

Iron Ore Review – Where to for the West African juniors?

10 February 2014

Key Issues

- Consensus outlook is for downside risk to iron ore prices over the next couple of years.
- New projects coming on stream should plan for a CFR price with a 62% benchmark of below \$120/t.
- Development potential not scale is key to upside for exploration juniors.
- Valuation metrics such as EV/tonne to assess comparative value may no longer hold as the key to value is access to market rather than size of resource.
- Window to development beyond 3-5 years could now be an advantage.

Valuation

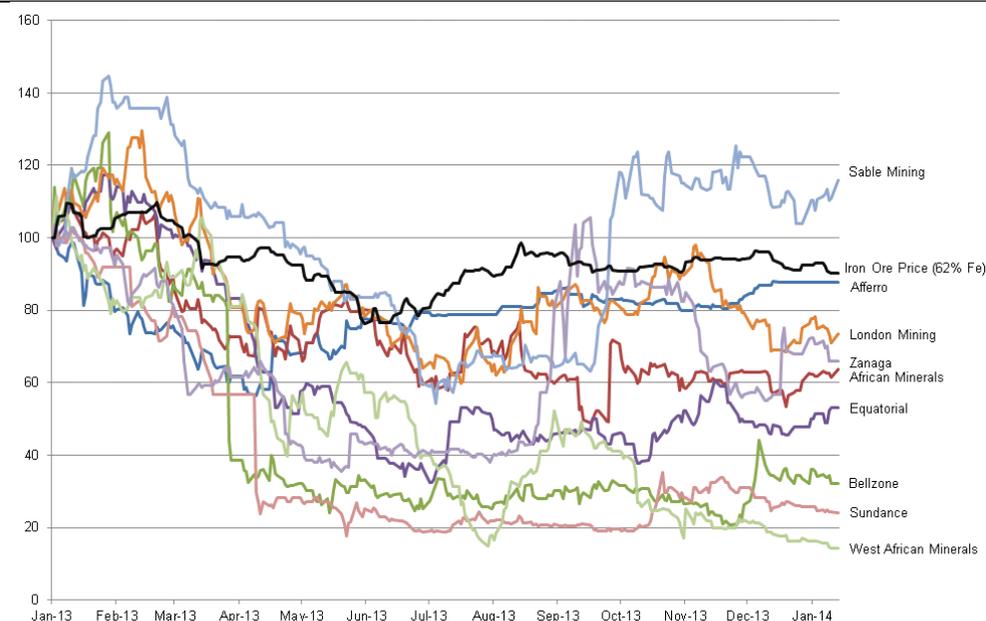
The market is paying less for tonnages in the ground with potential “development” tonnage being more highly ranked than tonnes in the ground. Projects that are perceived to have an infrastructure solution are ranked higher than projects with no framework on infrastructure.

Project	Mkt Cap/NPV	Contained Iron Mt
	NPV	Iron Mt
Nkout	5.4%	526
Kalia	3.6%	1,383
Mayoko-Moussondji	43%	245
Malelane	3.0%	51
Nimba	51.8%	105
Mbalam-Nabeba	7.2%	1,933
South Diadom/Binga	3.5%	32
Zanaga	7.3%	2,176

Source: SP Angel Estimates, Company reports

The sector has underperformed a sideways move in iron ore over the last year.

Relative Performance of Iron Ore Juniors and Iron Ore Price



Source: SP Angel, Bloomberg

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Executive Summary

In this review we set out the back drop for the iron ore market. The new supply of iron ore particularly from the low cost majors is a story that has been well documented over the last year and we set out below in our iron ore review why that argument is well supported. Iron ore prices have been surprisingly resilient till the recent sell off, but may prove to be vulnerable in the next 2-3 years while supply comes on stream against a potential slow down in Chinese demand.

Our analysis shows that growth rates for demand in iron ore in China below 5.5% will lead to surpluses being built up between 2015 and 2017 based purely on incremental supply from the Pilbara.

Against this scenario, we look at the implications mainly for the junior iron ore explorers in West Africa. We have not reviewed the two main junior companies already in production in detail, African Minerals and London Mining but would consider both companies vulnerable to production from the majors at considerably lower all in costs.

Key points that come out in our analysis:

- The market is paying less for tonnages in the ground.
- Potential “development” tonnages are more being highly ranked than tonnes in the ground.
- Projects that are closer to an infrastructure solution are ranked higher than projects with no framework on infrastructure.
- Projects with potential for development coming in after the “glut” in iron ore supply could attract more interest than large scale projects which are “stranded” by high capital investment requirements for rail, port and power.
- Metallurgy is the key.
- Diversification by players outside the majors could be a key support for projects in West Africa.
- Recent corporate activity by companies such as Posco and Jindal Steel could be a promising first step towards small scale steel production in Africa and creating a market closer to home.
- Availability of power could be a game changer and set the path for new steel mills to be built in West Africa.
- Haematite projects with DSO offer the best economics and potential for juniors and companies with these projects will command a premium if infrastructure is also in place.
- Magnetite coastal projects with coarse resource which does not require grinding also have good development potential.

- The development of a number of projects in West Africa will have key social and environmental challenges with some projects being sited in pristine primary jungle.
- Environmental issues need to be viewed in the context of existing policy on national parks already created in countries such as Gabon and Cameroon, which would act as a mitigating factor.
- A number of projects are exposed to cross border issues such as Sable and Sundance where projects are located and mined in one country and transported cross border to the port in another country.
- Fiscal terms and ownership of cross border agreements need yet to be tested.

The de-rating of the sector makes valuations more compelling and provides scope for selective buying.

- Timing now favours later stage explorers/developers to juniors in production.
- We like the Nimba project but the Sable share price has outperformed the sector and we believe risks remain on cross border issues and infrastructure.
- Sundance still has risks due to the scale of development and cross border issues but the current valuation is not demanding given its potential for development.
- We have initiation notes on West African Minerals and Afferro prior to the IMIC acquisition.

Table 2 – Stock Recommendations

Company	Ticker	Share price	Mkt Cap US\$m	Mkt Cap/ NPV	Project	Stage	Rec
IMIC	IMIC LN	31.5 p	58	5.4%	Nkout	PEA	Sell
Bellzone	BZM LN	4.2 p	50	4.0%	Kalia	DFS	Sell
Equatorial	EQX AU	A\$0.66	58	43%	Mayoko-Moussondji	Scoping	Hold
Ferrex	FRX LN	1.7 p	22.9	2.6%	Malelane	Scoping	NA
Sable Mining	SBLM LN	11.3 p	201	53.0%	Nimba	PFS - Q2 2014	Hold
Sundance	SDL AU	A\$0.09	276	6.8%	Mbalam-Nabeba	DFS	Buy
West African Min	WAFM LN	7.4 p	34.7	3.5%	South Djadom/Binga		Restricted
Zanaga	ZIOC LN	16.9 p	77.3	7.3%	Zanaga	DFS	Hold

Source: SP Angel Estimates, SP Angel acts as broker to WAFM.

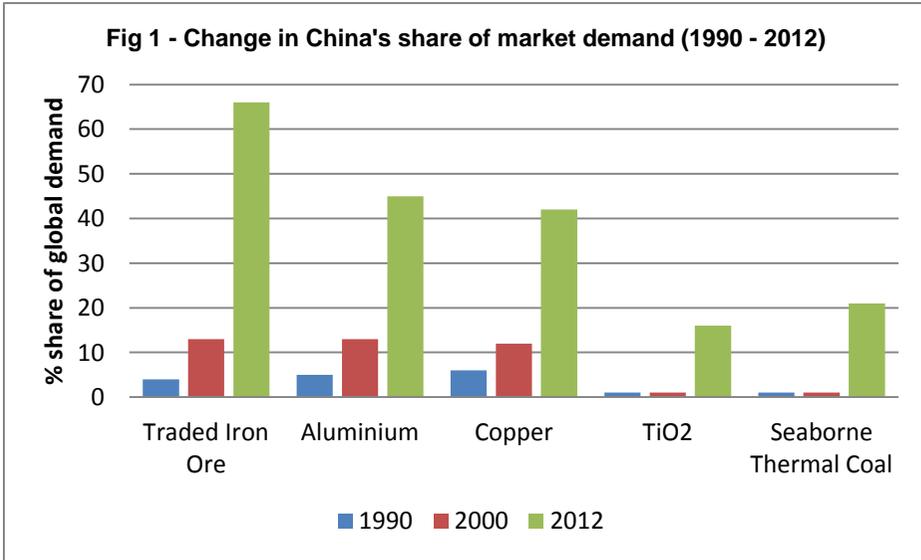
Our forecasts for iron ore prices – CFR 62% are \$120/t for 2014 and 2015 with a long term price of \$100/t.

Iron Ore Market Overview

The general consensus in the market is that iron ore prices are likely to be vulnerable to a sell off against a backdrop of supply coming on stream and an uncertain outlook for Chinese steel demand. While supply in the past has disappointed, this time the supply coming on stream is from the majors who have invested/committed most of the capital to support expanded production. 50% of supply is to come from funded projects in Australia and Brazil.

Iron ore prices and other bulk commodities started to move down ahead of the general sell off in the commodity sector as iron ore and coking coal have for the last decade been closely linked to the Chinese steel cycle and the restocking and destocking cycles of the Chinese steel mills.

Prices recovered in the first half of 2013 and have remained surprisingly strong despite expectations of a slowing down of the Chinese steel cycle and the increased supply from the majors.



Source: CRU, Brook Hunt, Rio Tinto, SP Angel

Previous high prices had been driven by the high cost of production in China required to deliver the marginal tonne to the Chinese steel mills. When demand remains high the cost curve can be the determinant of price. However, as demand weakens, the marginal cost argument no longer holds and high cost production no longer becomes viable.

The increase in supply from low cost majors is now likely to be the driver of prices. Greenfield projects coming on stream will now need to be at the lower end of the cost curve to justify the large capital investment required to bring projects on stream.

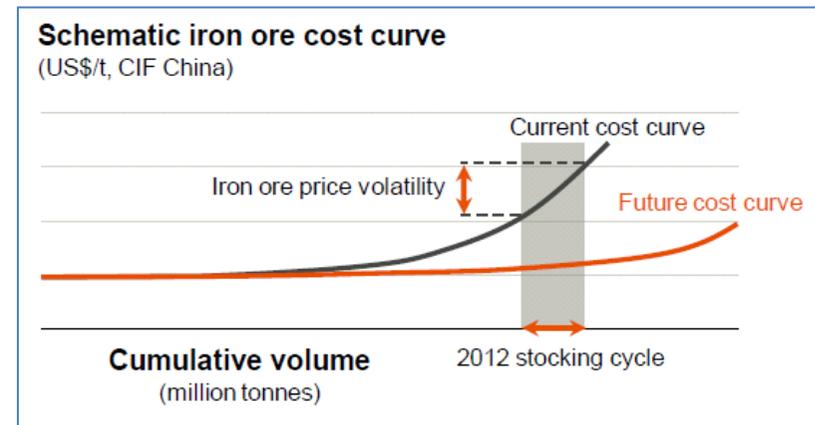
The spot market in iron ore has introduced the dimension of short term influences against previous longer lead time decision making.

Factors driving the iron ore price down remain intact

The Shifting of the Cost Curve

The low cost production in Australia is now more likely to drive iron ore prices rather than the marginal cost of production in China as rapid demand in China is no longer the key driver.

Figure 2 – Shifting Iron Ore Cost Curve

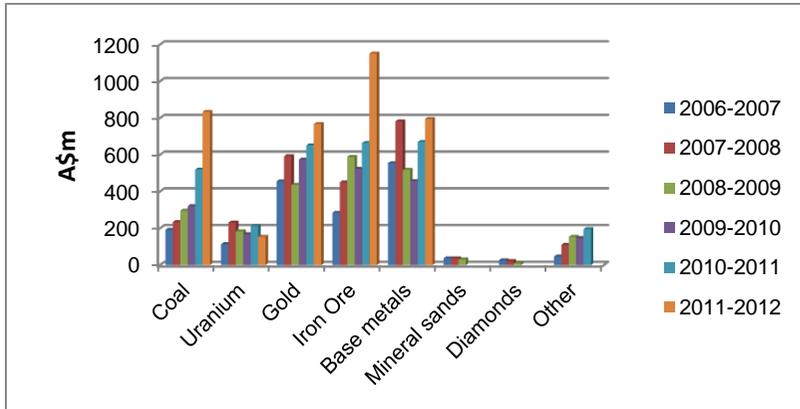


Source: BHP Billiton Presentation, Platts

Iron Ore Majors continue to build low cost supply

Iron ore majors in Australia have invested significantly in iron ore capacity since 2006 in Australia far out pacing investments made in other commodities in country.

Fig 3 - Australian Exploration Expenditure Across Commodities (2006 -2012)



Source: BREE

Based on projections from the BREE, iron ore exports are set to grow and expected to double over the next 10 – 12 years. This will result in Australian iron ore accounting for 50% of global exports by 2015 (or 678 Mt) against 41% in 2011.

Table 3 – Expected Iron Expansion from the Pilbara

Pilbara Iron Ore Expansion Estimate	2013	2014	2015	2016	2017	2018	2020
Rio Tinto	mtpa	237	260	290	290	360	360
BHP	mtpa	180	212	235	235	235	235
Fortescue Metals Group	mtpa	82	100	127	127	127	127
Other	mtpa	10	12	45	65	65	65
Atlas Iron	mtpa	10	12	15	15	15	15
Roy Hill	mtpa			30	50	50	50
Total	mtpa	519	596	742	782	852	852
Growth	%		15%	24%	5%	9%	0%

Source: SP Angel, Bloomberg, Company reports

The majority of new supply projected between 2013 and 2015 comes from the majors. Investor pressure on the majors to improve returns to shareholders through curbing capital spend may be too late with most of the capital already committed and spent to bring new capacity on board.

Despite overall cut backs in capex plans, iron ore expansion capex plans of Rio Tinto and BHP remains intact. Apart from Simandou where the capital approved and committed will need to go up to bring the project on stream, a significant amount of capex has already been committed (see Table 4).

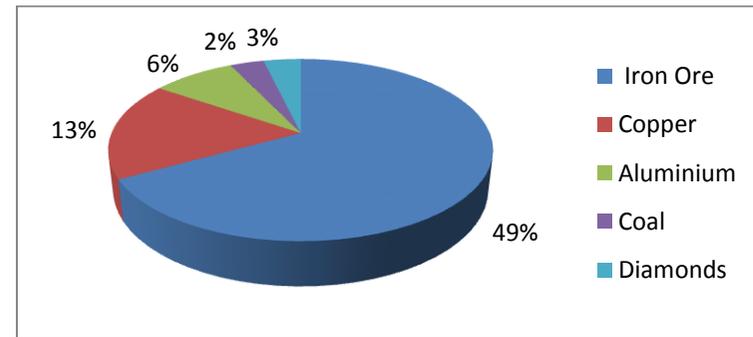
Table 4 – Rio Tinto Iron Ore Projects (100% basis)

	Capex Approved - \$bn	Capex Remaining - \$bn	Capex Remaining - %	Production Mt/a
Hope Downs 4	2.1	0.7	33%	15
Yandioogina	1.7	1.6	94%	4
Pilbara 290	9.8	5.1	52%	53
Marandoo	1.1	0.2	18%	15
Pilbara 360	5.9	5.2	88%	70
Simandou	1.0	1.0	100%	N/a
Total Iron Ore	21.6	13.8	64%	157

Source: Rio Tinto Annual report 2012, SP Angel

Iron Ore remains a key area of investment for Rio Tinto accounting for 49% of approved capital expenditure as at the end of FY 2012.

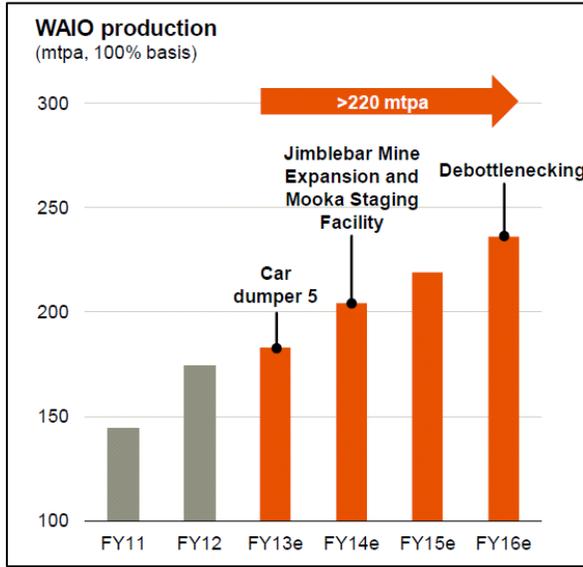
Figure 4 - % of Approved Capital Projects at Rio Tinto



Source: Rio Tinto, SP Angel

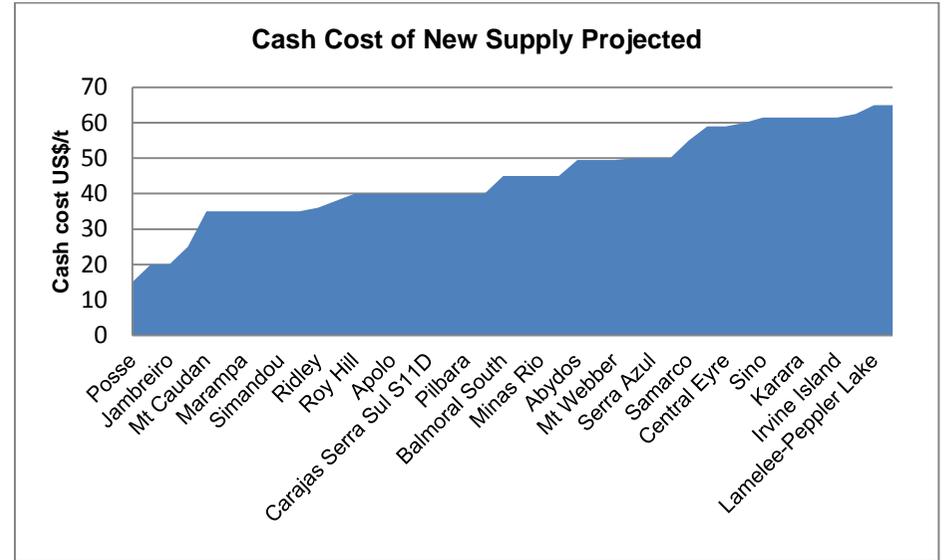
WAIO mine expansion should increase BHP's mine production by 35 mtpa taking total production to 220 mtpa by Q1 CY 2014.

Figure 5 – Expansion of BHP's WAIO



The new supply of iron ore will be dependent on the availability of capital outside the majors. While the cash cost of supply of iron ore looks compelling in terms of the availability of projects at low operating cost per tonne, the reality is that a number of these projects require a significant amount of infrastructure investment in new regions in West Africa – the scale of investments projected are likely to take longer.

Fig 6 – Cash Cost of New Supply

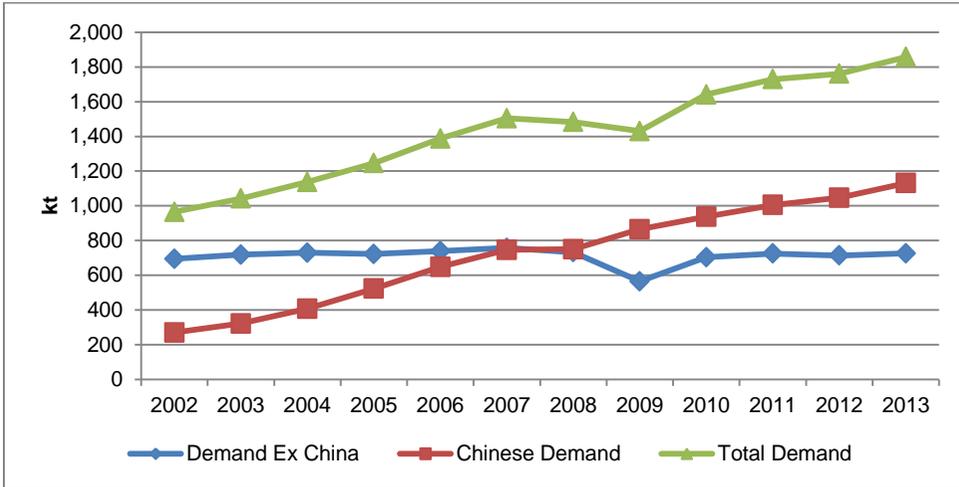


Source: Bloomberg Estimates, SP Angel

Demand for iron ore still dependent on Chinese growth to take up projected expansion from Pilbara

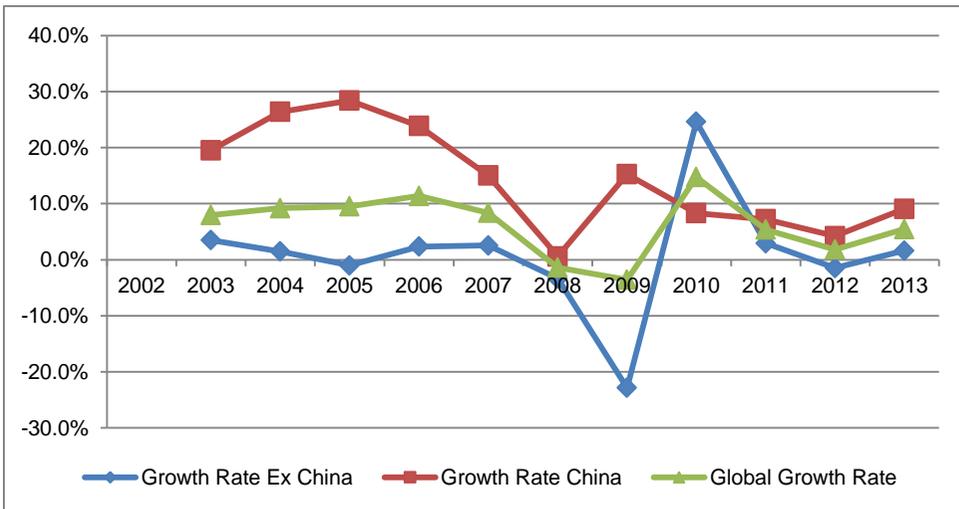
The ability to take up additional supply is still dependent on Chinese demand with growth in global demand driven primarily by Chinese demand. Global growth ex China has gone sideways from 2002-2013.

Fig 7 - Demand for Total Iron Ore – 2002-2013E



Source: SP Angel, Bloomberg Data

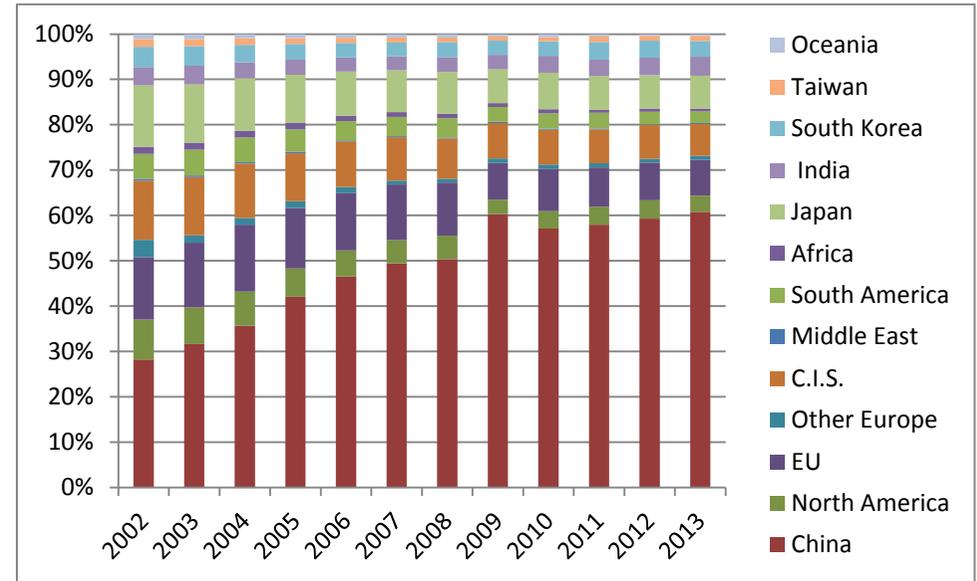
Fig 8 - Growth Rate for Demand China versus Rest of World Ex China



Source: SP Angel, Bloomberg Data

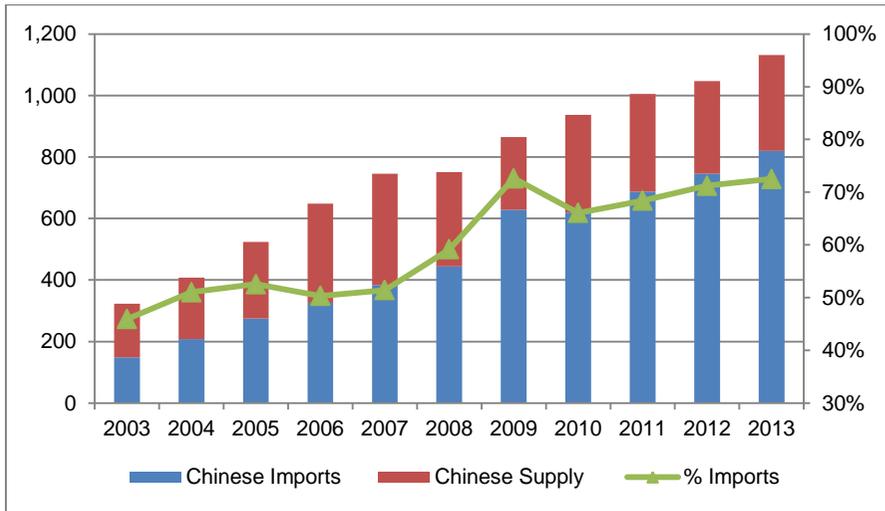
Chinese demand now dominates the market.

Fig 9 - Composition of Total Iron Ore Demand – 2002 – 2013E



Source: SP Angel, Bloomberg Data

Most of this demand in China has been met through growth in the seaborne market and imports into China.



The build up deficits and surpluses depend very much on whether there is any scope for significant growth in steel demand in the world ex China assuming Chinese growth starts normalising. Below we look at surplus build up based on different growth rates for total Chinese demand against the rest of the world growing at 1% and 3% based purely on supply from the Pilbara which will dominate most of the projected supply.

Table 5 (a) – Projected Surplus/Demand based on Total Chinese Demand and 1% global growth rates

Demand growth in China	2014	2015	2016	2017	2018	2019	2020
9.6%	-28	-7	-104	-184	-347	-526	-721
7.5%	-4	44	-21	-63	-183	-312	-450
5.5%	18	92	56	46	-39	-127	-220
4.5%	30	116	93	98	30	-41	-115
3.5%	41	139	129	148	96	41	-15
2.5%	52	162	165	197	159	119	79
1.0%	69	196	218	268	249	230	210
0.0%	80	219	252	314	307	299	291

Source: SP Angel

Table 5 (b)– Projected Surpluses narrow if growth rates ex China are at their high of 3%

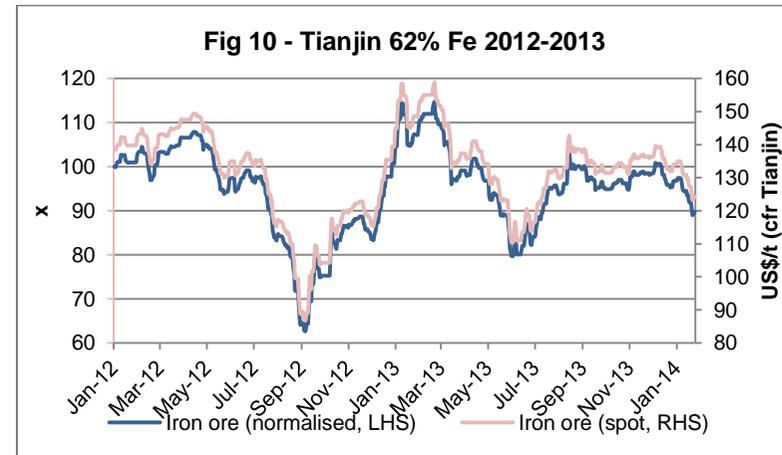
Demand growth in China	2014	2015	2016	2017	2018	2019	2020
9.6%	-50	-45	-158	-254	-434	-631	-844
7.5%	-26	7	-74	-133	-270	-417	-573
5.5%	-4	55	2	-24	-126	-232	-343
4.5%	8	78	40	28	-57	-146	-238
3.5%	19	102	76	78	9	-64	-138
2.5%	30	125	112	128	72	15	-44
1.0%	47	159	164	199	162	125	87
0.0%	58	182	198	244	220	194	168

Our analysis is based on total Chinese demand but the impact on the seaborne market could be greater. Surpluses in the seaborne market could be higher if imports do not continue to displace higher cost Chinese production.

Also our analysis is based purely on supply from the Pilbara with supply from other regions likely to change this picture further.

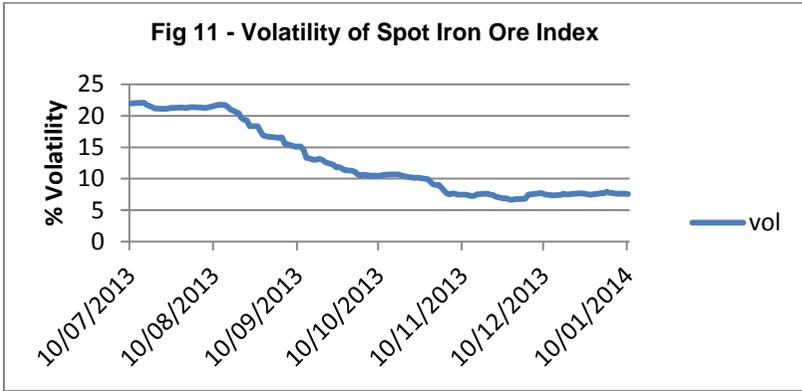
Outlook for prices

Prices rebounded in the second half of 2012 and fell again through the first half of 2013 before recovering in the second half. Prices had remained relatively resilient against a lowering of expectations on Chinese demand and news flow on rising supply but have recently given up gains.



Source: Bloomberg

The volatility of the spot iron ore index has also been trending down.

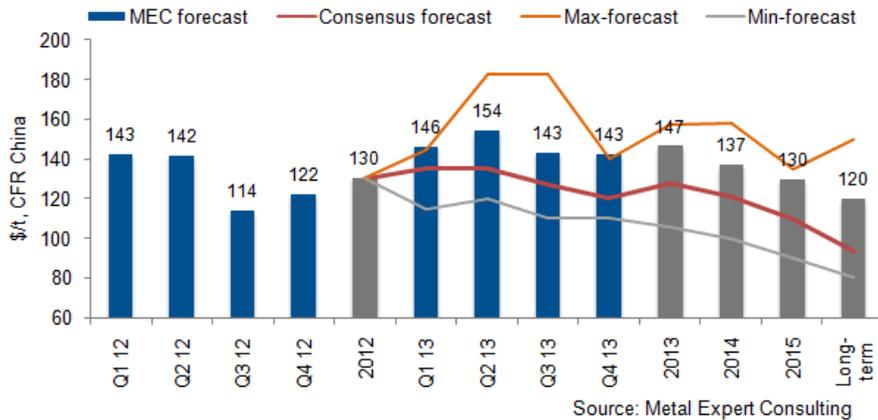


Source: Bloomberg, SP Angel

Against this background consensus forecasts have trended down

The following table shows forecasts from Metal Expert Consulting (made in Jan 2013) premised on the big four curtailing projects and the majority of new supply coming on stream with Chinese backing bringing on less supply (200 mt) and hence resulting in more optimistic prices.

Fig 12 – Iron Ore Forecasts (Jan 2013)



Source: Metal Expert Consulting

Since then Bloomberg shows consensus forecasts as coming down although given the resilience in iron ore prices in the second half of 2013 has resulted in short term forecasts being shifted up in line with higher spot prices.

Table 6 – Bloomberg Consensus Forecasts

	As of	2014	2015	2016	2017
Median	Jul-13	114	106	100	100
Mean	Jul-13	114.9	107.4	101.2	100.7
High	Jul-13	133	130	113	107
Low	Jul-13	100	90	90	95
Forward - US\$/t	US\$123.9				
Median	Jan-14	119	115	108.9	100
Mean	Jan-14	117	113	106	101
High	Jan-14	144	155	139	124
Low	Jan-14	95	90	75	75
Forward - US\$/t	US\$131				
Change in Forecast					
Median		5	9	8.9	0
Mean		2.1	5.6	4.8	0.3
High		11	25	26	17
Low		-5	0	-15	-20

Source: Bloomberg

Low cost supply will see prices range bound at best

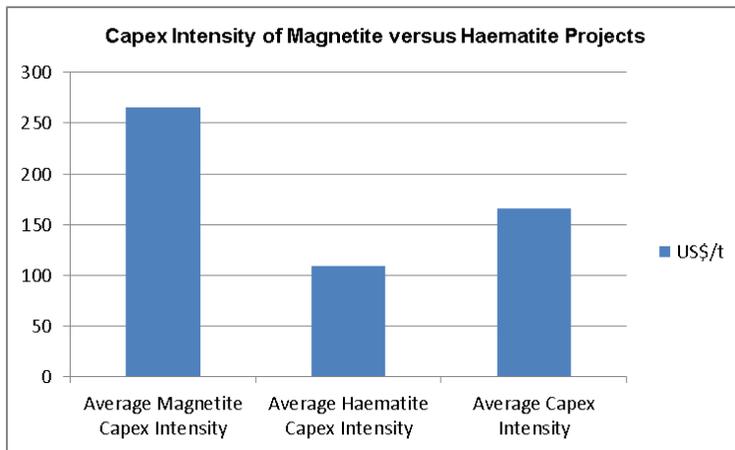
Rio's aggressive expansion plans in iron ore from the Pilbara where automation is central to their strategy are likely to set a high hurdle for new projects. Rio is demonstrating that automation provides greater efficiency and lower production costs. Their Electronically Controlled Pneumatic (ECP) brakes in their freight cars and locomotives (which is for 3 locomotives and 234 ore cars) is said to have increased productivity by 20% in the 230 Mt/a to 353 Mt/a expansion.

New projects will have to compete with an all in cash cost of \$30-\$35/t for production by Rio Tinto setting a low bar for other projects targeting development. The weakening of the Australian dollar after a significant period of appreciation should also ease cost pressures for Australian based operations.

The outlook for the West African junior producers against this back drop

Projects that have a large DSO component based on high grade haematite provide the most economically viable option for juniors in this space. The case for haematite has become more compelling against a backdrop of large low cost supply coming out of the Pilbara.

Figure 13 – Comparison of Capex Intensity of Haematite/Magnetite Projects



Source: Bloomberg, BREE

The reality is that a number of projects that are with the listed juniors are still based on magnetite with an intermediary “haematite” resource – these are oxidised/weathered ores at the top of a larger scale Banded Iron Formation which can be technically referred to as haematite as the mineral form is an oxide (Fe_2O_3).

This would be a useful source of Direct Shipping Ore (DSO) if the grades were sufficiently high. Most of the haematite part of resources have generally been low grade and therefore have been termed pDSO/bDSO or “mainly” DSO implying that these need to be upgraded before they can form a predominantly fines DSO product.

The degree of beneficiation depends on the type of resource with some resources with clay sized haematite crystals formed from the weathering process being prone to high moisture levels because of wet weather conditions in West Africa. The two active listed juniors, African Minerals and London Mining have suffered from the impact of this during their ramp up period. Mine plans have been altered to cope with this.

The crust can also have a goethite type iron oxide which can have higher deleterious elements that need to be taken out during the processing stage. The issue of metallurgy impacts on the economics of the project both in terms of cost of production and ultimate pricing of the product.

Magnetite projects are still economic based on the coarseness of resource and proximity to port or power infrastructure.

Juniors in production in West Africa have scaled back ambitions

African Minerals and London Mining have already started producing from Sierra Leone. The pace of ramp up at both companies have been slower than expected with London Mining producing around 3.5 mtpa with a target to ramp up to 6 mtpa with capex investment of \$240m. African Minerals downgraded production profile to 11-13 mtpa for 2013, is targeting 20 mtpa prior to any further investment in mine optimisation. Both companies have downgraded both the scale and timing of expansion plans based on operational realities.

The cost of production has been higher than expected with operating cost per tonne at London Mining around \$50/t much higher than in feasibility studies with shipping costs putting FOB prices under pressure. Further capital investment to expand production to 6 mtpa has resulted in debt repayment scheduled being extended. Both African Minerals and London Mining have had to revise operating practices to manage heavy rainfall and moisture content. The experience of both these operators will result in greater scrutiny of feasibility studies from other West African projects.

Other West African projects have been pushed back

Other projects in the pipeline to come into production such as Simandou in Guinea and Mbalam in the Cameroon are contingent on significant investment in port and rail infrastructure which are yet to be put in place. Given the lack of clarity on the requisite investments and the development period, we would expect the timeline for these projects to production to be put back to CY 2017 at the earliest.

Table 7 (a) – Probable New Capacity – Jan 2014

Project	Company	Country	2013	2014	2015	2016	2017	2018
			Mt	Mt	Mt	Mt	Mt	Mt
Mayoko	Exxarro	Rep of Congo		2	2	2	10	10
Pepel 35	African Minerals	Sierra Leone					7	15
Marampa	Cape Lambert	Sierra Leone	2	5	5	10	10	10
Marampa	London Mining	Sierra Leone	3	5	5	5	5	5
Mbalam	Sundance Resources	Cameroon						5

Source: Bloomberg, SP Angel

Table 7 (b) Probable New Capacity from West Africa - Jan 2013

Project	Company	Country	2013	2014	2015	2016	2017	2018
			Mt	Mt	Mt	Mt	Mt	Mt
Simandou	Vale	Guinea		15	15	15	15	15
Marampa	Cape Lambert	Sierra Leone	2	5	5	5	5	5
Marampa	London Mining	Sierra Leone	8	8	8	8	8	8
Mbalam	Sundance Resources	Cameroon			17.5	17.5	17.5	17.5
Simandou	Rio Tinto	Guinea				40	40	40

Source: Bloomberg, SP Angel

The Simandou project requires a new Trans-Guinean railway of 670 km to transport iron ore to a new deep water port south of Conakry. The project has suffered from issues including an investigation of corruption into BSG Resources who acquired a stake in Simandou and sold part of it on to Vale. A recent meeting between Rio Tinto, the IFC and the Guinean government in London has resulted in a commitment to bring this project estimated at \$20bn into production. Rio has pushed back the start of the project from 2015 to 2018.

The other key project in the region is the Mbalam project belonging to Sundance Resources. The project which is currently looking for strategic partners and project financing will take at least 6 months to complete detailed engineering work and will take 3 years to build. This would suggest that CY 2015 for targeted production from this project is optimistic with production unlikely to come through till the second half of CY 2018 assuming Sundance is successful in securing funding towards the end of this year.

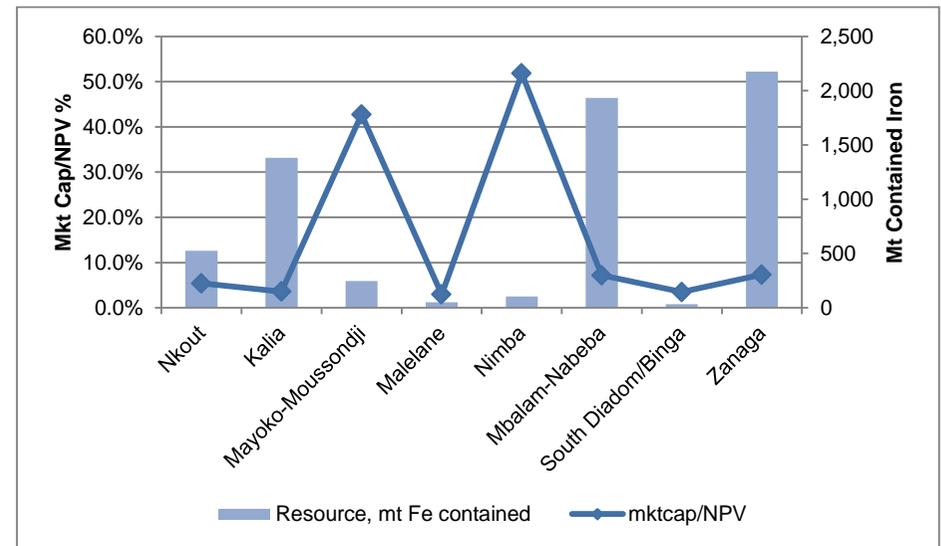
There are smaller scale projects with planned output of around 3 mtpa that could come through faster such as Exxarro’s project in the Republic of Congo. Refurbishment of the railway near this project would be helpful to Equatorial which is seeking investment to bring on a project of a similar scale. Sable Mining also has potential with the Nimba project subject to agreement with the Liberian government and Mittal on the use of the refurbished railway line which runs close to its project in South Guinea to the port of Buchanan.

The biggest challenge remains access to infrastructure

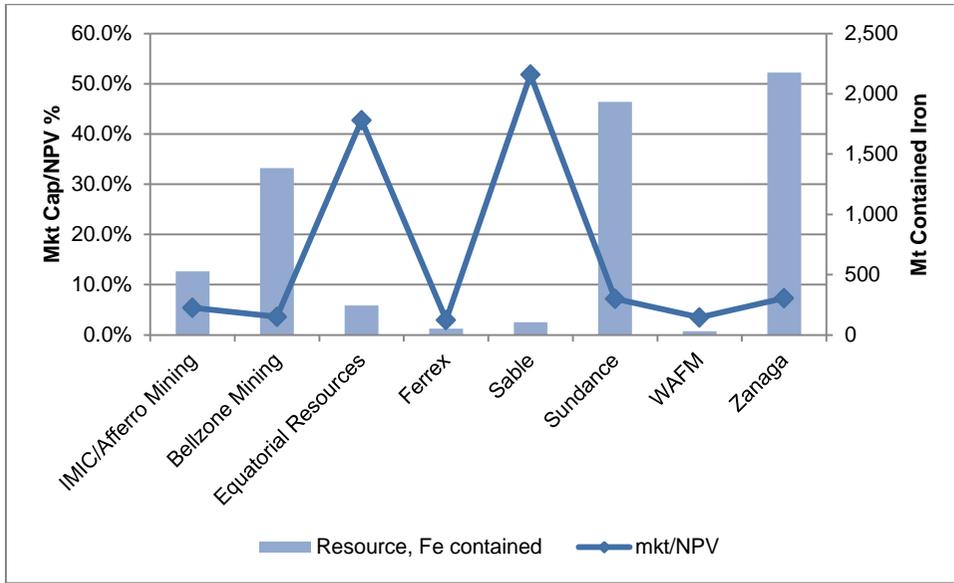
Despite progressing projects through exploration to feasibility, share prices and re-ratings have not followed suit – the market is not willing to pay much for projects with development prospects dependent on large infrastructure investments.

Our analysis based on current market capitalisations to estimated NPV on a number of projects in West Africa suggests that the market is paying little in terms of premium for resources in the ground unless there is a perception of an infrastructure solution. Two projects that stand out in our analysis is Sable’s Nimba project and Equatorial’s Mayoko-Moussondji projects where a higher premium could reflect perceptions of access to transport.

Figure 14 - % of Market Cap/NPV against resources in the ground



Source: SP Angel



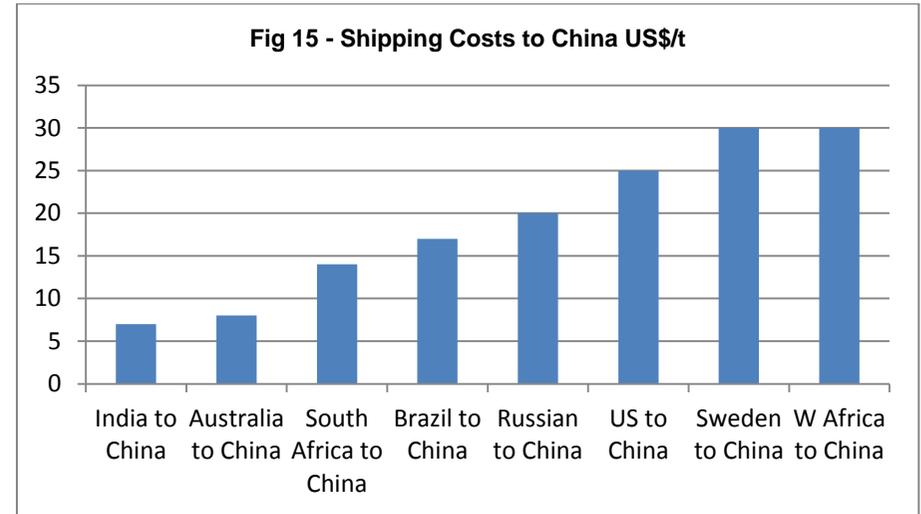
Source: SP Angel

Challenges remain to infrastructure even for projects seen to be close

Infrastructure solutions have involved using barging and transshipment in the case of London Mining and an existing single track route in the case of African Minerals. There have been challenges during the ramp up process in optimising this process which has resulted in additional costs being incurred.

The transport solution being proposed at Equatorial using an existing rail link to Pointe Noire will require refurbishment and also port development. Sable Mining's current proposed solution to developing the Nimba project involves an export decree from Guinea to Liberia. It is also not clear if the company will be able to come to an agreement directly with the Liberian government given any existing Mineral Development Agreement already in place between Mittal and the Government which are likely to have protected rights over the railway prior to the investment undertaken to refurbish the railway estimated to be close to \$1bn.

West African Projects are vulnerable to shipping costs pushing up effective cash costs



Source: SP Angel, Bloomberg

Diversification potential by non-producers could change the dynamics

West Africa is often referred to as the “New Pilbara” and as a means of mainly diversifying supply. There is particularly interest from Asian steel producers such as Jindal Steel and Posco. Both companies have been associated with a number of projects in West Africa with Jindal recently acquiring Legend’s Nyovayang project in Southern Cameroon for A\$12m. While the project does not look compelling on surface, the coastal location is useful.

High capital costs in terms of infrastructure investment needs to be offset by low operating costs and or a better product. Initial mine plans on both these fronts have been too optimistic as witnessed by problems at African Minerals, London Mining and the Bellzone JV at Forecariah.

New feasibility studies need to be more rigorous to address operational issues by the junior producers in the region:

- Transportation of product from mine to port – a number of issues have arisen as a result of transshipping in Sierra Leone.

- The impact of the weather in the rainy season has been underestimated with the high moisture content impacting prices as well as risks to shipping.
- The working capital requirements during the ramp up.
- Power requirements for magnetite resources which are not coarse and will need milling and grinding.

Pellets offer an option to command premium pricing against a drive to improve energy efficiency and cut back on pollution

Pellet premiums saw an improvement in the second half of 2013 as a result of a combination of better demand from European steel mills looking to manage emission targets as well as cut backs in production from Vale, through its idled Tubarao and San Luis plants and Cliff Natural Resources, cutting back on capacity in Quebec. Capacity taken out from idled plants amounted to around 11 Mt.

Pellet premiums in Europe for the second quarter 2013 were in the range of \$28/dmt and Platts predict that negotiations with Vale for 2014 are likely to be higher with negotiations between Vale and Northeast Asian mills said to be set at around \$40/dmt for 2014.

Pellets can be used in the efficient production of Direct Reduced Iron (DRI) or blast furnace iron. Pellets are uniformly sized and can contribute to faster reduction and higher metallization rates. Uniform mechanical strength and abrasive strength can increase the production of sponge iron by 25-30% for the same amount of fuel. The use of pellets reduces coal consumption with lower fines generation. Other cost advantages over lump iron ore is less of a need for crushing and screening.

Steel production is an energy-intensive process. The production of one ton of crude steel from iron ore generates about 1.2 tons of solid waste and approximately 1.8 tons of carbon dioxide. On average it takes 20.7 GJ (5,555 kwh) to make one tonne of crude steel cast (source World Steel Council). Energy is thought to account for around one third of steel production cost of an integrated steel mill.

Iron and steelmaking account for 20% of industrial final energy consumption and 30% of the world's direct industrial CO₂ emissions.

EU steelmakers account for 4 and 7% of all EU anthropogenic GHG emissions with EU having more rigorous emission targets than elsewhere in the world. The EU has an ambitious strategy to cut carbon emissions with steel targeted as one of the industries for regulation. The industry is expected to cut emissions by 34 and 40% by 2030 and 83 to 87% by 2050. European steelmakers will struggle to meet these targets.

The European steel maker's association, Eurofer, thinks that only a 10% reduction in emissions per metric ton between 2010 and 2030 and 15% between 2010 and 2050 is achievable based on existing technologies.

China is also looking to cut pollution which has led to the idling of some sintering plants in the country, which could lead to an increase for imported pellet and lump substitutes.

The most energy intensive process in steel production is the reduction of ferrous oxide into iron in the blast furnace. The blast furnace for making steel not only uses energy but also uses coke (its main source of energy) as a reducing agent in the blast furnace route. 75% of the cost of energy in blast furnaces is in the form of the reducing agent. For Electric Arc Furnaces by contrast the cost of energy is in the energy consumed in steel making, casting and hot rolling with total consumption of 3 – 4 Gigajoules.

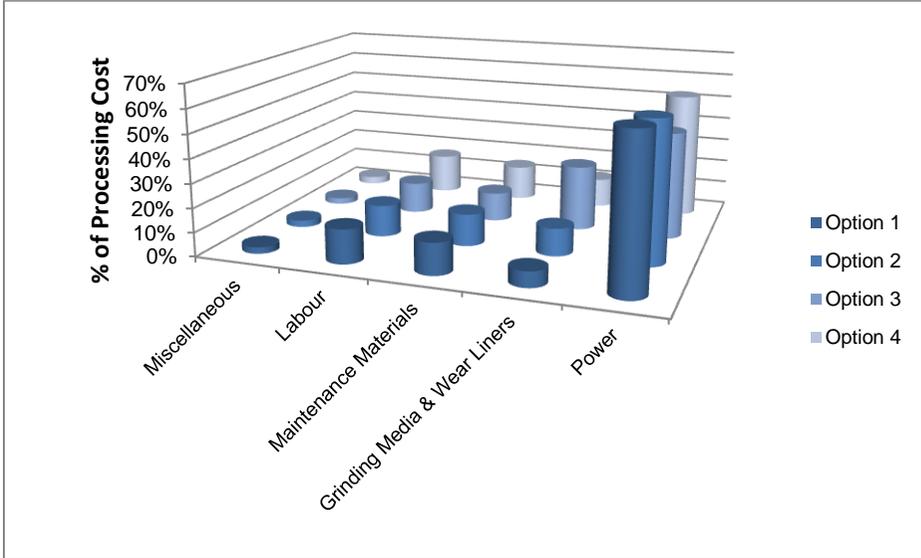
For Iron Ore Producers access and cost of power would be key

Pellets can be produced from both haematite and magnetite fines. Compared to direct ship haematite ores, magnetite deposits require beneficiation which often includes grinding to a particle size where magnetite is liberated from its silicate matrix. The amount of energy required to produce a magnetite product suitable for sale as pellet plant feed is substantially more than an equivalent direct ship lump.

A study conducted in 2009 on various processing techniques for grinding magnetite ores, found power as the dominant processing requirement and cost. Processing flow sheets considered were conventional three and four stage crushing followed by primary and secondary milling, primary crushing following by wet SAG milling and ball or pebble milling and autogenous milling for coarse grinding.

Downscaled production for the Zanaga project of 12 Mtpa of 66% pellet feed product requires 60 MW of power which they believe is available from the grid. A much larger scale production initially planned of between 30 mtpa would have required a dedicated power station of between 355 – 455 MW.

Fig 15 – Power Requirements on Grinding Options for Magnetite Ore



Source: SP Angel, Study by McNab, Jankovic, David and Payne - 2009

A 200 MW hydropower station has now been built in the Cameroon near Kribi and close to WAFM’s Binga project with an additional 216 MW plant to be finished in 2014.

Availability of power could be a game changer and set the path for new steel mills to be built in West Africa.

Attempts at steel production outside South Africa has been mixed at best with Nigeria, Zimbabwe and Republic of Congo with mixed success as a result of political and financial reasons. Nigeria is the most advanced.

The Zimbabwean Iron and Steel Company (ZISCO) had a 1 mtpa blast furnace which has since been in decline. The Republic of Congo initiated the building of a steel plant in 1983 but the construction was suspended in January 1986 due to financial difficulties. The availability of iron ore and power to coastal steel mills could be an attractive proposition and could account for the interest of steel producers such as Jindal Steel and Posco.

Resources of alloying elements such as chromite, cobalt and manganese are also available.

West African Iron Ore Transactions

- The African Iron takeover by Exxaro Resources in Q1 2012 was at a high price for a resource which did not have high grades at US\$6.50/t.
- It is unlikely this benchmark will be repeated given the experience of junior iron ore producers that have since come into production.
- Chinalco bought into the Simandou project at an implied price of US\$2/tonne.
- Legend Mining has recently sold out to Jindal Steel at US\$17.5m for an exploration target with potentially low grades in the Cameroon.
- Kumba (Anglo American) recently signed an agreement to fund exploration work at the Mbega project owned by Ferrex in Gabon. Kumba are paying for exploration work already done as well as funding further exploration for around \$7m.

Company	Project	Acquisition price/ Valuation US\$m	Exploration Target	Resource	Acquirer	Time
Legend Mining	Ngoyayang	17.5	300-500 Mt at 16-40% Fe	None	Jindal Steel	Q4 2013
Afferro	Nkout	200		1.58 Bt at 33.3% Fe 64.3 Mt at 54.5% Fe	IMIC	Q1 2013
African Iron	Mayoko	360		120 Mt at 46% Fe	Exxaro	Q1 2012
CMEC	Belinga	32.5	Potential 30 mtpa	None but high grade 62% Fe	Gabon Govt	Q1 2012
Gabon Govt	Belinga	Contract	Potential 30 mtpa	None but high grade 62% Fe	BHP Put on hold	Q1 2012 Q3 2013
Rio Tinto	Simandou	\$1.35 bn for 45 %		2,254 Mt at 65.7% Fe	Chinalco	Q1 2009
BSG	Simandou	\$2.5 bn for 51%			Vale	Q2 2012

Source: SP Angel

Revised DFS still not attractive

Price: 4.1 pence Mkt Cap £30.6m

03 February 2014

Key Issues

- Kalia has become main focus with a significant scale back on project from mining initially high grade oxide with 7 mtpa of output vs previous 20-40 mtpa.
- Capex now under \$1bn instead of previous \$4.4bn which factored in development and mining of the lower grade magnetite resource.
- An interim trucking solution is being proposed with trucking along a road which would be taking the same route as the initial rail link to be developed by Chinese consortium.
- 7 mtpa of 58% Fines for a 10 year mine life with second phase unlikely to be funded by internally generated cash flow.
- Opex per tonne of \$34.4/t (company) and ours \$38/t may still understate trucking costs.
- Under a weaker outlook for iron ore pricing, we believe the project may struggle to get funding.

Overview

- The company has two iron ore projects in Guinea, Forecariah JV and Kalia.
- The main focus of new management is the Kalia project at BFS stage.
- A revised BFS on Kalia was published in Sept last year scaling back the ambitions of the project with much smaller start up production.
- The revised phased development reduces project capex to \$865m for 7 mtpa – this mainly relies in trucking to port in the first phase.
- \$379m (44% of capex) to be spent on a 285 km road to Forecariah where a haul road connects to Konta Port.
- Reserves of 59.8 Mt at 54.1% Fe supports 6 out of 10 years of the initial mine plan.

Valuation

We estimate a geared NPV of \$738m, an ungeared NPV of \$212m and an IRR of 16% for the Kalia project:

- We have modelled a 10 year initial mine life with head grades of 54.1%, a strip ratio of 0.8 and mass recovery of 72%.
- The company have operating costs (ex royalties) of \$34.4/t against our estimate of \$37/t assuming a trucking cost of \$11.13/t which seems low.
- We use mining and operating costs for their high grade scenario in original DFS of \$2//t for mining and \$6.73/t for processing.
- Limited scope for equity funding on a stand alone basis.
- We assume an iron ore price of \$120 CFR 62% (less grade discount), a discount rate of 12% and shipping costs per tonne of \$30/t.
- The company are targeting a 58% fines product benchmarked against the 58% CFR North China price with LOI of 9%.
- Geared NPV assumes a combination of bank, royalty and convertible funding.

Kalia (Guinea) - Key Parameters	
Resource – Total	4,720 @ 36%
Stage of Development	DFS
Production – Phase 1	7 mtpa 58.5% Fines
Type of product	58% Fines < 6mm
Capex to First Production	865
Projected Opex	\$34-\$37/t
Distance to Port	346 km
Delivery to port	Trucking/Rail (after)

Source: SP Angel, Company data

Share price versus Mining indices and Iron ore price



Source: SP Angel, Bloomberg

Summary

Bellzone has a large resource in Guinea close to the borders of Sierra Leone. The company recently established a reserve of 58.8 Mt at 54.1% Fe based on a total oxide resource of 124.2 Mt at 53.3% Fe (assuming a cut off grade of 48%). There is a larger oxide and supergene BIF of 913.2 Mt at 36.3% Fe and a magnetite BIF resource of 29.3% Fe.

The updated BFS is looking to develop the smaller oxide reserve as a first phase. The project will require infrastructure development to get the product to market. The Kalia project had been premised on development of port and rail infrastructure by CIF. In 2010 China International Fund (CIF) committed \$40m to fund the feasibility study for port and rail with China Rail Eryuan Engineering Group (CREEC) and CCCC to work on the feasibility for the rail and port. This was based on an accord signed with the government which gave them exclusive rights over the identified 300 km rail route and the Matakan port site for a period of 30 months.

The initial DFS on the project published in July 2012 envisioned a different development path for the mine with higher volume production coming on stream within two years into the project premised on a rail and port infrastructure being in place. The trucking solution based on building a road along the route of proposed railway should in theory create a route to market without funding the railway.

Our analysis shows that the reduced tonnages of 58% Fe fines product accompanied by scaled back capex does not enhance the economics of the project. We also believe shipping cost of \$20/t may be optimistic and have applied a uniform \$30/t for all projects coming out of West Africa.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
New DFS Plan	mtpa	7	7	7	7	7	7	7	7	7	7
Head Grade - Fe %	%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
Product - 58% Fines %											
Prev DFS Plan											
Oxide Product	mtpa	5.8	20.8	30.4	25.9	26.5	26.5	26.5	26.5	26.5	
Grade		58.70%	58.70%	58.70%	60.25%	60.25%	60.25%	60.25%	60.25%	60.25%	
Magnetite Product	mtpa			0.25	5.11	14.5	19.2	19.2	19.2	19.2	
Grade		67.50%	67.50%	67.50%	67.50%	67.50%	67.50%	67.50%	67.50%	67.50%	
Power Availability	Mw	20	100	120	240	360					



Source: Company reports

The initial mine plan also assumed the availability of power as the project transitioned from mining and producing from high grade oxides to lower grade oxides and then to the supergene and magnetite resources. The step up in power went from 20 MW at the start of the project to 100 Mw additions with maximum power availability of 360 Mw in 2017 when the magnetite processing started.

We see the next stage of development to be constrained by both transport and power issues which would in turn constrain any improvement in the economics based on an increase in output and top line.

Bellzone Mining - Key Parameters		
Resource - Total (Oxide)	mt	913
Grade	%	36%
Resource - Total (Magnetite)	mt	913
Proportion Indicated	%	36%
Reserve	mt	124
Grade	%	53.5%
Amount of Drilling	metres	240,000m
Project Cost to Date	\$m	\$150m
Location		Guinea
Stage of Development		DFS
Time to do Feasibility	months	Work started in 2007
Production - Phase 1	mt	7 mtpa 58.5% Fines
Production - Phase 2	mt	Expansion to 30 Mt
Capex to First Production	\$m	865
Plant Costs	\$m	\$208
Infrastructure	\$m	\$657
Mode of Transport to Port		Trucking till rail development
Distance to Port	km	346 km
Distance to nearest road	km	285 km
Port Arrangements		Transshipping to Cape Size Vessels
Power Requirement		20 MW
Projected Opex	\$/t	\$34-\$37/t
Type of product		58% Fines < 6mm
Deleterious Elements	%	4.95% Al ₂ O ₃ , 2.11% SiO ₂ , 0.09% P
Moisture	%	9%
Management Change		Glen Baldwin new CEO/Nik Zuk has left
Consultant		Fluor
JV Partner		None
Date Exploration Licence Granted		Nov 2007
Mining Licence		Mining Convention in Place

Source: Company Reports, SP Angel

Equatorial Resources (EQX AU)

Hold

Small scale and access to rail infrastructure could enable development

Price: A\$0.54 Mkt Cap A\$66m

10 February 2014

Key Issues

- Flagship Mayoko-Moussondji is small targeting 0.5 – 2 mtpa with potential to grow.
- Resource not high grade but operating costs helped by high mass recoveries and low strip ratio.
- Two stage development with first phase of \$114.4m and \$230.6m in second phase lowers start up costs.
- Proximity of Exxaro's Mayoko project provides scope for rationalisation.
- Low grades still leave this project exposed in a low iron ore price environment with a breakeven hurdle rate of \$105/t CFR.
- Feasibility needs to be completed with further work to upgrade the resource from a mainly inferred to measured and indicated category.

Overview

- Mayoko-Moussondji is located in Republic of Congo
- Adjacent to the Mayoko project owned by Exxaro, the South African coal producer that paid \$349m to acquire African Iron in January 2012.
- Equatorial has had a double benefit from the sale of a stake in African Iron which netted \$65m enabling their exploration programme to progress at the project without diluting shareholders.
- Project cost estimated at \$63m for 58,760m of drilling for a total resource of 767 Mt at 32% Fe and completion of an advanced scoping study including feasibility on refurbishment of an existing trail track – 465 km to port.
- Republic of Congo has a good track record recently on infrastructure projects – one of the main oil producers in sub-Saharan Africa with a progressive policy on resource development including encouraging shared use of the railway.

Valuation

We estimate a geared NPV of US\$165m for the project and IRR of 23%. Including cash of A\$27m (estimated) takes the valuation to US\$192m (A\$206m).

- We have modelled the mine plan on the company's relatively advanced scoping study starting at 0.5 mtpa on initial capex ramping up to 2 mtpa.
- A mine life of 23 years based on the 102 Mt at 40.6% Fe.
- Head grades of 44% and a mass recovery of 50% is factored into our valuation.
- Initial capex of \$114.4m with a second phase investment of \$230.6m.
- Operating costs per tonne are estimated at U\$42/t.
- We assume an iron ore price of \$120 CFR, a discount rate of 12% and shipping costs per tonne of \$30/t.
- The company are targeting a premium fines product of 64% - we assume no price premium based on potential moisture content.

Equatorial Resources – Key Parameters	
Resource - Total	767 Mt @32%
Stage of Development	Scoping/Feasibility
Production - Phase 1	0.5 mtpa
Capex to First Production	US\$114m
Projected Opex	\$41.43/t
Type of product	64.1% Fines
Distance to Port	465 km
Mode of Transport to Port	Rail to be upgraded

Source: SP Angel, Company data

Share price versus Mining indices and Iron ore price



Source: SP Angel, Bloomberg

An SP Angel analyst has visited this project

Summary

Equatorial has done a lot of work on this project with DC and RC drilling of 58,760m for 505 holes and detailed metallurgical work – the aim is to start mining the colluvium haematite resource for the first four years to minimise start up costs.

Metallurgical work has shown that the resource can upgrade well with haematite and magnetite said to be well liberated and significantly denser than the surrounding clay – this lends itself to simple washing and gravity separation. The fines product being contemplated is said to have lower phosphorous than a number of Australian fine iron ores. This might be good for blending with other ores.

Equatorial have been in a happy position to do the work on this project having benefitted from selling their stake in African Iron for \$65m adding to their cash pile at the time totalling \$90m in Feb 2012. This has enabled them to do an advanced scoping study which does not need much work to upgrade to a feasibility study.

The scoping study completed in July shows a phased development at the project with Stage 1 to produced 500 ktpa ramping up to 2 mtpa in 18 months targeting a 64.1% premium fines product.

Based on the initial Hematite resource the operating mine life is expected to be 23 years with the first 6 years based on an indicated resource representing 25% of the total resource.

The initial capex is estimated at US\$114m with total capex to get to 2 mtpa estimated at US\$231m.

Mine and processing account for 18% of costs at \$41m with rail rolling stock of \$82m (35%), rail at \$29m (13%) and port at \$27m (12%).

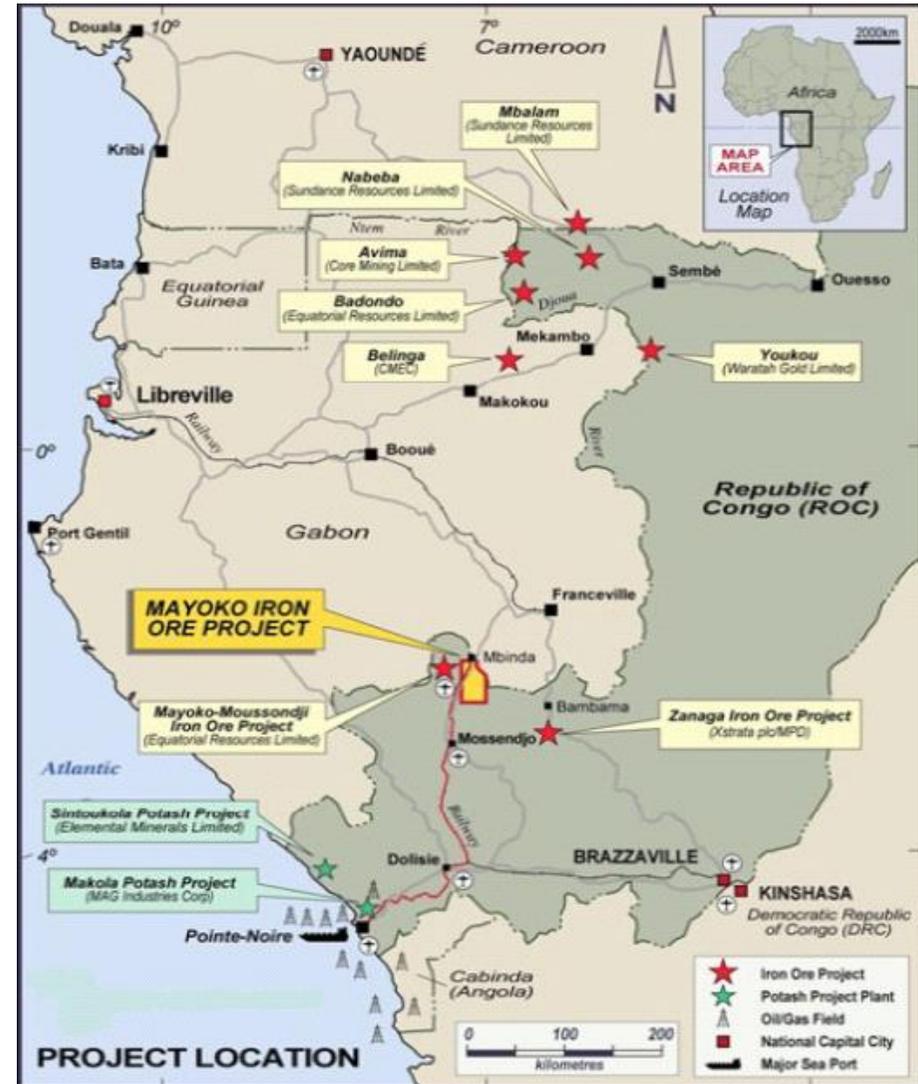
Total costs have potential to be reduced through leasing arrangements on rolling stock, improvements in tailings management and partnership arrangements with Exxaro Resources.

Total operating costs FOB is estimated at \$41.4/t with mining accounting for 39% and rail the other element at \$13.7/t or 33%.

The company need to obtain environmental approvals, upgrade the resource and prepare the mining licence. The timeline to initial production is estimated to be 15 months following an issue of a licence.

The scoping study shows a much less ambitious target of 2 mtpa at ramp up in the second phase. This results in a more manageable capex which has scope to come

down with leasing arrangements for rolling stock accounting for 35% of the capex. The second phase of capex does need to be funded as the company is unlikely to be sufficiently cash flow generative to be able to fund expansion from internally generated funds.



Source: Company reports

The mine operating costs look high for a scoping study stage. Grades are low but the material is friable with low strip ratios and high mass recoveries helping the economics. We look forward to having further detail on the rail and port feasibility and work that needs to be done to put this in place.

Discussions have been on going to find a strategic partner. A large proportion of the ground work done and once a mining convention is in place, this becomes an attractive investment for a strategic buyer.

This is a small project which is not DSO or high grade but its route to commercialisation is more apparent.

- The company has formalised its agreement with the government of the Republic of Congo on the use of the existing railway line.
- The government have confirmed that the rail and port infrastructure will remain state owned and made available to multiple uses.
- The infrastructure covers the existing railway linking Mayoko to Pointe-Noire and the existing port facilities at Pointe-Noire.
- Commercial terms will be the same across the different mining companies planning to access the railway – this would imply same terms for Equatorial and Exxaro.
- Existing rail and port infrastructure needs to be upgraded including re-opening passing loops along the line and installation of a rail loop at Mayoko.
- Equatorial and Exxaro will need to pay for the required upgrade but will be treated as prepayment by the rail operator CFCO.
- The implied tariff cost incorporated in the scoping study is \$13.75/t.

Partnership opportunity with Exxaro provides scope for economic uplift to the project

Total costs have potential to be reduced through leasing arrangements on rolling stock, improvements in tailings management and partnership arrangements with Exxaro Resources.

The Mayoko project had a 121 Mt resource when it was acquired from African Iron and has since been expanded to 730 Mt with a DSO cap of 55% Fe and beneficial DSO ore at 41% Fe. Exxaro has a target to start mining in the second half of 2014 at 30 ktpm with a ramp up to 2 mtpa in 2015 rising to 10 Mt in 2019.

Exxaro has spent US\$83m on the project in the first six months of 2013 with a total spend of R1.3 bn (US\$186m). Total capex for the project is expected to be

US\$320m to US\$340m. The project has 1,350 ore containers, 8 locomotives and 90 rail wagon already in place with Plant 1A delivered.

The project has been delayed as a result of waiting for the ROC Mining Convention. Against a weak background for coal prices and the delay in the project, it could make sense for Exxaro and Equatorial to share costs where possible. It is unlikely that Exxaro needs the additional resource. At the same time they have ambitions to grow their production to 10 mtpa and may need Equatorial's allocation on the rail line. Either way there is an argument for some form of collaboration which will improve the economics of both projects.

At the end of H2 2013, Exxaro had an undrawn capacity of Rand 4.4bn (\$440m) with net financing cost cover of 6x. Net debt stands at \$367m with a net debt/equity ratio of 12%.

Exxaro could have sufficient resource of their own and initially at a higher grade to want to buy Equatorial Resources for their resource. There could be an argument for the government to allocate rail capacity to both parties and it may work to have joint investment by both parties particularly with respect to allocation of rail and for port development.

Exxaro recently received its Mining Convention for the Mayoko project and this should provide more visibility on development in this area.

Equatorial Resources - Key Parameters		
Resource - Total	mt	767
Grade	%	32%
Proportion Measured	%	0%
Proportion Indicated	%	4%
Proportion Inferred	%	96%
Haemetite Resource	mt	102 (25% indicated)
Grade	%	40.6%
Amount of Drilling	metres	58,760m (505 holes)
Project Cost to Date	US\$m	\$63 m (Estimated)
Location		Republic of Congo
Stage of Development		Close to Feasibility
Book value of project	US\$m	
Production - Phase 1	mt	0.5
Production - Phase 2	mt	2
Life of Mine	years	23
Capex to First Production	US\$m	114
Total Capex	US\$m	US\$345m
Plant Costs	US\$m	\$41m
Infrastructure	US\$m	\$144m
Mode of Transport to Port		Rail
Distance to Port	km	465 km
Distance to nearest road	km	
Port Arrangements		Existing port infrastructure
Power Requirement		Mainly diesel generation
Projected Opex	\$/t	41.43/t
Type of product		64.1% Fines
Moisture	%	9%

Source: Company Reports, SP Angel

High quality resource with potential for real DSO

Price: 11.3 pence Mkt Cap £123m

10 February 2014

Key Issues

- Nimba project is a high grade resource (59% Fe) with potential to produce DSO in the form of lump and fines of 65.8%.
- The resource is based on a plateau which is easily mineable to a depth of 15m.
- Lump potential is currently 15% of resource with scope to increase this to 40%.
- The project is in Guinea but the company have secured an export decree from Guinea to take product through Liberia.
- An MOU has just been signed with Liberia to infrastructure development for Nimba and to discuss fiscal terms for the existing rail way line.
- A PFS is being targeted for the second quarter of next year.
- The Sable Nimba project borders the foothills of Mt Nimba which has been demarcated as a Unesco Heritage site for nature.

Overview

- The Nimba project is in Southern Guinea close to the Liberian border.
- Unlike a number of iron ore projects in Africa, the resource is in a plateau formed from thick channels enriched by boulders from nearby Mt Nimba.
- The resource is over three plateaus with Plateau 2 targeted for initial mining with a high grade resource of 59% Fe.
- The company has targeted a route to market through Liberia using mainly an existing single track railway to Buchanan used and refurbished by Mittal.
- 20% of Sable's subsidiary West Africa Exploration is owned by a local Guinean partner helping to negotiate both the export decree from Guinea and further the MOU now in place with Liberia to set terms for use of transporting product to port of Buchanan in Liberia.

Valuation

We estimate a geared NPV of US\$487m for the project and an ungeared NPV of \$388m and IRR of 35%.

- We have modelled a 15 year mine life based on the current reserves at the project of 124 Mt at 53% Fe.
- Production of 3 mtpa of high grade both lump and fines DSO.
- Head grades of 53% are used with strip ratio of 0.5 and mass recovery of 66%.
- Initial capex of \$300m has been estimated including \$100m for infrastructure.
- Operating costs per tonne are estimated at U\$30/t including \$12/t for the railway.
- We assume an iron ore price of \$120 62% CFR, a discount rate of 12% and shipping costs per tonne of \$30/t.
- We do not assume any premium for the 65.8% Fe till further information is available on the metallurgy.

Sable Mining - Key Parameters	
Resource - Total	178.4Mt @59%
Stage of Development	Close to Feasibility
Total Capex	US\$345m
Production - Phase 1	3mtpa
Projected Opex	US\$30/t
Product	DSO - Lump and Fines
Distance to Port	260 km
Transport to Port	Rail (spur line needed)

Source: SP Angel, Company data

Share price versus Mining indices and Iron ore price



Source: SP Angel, Bloomberg

An SP Angel analyst has visited this project

Summary

Sable Mining has a high grade resource in Southern Guinea close to the borders of Liberia. The project has taken two years to establish a resource and is close to the Liberian border.

This is an extremely high grade resource as witnessed during a recent site visit. The resource is based on an alluvial fan in a plateau built up in thick channels accumulating from the boulders from the nearby Mt Nimba which have been smashed and eroded over the years. This has formed channels of high grade canga with channel thickness ranging from 5 – 20m. The resource based in a plateau is easily mineable down to a depth of around 15m (Phase 1) with metallurgical test work showing potential for a simple dry crushing and screening operation to produce high quality DSO product of 65.8%.

This looks genuinely like an economic DSO project – the product at the first stage is a high grade DSO lump product with cores showing continuity of grade in the consolidated levels.



The company are targeting to increase the yield for the lump fraction from 15% to 40%. A fines product which currently forms the majority of the feed material is around 63.8% - aluminium and silica content are high at 3.7% and 4.5% respectively for the deslimed +38 um fines product and mine planning and

scheduling is being looked at to minimize these deleterious elements in the feasibility study.

Access to market is still being finalised - an MOU has been signed with the Liberian government for rail access to the port of Buchanan. (A mining licence is already in place from Guinea where the project is located).

A rail track to the port of 267 km has already been refurbished by Arcelor Mittal who currently mines at Mt Tokadeh which is 44 km from Sable’s North plateau. The refurbished rail line has capacity for 15 mtpa with expansion potential to 25 mtpa by adding two passing loops. Mittal is currently using around 4 mtpa of capacity leaving spare capacity – Mittal has a target to increase their own production to 15 mtpa by 2015 by building a US\$1.5bn concentrator.

Sable’s northern plateau is 27 km from the rail head at Yekepa and 45 km to Plateau 2 where initial mining is to be located. Sable needs to develop 26 km of road to truck product to the rail head (\$30m) and refurbish 17 km of railway (\$15m).



It is a precursor to a final agreement on the development, use and operation of the railway once technical due diligence and fiscal terms have been negotiated. This is an important step forward in Sable’s ability to develop the Nimba project. The MOU follows an Export decree issued by the Government of Guinea giving the company permission to export iron ore through Liberia. This was the first to be issued in Guinea and quite an achievement for the company.

The existing rail line is a multi-user line and under the MDA signed between Mittal and the Liberian government, the latter can allow third party access to the rail providing Mittal receives reasonable compensation for the use of the rail. The current capacity of 15 mtpa should enable Sable to negotiate fiscal terms to use the railway despite Mittal’s stated plans to expand their current production. Mittal is exporting a fines product from Yekepa while Sable plans to export a high grade DSO lump product.

Sable is targeting a PFS for the second quarter of 2014 where there should be greater clarity on the fiscal terms. This project has a quality of resource not widely seen amongst the junior miners in Africa and is now on its way to negotiating an access route to market.

The project borders the Mount Nimba nature reserve which is a Unesco registered site which covers 17,540 ha of which 12,540 ha are in Guinea. There may be issues that arise with the proximity of the licence to the reserve which although not part of the reserve may be seen as threatening to the integrity of the reserve. The reserve is said to contain a number of IUCN Red listed animals and plants and would therefore set a high bar to any activity deemed to infringe on the reserve. The company is said to have had talks with Unesco on this matter and believe they will get approval for the project.

Sable Mining - Key Parameters		
Resource - Total	mt	178
Grade	%	59%
Proportion Measured	%	0%
Proportion Indicated	%	75%
Proportion Inferred	%	25%
Haemetite Resource	mt	178
Grade	%	59%
Amount of Drilling	metres	58,760m (505 holes)
Project Cost to Date	US\$m	\$63 m (Estimated)
Location		South Guinea
Stage of Development		Close to Feasibility
Book value of project	US\$m	
Production - Phase 1	mt	3
Production - Phase 2	mt	
Life of Mine	years	23
Total Capex	US\$m	US\$345m
Plant Costs	US\$m	\$41m
Infrastructure	US\$m	\$144m
Mode of Transport to Port		Rail
Distance to Port	km	260 km
Distance to nearest road	km	30 km
Port Arrangements		Available port infrastructure
Power Requirement		Mainly diesel generation
Projected Opex	\$/t	30/t
Type of product		24% Lump 76% Fines DSO
Moisture	%	9%

Source: Company Reports, SP Angel

Sundance Resources (SDL AU)

Buy

Price: A\$0.10 Mkt Cap A\$305m

10 February 2014

Key Issues

- The high grade haemetite reserve could support a new 510km railway from the project to a new deep water port at Kribi.
- \$4.6bn was estimated at a DFS produced in 2011 with \$2bn estimated for the railway.
- The scale of investment needs to attract a significant proportion of offtake or royalty pre-payment to bring in the requisite project financing.
- During the abortive bid by Hanlong the company secured a mining permit from the ROC and signed a convention agreeing attractive fiscal terms with the Govt of Cameroon.
- Royalties of 2.5%, a tax holiday of 5 years provides cash flows to support debt funding of the railway and enables more royalty backed financing.
- The development of a heavy gauge railway line will open up the region to other iron ore projects awaiting development and could attract multilateral financing.

Overview

- The Sundance Mbalam project straddles the Republic of Congo and Cameroon.
- The project established a DFS in Q2 2011 but development has been held up by an 18 month protracted bid by Hanlong that failed.
- The company is seeking alternative partners to get the project to development.
- The project has a high grade haematite reserve of 436 Mt at 62.6% Fe for a first phase development followed by a larger itabirite resource.
- The availability of significant high grade DSO makes this project more likely to get to development despite the scale of infrastructure development.
- The DFS estimated \$4.6bn for 35 mtpa production with 43% for the rail.

Valuation

We estimate a geared NPV of US\$5.5bn for the project and ungeared NPV of \$3.85 bn and IRR of 26%. Development assumes significant debt and royalty pre-payments.

- We have modelled a Phase 1 development of 10 years from reserves of 436 Mt producing 35 mtpa 63.6% fines at \$4.6bn of capital outlay starting with rail development 2 years before mining can start.
- The DFS assumes \$2bn for the rail development or around \$4m/km of rail. This compares to around \$2m/km estimated for the refurbishment of old Lamco line refurbished by Mittal in Liberia.
- A strip ratio of 0.9 and 81% mass recovery for first phase mining is assumed.
- Mining and processing costs are assumed to be under \$10/tonne with port and G&A costs giving an operating cash cost of \$21.80/t.
- Phase 2 development for another 15 year mine life of 35 mtpa of concentrate is based on further capex of \$3.2bn including the need for power.
- We assume an iron ore price of \$120 CFR, a discount rate of 12% and shipping costs of \$30/t and no premium for fines or concentrate product.

Mbalam/Nabebe - Key Parameters	
Resource	4,822mt @39.6%
Stage of Development	DFS
Capex to First Production	US\$4,700m
Distance to Port	510 km
Mode of Transport to Port	Railway to be built
Production - Phase 1	35 mtpa
Projected Opex	US\$21.2/t
Type of product	66% Fe Fines

Source: SP Angel, Company data

Share price versus Mining indices and Iron ore price



Source: SP Angel, Bloomberg

Summary

Sundance Resources have two deposits which make up the Mbalam project – the Mbarga mainly a high grade haemetite resource and a larger scale itabarite resource at Nabeba. The projects which straddle the Cameroon and Republic of Congo established the first resource in 2009 of 215 Mt has grown it to over 4 Bt with the addition of the larger resource at Nabeba. The project is well advanced at DFS stage and had a protracted process of being bought by Hanlong before the bid collapsed after 18 months, as Hanlong failed to come up with funding and the founder was being pursued by the Chinese authorities.

Following the failed bid in March 2013, the company has been looking for strategic partners and an alternative path to development. The company are looking at three options to advance the project – JV at the asset level with a steel mill or large player, cutting the capex for the project by looking for an infrastructure partner or a takeover.

The Mbalam-Nabeba project did progress during the bid period with an upgrade on the haemetite resource – they now have a JORC reserve of 436 Mt at 62.6% Fe and regulatory permits, environmental approvals and DUP for the rail corridor. Environmental approvals are already in place for the port, rail and mine in the Cameroon and there is a declaration of land for public utility in place for the port and rail corridor.

The reserve estimation is based on a 2.6% cut off for aluminium which is the quality of fines to serve coastal Chinese steel mills. There is scope for DSO reserves to go up should the company look at the product specification required for the inland steel mills. Most of the DSO for the project comes from the ROC deposit with the Cameroon being mainly itabirite.

The project requires \$4.6bn of funding (this needs to be re-estimated) including a \$1.2bn EPCM, owners cost and contingency element. The key funding requirement is for the rail (43% of funding) which will take 3 years to build and bring the project on stream. Seven routes were looked at for the rail by Calibre with the chosen route of 510 km selected to go round the nature reserves.

The whole route will require only 640m of bridges. The rail route planned in the Sundance DFS is for 35 mtpa capacity but can be expanded to 100 mtpa.

The key to the funding for the railway will depend on a form of off take for the high quality product from Sundance. These contracts will form the basis of the funding for the rail and port.

Sundance Resources has raised A\$40m by way of a convertible note issued to Noble Resources and Blackstone Alternative Solutions, DE Shaw and Senrigan Capital. Funds and is to be used for working capital to progress the Mbalam-Nabeba project.

Noble will have the right to convert the note into 30% of yet to-be formed marketing services company or to convert into Sundance shares at 12 cents a share. Noble Resources, the iron ore and bulk commodity traders are likely to want a foothold in the company for iron ore trading further down the line.

Noble will have the right to convert the note which has a 10% coupon into 30% of a to-be formed marketing services company or to convert into Sundance shares at 12 cents a share. The investor consortium of Blackstone, DE Shaw and Senrigan investing A\$20m is into a 2 year zero coupon convertible with a conversion price of 10 cents a share. Both Noble and the investor consortium will be issued additional options subject to shareholder approval of 200m and 260m each.

The cash injection has come at a crucial point for Sundance which had around \$30m in cash at the end of July 2013 with a cash burn rate of \$2-2.5m.

These investors should also bring more clout to this project and open the way to broader funding discussions. The key to the funding for the railway will depend on a form of off take for the high quality product from Sundance. These contracts will form the basis of the funding for the rail and port.

It will take 6 months for detailed engineering work to be put into place to build the rail. The Sundance project has sufficient high grade DSO to make the economics of the rail work. The project is being watched closely as a number of other mainly magnetite projects are waiting for development opportunities once a transport link is being put into place.

Projects such as Nkout will benefit from the rail and should IMIC be successful in achieving a strategic partner for the project could contribute towards rail development – below are the scenarios put forward in Afferro’s PEA on the project.

Scenario	35 Mtpa Cost (US\$m)	25 Mtpa Cost (US\$m)	15Mtpa Cost (US\$m)
Tariff	497	440	369
Shared Port and Rail	1,738	1,465	1,028

Source: Nkout PEA report, SP Angel

The government of Cameroon is seeking an open access solution to the railway and tariffs are likely to be influenced by a number of factors including whether users have invested capital (either directly or through a strategic partner), the returns required by investors and the timing and tonnage from other projects.

Port development is more advanced. The development on Kribi deep sea port started in December 2010 and Phase 1 is scheduled to be completed by 2014. Upon completion the main port which has a depth of 5 to 16m is expected to take vessels with a capacity of 100,000 tonnes. The port is being planned with specialized terminals for oil, alumina and iron ore with these expected to be developed after the main port in 2015.

Resource - Total (Haemetite & Itabirite)	mt	4,822
Grade	%	39.60%
Haemetite Resource	mt	775.5
Grade	%	57.20%
Reserve - Probable	mt	436.3
Grade	%	62.60%
Location		Cameroon/Republic of Congo
Stage of Development		DFS
Production - Phase 1	mtpa	35
Capex to First Production	\$m	4,700
Plant Costs	\$m	914
Infrastructure	\$m	2,556
Mode of Transport to Port		Railway to be built
Distance to Port	km	510 km
Port Arrangements		To be built
Projected Opex	\$/t	21.2
Type of product		66% Fe Fines

Source: Company Reports, SP Angel

Zanaga Iron Ore (ZIOC LN)

Hold

Large investment and scale with phased development lowering hurdle

Price: 17 pence Mkt Cap £47.4m

10 February 2014

Key Issues

- Phased development scales back capex by a third to \$2.5-\$3bn.
- Glencore has restated commitment to take the project to feasibility.
- Potential for small scale DSO of 1-2 mtpa could bring early revenues on trucking using existing roads.
- A high grade pellet product of 66% differentiates this product with access to power making pellet production feasible.
- Feasibility done to a high standard by Xstrata with \$300m invested to date.
- Still needs significant investment in 370 km slurry pipe line to get to market – will need a strategic investor looking for scaling up to 30 mtpa from current 12-14 mtpa Phase 1 development.

Overview

- The Zanaga project is located in Republic of Congo
- The project has been mainly explored by Xstrata when they took a 50% and 1 share in the company in 2011.
- A large scale magnetite resource has been proved of 6,800 mt with a reserve of 2,500 mt at 34% Fe with 176,000m of drilling.
- A feasibility study initially established large scale production of 35-40mtpa with capex of around \$7.5bn with a 370 km slurry pipe line to port.
- A revised phased development reduces project capex to \$2.5bn for 12-14 mtpa – still requires deep pockets and a strategic partner for 370km pipeline.
- Republic of Congo has a good track record recently on infrastructure projects – current government royalty terms offers scope for third royalty funding.

Zanaga Iron Ore – Key Parameters	
Resource - Total	6,800Mt at 32%
Development Stage	Revised feasibility
Capex to Production	US\$2,500-3,000M
Production(Phase 1)	12 Mt + 1-2 Mt of DSO
Projected Opex	US\$37-40/t
Type of product	66%(pellet), 60-62%(DSO)
Distance to Port	370 km
Transport to Port	Slurry Pipe Line

Source: SP Angel, Company data

Share price versus Mining indices and Iron ore price



Source: SP Angel, Bloomberg

Valuation

We estimate a geared NPV of US\$1,055m for the project and IRR of 30%. Including cash of A\$27m (estimated) takes the valuation to US\$1,082m.

- We have modelled the mine plan of 20 years based on 500 mt of 42% friable materials.
- Head grades of 42% and a mass recovery of 40% is factored into our valuation.
- Significant scale of capex requires a combination of debt and royalty funding.
- Limited scope for equity funding on a stand alone basis.
- Operating costs per tonne are estimated at US\$37- US\$40/t.
- We assume an iron ore price of \$120 CFR, a discount rate of 12% and shipping costs per tonne of \$30/t.
- The company are targeting a premium fines product of 66% - we assume no price premium based on potential moisture content.

An SP Angel analyst has visited this project

Summary

Zanaga is a large scale iron ore project in the Republic of Congo. The project which started initial exploration in May 2007 has had Xstrata funding the feasibility and value engineering exercise since late 2009. A significant amount of drilling has been done on this project with a total of \$270m spent to take it to PFS and further funds spent to date to take total spend to \$300m.

Over the duration of the Glencore/Xstrata merger while the PFS and Value Engineering Exercise was completed, the market has had strong reservations about the prospects for this project given the initial scale of capex of around \$7.4 bn based on potential output of 35-40 mtpa.

With a different management approach in place at Glencore Xstrata under Ivan Glasenberg, a fresh approach is being taken to how the project can be taken into development. The notion of “phased” development has been brought to the project and this has resulted in the project being scaled back to a third of the original level and now stands at \$2.5-\$3bn.

	Indicative 12+2 mtpa Stage 1 (US\$m)	Previous 30 mtpa PFS (US\$m)
Initial capital cost reduced to 1/3	\$2.5-3 bn	\$7.4 bn
Improved capital cost intensity	\$200/t	\$245/t
LOM Operating Costs	\$37-\$40/t	\$23/t
Product	66% Fe Pellet Feed and 60-62% Fe DSO	68% Fe Pellet Feed
Change in Infrastructure	Smaller pipeline, Existing road/rail for DSO	Larger pipeline
Power requirements	Existing power (60 MW from the grid)	350-400 MW power plant required
Port Requirements	Transshipment to Cape Size vessels	Large scale deep water port

Source: Company presentations, SP Angel

The scaling back and phased approach result in a smaller plant, savings on power and a smaller pipeline. The diameter of the pipeline has been halved from the original 900 cm planned to 450cm with pipeline costs coming down from \$1.2bn to \$700m.

Power costs in the initial feasibility were significant at \$700m with a 340 MW plant to be built at \$400m power plant with \$300m for transmission lines. The scaled back project will require around 60 MW which is expected to come from the grid which is thought to have 100 MW of excess capacity. This will require an investment of around \$100m with some scope to cover the costs through leasing arrangements.



Source: Company reports

In terms of product, the grade of the pellet feed has come down 2% from 68% for a magnetite pellet feed to a 66% haematite pellet feed with opex going up from \$23/t to \$37-\$40/t. The product quality remains high relative to other projects in the region and the increase in opex partially reflects including a DSO product which could potentially be trucked to port.

A new national highway is in place offering access from the port at Pointe Noire to Matzuma with a new road to be built to Zanaga which is 50 km from the project. There is a laterite road already in existence between the project and the town of Zanaga. The DSO product offers some early revenue potential to the project with a breakeven rate of \$80/t CFR with trucking cost estimated at this stage to be around \$25/t.

A work programme to advance the project has now been agreed with Glencore to complete the feasibility study by March 2014, put in the mining exploitation licence, progress regulatory approvals and look into the DSO opportunity. Glencore is to fund the programme with a contribution of \$17m from Zanaga.

In addition to the agreement on the work programme both sides have changed the terms of the JV with the pre-emptive call option over Zanaga shares now removed which frees up the project for potential buy in from a third party.

The phased development of the project brings down the capex significantly. The size of investment at \$2.5-\$3bn does still need to attract capital outside of Glencore. To this extent, the company have been with the help of Glencore been having discussions with a potential strategic investment from a steel mill.

Given the targeted pellet product, it is likely that this will attract investment from a Chinese steel mill. Chinese steel mills have developed the use of technology for pellet feed agglomeration to be used in sinter blast furnaces.

The Republic of Congo has a relatively stable background unlike the Democratic Republic of Congo (DRC) and has been successful in pushing forward development projects as witnessed by the recent highway development and the availability of power.

Zanaga Iron Resources - Key Parameters		
Resource - Total	mt	6,800
Grade	%	32%
Proportion Measured	%	35%
Proportion Indicated	%	34%
Proportion Inferred	%	31%
Reserve	mt	2,500
Grade	%	34%
Amount of Drilling	metres	176,000
Project Cost to Date	\$m	300
Location		Republic of Congo
Stage of Development		Revised feasibility to be completed in
Time to do Feasibility	months	
Cost of Feasibility	\$m	
Book value of project	\$m	
Production - Phase 1	mt	12 Mt + 1-2 Mt of DSO
Production - Phase 2	mt	Expansion to 30 Mt
Capex to First Production	\$m	\$2,500 - \$3,000
Plant Costs	\$m	\$250
Infrastructure	\$m	\$700
Mode of Transport to Port		Slurry Pipe Line
Distance to Port	km	370
Distance to nearest road	km	50km to Zanaga w here tarmac road to complete
Port Arrangements		Transshipping to Cape Size Vessels
Power Requirement		60 Mw from Grid
Projected Opex	\$/t	\$37-40/t
Type of product		66% Fe (pellet feed) and 60-62% (DSO)
Moisture	%	8%
Management Team		
Management Change		
Consultant		
JV Partner		Glencore Xstrata
Date Exploration Licence Granted		May 2007
Mining Licence		Application for mining licence Q2 2014

Source: Company Reports, SP Angel

Investment Research

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