likely incomplete by standard socio-centric SNA criteria. KPK investigators identified whether actors knew TAJ, but not whether they knew all of the other actors identified in the witness lists. As a result, the full set of relationships between nodes could not be confirmed. Moreover, the evidence in the investigation report yielded some 90 additional actors

61. Newspaper reporting on TAJ's case often lacked important details or misrepresented key facts about the case. In this instance, NGO reporting, archived online, played a fundamental role in correcting the public record. Indonesia-based Eyes on the Forest is a coalition of environmental nongovernmental organisations that investigates deforestation and land grabbing in Indonesia.

62. Csardi and Nepusz 2006; R Core Team 2019.

63. Bonacich 1987; Brin and Page 1998.

64. The clustering was based on the edge measure, that is, the number of shortest paths summed across all pair-wise combinations of two different actors that pass through a tie (Newman and Girvan 2004).

who, knowingly or involuntarily, formed part of the network but had not been identified by investigators as witnesses. This suggests that this network's boundaries are fuzzy.

Another distortion to the data is that KPK investigators, seeking a successful conviction, were oriented to Indonesia's legal framework, which leaned heavily towards the pursuit of state actors over private actors or companies. As a result, there are worrying gaps in the data around private sector actors such as Rosman (N118), the director of PT RAPP, whose interests and resources were central to the functioning of the network. TAJ also approved timber utilisation licences for PT Mitra Hutani Jaya and PT Satria Perkasa Agung, both pulp supply companies affiliated to PT RAPP's competitor, PT IKPP. While investigators gathered material evidence associated with the procurement of these licences, they interviewed notably fewer witnesses affiliated to PT IKPP. N57, the first director of a large palm oil company, to whom TAJ was in huge financial debt, also escaped scrutiny. The exclusion of certain actors over others through the process of criminal investigation is known as the 'spotlight effect.'

Many individuals who wielded influence within the network successfully eluded prosecution

The spotlight effect has also meant that the dataset only partially reflects the flow of financial transfers through the network. KPK investigators mapped financial transfers between actors but only haphazardly pursued second-tier transfers to other nodes, which would have significantly increased network data. The data also show that some organisations and actors, such as the companies Surlani managed ostensibly 'for' TAJ, absorbed very large material transfers, but given their largely non-operational status it is unclear what these monies were ultimately spent on. Other actors identified in qualitative studies as fixtures of illegal logging rackets are absent, such as members of the military and police.⁶⁵ There is insufficient data, too, on how this network engaged with the Ministry of Environment and Forestry in Jakarta, despite the ministry's approval of secondary licenses associated with the scheme.⁶⁶ Nonetheless, assessments of the robustness of available data need to consider the timing of this case. In 2007, just three years after the anti-corruption commission's establishment, KPK investigators were still new to the job and anxious to gather as much evidence as possible. As a result, the investigation files pertaining to the TAJ case may in fact be the most complete dataset on corruption networks that the KPK has.

65. McCarthy 2006; Potter and Badcock 2001.

66. Among these were the annual and five-year workplans (*Rencana kerja tahunan*). The minister also approved an irregular post-factum 'dispensation' to approve an associated permit subsequent to the licences based on the national significance of the pulp industry.

Who associates in a corrupt network and why?

Distinct from criminal networks, corrupt networks are defined in the literature as broad and decentralised, sprawling across organisations and individuals and ‘involving many dozens, if not hundreds of persons’.⁶⁷ Many of these persons are what Wang refers to as ‘grey actors’ endowed with specialist skills, such as lawyers, notaries, accountants, surveyors, and technical consultants. Either unknowingly or with complicity, they enable some of the most important exchanges and functions within corrupt networks.⁶⁸

The network revolving around TAJ confirms these findings. It features 201 actors (nodes) across seven different occupational/associational categories. The vast bulk of this network is centred in urban areas, especially Pangkalan Kerinci, Pelalawan’s district capital, and Pekanbaru, capital of Riau province. Of the 201 actors, only 19 can be characterised as head of a political association or department of national government or active director of a private sector company. Only 37% of the 108 nodes interviewed by the KPK investigators stated that they knew TAJ personally. This means that a large proportion of actors were in fact loosely and potentially some unwittingly integrated, drawn into servicing the network through their institutional affiliation or their association with other actors.

TAJ’s network was highly stratified by status, gender, and class. These are structural inequalities that complicate factors of complicity and material gain. Many enablers of corruption are middle or low-level functionaries working in institutions where their careers are dependent on the discretionary power of higher-ups. The fact that TAJ’s ‘trust network’ included his wife and two children, the family house servant, and his personal driver raises questions of how kinship and trust are mediated through relations of structural inequality within a corrupt network. Whereas criminal networks are held together by the promise of mutual material gain, corrupt networks appear to be loosely integrated by a combination of mutual interests, professional obligations, social debt, familial obligations, and relations of coercion.⁶⁹

Table 2. Pulp industry actors dominate the composition of TAJ’s corrupt network

Occupation/sector	No. of nodes	% of total
Pulp industry	82	41.0%
District forestry	47	23.4%
Other	24	12.0%
Trust network	17	8.5%

67. Wang 2019.

68. Garay-Salamanca, Salcedo-Albarán, and Macías 2018; Jancsics and Jávora 2012.

69. Costa 2017; Wang 2019; Chang 2018.

Occupation/sector	No. of nodes	% of total
Non-pulp private sector	14	6.7%
Provincial forestry	9	4.5%
Government	8	3.9%
Total	201	100%

Nodes from the **pulp industry** constitute the largest occupational group within the network, making up 41% of the network. Many of these actors were mid-level management, including auditors, cashiers, accountants, legal advisors, human resource officers, camp managers, and foremen. Company-affiliated ‘grey actors’ with specialised skills took on key liaison roles, delivering instructions and money drops to TAJ’s inner circle. **District and provincial forestry officials** make up the second-largest occupational group within the network, with a combined 27.9% of nodes. Within this group, district-level officials predominate. Only nine actors were from the provincial forestry department, including departmental heads Syuhada Tasman, Asral Rachman, and Burhanuddin Husin, who were ultimately convicted for their roles.

The **government** category included elected members of local parliament, such as TAJ’s eventual successor and the head of the local chapter of the Golkar party. Government also included provincial and Jakarta-based politicians such as former Riau governors, then-governor Rusli Zainal, three forestry ministers and four forestry officials in central government. Finally, the ‘**other**’ category was characterised by actors in positions of oversight. These individuals were employed within civil society, the media, and government, including the Supreme Audit Commission (*Badan Pemeriksaan Keuangan*) and the Indonesian Institute of Sciences (*Lembaga Ilmu Pengetahuan Indonesia*).

Categorising actors by occupation is useful because it highlights groups with tight connections. Nodal clusters could be identified within PT RAPP/PT PKS and the Pelalawan district forestry office. Within the latter there emerged a core subset of five or six individuals who appeared to dominate departmental management, rotating through key positions, including that of departmental head. But occupational categorisation also provides a useful framework to reveal how important network actors resist easy compartmentalisation. This is in keeping with much of the existing literature that demonstrates that ‘category trespass’ is a typical feature of corrupt networks, particularly in contexts of pervasive or systematic political corruption.⁷⁰ It enables corrupt networks to expand in scale and extractive capacity as well as to access critical resources.

70. Chang 2018; Costa 2017; To, Mahanty, and Dressler 2014.

Wang⁷¹ describes four kinds of category trespass (also called ‘boundary spanning’ or ‘brokerage’) that serve to expand corruption networks: (a) officials transferred across bureaucratic jurisdictions, (b) private sector actors connecting different state actors, (c) state officials moving to the private sector, and (d) the kin of officials connecting state and private sector. In TAJ’s network, all four types were evident. TAJ’s kin served in company directorship roles, alongside former and current district forestry staff (and their kin). Directors of timber supply companies frequently fronted more than one business and had backgrounds as former employees of PT RAPP or PT PKS (see Table 1). During TAJ’s period as regent, the heads of the Pelalawan forestry department were also rotated to management positions in the regent’s office, specialising in forest conservation or environmental impact. Actors engaged in category trespass had many connections, but they nonetheless were not the most institutionally powerful actors in the network. This suggests that brokerage is a type of labour within corruption rackets reserved for middle and second-tier actors.

The relational structure of corrupt networks

Social network analysis identifies the structure of relations that enables a network to function.⁷² In the current study, as a first step, descriptive statistics were generated, providing insight into the overall topography of the network (Table 3). The values produced through this analysis suggest a network that was both large and broad, indicated by the low betweenness score. This is consistent with the large number of actors involved in this corrupt network, many of whom were undertaking routine bureaucratic activity to process the HTI licences. But the network was also relatively unconsolidated, as reflected in the low density and transitivity scores.

71. 2019.

72. Borgatti, Everett, and Johnson 2018.

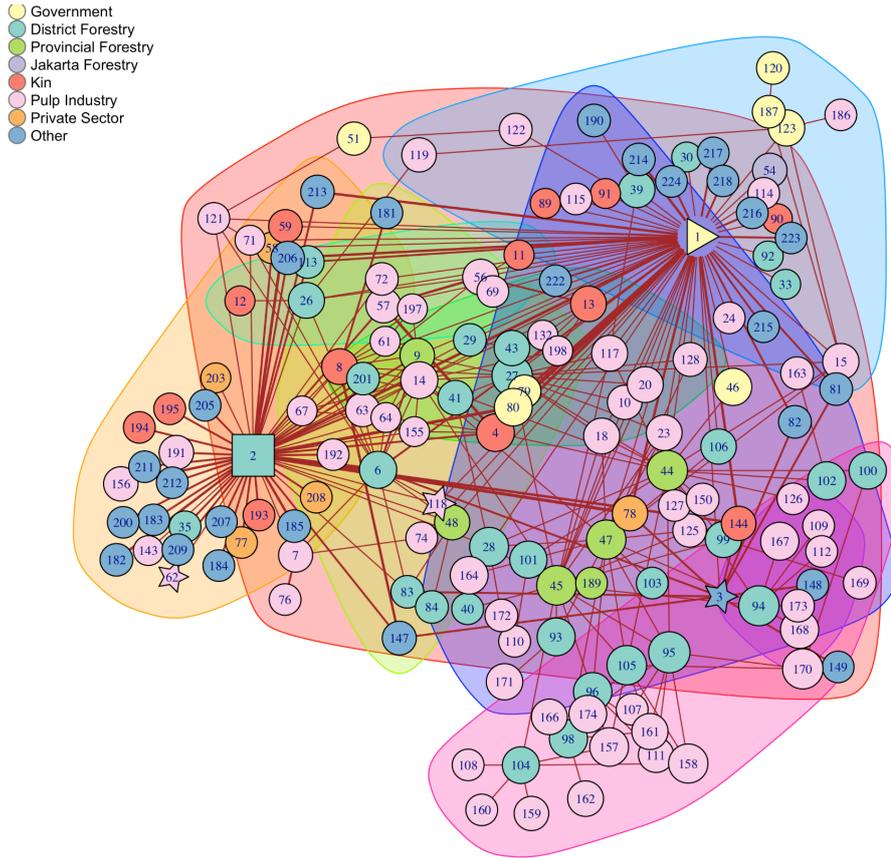
Table 3. Descriptive statistics of TAJ's network

Descriptive statistics	Network
Size	201 nodes
Tie density	0.0160
Reciprocity	0.452
Transitivity	0.045
Diameter	6
Degree	0.253
Closeness	0.480
Eigenvector	0.881
Betweenness	0.135
Mean distance	2.649

Note: Degree, closeness, eigenvector, and betweenness are typically node-level measures. However, the node-level measures may be 'centralised' across the network to report a graph-level measure (Wasserman and Faust 1994).

While topographical surveys provide a generalised representation of the relations within the network, Figure 2 provides a visualisation of tie betweenness, a measure of the most significant relationships in TAJ's network. Thicker ties between two nodes indicate a higher frequency of interaction, as outlined in the methodology. Larger nodes represent actors with a higher number of connections. Figure 2 also highlights otherwise obscured relationships, clusters, and subgroups. Coloured underlays organise nodes into the main relational groups within the network based on frequency of interaction.

Figure 2. Tie betweenness in the TAJ corruption network



Note: Actors are indicated by their identifying number in the dataset. As shown, TAJ (N1) and Budi Surlani (N2) are driving figures in the corrupt network.

The key relationships of Figure 2 are displayed in Table 4, which ranks the eight most active relational pathways within the network. Unsurprisingly, as Figure 2 shows, the most important relationship in the network was the one between TAJ (N1) and Budi Surlani (N2). TAJ and Surlani were also the actors with the most connections. The next most frequently traversed pathways were between TAJ and successive heads of the provincial Riau forestry department, namely Asral Rachman (N45), Syuhada Tasman (N44), and Burhanuddin Husin (N47); all were subsequently investigated by the KPK and convicted for corruption.

Moving further down the table, the ties ranking fifth and sixth in betweenness were those of provincial departmental heads Asral Rachman (N45) and Burhanuddin Husin (N47) with employees in the Riau forestry department (N98 and N104). N98 and N104 held, in different years, the same position with a sub-unit of the department that appears unrelated to the processing of logging licences. This suggests that individuals in forestry units that do not routinely process licences nonetheless wield enough informal authority to exert significant influence on the issuing of licences. That these relationships would rank so highly in tie betweenness underscores the stratified nature of the network and

the significant role of category-trespassing, lower-level grey actors in performing the labour that facilitates corrupt activity.

Table 4. The most active relational pathways within the TAJ network

No.	Tie	Betweenness ranking
1	N1 N2	1383.84
2	N1 N45	1084.62
3	N1 N44	891.94
4	N1 N47	882.08
5	N45 N104	610.29
6	N47 N98	447.81
7	N2 N28	445.60
8	N2 N14	423.51

Note: Tie betweenness is shown in descending order. All ties were given equal weighting for each of the different node and graph measures.

Much of the literature on criminal networks has suggested that network structure is mediated through the tension between twin needs for effectiveness and covertness.⁷³ Cunningham, Everton, and Murphy⁷⁴ argue that terrorist networks are highly responsive to law enforcement, shifting rapidly from hierarchical to decentralised cell-like formations. In TAJ's corrupt network, we see multiple network structures at work. Figure 2 shows two star-shaped formations dominating the network. These structures, also known as hub-and-spoke formations, are organised as we might expect around the highest-degree nodes, TAJ (N1) and Budi Surlani (N2). Star-shaped networks are characteristic of traditional organised crime.⁷⁵ These relational structures cluster communication and resource distribution around a central node to which all nodes connect, with no ties between the outlying nodes.

This type of network formation is efficient because it is so heavily centralised.⁷⁶ However, while hub-and-spoke networks are efficient at moving information and resources, they also render the hubs highly visible. Because the most connected nodes are also the most vulnerable to law enforcement, a centralised hub-and-spoke strategy is freighted with risk.⁷⁷ As such we see that TAJ directly monopolises the relationships with major political power brokers, regional leaders (N120) and forestry ministers. Wang⁷⁸ argues that one form of boundary spanning consists of private sector actors connecting state actors with each other. In Figure 2 we see that TAJ's access to

73. Everton 2012.

74. 2016.

75. Allum and Gilmour 2012.

76. Borgatti, Everett, and Johnson 2018, 184.

77. Diviák, Dijkstra, and Snijders 2019.

78. 2019.

the forestry minister (N51) is in fact indirect and is mediated by a pulp industry actor (N122).

Like TAJ, Budi Surlani is also a nodal hub in a star-shaped formation. As the network's most connected node, Surlani undertook the everyday housekeeping of corruption by physically channelling information and money. His network includes connections with a subset of the network under TAJ's direction. The effect is not just to bring the various arms of TAJ's political, economic, family, and social life into a single web, but to produce the appearance of distance between the district head and the corrupt scheme. Figure 2 shows a ring of 'spokes,' or dead-end relational structures, around Surlani. These are mainly second-tier bureaucrats from the district and provincial forestry offices, board members from pulp shell companies, and staff from the pulp industry and PT Rapp, from whom Budi Surlani received and delivered money.

In transcripts of his interrogation by KPK investigators, Surlani persistently argues that he was working at the behest of TAJ and did not personally profit from the scheme. However, the interaction database illustrates that Surlani, together with Pelalawan forestry department official Hambali (N6), procures significant sums of money from PT RAPP, which they sink into two of TAJ's shell companies. Surlani states to KPK investigators that this money was ostensibly for 'operational costs' of the companies that would ultimately enter into work agreements with PT RAPP (Table 1). Because the investigation money trail ends at this point, it's unclear how these large sums were disbursed, and investigators do not quiz the witnesses further about their long-term intentions for these companies. Indeed, Surlani and Hambali's interests are never made explicit.

Surlani is also tightly linked into another network that emerges around N3. With her friend Margareta (N8), N3 transfers sums of money to a small network of associates who have not cultivated relationships with TAJ. These include nodes N78, N147, N148, and N149. The latter three actors were never listed as witnesses by KPK investigators, despite N147 being a well-known PT RAPP employee and power broker in the Islamic Justice Party (*Partai Keadilan Sejahtera* or PKS). Why these sums are transferred in this way and for what purpose is not a point of investigation.

A second important relational dynamic is the modular shape, or subgroup, shown in the lower right-hand area of Figure 2. Modularity, observes Ferrali,⁷⁹ is a key feature of corrupt bureaucracies because it is an expression of the monopoly power of state actors. Figure 2 demonstrates a modular component around heads of the provincial forestry

79. 2017.

office, namely Syuhada Tasman (N44), Asral Rachman (N45), and Burhanuddin Husin (N47), who occupied this position in different periods over the life of the scheme. As head of this important office, these nodes dominated the processing of fraudulent licences and controlled the lower purple-coloured cluster otherwise inaccessible to TAJ and Surlani. Their monopoly control over the provincial forestry office explains the high ranking of these relationships in Table 3. This fits with recent findings by Mahanty⁸⁰ in her study of the role of state actors in smuggling routes in Vietnam.

Nodal analysis: Power and impunity in networks

The picture of how power is organised within TAJ's network changes when we shift the focus of analysis from the tie (relational data) level to the nodal (individual actor) level. Nodal centrality measures provide insight into which individual actors exert influence over the network. But centrality can be captured in distinct ways, each of which needs to be carefully considered in the context of networked corruption.⁸¹ For instance, *degree centrality* measures the number of ties a node has and assumes that the node with the highest number of ties exerts the most power. However, scholars of corrupt networks have observed that having numerous ties can leave key actors vulnerable to detection. As a result, orchestrators of corruption may choose to limit their social exposure and instead advance brokers or representatives who maintain ties on their behalf across the network.⁸² Thus, scholars suggest that while important actors might have low degree centrality, they are unlikely to have low *betweenness centrality*, a measure that better captures the actors who have indirect influence or gatekeeping power.⁸³ Actors with high betweenness centrality are critical 'transmission points' that connect one actor to another.⁸⁴

As expected, Budi Surlani and TAJ dominate all centrality measures. Their relationships are central to this network, and as a result, they are highly visible within the network. But when we move away from analysing tie data to consider individual node data, different dynamics of influence emerge. First, the influence of the provincial departmental heads evaporates (Table 4 and Figure 2). Instead, measuring by degree centrality advances a range of actors drawn from TAJ's inner circle and the boards of

80. 2019.

81. Centrality measures tested here include degree centrality, closeness, betweenness, PageRank, and eigenvector.

82. Wang 2019; Costa 2017; Diviák, Dijkstra, and Snijders 2019.

83. Diviák, Dijkstra, and Snijders 2019; Cunningham, Everton, and Murphy 2016.

84. Borgatti, Everett, and Johnson 2018, 201.

directors of his shell companies, including TAJ's brother Tengku Lukman Jaafar, federal official and wife to local bureaucrat (N3), Margareta (N8), Pelalawan district official Hambali (N6), provincial forestry official Andri Yama Putra (N9), and driver Muhammad Faisal (N4). In many ways this resonates with traditional representations of criminal networks, where trusted kin and associates dominate the inner circle of relations.

However, when organised by betweenness centrality, the range of actors that emerges shifts again. Here, alongside TAJ's trust network, we see the presence of a number of pulp actors, political and social figures, and provincial forestry bureaucrats. Specifically, this group includes two provincial forestry accountants (N84 and N83); a PT RAPP employee (N63) who enabled the scheme; PT RAPP general manager Rosman (N118), who financed the scheme; a palm oil baron (N57), to whom TAJ appeared heavily indebted prior to the scheme; and political actors, such as TAJ's campaign manager (N144), a local Golkar party power broker (N80), and a newspaper editor (N82). Distortions in the dataset mean we don't have a clear picture as to whether these actors knew each other directly. Fragmented by occupation, with distinct interests, this group of actors should not be understood as a shadowy cabal of puppeteers manipulating the network. However, these results do suggest that TAJ's network was peppered with individuals who had extraordinary access to key resources – public opinion, bureaucratic institutions, money, or political clout – and exerted influence over the network in less overt ways. These individuals successfully eluded prosecution, and a number of them continue to exert significant power over forestry politics in Riau.

Network analysis demonstrates that impunity underpinned the corrupt network

The question of impunity and power is further reflected in the structure of the network, discussed in the previous section. Hub-and-spoke formations, though efficient, are remarkably simplistic, and in this case they served to amplify the visibility of TAJ and Budi Surlani. Access to information and resources was relatively easy for most actors, increasing the chance that the network could be exposed. All of this suggests that TAJ and the actors in his corrupt network did not feel threatened by the law enforcement environment. Given the Indonesian police's low capacity and interest in investigating financial crime, as well as the fact that the anti-corruption commission was still in its infancy, the enforcement threat was indeed low. In Jakarta, the forestry ministry could barely get district heads to comply with regulation, let alone police district forestry offices in far-flung fields such as Pelalawan. Consequently, TAJ and other network actors could surmise that the risks were low, and they had little motivation to adapt the relationships and activities of the network to evade detection.

Beyond the lack of policing, TAJ's network had other reasons to believe they were impervious to law enforcement. TAJ rose to the regency at a time of unmitigated crisis in the pulp industry, a nationally significant industry whose unsustainable growth had thus far been propelled by fantastical planning, preferential state treatment, and legal transgression. As rancorous competition for raw materials threatened a fledgling industry, TAJ argued in court that issuing fraudulent licences to shell companies was a strategic workaround that would ensure timber supply. While the licences were not strictly legal, the fact that they were ultimately signed off by the forestry ministry confirmed in TAJ's eyes that these kinds of workarounds were tacitly permitted by Jakarta. In short, TAJ's network structure – unsophisticated, visible, and highly vulnerable – was seen by its core actors as sharing in the political and legal impunity that the pulp industry itself was perceived to enjoy. This case shows us that corrupt networks are shaped not just by the twin imperatives of secrecy and efficacy, but by national political economy dynamics.

More importantly for the Riau pulp barons, TAJ's scheme was more than a quick route to securing timber supply. This corruption network needs to be understood in historical perspective: emerging at a watershed moment for the industry, it laid the foundation for a system of pulp supply that combined the benefits of legal distance with the privileges of vertical integration. Anti-corruption efforts by the KPK effectively vaporised TAJ and provincial state actors from the network. But by failing to target the private sector in whose interests the scheme was established, the KPK allowed TAJ's network – so essential to the supply of pulp – to become effectively embedded in the pulp economy.

For PT RAPP this meant that its zombie logging companies could consolidate their presence by continuing to engage in illegal timber procurement, using such means as arson, illegal logging, fraudulent licensing, and tax evasion. Shell companies not only provided a consistent, predictable, and above all cheap supply of timber, they also projected an innocuous legal distance from PT RAPP and its parent company APRIL. In 2014, the Ministry of Environment and Forestry took established PT RAPP supplier PT Merbau Pelalawan Lestari (PT MPL, see Table 2) to court for illegal logging and environmental devastation based on TAJ's conviction and subsequent ones. This resulted in a record fine to the company of \$1.2 billion, a sum that remains unpaid today.⁸⁵ APRIL rejected allegations that PT MPL is an affiliate of PT RAPP and argued that it had not bought fibre from the company since 2005.⁸⁶

85. Jong 2016.

86. Eyes on the Forest 2016.

Since TAJ's imprisonment, corporate fraud has only intensified and led to rapid stripping of Riau's forests

The Indonesian government's failure to prosecute the companies' beneficial owners has had long-lasting, industry-wide impact, most notably in the replication of many elements of TAJ's crimes by the pulp conglomerates. A decade after TAJ's imprisonment, a report examining pulp supply chains to Asia Pulp and Paper, the rival conglomerate to PT RAPP's APRIL, found that 27 of the 33 supposedly independent pulpwood suppliers to the company were in fact managed by a circle of former and current employees of APP's finance, accounting, and legal departments and their relatives and associates.⁸⁷ This mimics the way in which PT RAPP orchestrated the takeover of TAJ's companies and installed directors of seemingly 'independent' pulp suppliers who were in fact PT Rapp employees. In other words, since the conviction of TAJ and others complicit in the scheme, pulpwood capitalism has continued to develop vertically integrated timber suppliers through fictitiously 'independent' shell companies.

Disrupting corrupt networks in Indonesia's forestry sector

The decade since TAJ's conviction has seen Indonesia implement far-reaching reforms aimed at tackling illegal deforestation. These include the adoption of international market-based incentives such as REDD+, as well as forest law enforcement and governance (FLEG) initiatives, industry certification, the expansion of domestic law enforcement, and a national moratorium on logging.⁸⁸ Yet the pulp industry's corporate structures appear to have evaded reform.

Using social network analysis to map the corrupt networks that drive deforestation provides an innovative way to organise and analyse corruption data, revealing patterns of networked activity that are otherwise difficult to observe. As we have seen, forestry corruption networks are remarkably broad and far-reaching. They have large numbers of actors, organised in clusters of association with unevenly distributed gains. In the network studied here, powerful state actors held monopoly control over key resources, making them principal players, but they were assisted by a raft of 'grey actors' in the private and public spheres who utilised their specialised skills in lawyering, surveying,

87. Koalisi Anti-Mafia Hutan 2018.

88. I thank John McCarthy for this point.

or accounting to enable the scheme to continue. The network's architects also leveraged existing social and structural inequalities to draw in collaborators. These small but essential roles distribute criminal responsibility in ways that complicate conventional ideas of judicial culpability.

SNA offers insights that can help strengthen the prosecution of corruption in Indonesia. In the case of TAJ, SNA confirms many of the prosecutorial and investigative decisions of the KPK investigators. These included the decision to home in on TAJ as the centre of this network and to pursue provincial heads of the forestry department, Burhanuddin Husin, Asral Rachman, and Syuhuda Tasman, for their participation in the scheme. Understandably, operating in a regulatory context in which corporate criminal liability was only weakly instituted, KPK prosecutors prioritised big political fish over private sector actors.⁸⁹

To understand who benefits from corruption, follow the money trail

Nonetheless, even with weak corporate liability, the failure to intercept co-conspirator Rosman, PT RAPP's general manager, is a glaring omission. Pulp actors represented the largest component of the network and were among the principal beneficiaries of the scheme. Not only did investigators tread lightly around PT RAPP; they did not subject PT IKPP, whose timber supplies also received fraudulent licences, to investigation at all. Neglecting to follow the trail of monetary transfers beyond second-tier transactions meant that the corrupt network appeared smaller than it likely was. This effectively obscured the roles of other network beneficiaries, including figures within the Pelawan political and civil elite and its pulp sector, who continue to wield power today. Over the long term this has led to major distortions in the sector. In this corruption case, TAJ provided logging licences to fictitiously 'independent' shell companies that were then vertically integrated into Riau's major pulp conglomerates. Since TAJ's imprisonment in 2009, this model of corporate fraud has not only continued but intensified, leading to the rapid denudement of Riau's primary forests.

The TAJ case and its long-term impact on the pulp sector also points to the critical role of state and non-state institutions in applying other forms of individual, administrative, and corporate sanctions. TAJ's collaborators continued their careers unhindered, some of them taking on powerful leadership positions in the forestry bureaucracy and local

89. In 2016, the Indonesian Supreme Court advanced corporate criminal liability by passing Regulation 13/2016, Manner and Procedure for the Handling of Crimes Committed by Corporations. This enables prosecutors and judges to sanction corporations for corporate crime conducted in their interests or due to omission.

politics. Calls by environmental NGOs to strip the involved companies of their HT licences were ignored by the forestry department, so these companies are still in operation as pulp suppliers. Surveyors, accountants, and lawyers who participated in the scheme have continued in private practice without sanction. Eradicating corrupt networks requires a corruption prevention strategy that actively coordinates across institutional and sectoral boundaries to deploy various forms of public accountability and sanction, including demotion, resignation, nullification of operating licences, public and sectoral ethical reviews, indemnity, and compensation. Moreover, policy makers concerned with the ongoing role of corruption in deforestation and the apparent resilience of corrupt networks in the pulp sector need to combine a more diversified law enforcement approach designed to decapitate networks with economic reform and the enforcement of fair and transparent corporate practice. Towards this end, adopting a political economy approach that critically, historically, and dynamically assesses the distortions and contradictions of the sector is crucial.

This U4 Issue highlights the critical and practical value that SNA can bring to the study of corruption and anti-corruption efforts in the forestry sector. Critical to this analysis is access to data, which in turn depends on the transparency and openness of legal case files. Anti-corruption agencies, the judiciary, and their supporters in the donor community should continue to prioritise open data initiatives in the legal sector to spearhead new innovations in the fight against corruption.

References

Allum, F. and Gilmour, S. 2012. Routledge handbook of transnational organized crime. Routledge.

Aspinall, E. and Berenschot, W. 2019. Democracy for sale: Elections, clientelism, and the state in Indonesia. Cornell University Press.

Aspinall, E. and Sukmajati, M. 2016. Electoral dynamics in Indonesia: Money politics, patronage and clientelism at the grassroots. Singapore: NUS Press.

Barr, C. 2001. Banking on sustainability: Structural adjustment and forestry reform in post-Suharto Indonesia. Bogor, Indonesia: Center for International Forestry Research; Washington, DC: World Wildlife Fund.

Barr, C., Resosudarmo, I., Dermawan, A., and McCarthy, J., eds. 2006. Decentralisation of forest administration in Indonesia: Implications for forest sustainability, economic development and community livelihoods. Bogor, Indonesia: Center for International Forestry Research.

Begley, T., Khatri, N., and Tsang, E. 2010. Networks and cronyism: A social exchange analysis. *Asia Pacific Journal of Management* 27(2): 281–297.

Bonacich, P. 1987. Power and centrality: A family of measures. *American Journal of Sociology* 92(5): 1170–1182.

Borgatti, S. P., Everett, M. G., and Johnson, J. C. 2018. Analyzing social networks. Sage.

Brin, S. and Page, L. 1998. The anatomy of a large-scale hypertextual Web search engine. *Computer Networks and ISDN Systems* 30(1–7): 107–117. Special issue, Proceedings of the Seventh International World Wide Web Conference, 14-18 April 1998, Brisbane, Australia.

Burgess, R., Hansen, M., Olken, B. A., Potapov, P., and Sieber, S. 2012. The political economy of deforestation in the tropics. *Quarterly Journal of Economics* 127(4): 1707–1754.

Chang, Z. 2018. Understanding the corruption networks revealed in the current Chinese anti-corruption campaign: A social network approach. *Journal of Contemporary China*, 27(113): 735–747.

Costa, J. 2017. Networks and illicit associations in corrupt exchanges: Representing a gelatinous system in Italy. *Global Crime* 18(4): 353–374.

Csardi, G. and Nepusz, T. 2006. The igraph software package for complex network research. *Interjournal: Complex Systems* 1695.

Cunningham, D., Everton, S., and Murphy, P. 2016. Understanding dark networks: A strategic framework for the use of social network analysis. Rowman & Littlefield.

Diviák, T., Dijkstra, J. K., and Snijders, T. A. B. 2019. Structure, multiplexity, and centrality in a corruption network: The Czech Rath affair. *Trends in Organized Crime* 22(3): 274–297.

Everton, S. F. 2012. Disrupting dark networks. Cambridge University Press.

Eyes on the Forest. 2006a. PT Arara Abadi of APP clearcuts natural forest in peat Kampar peninsula. 2 December.

Eyes on the Forest. 2006b. Riau Province: Rank no. 1 in illegal timber export. 27 January.

Eyes on the Forest. 2008a. Azmun: I am a victim of conspiracy. 3 September.

Eyes on the Forest. 2008b. Minister blames district head, Jikalauhari urges law enforcement. 10 April.

Eyes on the Forest. 2016. Fiber supplier fined by Supreme Court to pay IDR 16.2 trillion fine. 23 November.

Ferrali, R. 2017. Partners in crime? Corruption as a criminal network.

Garay-Salamanca, L. J., Salcedo-Albarán, E., and Macías, G. 2018. Macro-corruption and the Lava-Jato case: A criminal networks analysis. *Small Wars Journal*, 6 March.

Hadiz, V. 2010. Localising power in post-authoritarian Indonesia: A Southeast Asia perspective. Stanford University Press.

Human Rights Watch. 2003. Without remedy: Human rights abuse and Indonesia's pulp and paper industry. 6 January.

Jancsics, D. and Jávör, I. 2012. Corrupt governmental networks. *International Public Management Journal* 15(1): 62–99.

Jong, H. N. 2016. Landmark court ruling expected to serve as deterrent. *Jakarta Post*, 18 November.

Keller, F. B. 2016. Moving beyond factions: Using social network analysis to uncover patronage networks among Chinese elites. *Journal of East Asian Studies* 16(1): 17–41.

Koalisi Anti-Mafia Hutan (Anti Forest Mafia Coalition). 2018. Removing the corporate mask: An assessment of the ownership and management structures of Asia Pulp & Paper's declared wood suppliers in Indonesia. Jakarta.

KPK (Corruption Eradication Commission). Directorate of Research and Development. 2015. Preventing state losses in Indonesia's forestry sector: An analysis of non-tax forest revenue collection and timber production administration.

Mahanty, S. 2019. Shadow economies and the state: A comparison of cassava and timber networks on the Cambodia-Vietnam frontier. *Journal of Contemporary Asia* 49(2): 193–215.

Malm, A. and Bichler, G. 2011. Networks of collaborating criminals: Assessing the structural vulnerability of drug markets. *Journal of Research in Crime and Delinquency* 48(2): 271–297.

McCarthy, J. F. 2000. 'Wild logging': The rise and fall of logging networks and biodiversity conservation projects on Sumatra's rainforest frontier. Center for International Forestry Research.

McCarthy, J. F. 2002. Power and interest on Sumatra's rainforest frontier: Clientelist coalitions, illegal logging and conservation in the Alas Valley. *Journal of Southeast Asian Studies* 33(1): 77–106.

McCarthy, J. F. 2006. The fourth circle: A political ecology of Sumatra's rainforest frontier. Stanford University Press.

Newman, M. and Girvan, M. 2004. Finding and evaluating community structure in networks. *Physical Review E* 69(2): 026113.

Obidzinski, K. and Kusters, K. 2015. Formalizing the logging sector in Indonesia: Historical dynamics and lessons for current policy initiatives. *Society & Natural Resources* 28(5): 530–542.

Potter, L. and Badcock, S. 2001. The effects of Indonesia's decentralisation on forests and estate crops in Riau Province: Case studies of the original districts of Kampar and Indragiri

Hulu. Case Studies 6 and 7. Bogor, Indonesia: Center for International Forestry Research.

Potter, L. and Badcock, S. 2004. Tree crop smallholders, capitalism, and adat: Studies in Riau Province, Indonesia. *Asian Pacific Viewpoint* 45(3): 341–356.

R Core Team. 2019. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing.

Schuette, S. 2020. Select felling? Learning from KPK's forestry cases. Forthcoming U4 Issue paper.

Tacconi, L., Rodrigues, R. J., and Maryudi, A. 2019. Law enforcement and deforestation: Lessons for Indonesia from Brazil. *Forest Policy and Economics* 108: 101943.

Thee, K. W. 2009. The Indonesian wood products industry. *Journal of the Asia Pacific Economy* 14(2): 138–149.

To, P., Mahanty, S., and Dressler, W. 2014. Social networks of corruption in the Vietnamese and Lao cross-border timber trade. *Anthropological Forum* 24(2): 154–174.

Wang, Y. 2019. A network-exchange approach to corruption: Brokers and institution spanning in a Chinese corruption network. *Deviant Behavior*.

Ward, M. D., Stovel, K., and Sacks, A. 2011. Network analysis and political science. *Annual Review of Political Science* 14(1): 245–264.

Wasserman, S. and Faust, K. 1994. Social network analysis: Methods and applications. Cambridge University Press.

Wijaya, A., Samadhi, T. N. K., and Juliane, R. 2019. Indonesia is reducing deforestation, but problem areas remain. World Resources Institute blog, 24 July.

Zeng, K. and Eastin, J. 2011. Greening China: The benefits of trade and foreign direct investment. University of Michigan Press.