



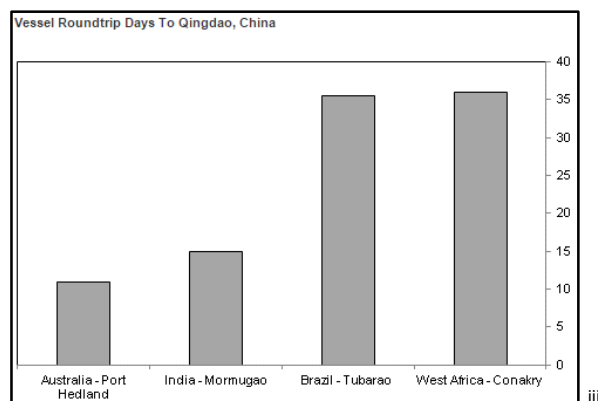
Introduction and Industry recommendations:

In our last article we focused on bulk cargo liquefaction associated with the three key mineral ore trades of iron, nickel and bauxite from countries that experience significant monsoon/rainy seasons. We identified various liquefaction prone trades still ongoing including continuing exports of low grade lateritic ores from the Philippines; bauxite exports from Malaysia and the potential for Vietnamese bauxite exports to increase if efforts designed to stimulate domestic smelting capacity continue to stall.ⁱ

We also, noticed a trend away from exporting unrefined ores, whether as a result of the Indonesian mineral export ban, the general decline in East coast Indian iron ore exports or other political initiatives to extract more profits domestically by developing local refining/smelting capacities. Unrefined ore movements, however, are rapidly increasing in certain other regions also vulnerable to significant rainy seasons.

In particular, West Coast African export volumes of unrefined iron ore and bauxite from countries such as Sierra Leone, Guinea and Liberia, now declared Ebola free, are set to rapidly increase. These 'frontier' countries are eager to take advantage of the economic benefits of monetizing their mineral ore deposits, both through royalties and taxes and stimulating local employment. Unfortunately, they lack the fiscal resources to subsidize the cost of developing these capital intensive projects which require complex transport infrastructures and are now held captive to the domain of outside investments. The increasingly thin profit margins available now and projected forward in what continues to be a deepening bear market for global commodities represent a significant headwind against spending generally, but also, importantly, against safety and quality spendingⁱⁱ. A fact which new, foreign investors are acutely aware of.

Vessel roundtrip days to China versus other major producers also represent an unavoidable headwind to profitability despite Africa having some of the lowest domestic mining costs for both Iron and Bauxite ores.

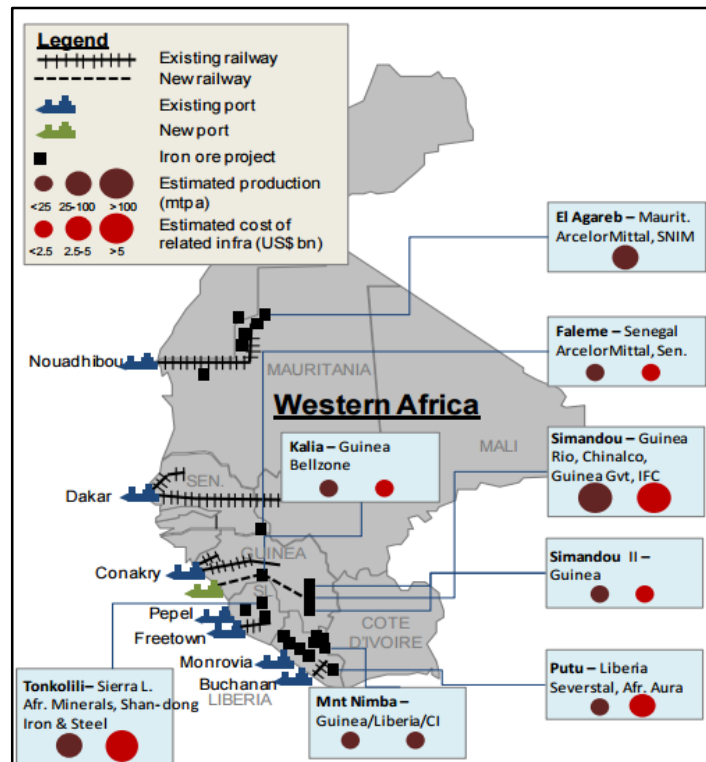


Such forces naturally run counter to the ability and/or willingness of these governments to self impose proper oversight and regulation on this now almost exclusively foreign (Chinese) investment driven industry. Particularly so when considering the degree to which each respective government is vulnerable to the smooth conduct of this trade for national GDP growth^{iv}.

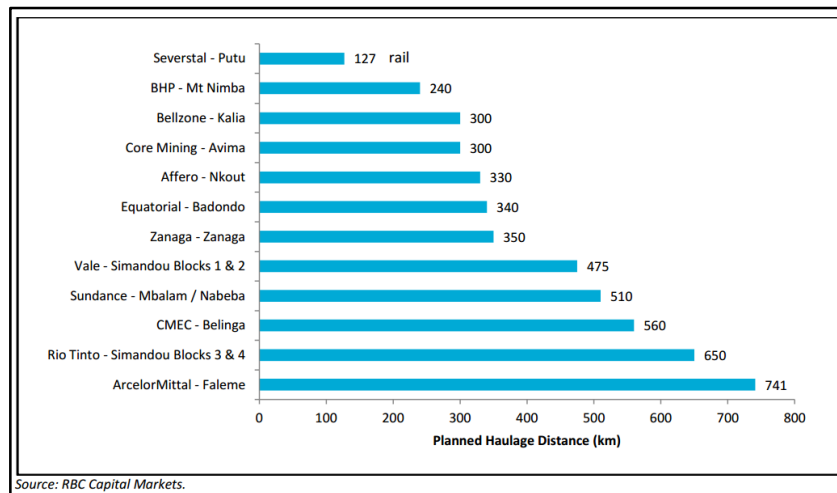


Whilst exports of unrefined ores from West Coast Africa are not new, port infrastructural development is starting from a low base or has been idle for long periods and may struggle to keep pace as rail movements from inland mine sites increase. The World Bank's 'Quality of Port Infrastructure' measures business executives' perception of their country's port facilities. Scores range from 1 (port infrastructure considered extremely underdeveloped) to 7 (port infrastructure considered efficient by international standards). In the latest ratings both Sierra Leone and Guinea achieved only 3.4 and 2.9 ratings respectively.^v

As export volumes increase so will the likelihood for a liquefaction incident occurring, especially since all three countries are exposed to 6 month long rainy/monsoon seasons, and have mining operations typically in excess of 200km inland. By way of example, the below figures summarise the general location of and pit-to-port distances for the major iron ore projects in West and Central Africa.



West Coast Africa major ports and inland rail links to iron ore projects^{vi}



Pit to port rail transport distances from West & Central African main iron ore projects.^{vii}

This paper argues that given the track record of continuing liquefaction incidents in these mineral ore trades from regions vulnerable to what are now increasingly unpredictable rainy seasons, domestic only driven implementation of international regulations is simply not enough. Instead, more proactive steps should be considered by other interested stakeholders - in addition to those ordinarily undertaken on behalf of shippers by the designated 'competent authority' - to help provide more robust management of these risks where such trades continue.

A good first step would be for the International Group of P&I Clubs to proactively intervene on the way in which their collective ship owning and operating memberships' conduct of such trades is carried out. This has been done for the unrefined nickel ore trade, specifically out of the Philippines and Indonesia since 2012, by way of an IG Circular in response to a string of casualties.^{viii} Aside from mandatory notification, one possible requirement in addition might be that particular clausings also be incorporated into all contemplated fixtures for the carriage of a cargo that has the potential to liquefy. The BIMCO clause is one such example as set out in their special Circular No.4 25th July 2012.^{ix}

Sierra Leone Iron Ore exports:

Taking Sierra Leone first, it is located on the West Coast of Africa bordered by Guinea to the North and Northeast, Liberia to the South and Southeast, and the Atlantic Ocean to the West.

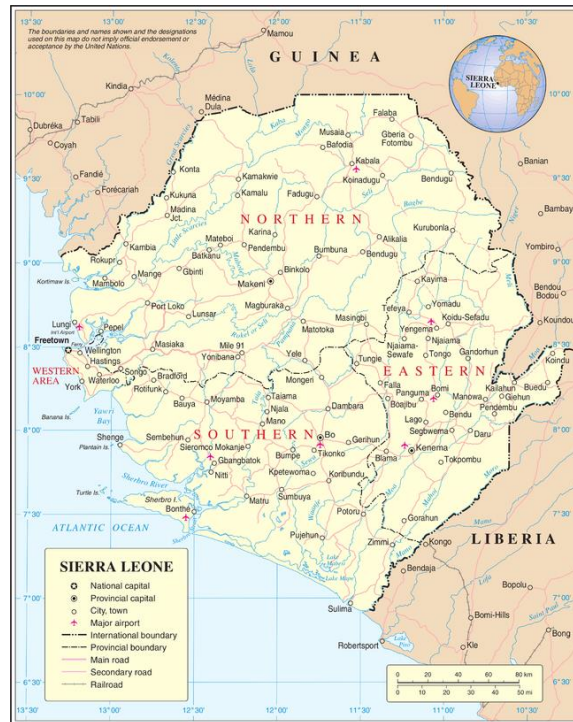


Figure 1^x

There are two seasons determining the agricultural cycle: the rainy season from May to November, and a dry season from December to May. Average rainfall is highest at the coast, 3000–5000 mm per year; moving inland this decreases and at the eastern border of the country, the average rainfall is 2000-2500mm.^{xi} The below diagram illustrates these spectacular precipitation cycles.

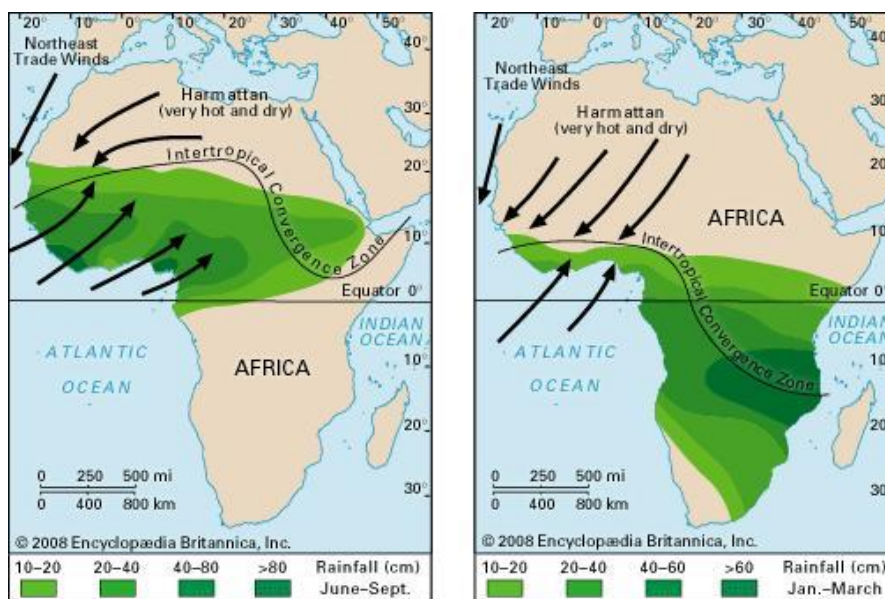


Figure 2^{xii}



Figure 3^{xiii}

Bulk ore exports from West Coast African countries such as Sierra Leone date back to the 1960's. The trade diminished though as South Africa's dominance as the continent's chief iron ore and coal exporter rose.

During last few years, Sierra Leone became an important alternative supplier to China with annual iron ore exports reportedly surging to 12mt in 2013. By comparison, smaller volumes were derived from Liberia - just over 1mt - and 0.2mt from Guinea. These export volumes continued to increase until the outbreak of Ebola which had a devastating impact on the industry as a whole. This was pernicious in its effect given the degree to which overall GDP is reliant on mineral export revenues. Lansana Fofanah, a senior economist in Sierra Leone's Ministry of Finance and Economic Development recently commented; *"The impact of Ebola in terms of iron-ore revenue is huge. Iron ore is responsible for the country's double-digit growth since 2011 until the Ebola outbreak."*^{xiv}

Even with Ebola restricting economic activity in Sierra Leone, its iron ore exports in 2014 still managed to grow to No.9 globally in terms of USD \$ value exported. Indeed Sierra Leone has been the fastest growing exporter since 2010.

Below are the 15 countries that exported the highest dollar value worth of iron ore during 2014:^{xv}

1. Australia: US\$60.2 billion (50.6% of total iron ore exports)
2. Brazil: \$25.8 billion (21.7%)
3. South Africa: \$6.7 billion (5.7%)
4. Canada: \$4 billion (3.4%)
5. Ukraine: \$3.3 billion (2.8%)
6. Sweden: \$2.8 billion (2.4%)
7. Russia: \$1.9 billion (1.6%)
8. Iran: \$1.9 billion (1.6%)
9. Sierra Leone: \$1.7 billion (1.4%)
10. United States: \$1.3 billion (1.1%)
11. Chile: \$1.1 billion (1%)
12. Kazakhstan: \$1.1 billion (0.9%)
13. India: \$874.4 million (0.7%)
14. Mauritania: \$854.2 million (0.7%)
15. Peru: \$646.7 million (0.5%)



Against the backdrop of a collapsing global commodity market and more recently the impact of the Ebola outbreak, longtime players in the African mineral mining and export trade have continued to lose ground and in some cases had the rug pulled from under them.

In November 2011 a supramax bulk carrier departed from the port of Pepel loaded with iron ore, reinstating another long-defunct operation in Sierra Leone. The then mining company African Minerals had installed a capsized trans-shipment facility at Pepel to serve its Tonkolili mine, whilst another mining company, London Mining Plc, had begun exporting from its Marampa mine in 2012^{xvi}. Since development of these projects a lot has happened.

African Minerals Ltd, used to be the biggest single contributor to Sierra Leone's economy, employing 7,000 people at the Tonkolili mine that had commenced operations in 2011 and cost more than USD \$1.7B to develop. As ore prices fell the London-based company's stock slumped over 92% during 2014 & 2015. The company tried, unsuccessfully, to renegotiate loans and strip out costs to remain profitable.^{xvii} The other producer in the country, London Mining Plc experienced similar woes and its stock was down 96% and was even reported as saying recently that its shares had no value as it looks for a rescue investor^{xviii}.

By May 2015, then minority Chinese stakes in these projects had been converted to 100% stakes for pennies on the dollar. An opening ceremony was launched on 6th May 2015 for the Tonkolili project with the new enterprise driver Shandong Steel and Iron Group (SISG).^{xix}



Figure 11^{xx}

The 2 principle iron ore projects in Sierra Leone are presently the Marampa and Tonkolili mines.

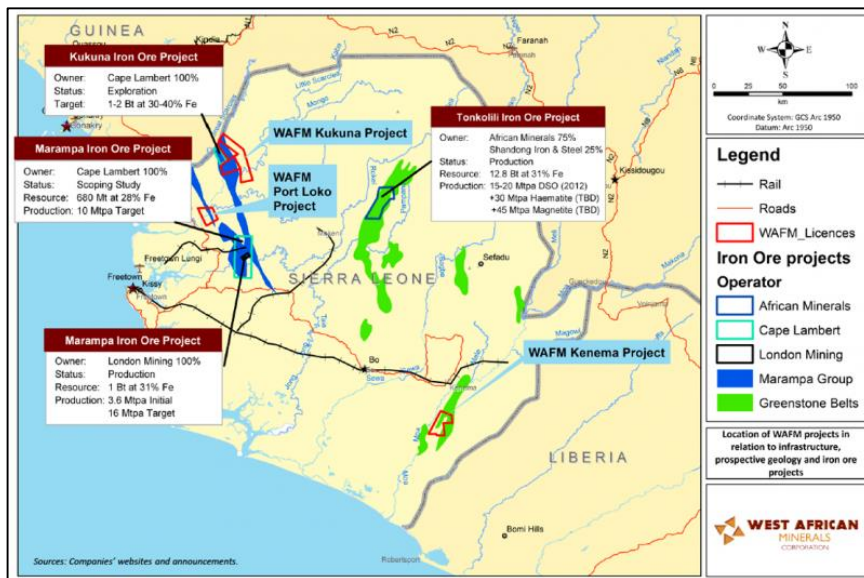


Figure 4^{xxi}

The Tonkolili project boasts an estimated 60 year mine life and a Joint Ore Reserves Committee-compliant resource of 12.8bt. It was being developed in a number of staged expansions.^{xxii}



Figure 5^{xxiii}

The mining style is open pit however, with the Tonkolili project, significant infrastructural development has been needed since African Mineral's initial project development in 2011 by way of extensive rail connectivity from mine sites to the port loading zones some 200km away.

Reportedly, African Minerals had completed the USD \$1.7bn development of Phase 1 which, fully funded, was then projecting to produce 20mt of direct shipping iron ore per annum at full capacity. The next stage of the then project expansion contemplated the production of up to 35mtpa of 64% high grade hematite concentrate and the expansion of the current port facilities at Pevel, expected to enter production in 2016^{xxiv}.



The Company had also developed significant port and rail infrastructure to support the operation of the Project, via its subsidiary African Rail and Port Services (SL) Limited (“ARPS”), in which the Government of Sierra Leone (“GoSL”) has a 10% free carried interest.^{xxv} Most of this infrastructure has been largely idle or underused as the transition from originator London based investments slowly gave way to new Chinese backed ‘distressed asset’ investments, compounded of course by the nation-wide Ebola outbreak. The basic building blocks are all in place though and capesize bulk carrier loadings have already commenced.



Figure 6^{xxvi}



Figure 7^{xxvii}



Figure 8^{xxviii}

The Marampa project is also an open pit mine utilizing rail infrastructure to connect ore to the port loading zones. Here though they have had to utilize river barge movements and a trans-shipment operation at the port of Freetown.^{xxix} Once employing over 1 300 employees with annual expected production of 5-7mt iron ore^{xxx}, its owners recently slipped into administration citing depression with the iron ore commodity market globally as well as the combined effects of the Ebola outbreak.



Figure 9^{xxxi}

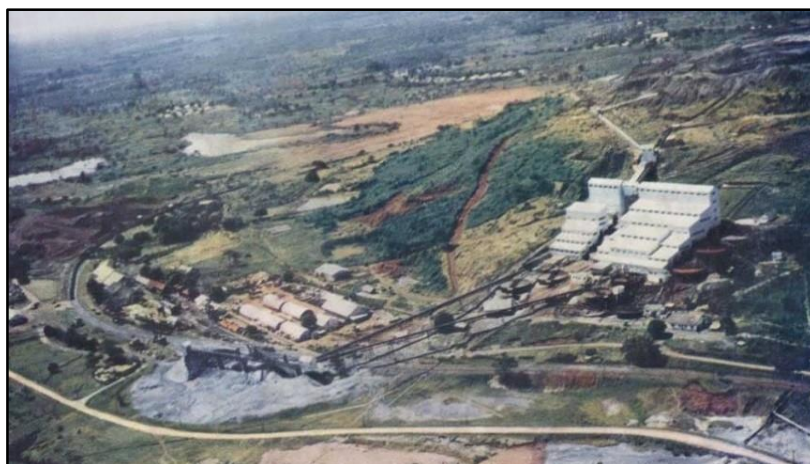




Figure 10^{xxxii}

In November of this year the World Health Organization also officially declared Sierra Leone as Ebola free^{xxxiii} ending a long period of social and economic stress to the society at large, the government institutions and business in general.

Consequently, a significant ramping up in iron ore exports from Sierra Leone has materialized and is set to continue. Against this looms the specter of the next monsoon season, due to commence around May 2016. Whilst several of the International Group P&I Clubs have in the past – in 2012 - issued Circulars and advice bulletins warning of the risks of liquefaction from loading cargoes of Iron Ore out of Sierra Leone^{xxxiv}; such reporting was somewhat limited and likely reflected the rather low volumes being exported generally then. This could well change now that export volumes are once again increasing.

As with most iron ore export operations, practical concerns could well arise and include;

- Lack of understanding of the issues of liquefaction
- Iron ore fines or Bauxite not being declared as a Group A cargo under the IMSBC Code where appropriate
- Lack of any actual competent authority as provided for in the IMSBC Code (competent laboratories & surveyors etc.)
- No certificates of moisture content and transportable moisture limit issued by the shipper
- Cargos being incorrectly described to avoid being subject to the requirements of the IMSBC Code
- Inaccurate or fraudulent moisture content or transportable moisture limit certificates issued by the shipper
- Only one certificate issued for moisture content and transportable moisture limit even though there may be more than one distinct source of cargo – so called 'chain of custody' or evidential probity of certificates versus cargo actually loaded could be particularly problematic where you have complex and long distance logistics involved from extraction to load site
- Masters being placed under commercial pressure not to delay loading by raising concerns and to accept cargoes without sufficient certification
- Moisture content certificates more than seven days old
- Cargo not stockpiled but delivered straight from the mine
- Restrictive charter party clauses
- Physical threats and intimidation forcing masters and surveyors to accept cargo
- Refusal to provide proper access for surveyors to sample and inspect the cargo before the ship is asked to start loading



Guinea Iron Ore & Bauxite exports:

The following extracts are taken from KPMG's recent 2014 report on mineral ore exports out of Guinea.

Guinea has some of the world's largest high-grade bauxite and iron ore reserves, but has been largely unable to benefit from its mineral resources, due to sustained instability, political risks and lack of infrastructure. The government instability has increased markedly since the failed coup in 2011 and continues to be the biggest impediment in Guinea's economic growth. Guinea holds in excess of a quarter of global bauxite reserves and has large quantities of high-grade iron ore reserves, with most reserves exceeding 60% grade. These deposits are largely untapped and thus present significant opportunity to mining companies. Guinea is expected to become the world's fourth-largest bauxite producer by 2017.

Guinea was the world's sixth largest bauxite producer in 2012. The West African nation produced 19mt of bauxite in 2012 and according to Business Monitor International (BMI), Guinea's bauxite production is expected to reach 40.7mt in 2017. This will make Guinea the fourth-largest bauxite miner globally. The Guinean government is more optimistic. In a March 2013 statement, President Alpha Conde's office forecast annual bauxite output reaching 61mt by 2016-17, and that of alumina between 16 and 20mt.^{xxxv}

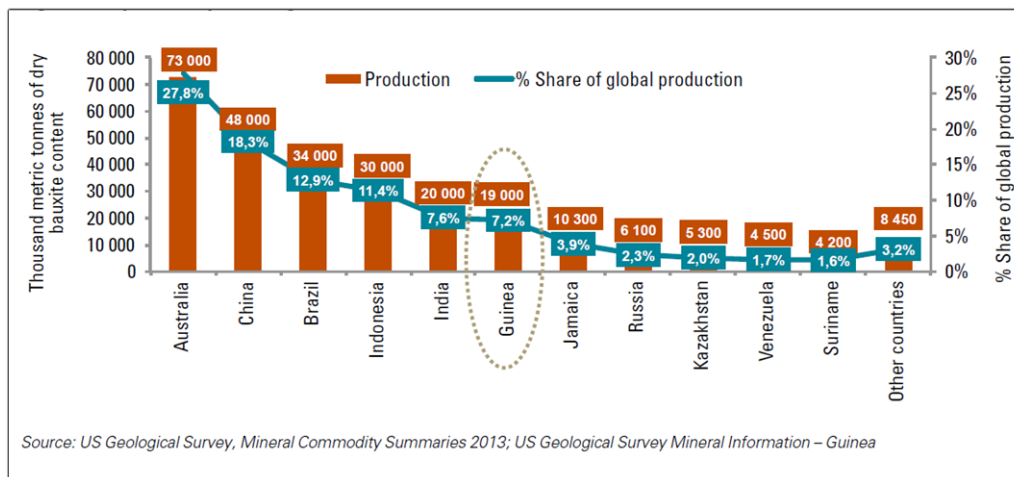


Figure 12^{xxxvi}

Similar to most of the other West African nations, Guinea faces serious infrastructure challenges with a transport network insufficient to meet even the current requirements. The country's electricity sector is also severely under-developed and presents an acute challenge to the power-intensive mining sector. However, this creates substantial opportunities for investment in infrastructure, transport and electricity networks. Over the past five years, Guinea has received investment of about USD \$2.5B, which is relatively weak compared to its other mineral-rich neighbors. Despite Guinea's high-quality mineral resources, numerous international firms have taken a wait-and-see approach due to the uncertain business and political environment in the country. Following the successful election of President Alpha Conde in 2013 there is growing interest from international mining firms, and the



mining sector is set to experience high growth in coming years as further political and infrastructure challenges are overcome.^{xxxvii}

This was demonstrated recently by President Alpha Conde's appointment of mining executive Mamady Youla as the country's prime minister. Youla, an economist, had been previously serving as general manager of Guinea Alumina Corp Ltd., a bauxite and alumina development company and is expected to utilize his private business ties.^{xxxviii}

On 17th November 2015 the last known Ebola patient in Guinea (a 21 day old baby girl) was reportedly recovered and the country would be officially declared Ebola free if there were no new cases within the 6x weeks thereafter.^{xxxix} On 29th December 2015 the WHO declared the end of Ebola virus transmission in the Republic of Guinea since 42 days had passed since the last person confirmed to have Ebola virus disease tested negative for the second time. Guinea would now enter a 90-day period of heightened surveillance.^{xl}

The below map shows an approximate distribution of current international backed mining projects as of October 2013 however, development has continued apace.



Figure 13^{xli}

In October 2015, the Winning International Group of Singapore (Winning) announced that through a consortium it has invested USD \$200M in the bauxite-mining concession of the Boke Region of western Guinea. Winning provides holistic logistics solutions for China's nonferrous metal industry to develop new markets, import resources and ship goods and has established long-term strategic partnership with enterprises from China, Indonesia, Malaysia, India and Australia to this end.

Partnering with Weiqiao Pioneering Group from China's Shandong province, UMS as well as China's Yantai Port Group, the company plans to increase its production of bauxite ore from 5mt to 10mt, and eventually to 30mt under three phases in two years, becoming the world's largest single bauxite producer.^{xlii}



In a marketing presentation, Guinea Iron Ore Ltd 'GIO' highlight planned infrastructural development of a multi-user rail line for their Gaoual project in North East Guinea bordering Guinea-Bissau, which is typical for operations of this nature.

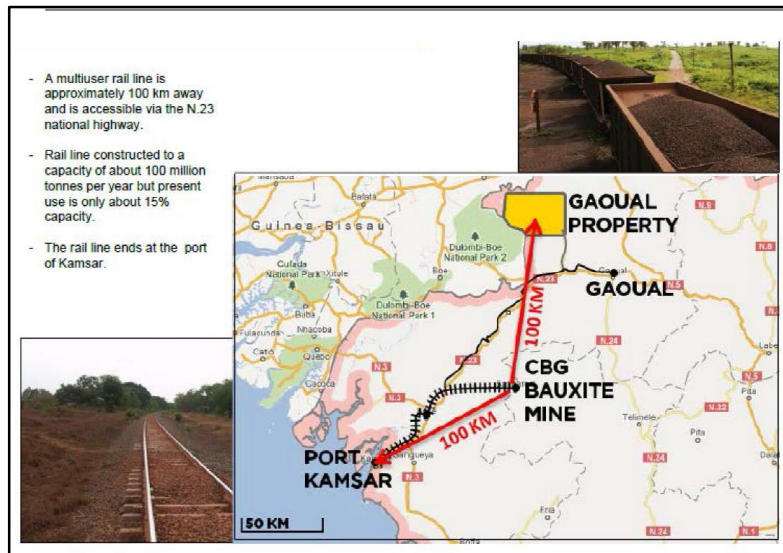


Figure 14^{xliii}

Other projected port and rail infrastructural development is also highlighted below.

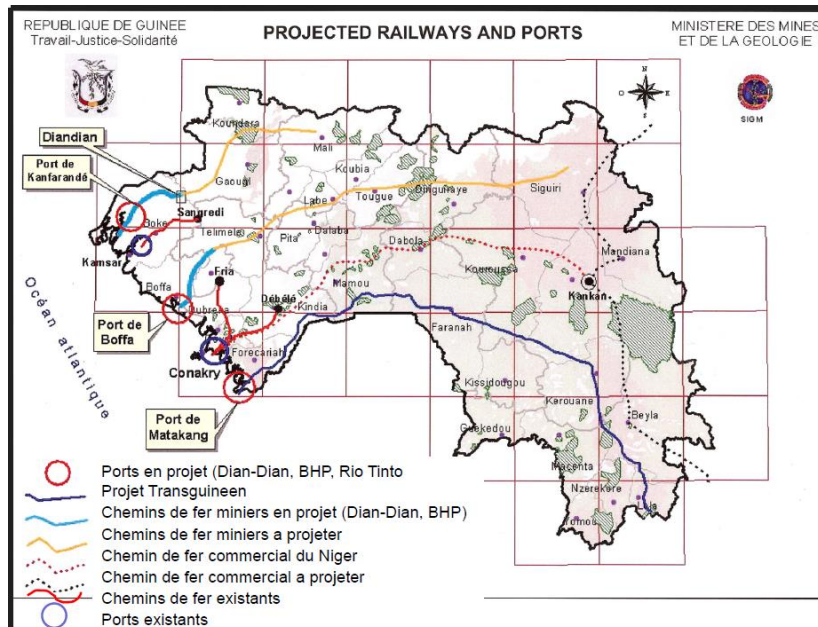


Figure 15^{xliiv}

As with Sierra Leone, the large distances inland from extraction sites to eventual port loading zones bring new practical concerns for a prospective carrier.



The largest single producer of bauxite in the world happens to be in Guinea, Cie des Bauxites de Guinée's (CBG) whose operations are located in the west of Guinea, close to the border with Guinea-Bissau and since opening in 1973 has reportedly produced over 260mt of bauxite for export.

CBG's operations consist of a Kamsar bauxite treatment plant on the West African coast, and a group of open pit mines located 100km inland, centered on the community of Sangarédi. Here is how CBG's pre-rail shipment stages of extraction and ore processing are described.

'After stripping any thin overburden, the ore is blasted and then loaded using hydraulic excavators into haul trucks for transport to the mine stockpiles.

Bench heights of up to 8m allow most of the ore to be mined in one horizontal pass. The mining fleet consists of Demag H185 excavators, Caterpillar 992C and 992D wheel loaders, and 17 Caterpillar 777B and 777D trucks.

Run-of-mine ore is stockpiled in long piles that run parallel to the mine's rail sidings, with material from the different pits being tipped in layers to give a consistent blend. The stockpiles are then reclaimed using Caterpillar 992s that dump directly into rail wagons alongside.

About two hours is needed to load each 100-wagon train, each car carrying around 82t of bauxite. Five or six trains carry ore from the mine to Kamsar each day.^{xlv}

If sampling and testing from stockpiles at the load zones is not done or cargo from different mine sites is mixed for loading on a vessel, establishing a proper chain of custody is difficult if possible at all. This is particularly so where complex extraction to pre-loading logistics are involved bringing into question the evidential probity or reliability of moisture certification provided.

As mentioned earlier, Guinea is also home to one of the largest untapped iron ore deposits in the world. According to KPMG, the Simandou project is set to become the largest integrated iron ore mine and infrastructure venture of its kind in Africa. Rio Tinto owns the controlling stake of the southern concession of Simandou. The mining company said work on the USD \$18.3B project, which includes a 670 km Trans-Guinean railway and a new deep-water port south of Conakry, could start once the Guinean government approves an investment framework. Rio Tinto estimate that the mine could produce 95 million tons once it reaches its full capacity and puts the potential yield of the site at 2.4bt of high-grade iron ore. Development of the northern part of Simandou has been marred in controversy. The concession is owned by BSGr and Brazilian mining company Vale. The former has been accused of bribing officials to win the rights to the concession in 2008, which has become the subject of a Federal Bureau of Investigation (FBI) probe. Until the matter is resolved, the northern part of Simandou will lie idle. According to BSGr, the production target for the project is 50-70mtpa. According to the World Bank's Sustainable Energy, Oil, Gas, and Mining unit (SEOGM), Guinea's estimated iron ore production is as follows:



Project	Company	Total Reserves if known	Estimated annual production (Mtpa)
Simandou 1 and 2	Vale/BSGR	5.500 Mt (60-67%)	50 by 2020
		10-15,000 Mt (40%)	unknown
Zogota	Vale	unknown	15 by 2014
Simandou 3 and 4	Rio Tinto/Chinalco/IFC	2,417 Mt (66%)	95 by 2020
Forecariah	Bellzone	N/A	10 by 2013
Kalia	Bellzone/CIF	3,273 Mt (23%)	50 by 2018
Nimba	BHPB/AREVA/ Newmont	1,200 Mt (grade unknown)	Estimated production unknown
TOTAL			up to 250 by 2020

Sources: SEOGM

Figure 16^{xlvi}

Port throughput volumes at Conakry - as well as further north out of Dakar, Senegal - for unrefined iron and bauxite ores may well also be set to increase from projects designed to unlock the significant deposits in landlocked Mali. Mali is looking to diversify its mining activities away from the present ore focus on gold and develop its other mineral ore deposits but needs to link up to the Atlantic via existing rail infrastructure through Guinea. Chinese backed infrastructure investments were concluded to this end at the end of 2014 as rail projects worth some USD \$9.5B were agreed. Of these 'framework agreements', USD \$8B will reportedly finance a 900-km (560-mile) railway to Guinea's port capital Conakry and \$1.5B would renovate a rail link to Senegal's capital Dakar, Mali's main gateway port.^{xlvii}

Guinea, like Sierra Leone, also experiences a long rainy/monsoon season from May until November.



Figure 17^{xlviii}

As with Sierra Leone's increasing iron ore export operations, similar practical concerns could well arise and include;

- Lack of understanding of the issues of liquefaction



- Iron ore fines or Bauxite not being declared as a Group A cargo under the IMSBC Code where appropriate
- Lack of any actual competent authority as provided for in the IMSBC Code (competent laboratories & surveyors etc.)
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Liberia Iron Ore exports:



Figure 18^{xlix}

Liberia is one of the poorest countries in the world, and its economy is extremely underdeveloped, largely due to the First Liberian Civil War from 1989-96. The civil war destroyed much of Liberia's economy, especially the infrastructure in and around Monrovia. Liberia borders Sierra Leone, Guinea and Cote D'Ivoire and faces seaward experiencing the same spectacular rainy/monsoon season as Sierra Leone.



Figure 19ⁱ



Like Sierra Leone and Guinea, Liberia was officially declared Ebola free on 3rd September 2015 whereupon it entered a 90x day period of heightened surveillance.ⁱⁱ A 15x year old boy from the Monrovia neighborhood of Paynesville has recently become infected though bringing the overall country status again into question.ⁱⁱⁱ

Liberia's iron ore production ceased during the civil conflict, which persisted from 1989 for fourteen years. By September 2011 global steel producer ArcelorMittal had restarted ore exports, when a 63,000 tons panamax size shipment was loaded at Buchanan port. As volumes from the Yekepa/Nimba mine rose, an offshore loading facility for capsized bulk carriers was subsequently introduced.ⁱⁱⁱ Investments since then have continued apace.

By late 2012 ArcelorMittal after some USD \$800M in investments in the abandoned Yekepa mines, rail and port infrastructure was reportedly achieving 2x trains per day each with approx. 70x cars loaded with 630t's. Their target was for a total of 4mt shipped during 2012 with forward projections into 2015 for 15mtpa.^{iv}

By January 2015 Sable Mining had agreed a USD \$1.3B deal to export iron ore via Liberia. The 25-year deal, mandated the firm to expand rail links between Guinea & Liberia, should allow it to begin transshipping ore from the Mount Nimba mine later this year. Sable will reportedly be investing USD \$300M in the first five years of the project and USD \$1B in the remaining 20, and would ship its ore via the Liberian port of Buchanan.^v

China Union who originally signed a 25-year Mineral Development Agreement (MDA) with the Government of Liberia in 2009 had committed to invest USD \$2.6B to renovate and revitalize the former Bong Mining Company. With the completion of Phase One of their operations in July 2013, full-scale mining began with the setting up of camps, hydraulic and conveyor belt machines, and completion of repairs on the railroad between Bong Mines and Monrovia. By 13th February 2015, shipments had resumed from the long-closed Bong mine via new operators China Union (part of Wuhan Iron & Steel) as a majority shareholder in the project.^{vi}

Below shows the *GMT Phoenix* being loaded with China Union's first shipment of 50 000 mts of iron ore at its load facilities in Freeport, Monrovia in February 2015.





Figure 20^{lvii}

Below shows the relative distribution of iron ore mining operations in Liberia.

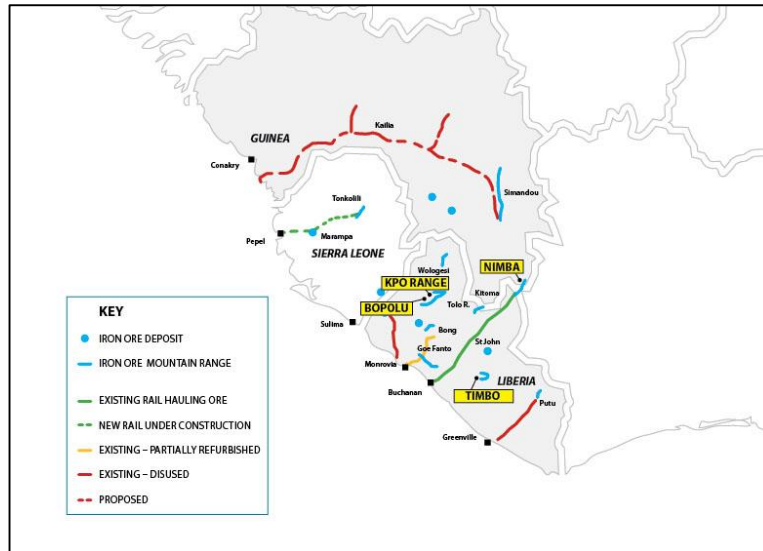


Figure 21^{lviii}

Eltvedt & O'Sullivan via their local agent TCI were commissioned by the Swedish Club in October 2012 to investigate and report on the then newly established Arcelor Mittal mining operations out of the Yekepa mines.

Although somewhat dated now, the following are some of the more pertinent extracts from that report^{lix},



Port and Loading Facility



There are two berths in the port. The public berth is for general cargo and the exportation of logs. The other berth is part of ArcelorMittal's concession and is dedicated to loading iron ore. It can accommodate one bulk carrier of approximately 56000T at a time. ArcelorMittal has plans to increase the loading capacity of the port by the use of barges taking ore to Cape size bulkers at anchor outside the Port. However, it is not clear where the barges will berth / load when there is a bulker already alongside as there is no available quay space at present.

Navigation in and out of the port is limited to daylight only and vessels departing full have to wait for high water. Tugs are available and are based in the port.

Climatic Conditions

It should be noted that during the wet season (June – November) it rains every day and sometimes for several days non-stop. Although we visited towards the end of this season there were still heavy showers most evenings. The actual amount of rainfall at the iron ore mine, which is inland, is far greater than the amount received on the coast / at the port. Therefore, in this period there is a higher risk of the iron ore being too moist / rejected by the vessel and /or surveyor for loading. It is therefore highly recommended that each vessel has a P&I surveyor appointed to assist the Master as much as possible.



At the time of our visit the port was already full of iron ore waiting to dry out and be loaded. Consequently the daily trains from the mine had been cancelled until further notice.



Cargo Management / Loading

The iron ore arrives at the port from the mine by train - a journey that takes 6-8 hours. Whilst on the train the iron ore is exposed to the elements as the wagons are not covered. On arrival at the port the wagons are emptied by mechanical digger onto a conveyor belt.



(c.f. photographs on final page) This new cover protects the iron ore from further moisture (rain), but, due to the fact that the sunlight is not in direct contact with the ore, does little to assist in drying out ore that is received already 'wet' from the mine and / or train.

This belt then carries the ore into a covered storage area where it is deposited in 10 different stock piles (bays). These bays were, until recently uncovered, with the ore only being covered by tarpaulins in case of rain.



During our visit we could see ore being taken out of the covered bays and placed in small piles on the quay. The Deputy Port Manager explained that this was being done in order to dry the cargo as the moisture content was too high for loading. This ore would be put back under the covered area later in the day to avoid any overnight moisture / rain. This daily process had been going on for some time and there was a vessel alongside that had been there for over a month awaiting suitable (dry) cargo to load.

Although we were advised that the Port Manager was under no commercial pressure to load 'moist' iron ore and loading was carried out with the full co-operation of the Master it should be noted that ArcelorMittal is, as well as the shipper, also the charterer of the vessel. Therefore one could surmise that it is ultimately in their interest to load the vessel as quickly as possible.



For information we noted that during our visit that the vessel alongside, MV Triton Bulker, was not loading any cargo as the iron ore was declared as too moist – according to SGS moisture content testing. The vessel had already been there for one month without loading and was costing ArcelorMittal USD 19000 per day in demurrage.

Once the moisture content has been passed as fit for loading the ore is loaded in two ways.

1/ Ore is taken by bulldozers from the stock bays and placed in small piles on the quay alongside the vessel (50m away) where it is loaded by the ship's cranes / grabs which are operated by the stevedore.

2/ A shore to ship loader is used to transfer the ore directly into the vessel's hold.

The current machine (seen on the left in the below photograph) is old and slow and breaks down under a heavy load, but it supplements the above method.

A new machine from Belfast (centre and right in the below photograph) had been off-loaded a few days prior to our visit and was still undergoing testing. Once fully

operational it will eventually be fed directly from a silo that is being reconditioned and, it is claimed, will be capable of loading a complete vessel in one day as opposed to about six days at present (WP). However, this is some time in the future as there is still work to be done to the infrastructure to be able to supply the ore to the loader at the required rate.

Moisture Testing and Documentation

Every cargo loaded has to be tested and have a certificate issued (Certificate of Assay) to certify the iron ore's Flow Moisture Point (FMP) and Transportable Moisture Limit (TML). This testing has to be done at a recognised establishment and has to be carried out no more than six months prior to loading. For cargo loaded ex Buchanan the testing is done by Alfred Knight in the UK. The TML is 90% of the FMP and iron ore should be rejected for loading when the Moisture Content (MC) exceeds the TML.

There is a slight flaw in the above test given that the sample is taken from the mine, which can be a vast area and have ore of different moisture content in different parts of the mine, whilst there is no way of tracing the cargo that is actually loaded back to the same part of the mine from where the sample was taken.

The Deputy Port Manager advised us that recently a new test was carried out by Alfred Knight with a composite sample from the mine and this gave a lower FMP than previous



testing. Consequently the MC has to be lower than previously in order to be accepted for loading. This will reduce further the risk of liquefaction of the iron ore during the vessel's voyage.

On-site testing at the port can be carried out by any interested party at any time. Usually can tests are performed by the surveyor (if appointed) and ship's officers with ArcelorMittal in attendance. These tests are done either on the undercover stock bays or piles alongside the vessel in order to spot any problems before the cargo is actually loaded. If there is any suspicion regarding the results of the can tests and the MC then further testing is carried out by SGS.



SGS is located in a converted 20' container on the quay. Iron ore samples are first weighed and then baked in one of two ovens for eight hours before being re-weighed. From the results the moisture content (MC) is



calculated and a certificate issued. If the MC is over the TML the cargo is rejected and not loaded.

Even though SGS is supposed to be independent and impartial it is worth noting that SGS is actually paid by ArcelorMittal for the testing they carry out.

When TCI Liberia is appointed to attend a vessel loading iron ore at Buchanan our surveyor will go to the port prior to the vessel's arrival with two supervisors in order to start carrying out can tests on the cargo before loading commences. Once operations have started the surveyor and / or his supervisors are available 24/7 to assist the Master in any way possible regarding the cargo and its testing as required. Then, on completion of loading the surveyor will attend for the signing of the final documentation.

Overall, the impression from the ArcelorMittal staff at the port is that they take the issue of the iron ore moisture content seriously and work with all parties to ensure unsuitable cargo is not loaded. The Deputy Port Manager explained that it was very frustrating to receive 'wet' cargo on the trains from the mine that then had to be dumped somewhere (not on the vessel!) as it was unfit for loading.

It should be noted that not all vessels loading iron ore at Buchanan have a P&I surveyor appointed. This is especially true in the dry season when there are fewer problems with moisture in the cargo.

This report, although dated October 2012, highlights some of the very real practical safety concerns that will arise in this trade in spite of any best endeavors being undertaken by shippers and their representatives. Therefore again, as with the above trades analyzed out of Sierra Leone and Guinea, similar practical concerns could well arise and include;

- Lack of understanding of the issues of liquefaction
- Iron ore fines or Bauxite not being declared as a Group A cargo under the IMSBC Code where appropriate



- Lack of any actual competent authority as provided for in the IMSBC Code (competent laboratories & surveyors etc.)
- No certificates of moisture content and transportable moisture limit issued by the shipper
- Cargos being incorrectly described to avoid being subject to the requirements of the IMSBC Code
- Inaccurate or fraudulent moisture content or transportable moisture limit certificates issued by the shipper
- Only one certificate issued for moisture content and transportable moisture limit even though there may be more than one distinct source of cargo – so called ‘chain of custody’ or evidential probity of certificates versus cargo actually loaded could be particularly problematic where you have complex and long distance logistics involved from extraction to load site
- Masters being placed under commercial pressure not to delay loading by raising concerns and to accept cargos without sufficient certification
- Moisture content certificates more than seven days old
- Cargo not stockpiled but delivered straight from the mine
- Restrictive charter party clauses
- Physical threats and intimidation forcing masters and surveyors to accept cargo
- Refusal to provide proper access for surveyors to sample and inspect the cargo before the ship is asked to start loading

ⁱ Source: <http://www.norclub.no/network/bulk-cargo-liquefaction/>

ⁱⁱ The National Institute of Statistics and Economic Studies (Insee) shows the current spot price CIF for Iron Ore 62% Fe content into Tianjin, China as dropping to USD \$46/ton range as of November 2015 down from its peak of some USD \$180/ton in early Jan/Feb 2011. Source: <http://www.bdm.insee.fr/bdm2/affichageSeries.action?idbank=000455735&page=tableau&codeGroupe=298&recherche=idbank>

By end November 2015 Platts was assessing the 62% Fe IODEX \$1.55/dry mt lower at \$42.50/dmt CFR North China, another historical low for the assessment. Source: <http://www.platts.com/news-feature/2015/metals/steel-raw-materials-pricing-analysis/index>
Stripping out insurance and freight leaves an increasingly smaller slice to cover production costs.

ⁱⁱⁱ Source: <http://www.bmiresearch.com/news-and-views/tracking-the-cost-leaders-in-iron-ore-production>

^{iv} Sierra Leone’s economy received a boost when two substantial iron ore mines started production. These two iron ore projects caused real GDP growth in Sierra Leone to jump from an average of 5.7% p.a. during 2010-11 to 15.2% and 20.1% in 2012 and 2013, respectively, according to the International Monetary Fund (IMF). Source: https://www.kpmg.com/Africa/en/KPMG-in-Africa/Documents/2015%20Q1%20Snapshots/KPMG_Sierra%20Leone%202015Q1.pdf

In Guinea mining contributed about 21.6 percent of GDP in 2012, while it consistently makes up around 90 percent of the country’s total exports. Source: <https://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/mining-country-guides/Documents/guinea-mining-guide.pdf>

The Liberian economy recorded a real GDP growth rate of 8.1% in 2013, led by a more than doubling of iron ore exports, construction, and a robust service sector performance. The economy is projected to expand by 6.8% in 2014 and 8.2% in 2015. Increasing iron ore



production and concession-related foreign direct investment (FDI) will continue to support headline growth. This ramping up in iron ore production by Arcelor Mittal now represents about 25% of GDP, but only employs about 8% of the labor force. Source; http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Liberia_EN.pdf

^v Source; <http://data.worldbank.org/indicator/IQ.WEF.PORT.XQ>

^{vi} Source; <http://www.ifc.org/wps/wcm/connect/c019bf004f4c6ebfbd99ff032730e94e/Mine+Infra+Report+Final+Copy.pdf?MOD=AJPERES>

^{vii} Ibid

^{viii} An example of the UK Club IG Circular issued in June 2012 can be found here; <http://www.ukpandi.com/loss-prevention/article/circular-8-12-dangers-of-carrying-nickel-ore-from-indonesia-and-the-philippines-mandatory-notification-requirements-5376/>

A follow up explanatory Circular was also issued by the UK Club the details of which can be found here; <http://www.ukpandi.com/fileadmin/uploads/uk-pi/LP%20Documents/liquefaction.pdf>

^{ix} The clause can be found here; https://www.bimco.org/~media/Chartering/Special_Circulars/SC2012_04.ashx

^x Source; https://en.wikipedia.org/wiki/Sierra_Leone_Civil_War

^{xi} Source; <http://global.britannica.com/science/West-African-monsoon>

^{xii} Ibid

^{xiii} Ibid

^{xiv} Source; <http://www.bloomberg.com/news/articles/2014-10-12/in-ebola-stricken-sierra-leone-mining-price-war-deepens-crisis>

^{xv} Source; <http://www.worldstopexports.com/iron-ore-exports-country/3226>

^{xvi} Source; <http://www.hellenicshippingnews.com/bulking-up-in-africa-china-inflates-seaborne-minerals-export-trade/>

^{xvii} Source; <http://www.bloomberg.com/news/articles/2014-09-30/african-minerals-may-breach-debt-covenants-after-profit-slumps>

^{xviii} Source; <http://uk.reuters.com/article/london-mining-financing-idUKL3N0S31LY20141008>

^{xix} Source; <https://www.steelfirst.com/Article/3434921/African-Minerals-London-Mining-and-the-fall-of-Sierra-Leones-iron-ore-sector.html>

^{xx} Source; http://www.fmprc.gov.cn/mfa_eng/wjb_663304/zwjg_665342/zwbd_665378/t1262826.shtml

^{xxi} Source; <http://www.westafricanminerals.com/content/projects-investments/sierra-leone>

^{xxii} Source; <http://www.miningne.ws/2013/08/01/tonkolili-3-projects-in-one/>

^{xxiii} Source; <http://spilpunt.blogspot.no/2007/04/sierra-leone.html>

^{xxiv} Source; <http://standardtimespress.org/?p=5672>

^{xxv} Source; <http://standardtimespress.org/?p=5672>

^{xxvi} Source; <http://www.unep.org/disastersandconflicts/CountryOperations/SierraLeone/Photogallery/tabid/55337/Default.aspx>

^{xxvii} Source; <http://awoko.org/2014/04/16/sierra-leone-news-aml-success-story-continues-in-2014/>

^{xxviii} Source; <http://www.e-mj.com/features/5492-market-slump-slows-africa-s-iron-ore-project-growth.html#.VIWxvHYveUk>

^{xxix} Source; <http://www.hellenicshippingnews.com/bulking-up-in-africa-china-inflates-seaborne-minerals-export-trade/>

^{xxx} Source; <http://www.mining.com/african-minerals-founder-to-buy-broke-london-minings-sierra-leone-assets-30296/>

^{xxxi} Source; <http://www.skuld.com/topics/cargo/solid-bulk/cargo-liquefaction/sierra-leone-iron-ore/>

^{xxxii} Source; <http://www.miningglobal.com/operations/1206/African-Minerals-Founder-Strikes-Deal-to-Buy-Marampa-Mine-from-London-Mining>



^{xxxiii} Source; <http://www.afro.who.int/en/sierra-leone/press-materials/item/8139-who-commends-sierra-leone-for-stopping-ebola-virus-transmission.html>

^{xxxiv} Various examples can be seen here; <http://www.skuld.com/topics/cargo/solid-bulk/cargo-liquefaction/sierra-leone-iron-ore/>
<http://www.skuld.com/topics/cargo/solid-bulk/cargo-liquefaction/west-africa-loading-mineral-ore-cargoes/>

^{xxxv} Source; <https://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/mining-country-guides/Documents/guinea-mining-guide.pdf>

^{xxxvi} Ibid

^{xxxvii} Ibid

^{xxxviii} Source; <http://www.bloomberg.com/news/articles/2015-12-27/guinea-names-mining-executive-mamady-youla-as-prime-minister>

^{xxxix} Source; <http://www.bbc.com/news/world-africa-34840692>

^{xl} Source; <http://www.afro.who.int/en/media-centre/pressreleases/item/8252-end-of-ebola-transmission-in-guinea.html>

^{xli} Source; <http://www.giolimited.com/>

^{xlii} Source; http://www.china.org.cn/world/Off_the_Wire/2015-10/06/content_36750546.htm

^{xliiii} Source; <http://www.giolimited.com/>

^{xliv} Ibid

^{xlv} Source; <http://www.mineralcrusher.com/solution/list/equipmenttominebauxite.html>

^{xlvi} <https://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/mining-country-guides/Documents/guinea-mining-guide.pdf>

^{xlvii} Source; <http://uk.reuters.com/article/mali-mining-china-idUKL6N0SJ06920141027>

^{xlviii} Source; <http://global.britannica.com/science/West-African-monsoon>

^{xlvi} Source; https://en.wikipedia.org/wiki/List_of_cities_in_Liberia

^l Source; <http://global.britannica.com/science/West-African-monsoon>

^{li} Source; <http://www.who.int/mediacentre/news/statements/2015/ebola-transmission-over-liberia/en/>

^{lii} Source; <http://www.reuters.com/article/2015/11/22/us-health-ebola-liberia-idUSKBN0TB0GV20151122#fggtBfECpOLxWBGm.97>

^{liiii} Source; <http://www.hellenicshippingnews.com/bulking-up-in-africa-china-inflates-seaborne-minerals-export-trade/>

^{liv} Source; <http://corporate.arcelormittal.com/news-and-media/news/2013/march/01-03-2013>

^{lv} Source; <http://af.reuters.com/article/investingNews/idAFKBN0KW1LH20150123>

^{lvi} Source; http://www.emansion.gov.lr/2press.php?news_id=2893&related=7&pg=sp

^{lvii} Source; <http://allafrica.com/view/group/main/main/id/00029231.html>

^{lviii} Source; <http://www.sablemining.com/portfolio/nimba.html>

^{lix} Source;
<http://www.swedishclub.com/upload/Loss%20Prevention1147/Port%20of%20Buchanan%20%20TCI%20Monrovia%20report.pdf>