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THE UNIVERSITY OF QUEENSLAND
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Just Transitions and the Pacific

Case Study 2:
Nickel in New Caledonia

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Version 3

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Work Package 2: to develop three qualitative case studies on the justice dimensions of extracting different ETMs in the Pacific under conditions of climate change: Papua New Guinea (copper), New Caledonia (nickel), and Cook Islands (cobalt)

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Contents

Notes on the conceptual framework

This document presents one of three country case studies produced as part of the Just Transitions in the Pacific Project – each focused on a particular Energy Transition Metal sourced from a given Pacific country:

- Papua New Guinea (copper)
- **New Caledonia (nickel)**
- Cook Islands (cobalt)

The case studies offer a granular examination of justice issues that accompany increased pressure to extract ETMs found in the Pacific for global renewable energy technologies.

The energy justice literature generally accepts three foundational justice elements, or what Raphael Heffron and Darren McCauley (2018) have termed a 'triumvirate of tenets': distributive, procedural and restorative justice. Expanding on this, Heffron has developed a 'JUST framework' to consider 'the role of justice in developing critical minerals' (Heffron 2020). In summary, the framework stresses the following elements:

- three core forms of **justice**: procedural, distributive and restorative justice
- two **universal** forms of justice: cosmopolitanism and recognition
- attention to the **spatial** dimensions of developing critical metals
- attention to the **temporal** dimensions of developing critical metals and climate change initiatives

This framework unites climate, environmental and energy (CEE) justice considerations with the view towards reducing inequality and injustice within society, and we adopt these elements accordingly (see Box 1).

Box 1: Justice Dimensions

Procedural justice: refers to fairness of processes used by those in positions of authority to reach specific outcomes or decisions.

Distributive justice: recognises that the economic, political, and social frameworks that each society has result in different distributions of benefits and burdens across members of the society.

Restorative justice: emphasises peaceful processes 'whereby parties with a stake in a specific offence collectively resolve how to deal with the aftermath of the offence and its implications for the future' (Marshall 1999:5).

Cosmopolitanism justice: stems from the belief that we are all 'citizens of the world' and pushes us to consider the effects of actions beyond specific territorial boundaries or legal jurisdictions.

Recognition justice: defines the conditions of a just society through the aim of recognising the individual dignity of all individuals.

The JUST framework helps us to emphasise past, present, and future injustices of extracting ETMs – and the restorations or reparations that are also required – and to consider how justice issues arise over different time and spatial scales.

In the Just Transitions and the Pacific project, we extend this framing to understand how justice issues interact and transform across these scales – what we term **justice convergences**.

Building on the foregoing discussion and categorisation of justice issues related to the extraction of ETMs in the Pacific, in our project – and through the three case studies - we stress the need to understand the relationship between justice issues: how they converge and transform one another, and the effect of time and scale on these convergences and their impacts.

Country location map

Figure 1. The Pacific region (source: ANU CartoGIS unit)

Abbreviations

CRM	Critical Raw Material.
Coutumiers	Kanak people in the context of attachment to the land and to Kanak custom.
DIMENC	*Direction de l'industrie, des mines et de l'energie de la Nouvelle-Calédonie*.
ESG	Environmental, Social and Governance (risks, issues, performance).
ETM	Energy Transition Metal.
FLNKS	Front de Libération Nationale Kanak et Socialiste [‘National Kanak Socialist Liberation Front’].
FPIC	Free, Prior and Informed Consent.
GDPL	*Groupement de droit particulier local* [‘Special Local Rights Grouping’].
GÉOREP	*Le portail de l'information géographique du gouvernement de la Nouvelle-Calédonie* [‘GIS portal of the government of New Caledonia’].
HPAL	High Pressure Acid Leaching.
ISEE	Institut de la statistique et des études économiques [‘Institute for statistics and economic studies’].
KNS	Koniambo Nickel SAS.
MKM	Maï Kouaoua Mines.
NHC	Nickel Hydroxide Cake.
NMC	Nickel Mining Company [subsidiary of SMSP].
OEIL	*Observatoire de l'environnement* [‘Environment Observatory’].
PGM	Platinum Group Metal.
PROMOSUD	*Société de financement et de développement de la province* Sud [‘South Province Finance and Development Company’].
Schéma	*Schéma de mise en valeur des richesses minières* [‘Framework for the Development of Mineral Resources’].
SLN	Société le Nickel [‘The Nickel Company’].
SMSP	*Société minière du Sud Pacifique* [‘Mining company of the South Pacific’].
SOFINOR	*Société de financement et d'investissement de la province Nord* [‘Finance and Investment Company of New Caledonia’].
SMT	Société des Mines de Tontouta [‘Tontouta Mining Company’].
SPMSC	Société de participation minière du Sud calédonien [‘South Caledonia Mining Holdings’].
SSNC	Société du nickel de Nouvelle-Calédonie et de Corée [‘Nickel Company of New Caledonia and Korea’].
STCPI	Société territoriale calédonienne de participation industrielle [‘Caledonian Industry Holdings’].
STENC	*Le schéma pour la transition énergétique de la Nouvelle-Calédonie* [‘Plan for energy transition in New Caledonia’]
Vale NC	Vale Nouvelle-Calédonie SAS.

1. Introduction

New Caledonia, today a French 'special collectivity' in the South Pacific, came to prominence in the 19th century as a penal colony for French criminals and political prisoners, including 4500 deported members of the Paris Commune at the end of the Franco-Prussian War, and over 1000 Algerian insurrectionists. For their part, the Indigenous Kanak (Melanesian) people would live under a system of control known as the *Indigénat* ('Native Code') from 1887 to 1946. In the post-war period, now French citizens, Kanaks living in northern New Caledonia and the Loyalty Islands, where they formed the majority of local populations, suffered from poorer services, less infrastructural development, and fewer economic opportunities than in the prosperous south of the main island where people of French descent predominated (for historical overviews see Aldrich, 1990; Muckle, 2002; Fisher, 2013; Le Meur, 2013).

It was in this context that a nickel industry began in New Caledonia, fitfully after a French mining engineer, Jules Garnier, identified its nickel reserves in the 1860s, with a rush from 1873 as hundreds of small companies sprung up (Bencivengo, 2014), and then on an industrial scale once the first big company, Société le Nickel (SLN), was founded in 1880 by a group of investors (Newbury, 1955; Bencivengo, 2010).

If Kanaks were involved in the early nickel mining industry, it was as unskilled labourers, but few were engaged.

In 2022, a vastly different social, political and economic landscape has replaced the colonial beginnings of the industry at the same time as increasing interest in nickel, principally for battery production, has triggered a price rise in this commodity and looks set to shape the industry for the coming decades.

2. New Caledonia as a source of Energy Transition Metals

2.1 Nickel

Nickel is by far the most important commodity mined in New Caledonia, which was the world's fifth-largest nickel producer in 2019, with exports totalling 220,000 tonnes of nickel content or about 8.1% of world production from some 40 main mine site centres (Figure 5).

At the present day, there are three vertically integrated companies able to mine, process, and export nickel:

- Société Le Nickel (SLN), the oldest, holds important mining concessions at Thio and Kouaoua (east coast), Népoui-Kopéto and Tiébaghi (west coast) and at Poum (far north). Its Doniambo nickel refinery[1] on the outskirts of Nouméa has operated since 1910. Ownership is split between the French minerals group Eramet (56%), the holding company STCPI jointly owned by New Caledonia's three provinces (34%), and Nisshin Steel (10%) (see Newbury 1955; Bencivengo 2014; Black 2014).
- SMSP, owned by the North Province, is party to three joint ventures, in each of which it has a 51% share-holding: Koniambo Nickel SAS (KNS) is a joint venture between SMSP and the international miner Glencore plc (49%), with a refinery at Vavouto in the North Province, and nickel refineries in South Korea and China (see Horowitz, 2008; Kowasch, 2017).
- Prony Resources New Caledonia, a consortium comprising the local entity SPMSC (51%), Trafigura (19%), and a mixed group of investors (30%) operates a mine and refinery at Goro in the South Province (see Horowitz, 2014; Levacher, 2017).

In addition, twenty or more second-line companies that are only engaged in parts of the process of mining, and do not do their own refining, operate across the territory and are loosely known as *petits mineurs* ('small

[1] The term 'refinery' will be used here for all processing plants. More technically, 'smelter' and 'refinery' may be differentiated within the industry.

miners'). Some are well capitalised and export unprocessed nickel ore, while others are restricted to subcontracting to the bigger companies, or do mining and use small coastal bulk carriers to ship ore from coastal wharves to one or other of the refineries (Bouard et al, 2019).

Among the ore exporters is SMSP's subsidiary, NMC ('Nickel Mining Company'), which sends lower grade ore for processing at SMSP's two offshore refineries, at Gwangyang in South Korea, where the minority partner is POSCO, a multinational Korean steelmaker, and at Yangzhou in China, where the minority partner is Yangzhou Yichuan Nickel Industry Co Ltd.

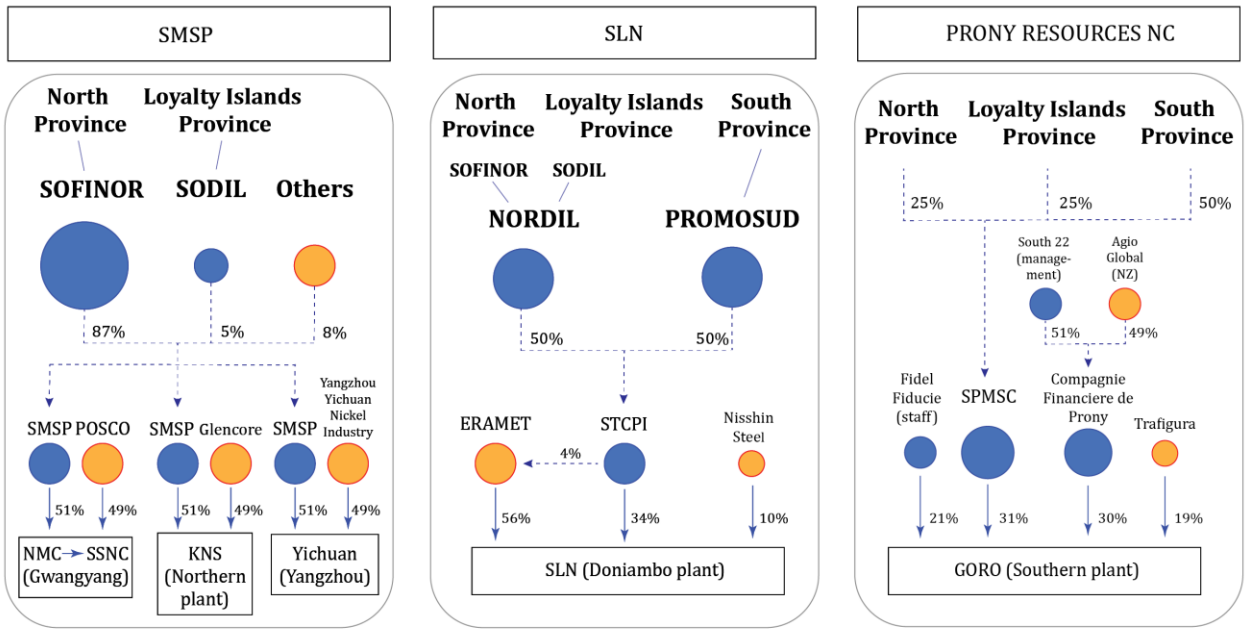


Figure 2. Ownership details for the three consortia with refinery operations in 2022.
Source: Burton & Levacher (2021, Figure 10.1) updated with information from https://pronyresources.com/.

2.2 Secondary ETMs

Cobalt and scandium co-occur with nickel in New Caledonia, and geological surveys have identified deposits containing copper, zinc, chromite and platinum group metals (PGMs). Of these, only cobalt is currently extracted and only as a by-product of nickel refining.

While the focus of this case study is nickel, these other ETMs merit brief mention here.

2.2.1 Cobalt

The different nickel refineries produce different grades of material, with different cobalt contents, which are both influenced by the nature of the deposits they are exploiting. SLN's Doniambo refinery historically used a pyrometallurgical (smelter) process to produce ferronickel and then nickel matte, which has a typical composition of 73-78% nickel, 3% copper, 0.8% cobalt, with traces of platinum group metals (PGMs). This was then further refined at a plant at Le Havre in France to produce pure nickel, but it became uneconomic to supply the Le Havre plant from Nouméa, and SLN ceased exporting matte in 2016.

SLN now only exports 'SLN25' ferronickel pellets (Eramet, 2016), a second-grade product destined to be primarily used in the making of stainless steel. SLN is the world's largest producer of this form of nickel, and the pellets have a typical composition of 20-28% nickel, 0.65% chromium and 0.6-0.8% cobalt (Eramet, 2018).

At Goro, a High Pressure Acid Leaching (HPAL) process is used. Technical problems in getting the process to work prompted the previous owner to bring an intermediate product, Nickel Hydroxide Cake (NHC), to market instead (Vale 2010). NHC has a composition of 37% nickel and 2-3% cobalt. The higher concentration of cobalt means that it is economically viable to extract it with a further process.

Around 2,100 tonnes of cobalt were exported from New Caledonia in 2019, or about 1.5% of world production (USGS, 2020).

2.2.2 Copper and Zinc

A recent geological assessment draws attention to the fact that copper, zinc and silver occur in the catchment of the Diahot River in the northern part of the main island at former mine sites that were last exploited before WWII (Maurizot et al., 2020a). However, it is thought that no new exploration drilling has taken place since the 1990s.

2.2.3 Scandium

The rare earth scandium, which co-occurs with nickel and cobalt, is found in New Caledonia, for example at Goro and Koniambo, but it is not currently exploited (Maurizot et al., 2020b, p. 269).

Reports of new processes (e.g. Barich, 2020; Klimpel et al., 2021) stand to change the economics of extraction for scandium as the energy transition gathers pace, so future production in New Caledonia is conceivable.

2.2.4 Chromium

New Caledonia also has deposits of chromite, a mineral composed of iron and chromium compounds, with the most extensive being at Tiébaghi and Poum in the far north. New Caledonia was a chromite producer as far back as 1880, but there has been no production since 1990 (Maurizot et al., 2020, pp. 269-271).

2.2.5 Platinum Group Metals

The platinum group metals (PGMs) are on the EU Critical Raw Materials (CRM) list (European Commission, 2020). The presence of PGM-bearing rocks in various parts of New Caledonia has been picked up in geological survey work, mostly in association with chromite (Maurizot et al, 2020b). There have been no proposals to date to target PGMs at active or future mines.

3. The colonial background to mining in New Caledonia

To understand likely future environmental, social and governance (ESG) risks in New Caledonia if the demand for nickel rises as part of the energy transition, we must both look back into the past and at current trends in the society of New Caledonia.

3.1 Colonial history / ecological imperialism

Who was where when mining titles were issued across swathes of the inland parts of New Caledonia is critical to understanding contemporary justice issues. The exact population of New Caledonia before contact with Europeans in the 1790s is not definitively known, but where people lived is becoming clearer. The colonial-era picture was that a population of 40,000-50,000 Kanaks was present when the French claimed possession in 1854, probably mostly in coastal areas, and that this declined to the 27,100 censused in 1921 (Ward, 1982, Table 1). Any greater decline was deemed ‘exaggerated’ as late as 1990 (e.g. Alfrich, 1990). However, Sand, Bole and Ouetcho (2007) rebut this with archaeological evidence of a much fuller settlement of Grande Terre, the main island. They point to ‘densely occupied seashores, valleys, and inner plateaus’, and lend weight to accounts that introduced diseases ‘destroyed hundreds of villages’ in the 1820s and the statement of the Marist missionary Father Rougeyron that an epidemic carried off half the population of Hienghène in 1847 (Douglas, 1972, p. 51). Sand et al do not give a figure for the pre-contact population of New Caledonia, but they say that an estimate of 80,000-100,000 is still ‘far too low’.

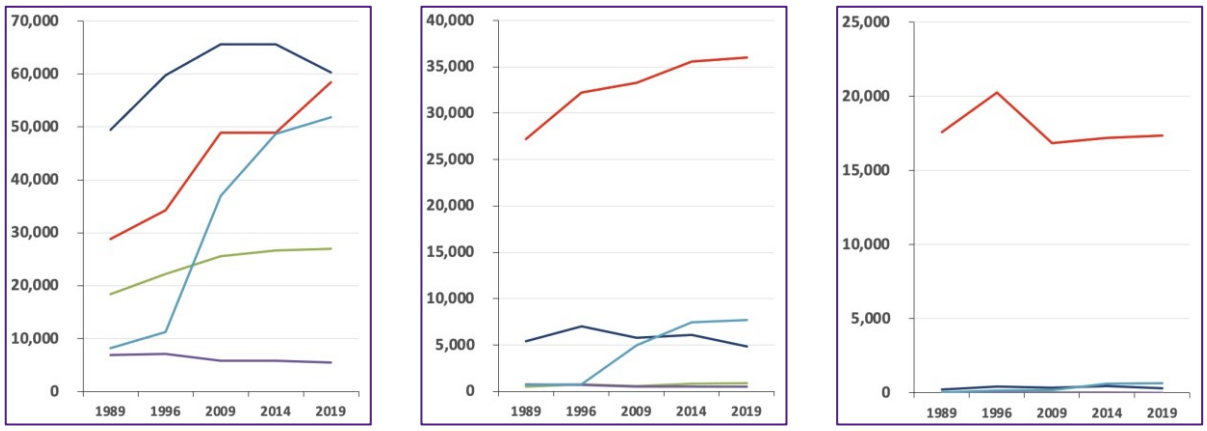
This puts new light on the scale of dispossession in the interior, where most active mining titles are located, highlighting what Crosby (1986) called ‘ecological imperialism’ by introduced disease. If the largely unseen loss of population was the first act, the second was a colonial ideology of seeing land ownership by

Melanesian cultivators as only 'a sort of right of occupation' that a 'civilised power, in establishing a colony, acquired the right to do away with' (Douglas, 1972, p. 369). The third act was the actual displacement of Kanaks, as French settlers acquired prime land for agriculture and the raising of livestock. Numerous land conflicts resulted in the cantonment of Kanaks on reserves amounting to only small parts of their original territories (Douglas, 1972, pp. 364-366). The major insurrection of 1878 led by Ataï, a celebrated chief at La Foa (Banaré, 2018), was crushed with ferocity and paved the way for the oppression of the *Indigénat* and an ever-greater alienation of land across Grande Terre. This was traced decade by decade for one district over a full century by Saussol (1989).

Simply put, the ease with which large-scale mining titles could be issued from the 1880s, enabling the early operations of SLN, which is still the holder of the greatest hectarage of titles in 2022, would not have been possible without each of the three complementing acts of colonial dispossession.

3.2 Resurgence of the Indigenous population – implications

In comparison with the dismal picture painted for the 19th century, recent trends in the demography of New Caledonia show a resurgence of the original population. The overall balance of numbers was by no means assured until quite recently due to the arrival of waves of new immigrants – for example, from Vietnam and Algeria – and even a periodically-repeated threat by loyalists to incentivise renewed settlement from France.



South Province North Province Loyalty Islands

Figure 3. Ethnic composition of the three provinces, 1989-2019.
Key: — Kanak — European — Wallis, Futuna, Tahiti — Asia — More than one ethnicity. Source: ISEE (2020).

The recent trend has profound political significance because the anti-independence parties in New Caledonia draw their support from voters of European (French) background, which is now a declining segment of the population (24% in 2019). By contrast, the Indigenous Kanak population (41% in 2019), which favours independence, is growing steadily (Rivoilan, 2020).

Recent census results (Figure 3) show that, even in the South Province, Kanaks, 20,000 behind only 10 years ago, will outnumber residents of European descent by the time of the next census in 2024. This is both from natural growth and internal migration from the other two provinces. In the less populous North Province and Loyalty Islands, Kanaks dominate.

Two independence referendums, held in 2018 and 2020, were both carried by the 'no' vote – narrowly in 2020. The independence coalition of parties, the *Front de Libération Nationale Kanak et Socialiste* (FLNKS), asked for the third vote, in late 2021, to be postponed because of the >200 COVID deaths in Kanak communities during the year. The poll proceeded with little Kanak turnout, and the result was a heavy, but meaningless, 'no'. The demographic trend, though, is that Kanak voters will outnumber loyalist voters in the next few years, and the issue is bound to be revisited.

4. Decolonising the nickel industry

4.1 A new start

Although the demographic resurgence was by no means assured in the 1980s, a modern New Caledonia is emerging from a fundamental political and economic reset initiated in 1988. The 1980s had been riven with violent clashes, known as *les événements* ('the events'), which centred on the struggle of the Indigenous Kanak (Melanesian) people for self-determination. The violence culminated in the crushing of Kanak militants by French special forces at the Gossanah cave on Ouvéa two days before the final round of the 1988 French presidential elections. The assault was ordered by the sitting president's rival, the rightist prime minister, Jacques Chirac. Defeating Chirac, the re-elected President Mitterand installed a conciliatory replacement and set him the task of restoring a peaceful dialogue between separatists and loyalists. A first set of political agreements, the Matignon-Oudinot Accords, were signed in Paris a month later.

As part of the agreements, New Caledonia would now be administratively divided into three provinces. Historically, meaningful economic activity had all been centred on the South Province, the location of the territorial capital Nouméa, the heartland of French settlement, and where three-quarters of New Caledonia's inhabitants, numbering 271,400 at the 2019 census, are to be found.

A second structure of administrative 'custom areas' (*aires coutumières*) was also created, regrouping the tribal areas into eight zones (five mainland, three island zones), each having a Custom Council (*Conseil coutumier*) and sending two senators to the territorial Custom Senate (*Sénat coutumier*). The customary residents of these areas are known as *coutumiers*, for which there is no convenient equivalent in English.[2]

A policy of economic *rééquilibrage* ('rebalancing') followed to address past inequities in the provision of infrastructure and services among the three provinces. The North, for example, previously had no urban development. Since the introduction of the, a new provincial capital, Koné, and a zone of development known as VKP (Voh-Koné-Pouembout) have sprung up, with the hospital, secondary schools, technical colleges and research institutions, development financing institutions, and employment opportunities that were previously lacking (Bouard et al, 2016).

Control of mineral resources, central to the economy, was not raised in the Matignon talks but came up as a precondition, a *préalable minier*, for further negotiations. The first political agreement related to mining was the Bercy Accord of February 1998. It laid the ground for a commercial agreement to create a joint venture, Koniambo Nickel SAS, between the now Kanak-controlled Société minière du Sud Pacifique (SMSP, 51%) and Falconbridge of Canada (49%) to build a new refinery at Vavouto near Koné, which would process ore from SMSP's nickel concessions inland of Vavouto.

These moves were complemented by the Nouméa Accord, signed later in 1998, resulting in the transfer of powers for the regulation of mining, among other things, from France, and with provisions for at least three referendums on the question of independence from France. A process of land reform had begun earlier, but a legal entity known as a GDPL (*Groupement de droit particulier local*) now began to be used for allocating unused state lands to customary owners (Le Meur, 2021).

The developments laid the ground for a shift of economic control of the nickel industry from a few families in the settler community to a much wider base of local ownership and to the establishment of a local, New Caledonian resource governance regime. The political and administrative reform process continues to this day (see also Burton and Levacher, 2021).

4.2 Decolonisation by bringing ownership into public hands

Other jurisdictions in the region, notably Papua New Guinea, have generally not had the financial means to buy equity in extractive projects and have relied on payroll tax, company tax, production royalties, export levies, and various forms of compensation regimes to keep the financial returns from mining onshore. New

[2] What is known as *statut civil coutumier* ('customary civil status') refers to Kanak residents of the *aires coutumières*, and was modernised from previous meanings in a series of New Caledonian laws from the 1980s to 2010s.

Caledonia has been able, with the backing of the French state, to pursue the objective of owning the means of production.

A critical development in 1990 was the creation of SOFINOR (*Société de financement et d'investissement de la province Nord*), a financing entity owned by the North Province and capitalised by France. It enabled the province to buy the shares of one of the pro-French signatories of the Matignon-Oudinot Accords, Jacques Lafleur, in SMSP, a mid-sized nickel mining company in Lafleur family hands since the 1960s. This has served as a paradigm for the public participation of each of the three provinces in the nickel industry, with PROMOSUD (South Province) and SODIL (Loyalty Islands Province) subsequently following the same model. By joining forces to create the *Société territoriale calédonienne de participation industrielle* (STCPI), these three entities were able to acquire 34% of the shares in SLN by 2007, starting the 'patriation' of the ownership of the 127-year-old company, long in the hands of Paris-based owners.

4.3 The patriation of mining powers

Following the 1998 Bercy Accord, mining powers were transferred from France to New Caledonia. The first tasks were to devise a *Schéma de mise en valeur des richesses minières* ('Framework for the Development of Mineral Resources') and to establish a local regulator in the form of *the Direction de l'industrie, des mines et de l'énergie de la Nouvelle-Calédonie* (DIMENC). DIMENC opened its doors in 2004. Work on the *Schéma* led to the passing of a Mining Law by the Congress of New Caledonia in 2009.

The *Schéma* emphasised the importance of processing nickel locally and exporting higher-value refined nickel, instead of sending unprocessed ore to overseas markets in bulk carriers. However, refinery operations are extremely energy intensive and until recently there has been no easy way of generating cheap power. The basics of the *Schéma* were adopted by the FLNKS in 2015 as a political stance known as the *doctrine nickel* – as much value must be gained from the mineral resources of New Caledonia by doing as much of the processing onshore as possible and creating as much local employment as possible.

4.4 Redressing environmental damage

The question of environmental damage brought about by the extraction of nickel has been late to gain traction in the political process. It has most obviously come to the fore at the Goro project in the South Province where an association known as Rhéébù Nùù ('the eye of the land') was formed by three local chieftaincies in 2002 to support Indigenous rights, whereupon it issued the 'Declaration on the Right over the Space and Natural and Cultural Heritage of Kanaky' (or 'Kanaky Declaration') which was influential in debates at the UN leading up to the 2007 Declaration of the Rights of Indigenous Peoples (Levacher, 2017). A political process followed in the South Province, which resulted in the signing of a *Pacte pour un développement durable du Grand Sud* ('Pact for the Sustainable Development of the Far South') containing measures for environmental remediation and financial compensation (Levacher and Le Meur, 2021).

Despite the signing of the *Pacte*, several chemical spills occurred at the Goro plant between 2009 and 2014, exposing the suboptimal standards of the then mine-operator, the Brazilian mining company Vale,[3] and a lax attitude in the South Province to environmental oversight (Le Monde, 2012; Horowitz, 2014) and again incurring the wrath of local chieftaincies.

As part of an attempt to formalise environmental assessment procedures, the Environment Department of the South Province developed a calculation tool ('*Outil de calcul des mesures compensatoires'*) to place a monetary value on land needed for mining (see Le Meur et al, 2021 for a critique). Levacher and Le Meur observe that there has been a shift from the 'social relations of production', in which the central concern was only how the industry was to be organised, to the 'social relations of compensation', in which the central concern is with 'the politics of rent sharing and redistribution issues' (Levacher and Le Meur, 2021).

[3] International attention was again drawn to Vale's judgement of environmental risk after dam collapses in 2015 and 2019 in Brazil caused major loss of life (Owen and Kemp, 2019).

4.5 Decarbonisation

In general, nickel refining in New Caledonia must bear much higher costs than in China, South, or Indonesia (a major competitor on the international market). A key factor is the extremely high cost of electricity.

The modernisation of New Caledonia's power generation system has lagged far behind demand. A 68MW hydroelectric dam was opened in 1959 at Yaté in the South Province and was seen at the time as a major advance in electrifying the territory, but with subsequent investment limited to small and mini systems, hydro produces only around 9% of total demand. The major sources of electricity in 2020 were coal (47%) and heavy fuel (34%), well in front of wind (1.5%) and solar (4.7%).[4] The three nickel refineries consumed about 75% of all power generated.

The high use of coal and fuel has made New Caledonia one of the world's highest carbon emitters per capita. Figure 4 shows the usage of energy by sector. As may be seen, coal is a major supplier of power to industry, notably in the form of an aging 150MW coal-fired power station next to SLN's Doniambo refinery.

Following the COP21 Paris climate summit, the government of New Caledonia announced a new initiative known as the *Schéma pour la transition énergétique de la Nouvelle-Calédonie* ['Plan for energy transition in New Caledonia'] or STENC (GoNC, 2016).

In 2020, expressions of interest were invited for the construction of a 130MW solar farm to replace the Doniambo coal plant, but no plans have been finalised. In 2021 Prony Resources announced that it would construct a 160MW solar farm to power the Goro refinery, with 340MW of battery storage, to be completed by 2025 (LNC, 2021, December 20). The aim is for operations at Goro to be carbon neutral by 2040 (LNC, 2022, May 13).

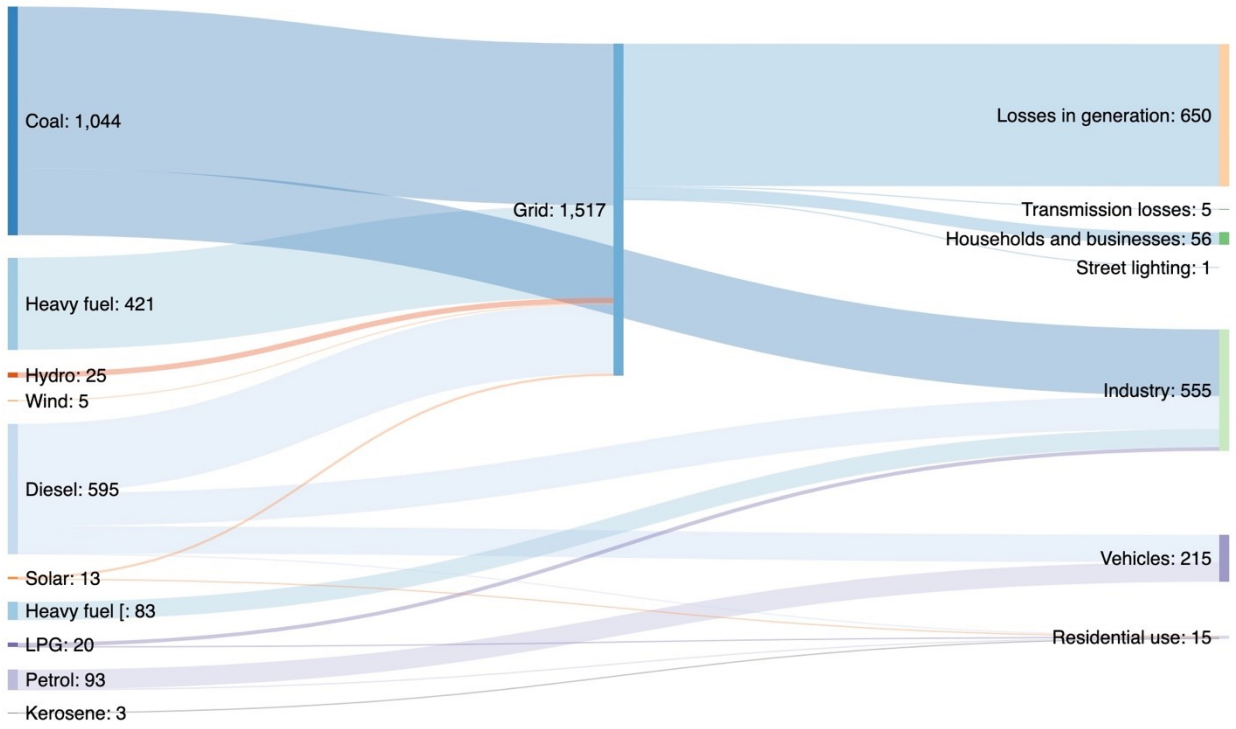


Figure 4. Sankey diagram of main energy flows in New Caledonia, 2019.
Data: GoNC (2019). Units: thousands of tonnes of oil equivalent (toe).

[4] Online data at https://observatoire-energie.gouv.nc/ (branch of DIMENC).

4.6 Sustainability and the export of low-grade nickel ore

The Congress of New Caledonia has determined, in alignment with the political platform of the pro-independence FLNKS party coalition, that nickel ore should be processed onshore in its entirety, on the principal grounds of the sustainability of the resource over the long term.

The key amendment to the Mining Law is Article R 132-3, passed in November 2009:

> Any sale of mining products for the benefit of an operator whose head office or residence is located outside New Caledonia is prohibited when it affects the sustainable exploitation of the mineral wealth of New Caledonia or the development and consolidation of its mining and metallurgical industry (*Journal Officielle*, 2009, p. 9637, Article R 132-3).

The beneficiary of the exemption was the North Province-owned SMSP, allowing it to send ore mined by its subsidiary NMC to the refineries that it owns in Korea and China.

However, a range of opponents has lined up against this. Weighed down by debt, SLN has regularly petitioned the government to be allowed an export quota for low-grade ore simply to be able to avoid operating at a loss. Two particular governmental authorisations have come under fire. Maï Kouaoua Mines (MKM) and Société des Mines de Tontouta (SMT), two of the smaller miners, were given permission to export low-grade ore to China and Japan, respectively, in 2015. Their arguments were that their mines were clogged with low-grade stockpiles that were not currently economic to process locally and were liable to cause environmental harm if they could not be removed. The North Province contested both authorisations in a series of appeal tribunals right up to the *Conseil d'État* ['Council of State'] in 2019, the highest appeal court of France (LNC, 2019, October 28).

A compromise solution was given in a government communication in 2021. It introduced a *redevance*,[5] an extraction royalty (a novelty for New Caledonia), to be shared between communes affected by mining and the budget of New Caledonia, and an export tax, to be paid into the *Fonds Nickel,* an existing environmental rehabilitation fund. In return, MKM and SMT were re-authorised to export ore with an average nickel content of 1.7% to China for a period of five years (GoNC, 2021). Several other small companies have also received similar authorisations at different times.

At stake was whether the smaller miners would survive in an economic climate of flat prices (2011-2021) and strong competition from lower-cost producers (especially in Indonesia) or whether they would fail, taking with them the economic activity and employment they generated.

4.7 The interest today – nickel as an ETM

Vale, the developer of the Goro project from 2006, sank as much as USD 9 billion (RNZ, 2020, June 5) into constructing the refinery for little return. Vale's problems centred on delays in getting the HPAL process to work, opposition from Rhéébù Nùù and blockades of its site, and the flat nickel price between 2011 and 2021. When it proposed to sell Goro in 2020, opposition came from all quarters. Kanak communities erupted at the initial suggestion to sell to an Australian company (e.g. LNC, 2020), and when SOFINOR, the financing arm of the North Province, put up a rival bid, the anti-independence leader and president of the South Province, Sonia Backès, declared that it was 'unthinkable' and that the proponents had 'a desire to economically colonise the southern province' (Maclellan, 2020).

Three developments changed the economic and socio-political landscape in 2021:

- The mine and refinery at Goro were taken over by a new 51% locally-owned consortium, Prony Resources (LNC, 2021, April 1).
- Tesla Inc signed a contract for Prony to supply its electric vehicle factories in Asia with 42,000 tonnes of nickel annually for at least five years (LNC, 2021, October 14).

[5] *Redevance* is the normal term used in New Caledonia when people discuss the idea of adopting a mining royalty, as understood in Australia or Papua New Guinea. However, in French *redevance* has additional meanings related to fees and licences.

- There was a significant upturn in the nickel price at the start of 2022, bringing prices to a ten-year high (LNC, 2022, January 16).

Thus, in the space of a few months, most of the previous obstacles were at least in the process of being resolved, and the Prony-Tesla deal signalled the first major order to be signed up directly between a New Caledonian exporter and a manufacturer at the forefront of the energy transition.

In examining the justice dimensions of an increase in demand for what New Caledonia offers, and therefore a prospective intensification of mining, it will be necessary to consider what industry response a sustained price rise will stimulate, say to 2-3 times the current price, and what a multiplication of 'Tesla' deals might do (1) to the choice of technology and volume of output of all the exporters, and (2) to the impacts on communities and the economy in general.

4.8 Previous surges of interest for comparison

Price has been the ultimate arbiter of whether economy booms or slumps throughout the history of the nickel industry in New Caledonia, but price trends need to be contextualised within a mix of strategic and technical factors over a long timescale:

1. Metallurgical innovations permitting a more effective use of alloys. In its early history, SLN was capitalised by the Paris-based Banque Rothschild to supply British iron and steel foundries, and Theodor Fleitmann's metalworks in Iserlohn, Germany, pioneered the development of nickel alloys, notably for 'nickel' coinage (Newbury, 1955, p. 99).
2. The pre-WWI 'naval race'. The Steel Manufacturer's Nickel Syndicate was formed in 1901 by European armaments firms led by Vickers Sons & Maxim to establish a preferential supply agreement with SLN. This time the context was a race among the Great Powers to build armoured battleships with nickel alloyed ('Krupp') steel.
3. The pre-WWII arms build-up of Germany and Japan. For a period in the 1930s, cashed-up brokers from Japan and Germany paid very high prices to buy unprocessed nickel from small local suppliers, again for armaments programs. The buying spree ended with the outbreak of war and, even with later shipments for the American war effort, New Caledonian producers were running at a loss by war's end (Bencivengo, 2014; Newbury, 1955).
4. The 'boom' and France's Billotte laws. When nickel began a global price boom in 1967, French authorities were fearful of foreign buyouts. Under the so-called 'Billotte' laws, nickel, chromium and cobalt were deemed strategic raw materials and control was transferred to the Ministry for Industry (Brou 1982: 112). New materials developed in this period included 35NCD16, a high-performance nickel steel used in the landing gear of the Anglo-French Concorde passenger aircraft, and RR58, an alloy of aluminium, copper, magnesium, nickel and titanium used in its airframe (Murphy, 1972). These advances went on to be used in Airbus's current lines of aircraft.

Each of these surges of interest was brought on by particular kinds of industrial innovation of importance to distant industries, and each shows up different risks for New Caledonia producers. On the one hand, demand for general uses such as coinage and nickel-steel has never intrinsically declined. On the other hand, surges in demand such as for armament programs have tended to be time-limited.

Billotte-style panics centring on narrow uses for nickel may be most similar to the 'metal-intensive' energy transition now underway. A rise in the price of each commodity is what producers hope for, but Azevedo et al (2022) point out that manufacturers can also respond by substituting other, less expensive materials ('materials substitution'), or by changing the technology they employ ('technology substitution').

In the case of aircraft, alloys used in landing gear may not have greatly altered between 1969 and 2022, but airframes and engines have undergone radical change in the direction of higher performance for less weight. It is unlikely that the absolute volume of the nickel supply is of concern to Airbus Industries today.

A contemporary example of materials substitution where volume of supply and price are both important is the mix of cobalt, nickel and manganese in battery packs. Cobalt gives the best energy density, but manufacturers opted to use more nickel as cobalt prices soared in 2018, compromising energy density for

lower price. After this, concerns about the limited worldwide supply of Class 1 nickel – what Prony Resources intends to supply to Tesla – made manganese more attractive since global reserves are much greater (Azevedo et al, 2022). No doubt, further innovation at all parts of the supply chain will alter the optimal mix as time goes by.

5. The justice dimensions of nickel production in New Caledonia

At the beginning of this case study, we introduced a conceptual framework for examining the role of justice in developing energy transition metals. We can use this as a lens to examine both historical and recent configurations of the nickel industry in New Caledonia, and consider procedural, distributive and restorative dimensions of nickel production in New Caledonia.

5.1 Procedural justice

This concerns the adequacy and fairness of legal and administrative processes surrounding an activity.

Until the signing of the Nouméa Accord in 1998, powers for the regulation of mining, and indeed many other local planning matters, were exercised from Paris. It meant that not only were Kanaks excluded from decision-making, the vast majority of residents of New Caledonia of all ethnicities were as well. On a visit to New Caledonia in 1966, the French president de Gaulle was concerned by the fact that nickel mining was largely dominated by SLN and a few large families and voiced support for the expansion of local nickel processing plant to a site in what is now the North Province.

The Nouméa Accord led to the transfer of regulatory powers to New Caledonia and the establishment of DIMENC in 2004. This in turn led to the development, through consultation, of the 'Mining Framework', the *Schéma*, and the passing of a territorial mining law in 2009. Other vital institutions at the territory government level are Géorep, the GIS portal of the government of New Caledonia, where an online mapping system allows users to inspect the latest information on mining titles, as well as environmental data, conservation zones etc, and ISEE, a specialised statistics agency.

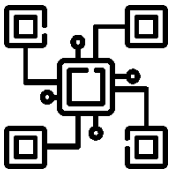
However, procedures for environmental regulation are lagging behind. In the South, Rhéébù Nùù had success in putting environmental matters on the table for discussion with the provincial government, but it was initially unable to get the underfunded regulators in the South Province to act effectively on repeated chemical spills from the Goro plant. In 2009, the South Province finally adopted an Environmental Code, mandated environmental impact assessment for the first time, and helped create the *Comité consultatif de l'environnement*, and the *Observatoire de l'environnement* ('Environment Observatory') known as l'OEIL, a research body.

In the North Province, the fact that the principal mining company and major local employer, NMC, is a subsidiary of the North Province's own holding company, SMSP, raises the question of a conflict of interest when it comes to the environmental damage done by mining. Similarly, a shortcoming of l'OEIL is that its work is focussed on the South, not evenly across the whole territory. L'OEIL also depends on the financial contributions of its members, which includes mining companies (LNC, 2020, June 10).

A blind spot for the government of the North Province, l'OEIL, and academic observers alike is illustrated by a 2017-20 conflict at SLN sites near Kouaoua. This comprises a series of mines in the mountains and a port on Kouaoua Bay, connected to the Mea mine by a 40-year-old 11km conveyor belt known as Serpentine. Repeated arson attacks were made on Serpentine between 2017 and May 2020, each time causing troublesome shutdowns for repairs. Nouméa-based media failed to investigate the causes for three years, not bothering to look further than 'disaffected youth', while researchers also seem to have been scarce on the ground in comparison to the well-studied community-mine issues at Goro (Horowitz, 2014; Levacher, 2017) and Koniambo (Kowasch, 2017) earlier in the 2010s.

What contrasted Kouaoua with Goro is the much greater length of time SLN had provided economic opportunity for the surrounding communities, whose non-party-aligned Kanak mayor has been sitting for several terms. This aligns with the North Province's long-term goal of economic emancipation, but it departs from standard party-backed North Province politics in that (a) the mayor ran on his own strength in the 2020 elections and resisted a joint Palika-Union Calédonienne ticket to unseat him and (b) a community-based environmental activist group, Chêne Gomme ('gum oak', a native myrtle) attacked SLN despite its historically good local partnerships.

Chêne Gomme's protests were over a mix of environmental impacts of expanded SLN operations at Kouaoua and youth unemployment issues. They were unable to be addressed through the long-standing politics of the North Province while the company's nascent efforts at community liaison had not progressed as far as the establishment of a formal grievance process or local discussion forum. A peace agreement was eventually signed at Kouaoua in mid-2020. It was agreed that SLN's local expansion plans would be reduced by 40%, that a monitoring committee would be established, and that the parties would endeavour to better articulate relationships between customary authorities, mining companies and contractors in the area (LNC 2020, July 6).



5.2 Distributive justice

This concerns the distribution of benefits and impacts from an activity.

As discussed above, public authorities in New Caledonia have been able, with the financial backing of the French state, to pursue the objective of owning the means of production, with the objective of sharing the benefits of mineral exploitation through spending from the public purse, which is a collectivist form of distributive justice. At the same time, over the last three decades, the political protagonists of New Caledonia have developed a propensity for arriving at grand *pactes* and *accords* aimed at redressing injustices with the deep historical roots sketched out in this case study. They have had a fair amount of success in doing this.

They have had rather less success in solving more localised disputes and grievances. For example, only belatedly has the Environment Department of the South Province developed a calculation tool to address the local-level aspects of damage to land and waters caused by mining activity.[6]

Constant opposition to Goro between the early 2000s and 2020 was addressed through higher-level political processes, not local grievance handling. This took the form of a *Pacte* for regional development, and finally by a restructuring of the ownership of the whole enterprise in the form of its takeover by Prony Resources, an entity majority-owned by local interests.

In this case, it can be argued that, however long it took to get results, at least the positions of the local customary authorities, the company, and the pro-France government of the South Province were clearly set out.

By contrast, the Chêne Gomme protests were effectively masked by the pro-mining stance of Kanak parties in the North Province, who have otherwise been very successful with their project to launch a series of publicly owned mining and refinery enterprises. This has led to the paradox that a pro-mining Kanak leadership has made it extremely difficult for the legitimate grievances of local Kanak communities to be addressed.

It is noteworthy that in signing a settlement agreement, the customary authorities and local activist groups in the Kouaoua area indicated that they expected that a regime for paying compensation for *local*

[6] By comparison, compensation assessment procedures for land acquisition and/or damage in Papua New Guinea were established as far back as the 1930s under the colonial administration of Australia, as land acquisition cases show.

environmental damages and a future production levy that *they* could benefit from would be established in the future (LNC 2020, July 6). This may yet take the government of the North Province some time to grasp.

The territorial government decision in 2021 that low-grade nickel exports would be subject to royalties, a portion of which would be paid to mine-impacted communes, and an export tax, is a step towards the realisation of this expectation (GoNC, 2021).[7]

5.3 Restorative justice

This concerns the adequacy and fairness of processes to remedy the effects of a past activity that has caused harm.

No measure has addressed the restorative aspects of justice in New Caledonia more than the policy of economic *rééquilibrage* to redress chronic disadvantage in the north and on the Loyalty Islands. However, it has taken generations for the original harm of the confinement of Kanaks on reserves and the harsh regime of the *Indigénat* to begin to be redressed, and budgets to be adjusted accordingly. Despite the development of Koné and the VKP economic zone, persisting disadvantage in educational attainments, rates of employment, and family income can be demonstrated from official statistics between the South and the other two provinces (see Bouard et al, 2016). A life expectancy 'gap' between Indigenous and non-Indigenous people, an annual political talking point in Australia, is almost certain to be present, but it cannot be measured at present from statistics released by ISEE.

The legacy also remains that Kanak tribes have official recognition in the form of administrative areas known as *tribu*, but that those who live *en tribu* may reside beneath a mountain range which would formerly have been their customary land, yet have negligible official rights to the mountain range itself.

A program of land reform was started in New Caledonia after the signing of the Nouméa Accord and now *coutumiers* have a growing say in how the mountain ranges are used today and will be used into the future, but adequate restorative justice would have to consider the considerable environmental damage already done to mountain ranges which bear the scars of 150 years of nickel extraction. This has not yet occurred.

6. The expected impacts of the global energy transition

It is now possible to look at the implications for communities in New Caledonia in a full-scale global energy transition.

6.1 There will be an intensification of the industrial forms we see today

Commentators on the global energy transition universally expect the demand for ETMs to increase by a large factor (e.g. Deloitte, 2020). Technology and materials substitution (Azevedo, 2022) may dent some, but not all, of the demand, so the conclusion must be that a lot more nickel must be mined in the coming decades.

For New Caledonia, this means increasing output. *Without technological change*, this means mining a greater volume of nickel-bearing material and, if existing refinery capacity proves insufficient, building more refineries. More mining, ore transportation and refining mean pressure for increased land acquisition for mines and roads, a greater demand for energy and an expansion of carbon emissions, with the accompanying local and global social and environmental impacts.

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[7] The decision came in the form of an *arrêté*, or governmental order, rather than emerging from legislation, which is indicative of a more ad hoc solution to a problem.

Among the justice issues just examined, better performance in the area of restorative justice will be needed. As seen at several sites, province-wide *pactes*, *accords,* and regulatory arrangements are no longer sufficient to satisfy the communities that feel mining impacts, and local benefit distribution agreements will increasingly have to be entered into.

6.2 Industry will be reconfigured by technologies not used today

With technological change, some of the impacts of intensifying the industry may be offset or avoided altogether. For example, we can anticipate that New Caledonia's electricity supply will be well on the way to being decarbonised by 2025 as large solar farms, currently in the planning stage, are completed. The heavy equipment used in mining is also likely to decarbonise, with Komatsu, the leading mining equipment manufacturer, announcing a 'Komatsu Greenhouse Gas Alliance' in 2021 to help 'achieve the ultimate goal of zero-emission mining' (Edwards, 2021).

These are predictable developments, even if they will take time to implement, but other forms of innovation are harder to anticipate. For example, new metal refining processes will be brought into use, but we cannot now see what impacts they will have. We can say that faster and more accurate assaying in front of the excavators at mine sites, and advances in drone surveying will enable operators to excavate particular grades of material with greater precision, optimising the feed to crushers and creating better consistency in the ore arriving at refineries and wharves. This in turn is likely to trigger a wide range of *social* and *environmental* responses connected to the sustainability of exploiting the overall resource in ways that cannot easily be predicted. It may intersect with questions about exportation again, a *political issue*.

With new, unknown processes becoming viable, we also cannot now tell what final form of nickel will be sent overseas to customers. What is sought by battery manufacturers is Class I (99% pure) nickel, but New Caledonia's current exports are either Nickel Hydroxide Cake (Goro) or ferronickel (Doniambo, Koniambo), both lower grades of nickel that are further refined by metallurgists in Asia. With cheaper power and/or new processes, we cannot easily predict how the refineries will be able to respond, but the drive will be to deliver purer nickel, and get more value from the resource.

6.3 New forms of supply-chain arrangements will emerge between New Caledonian enterprises, commodity traders, and overseas manufacturers.

The series of innovative financial, mine titling, and partnership deals to build the Koniambo refinery in the North Province, to ensure its had access to a large mineral resource within conveyor distance (mining titles in the Koniambo Massif), and to partner with oversea metallurgists in Korea and China transformed the basis of mining in that province. Previously, the northern mines were dependent on transporting their ore to SLN's Doniambo refinery or simply exporting it at a fraction of the refined value.

A similar attempt at capturing more of the supply chain was attempted at Goro by Vale, but difficulties in making the HPAL process work meant that it, and now Prony Resources, had to settle for exporting an intermediate product, NHC. SLN has also simplified what it exports to a single product, SLN25.

These decisions were based on the economics of refining, which has itself been transformed by the rise of low-cost producers, notably Indonesia, which now accounts for 30% of world nickel output (USGS, 2020).

Whether the nickel stays steady or rises in the face of increased demand, the struggle to ban direct exports of ore, mandated in the Article R 132-3 amendment to the Mining Law, represents a contestation between representatives of the 'old' industry, largely owned and operated by anti-independence interests based in Nouméa, and those of the 'new' industry, representing a broader base of local community / public ownership. The former point to hard cost calculations and, seeking to ensure that their enterprises remain profitable, want to retain the option to sell to low-cost refiners outside New Caledonia. The latter want ore that it is currently uneconomic to process onshore left in the ground in order to ensure the resource endowment of New Caledonia is not wastefully depleted.

This is ultimately a distributive justice issue – between the needs of today's producers and those of generations not yet born. It has currently resulted in a stalemate, with the government of New Caledonia periodically issuing exportation authorisations in defiance of Article R 132-3. However, future developments

can be conceived where technical innovation, coupled with New Caledonia itself being a beneficiary of the energy transition in the form of large-scale, lower-cost renewable electricity generation, will see the current Faustian bargaining superseded by new industrial configurations that better satisfy each of the parties.

Certainly, new supply-chain arrangements are likely to emerge between New Caledonian enterprises, commodity traders, and overseas manufacturers, replicating the 2021 Prony-Tesla deal.

6.4 The question of Free, Prior and Informed Consent

The critical issue covering all the justice dimensions is that of Free, Prior and Informed Consent (FPIC). The basic question concerns the circumstances in which mining is conducted and the sharing of benefits for the exploitation of the territorial mineral endowment, both now and as demand intensifies to meet the need of the energy transition.

But as seen at Kouaoua, it is no simple matter to determine who FPIC should be sought from. It is, in fact, necessary to think of this in double majority terms:

(1) Do citizens[8] as a whole agree?

(2) Do the *coutumiers* who have traditional cultural attachments to land affected by mining and their representatives agree?

It is suggested that the first constituency, a superset of the second, can deal with matters through the provincial assemblies and territorial Congress in the normal way. New Caledonians belonging to the second constituency have been pursuing a multistranded strategy of engagement in conventional politics, in formal education and employment and, in recent decades, in the business of mining itself, as well as pressing for a greater local say through the customary decision-making bodies as well as organisations like Rhéébù Nùù and its Kanaky Declaration. As discussed throughout this paper, transformative changes have occurred in New Caledonia since the turmoil of the 1980s: in political representation, in access to economic opportunities, in land reform, in the continuing steps towards local sovereignty. How the justice dimensions play out under the impetus of the energy transition depends on how the two constituencies handle each other's say in the affairs of New Caledonia.

7. References

ALDRICH, R., 1990. *The French Presence in the South Pacific, 1842-1940*. London: Macmillan.

AZEVEDO, M., BACZYNSKA, M., BINGOTO, P., CALLAWAY, G., HOFFMAN, K., & RAMSBOTTOM, O., 2022. *The raw-materials challenge: how the metals and mining sector will be at the core of enabling the energy transition*. London: McKinsey & Company

BANARÉ, E., 2018. Images et textes d'Ataï (1969-2016): L'élaboration de discours politiques kanak. *Journal de La Société Des Océanistes, 2*, 515–528. https://doi.org/10.4000/jso.9541

BARICH, A., 2020, May 28. Rio Tinto's scandium oxide 'breakthrough' tipped to 'normalise' critical metal. *S&P Global Market Intelligence*. Retrieved from https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/rio-tinto-s-scandium-oxide-breakthrough-tipped-to-normalize-critical-metal-58816989.

BENCIVENGO, Y., 2010.. La Société Le Nickel. Une entreprise au coeur de la naissance de l'industrie du nickel (1880-1914) ['SLN. An enterprise on the spot at the birth of the nickel industry']. Unpublished PhD thesis, Université Paris 1 Panthéon-Sorbonne.

[8] New Caledonian citizenship (*citoyenneté néocalédonienne*) was given meaning by a 1999 organic law stipulating that it meant anyone with French nationality principally resident in New Caledonia before 8 November 1998 (with whatever heritage) plus anyone born subsequently with at least one parent who satisfied the first criterion.

BENCIVENGO, Y., 2014. *Nickel: La naissance de l'industrie calédonienne.* Tours: Presses Universitaires François Rabelais. https://doi.org/10.3917/rfhe.004.0273.

BOUARD, S., SOURISSEAU, J.-M., GERONIMI, V., BLAISE, S., & RO'I, L. (EDS.). 2016. *La Nouvelle-Calédonie face à son destin. Quel bilan à la veille de la consultation sur la pleine souveraineté?* ['New Caledonia facing its destiny. An assessment on the eve of the referendum for independence'] Paris: Éditions Karthala.

BOUARD. S., LEVACHER, C., BENCIVENGO, Y., DECOTTIGNY, L., DEMMER, C., LE MEUR, P-Y., BLAISE, S. BURTON, J., ENJUANES, F. GROCHAIN, S. 2019. *Petites et moyennes entreprises minières en Nouvelle-Calédonie. Note de Synthese*. Pouembout, New Caledonia: Consortium IAC, IRD, CNRS, UNC, DWU https://cnrt.nc/uncategorized/2-rapports-scientifiques-lies-au-projet-pme-minieres-en-nouvelle-caledonie/.

BOYCE, G., 1998. The Steel Manufacturers' Nickel Syndicate Ltd, 1901-39: assessing the conduct and performance of a cooperative purchasing organisation. *Australian Economic History Review 38*(2), 155-175.

BROU, B., 1982. *30 ans d'histoire de la Nouvelle-Calédonie: 1945/1977*. Nouméa: Société d'études historiques de la Nouvelle-Calédonie.

BURTON, J., & LEVACHER, C., 2021. The state that cannot absent itself: New Caledonia as opposed to Papua New Guinea and Australia. In N. A. Bainton & E. E. Skrzypek, *The Absent Presence of the State in Large-Scale Resource Extraction Projects* (1st ed., pp. 313–346). ANU Press. https://doi.org/10.22459/AP.2021.10.

CROSBY, A., 1986. *Ecological Imperialism. The Biological Expansion of Europe, 900-1900*. Cambridge: Cambridge University Press.

DELOITTE. 2020. *Electric vehicles. Setting a course for 2030*. London: Deloitte North and South Europe

DOUGLAS, B., 1972. A history of culture contact in north-eastern New Caledonia 1774-1870. Canberra: Unpublished PhD thesis, Australian National University. https://doi.org/10.25911/5D7634C1DDEA0.

EDWARDS, D., 2021, August 19. Komatsu to develop zero-emission vehicles for mining industry. *Robotics and Automation News.* Retrieved from https://roboticsandautomationnews.com/2021/08/19/komatsu-to-develop-zero-emission-equipment-solutions/45593/.

ERAMET, 2016, August 16. *SLN focuses on SLN25 ferronickel production*. Media release. Retrieved from https://www.eramet.com/en/sln-focuses-slnr-25-ferronickel-production.

ERAMET, 2018. *SLN25. Bringing value to stainless steel makers*. Retrieved from https://www.eramet.com/sites/default/files/inline-files/eramet_sln25_2018.pdf.

EUROPEAN COMMISSION, 2020. *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability*. Brussels: European Commission

FISHER, D., 2013. *France in the South Pacific: Power and Politics.* Canberra: ANU Press. https://doi.org/10.22459/FSP.05.2013

FREYSS, J., 1995. *Économie assistée et changement social en Nouvelle-Calédonie*. Paris: Presses Universitaires de France.

GONC., 2016. *Le Schéma pour la transition énergétique de la Nouvelle-Calédonie*. Nouméa: Goivernment of New Caledonia. Retrieved from https://dimenc.gouv.nc/energie/le-schema-pour-la-transition-energetique-de-la-nouvelle-caledonie-stenc.

GONC., 2019. *Rapport* d'activité 2019 relatif à la mise en œuvre du *Schéma pour la transition énergétique de la Nouvelle-Calédonie.* Retrieved from https://observatoire-energie.gouv.nc/private/files/documents/Le-rapport-d-activites-2019.pdf.

GONC. (2021). *Communiqué. Permettre le retour de la compétitivité des mineurs et des métallurgistes. Calédonien*. ['Permitting the return to profitability of miners and nickel refiners'] Retrieved from https://gouv.nc/sites/default/files/atoms/files/2021.01.12_cp_extraction_et_exportation_de_minerai.pdf.

HEFFRON, R. J., 2020. The role of justice in developing critical minerals. *The Extractive Industries and Society,* 7(3), 855–863. https://doi.org/10.1016/j.exis.2020.06.018.

HOROWITZ, L. S., 2008. Destroying God's Creation or Using What He Provided? Cultural Models of a Mining Project in New Caledonia. *Human Organization, 67*(3), 292–306. http://www.jstor.org/stable/44127355.

HOROWITZ, L., 2014. Culturally articulated neoliberalisation: corporate social responsibility and the capture of indigenous legitimacy in New Caledonia. *Transactions of the Institute of British Geographers 40*(1), 88–101. https://doi.org/10.1111/tran.12057.

IEOM., 2020. *Nouvelle-Calédonie. Rapport annuel 2019*. Réaumur, Paris: Institut d'Emission d'Outre-Mer. Retrieved from https://www.ieom.fr/IMG/pdf/ra2019_nouvelle-caledonie_publication.pdf.

ISEE., 2020. Population de la Nouvelle-Calédonie selon la communauté d'appartenance, aux différents recensements. Excel spreadsheet. Nouméa: Institut de la statistique et des études économiques. Retrieved from https://www.isee.nc/population/recensement/communautes.

JOURNAL OFFICIELLE, 2009. Nouvelle-Calédonie. Congrès. Déliberations. Code minier de la Nouvelle-Calédonie (partie réglementaire., Chapter II. Prohibition of mineral exports. *Journal Officielle de la Nouvelle-Calédonie,* 24 November 2009.

KLIMPEL, F., BAU, M., & GRAUPNER, T., 2021. Potential of garnet sand as an unconventional resource of the critical high-technology metals scandium and rare earth elements. *Scientific Reports, 11*(1), 5306. https://doi.org/10.1038/s41598-021-84614-x.

KOWASCH, M., 2017. Social and environmental transformations in the neighbourhood of a nickel mining project: A case study from northern New Caledonia. In C. Filer & P.-Y. Le Meur (Eds.), *Large-scale Mines and Local-level Politics: Between New Caledonia and Papua New Guinea* (pp. 99–131). Canberra: ANU Press. https://doi.org/10.22459/LMLP.10.2017.03.

LASHITEW, A. A., ROSS, M. L., & WERKER, E., 2021. What drives successful economic diversification in resource-rich countries? *The World Bank Research Observer*, *36*(2), 164–196. https://doi.org/10.1093/wbro/lkaa001.

LE MEUR, P.-Y., 2013. Locality, mobility and governmentality in colonial/postcolonial New Caledonia: The case of the Kouare tribe (xûâ Xârâgwii), Thio (Cöö. *Oceania, 83*(2), 130–146. https://doi.org/10.1002/ocea.5009.

LE MEUR, P.-Y., LEVACHER, C., BOUARD, S., HERRENSCHMIDT, J.-B., & SABINOT, C., 2021. Mining and the value of place in New Caledonia: Negotiation, evaluation, recognition. *The Extractive Industries and Society, 8*(1), 44–54. https://doi.org/10.1016/j.exis.2020.08.010.

LE MEUR, P.-Y., 2021. Proof and test. The construction of customary land in New Caledonia. In Frezet, E., Goetzmann, M., & Mason, L., Eds.. *Spaces of law and custom* (pp. 161-178). London: Routledge. https://doi.org/10.4324/9780429330728.

LE MONDE, 2012, May 11. Nouvel incident à l'usine Vale en Nouvelle-Calédonie.

LEVACHER, C., 2017. Contesting the Goro nickel mining project, New Caledonia: Indigenous rights, sustainable development and the land issue. In C. Filer & P.-Y. Le Meur (Eds.), *Large-scale Mines and Local-level Politics: Between New Caledonia and Papua New Guinea* (pp. 183–206. Canberra: ANU Press. https://doi.org/10.22459/LMLP.10.2017.06.

LEVACHER, C., & LE MEUR, P.-Y., 2021. The compensation arenas in south New Caledonia. Minescape, governmentality and politics. *The Extractive Industries and Society*, 100999. https://doi.org/10.1016/j.exis.2021.100999.

LNC., 2019, October 28. Des autorisations d'exportation de nickel devant le conseil d'Etat. *Les Nouvelles Calédoniennes*.

LNC., 2020, June 10. L'Observatoire de l'environnement menacé par la baisse de ses ressources. *Les Nouvelles Calédoniennes*.

LNC., 2020, July 6. Kouaoua: que contient le protocole signé? *Les Nouvelles Calédoniennes*.

LNC., 2020, August 7. L'Ican interpelle la province sur le rachat de l'usine du Sud ['Intervention of ICAN [Instance coutumière autochtone de négociation] in the sale of the southern refinery']. *Les Nouvelles Calédoniennes.*

LNC., 2021, April 1. Vale a finalisé la cession de Vale Nouvelle-Calédonie à Prony Resources ['Vale has completed the sale of Vale NC to Prony Resources']. *Les Nouvelles Calédoniennes.*

LNC., 2021, October 14. Prony Resources et Tesla: le contrat est signé ['Prony Resoucres and Tesla: the contract is signed']. *Les Nouvelles Calédoniennes*.

LNC., 2021, December 20. TotalEnergies et Prony Resources misent sur l'énergie solaire ['TotalEnergies and Prony Resources bet on solar power']. *Les Nouvelles Calédoniennes*.

LNC., 2022, January 16. Un nickel au plus haut depuis dix ans ['Nickel at a ten year high']. *Les Nouvelles Calédoniennes.*

LNC., 2022, May 13. Le projet de mégacentrale solaire dans le Sud a franchi 'une étape majeure'. *Les Nouvelles Calédoniennes*.

MACLELLAN, N., 2020, December 10. New Caledonia's triple opportunity. *Inside Story*. Retrieved from https://insidestory.org.au/new-caledonias-triple-opportunity/.

MAURIZOT, P., SEVIN, B., LESIMPLE, S., COLLOT, J., JEANPERT, J., BAILLY, L., ROBINEAU, B., PATRIAT, M., ETIENNE, S., & MONNIN, C., 2020a. Mineral resources and prospectivity of the non-ultramafic rocks of New Caledonia. *Geological Society, London, Memoirs, 51*(1), 215-245. https://doi.org/10.1144/M51-2016-9.

MAURIZOT, P., SEVIN, B., LESIMPLE, S., BAILLY, L., ISEPPI, M., & ROBINEAU, B., 2020b. Mineral resources and prospectivity of the ultramafic rocks of New Caledonia. *Geological Society, London, Memoirs, 51*(1), 247–277. https://doi.org/10.1144/M51-2016-17.

MUCKLE, A., 2010. Troublesome chiefs and disorderly subjects: The 'indigénat' and the internment of Kanak in New Caledonia (1887-1928). *French Colonial History, 11*, 131–160. https://www.jstor.org/stable/41938200.

MURPHY, A. J., 1972. Metals in flight. *Journal of the Royal Society of Arts 120*(5195), 708-723.

NEWBURY, C.,1955. La Société Le Nickel, de sa fondation à la fin de la deuxième guerre mondiale, 1880-1945. *Journal de la Société des Océanistes 11*, 97-123.

OWEN, J. R., & KEMP, D., 2019. Displaced by mine waste: The social consequences of industrial risk-taking. *The Extractive Industries and Society, 6*(2), 424–427. https://doi.org/10.1016/j.exis.2019.02.008.

RIVOILAN, P., 2020. *La croissance démographique fléchit nettement en Nouvelle-Calédonie entre 2014 et 2019*. Nouméa: Institut de la statistique et des études économiques. Retrieved from https://www.isee.nc/population/recensement/communautes.

RNZ., 2020. Unease grows in New Caledonia over Vale nickel plant sale. *RNZ Pacific.* Retrieved from https://www.rnz.co.nz/international/pacific-news/418346/unease-grows-in-new-caledonia-over-vale-nickel-plant-sale.

SAND, C., BOLE, J., & OUETCHO, A., 2007. What were the real numbers? The question of pre-contact population densities in New Caledonia. In Kirch, P. V., & Rallu, J.-L., Eds.., 2007. *The growth and collapse of Pacific island societies: Archaeological and demographic perspectives* (pp. 306-325). Honolulu: University of Hawai'i Press.

SAUSSOL, A., 1989. Dynamiques foncières d'un centre de colonisation en Nouvelle-Calédonie: Le pays de Hienghène. *Revue française d'histoire d'outre-mer, 76*(284), 187–241. https://doi.org/10.3406/outre.1989.2749.

USGS., 2020. *Mineral Commodity Summaries 2020*. Reston, Virginia: United States Geological Survey.

VALE., 2010. *Annual Report*. Rio de Janeiro: Vale S.A.

VAN DER PLOEG, F., & POELHEKKE, S., 2009. Volatility and the natural resource curse. *Oxford Economic Papers*, *61*(4), 727–760. https://doi.org/10.1093/oep/gpp027.

WARD, A., 1982. *Land and politics in New Caledonia*. Canberra: Australian National University, Department of Political & Social Change.

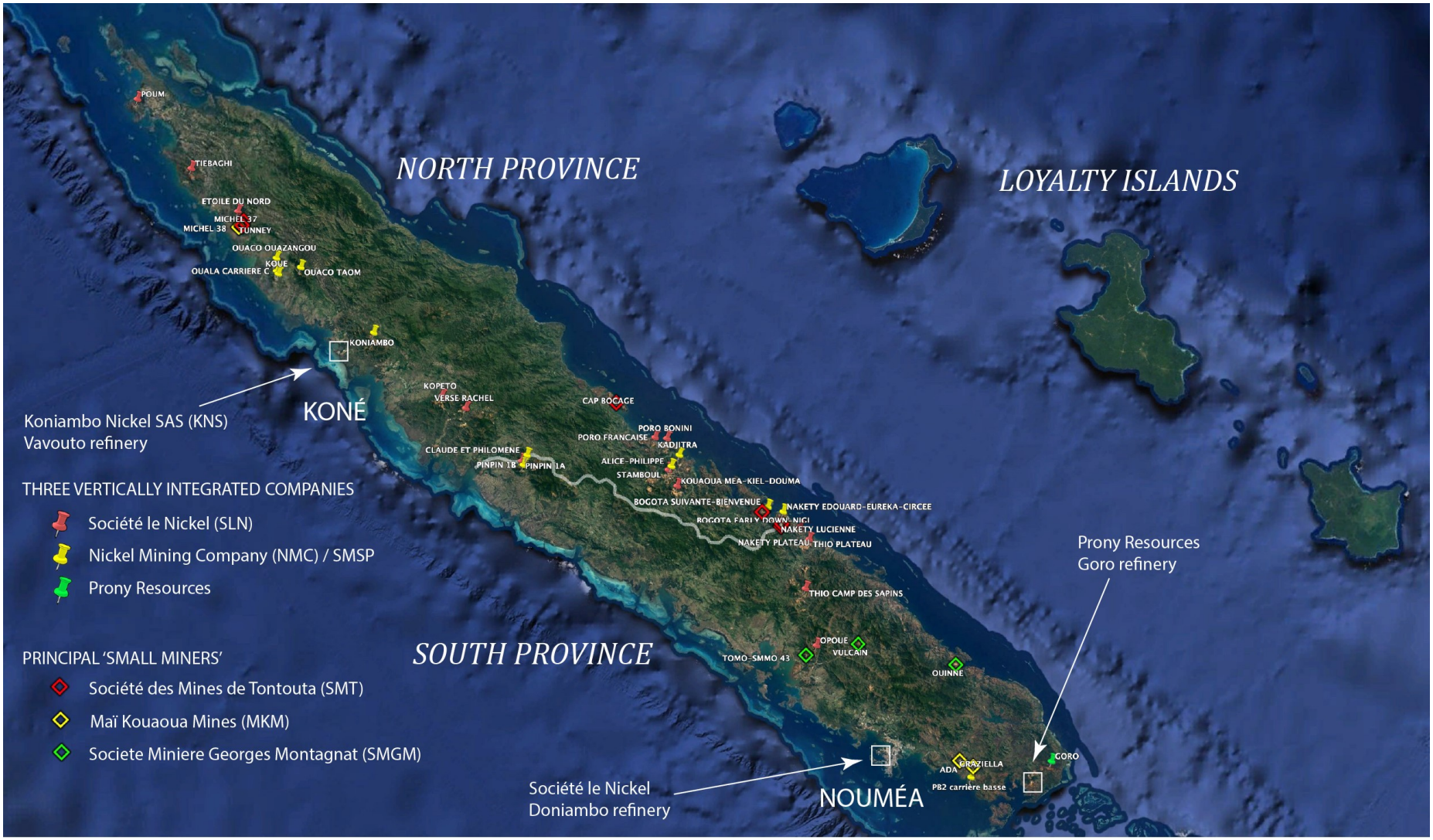

Figure 5. New Caledonia: title holders at 40 key mining centres in 2022.
Note: The DIMENC mining cadastre held details of 1506 individual titles on 17 September 2021. Data source: https://dimenc.gouv.nc/mines-et-carrieres/la-cartographie. Map base: Google Earth.