MODULE 8- ZINC MINING IN EUROPE

Zinc mining in Europe is largely conducted in Ireland, Sweden and Turkey. Lesser production also occurs in Spain, Portugal, Finland, Greece and numerous ex-communist countries.

The recent closure of the Lisheen mine in Ireland is well known as is the pending closure of the Pomorzany mine in Poland. However, brownfield expansions have also occurred in Sweden and Spain to lessen the blow from these losses. A significant brownfield expansion is also planned in Portugal.

Wildcards include the poorly understood production potential in Turkey and whether a novel nickel/zinc mine in Finland ultimately proves economic or is closed permanently shortly.

Ex-Communist countries are generally plagued with overstaffed mines utilizing clapped out equipment while mining mediocre orebodies.

Table 1 illustrates recent and expected mined zinc production based upon the analysis conducted in this report. Production will be hard pressed to return to 2012 levels by 2022.

Table 1 Summary of European Mined Zinc Production

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Ireland	335,500	317,000	281,000	203,000	150,000	140,000	130,000	125,000	125,000	120,000	120,000
Greece	17,531	20,632	21,123	12,000	13,000	13,000	19,250	25,500	25,500	12,500	12,500
Finland	51,504	40,065	32,082	23,520	42,000	47,000	52,000	42,000	32,000	30,000	30,000
Sweden	188,209	176,366	212,713	247,451	264,000	270,000	267,000	272,000	270,000	270,000	264,000
Portugal	30,006	53,382	67,378	61,921	71,000	70,000	70,000	90,000	120,000	150,000	150,000
Spain	28,037	30,907	31,570	35,000	50,000	60,000	75,000	75,000	75,000	75,000	75,000
Turkey	195,793	195,025	210,152	194,808	188,700	197,000	206,000	213,000	220,000	230,000	240,000
Poland	76,700	75,900	56,000	50,000	50,000	20,000	0	0	0	0	0
Ex-Yugo.	50,132	56,257	57,789	61,000	63,000	65,000	67,000	69,000	71,000	73,000	75,000
Other	27,416	22,802	20,400	18,400	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Total	1,000,828	988,336	990,207	907,100	911,700	902,000	906,250	931,500	958,500	980,500	986,500

Ex-Yugo.= Ex- Yugoslavia= Macedonia, Bosnia and Herzegovina, Kosovo, Montenegro, Serbia
Other= other ex-communist countries= Armenia, Bulgaria, Romania

My review revealed little in the way of eureka moments. There are no hidden stock tips on page 32 or any page for that matter. I came away with more respect for Boliden after this review though. There are no deposits in Europe that I have come across screaming to get into production due to wonderful economic potential at current commodity prices.

If you stopped reading at this point, I would not blame you.

Ireland

Recent production in Ireland was from three mines: Tara, Lisheen and Galmoy. Lundin's Galmoy closed in 2009 and Vedanta's Lisheen closed recently in November 2015. These past producers are not discussed here. Only Boliden's Tara mine remains in production but mining grades are in gradual decline.

Like much of Western Europe, Ireland is a relatively high labour cost environment. The mines have been able to utilize a combination of bulk mining methods and more selective room and pillar type methods. Deposits tend to be flat lying so the method selected is largely a function of the orebody vertical thickness.

Tara

The Tara mine geology is described as:

> *The orebody comprises a stacked series of lenses of massive sulphides hosted in Lower Carboniferous carbonates that formed in a shallow tropical sea over 350 million years ago. Situated between 50 and 900 metres below surface, the minable thickness of the Navan orebody ranges from 15 to 80m, the latter value more common in the eastern section. In plan, the deposit stretches over an area of 4km by 1.5km. The ore minerals are sulphide of zinc (sphalerite) and lead (galena) with sulphides of iron (pyrite and marcasite) occurring as accessory minerals. Small amounts of silver are also present.*

This mine commenced production in 1977 with a reserve base at that time of 70 MT grading 10.1% Zn and 2.6% Pb. Blasthole stoping is the primary mining method. The mine can currently best be described as a swing producer that does not swing since its parent company, Boliden, essentially subsidizes the mine during low commodity price cycles. I therefore expect the mine to continue in production to take advantage of the recent and expected upturn in zinc prices while ore grade declines. Cash costs in recent years have been in the $US0.75/lb. range after Pb credits but after including sustaining capital, all-in costs have been closer to $US0.90/lb. The mine is therefore considered a fourth quartile cost producer. Since Boliden must source zinc concentrate from external mines to satisfy their smelters, they will be very reluctant to close this mine particularly in a tight concentrate market. Boliden seems to treat Tara as a necessary evil. If only the Irish would put down the Guinness and mine like the Swedes.

Table 2 illustrates proven and probable reserves as of December 31, 2015 and 2015 production results. The mining grade has dropped steadily leading to a gradual reduction in annual output. Table 3 reflects a continuation of this grade decrease based on the mining of 2.4 MT of ore annually at 95% zinc recovery. This is slightly below mill capacity of ~2.6 MT of ore annually to reflect more difficult mining conditions as the mine reaches the end of its life. This mine is not likely to go away anytime soon however based upon the reserve and resource base and the tight concentrate market conditions.

Table 2 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Zn%	Pb%
P +P Reserves	17,000,000	6.3	1.5
2015 Production	2,197,000	6.4	1.3

Table 3 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
166,000	166,000	150,000	133,000	150,000	140,000	130,000	125,000	125,000	120,000	120,000

2016 production is Q1-Q3 actual prorated to 12 months.

Ireland Summary

Since it is unlikely that any current exploration project could be placed into production prior to 2022, mine production will be entirely from Tara. Table 4 therefore lists previous and expected zinc production for Ireland.

Table 4 Actual and Expected Mined Zinc Production for Ireland

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Tara	166,000	166,000	150,000	133,000	150,000	140,000	130,000	125,000	125,000	120,000	120,000
Lisheen*	169,500	151,000	131,000	70,000	0	0	0	0	0	0	
Total	335,500	317,000	281,000	203,000	150,000	140,000	130,000	125,000	125,000	120,000	120,000

*Vedanta wins the award for most annoying production reporting. Figures for 2012-2016 are for financial years ending the subsequent March 31. Figures for FY 2015 were reported by Vedanta as a combination of lead and zinc metal so I have estimated actual FY2015 based on the relative split. I have added Tara's calendar year production to Lisheen's financial year production since going through quarterly production results for Vedanta would be a form of torture I won't let Tom Albanese subject me to. In other instances these jokers added Ireland's zinc production to South Africa's and reported only this one number, no doubt to save embarrassment at one of the operations. Figures above therefore will not reconcile with figures you may see elsewhere but you get the point of this exercise, zinc production in Ireland will fall by roughly 60% during this ten year period of assessment.

Ireland Exploration Potential

Ireland is a good place to look for zinc. I am not particularly up to speed on what is under evaluation there apart from Glencore's Pallas Green project. Glencore reports inferred resources of 44 MT @7% Zn and 1% Pb from depths of 300m to 1,300m. Glencore describes the project as:

> *The Pallas Green project is situated near Limerick in Southwestern Ireland. The Tobermalug zone consists of multiple, subhorizontal, stratiform lenses of Irish-type, breccia-hosted, sphalerite-galena-pyrite within a Carboniferous limestone. The lenses occur over an area 4,000m by 4,000m, and from 300m to 1,300m below surface. The Inferred Mineral Resource is based on 370,000m of diamond drilling in 735 drill holes completed between 2005 and the end of 2014. Drill spacing is nominally 100m but 178 infill drill holes at 50m spacing have been completed. Mineralisation wireframes were built taking into account a cut-off of Zn + Pb and a minimum 3.0m true thickness, and constrain interpolation by Inverse Distance Weighting (IDW) in a block model.*

A technical paper more fully discussing the geology is here. This deposit could not possibly be in production for at least five years if Glencore had the heart, which I doubt currently.

Boliden previously mentioned three exploration projects in Ireland: Strokestown & Slievedart, Tullamore and Limerick but does not provide resource estimates if in fact they exist.

Some background on the zinc/lead deposits in the Irish Midlands can be found in Section 8 of the Mallow NI 43-101 filed by Rathdowney Resources on April 14, 2010. www.sedar.com. Unfortunately, this does not include information on Tara to the north.

Lundin in 2011 reported interesting zinc intercepts at their Clare Project but I have not seen any follow up on this. Likewise, Teck (Connemara) reported zinc adjacent to the Pallas Green project in 2007.

Greece

Zinc mining in Greece is conducted by Eldorado Gold at the Stratoni silver/lead/zinc mine. Eldorado is also developing the nearby Olympias gold/silver/lead/zinc mine.

The Stratoni mine is an underground mine using labour intensive drift and fill mining methods to extract approximately 175,000-250,000 T per year of ore grading 10% Zn, 6% Pb and 180 g/t Ag. This ore is milled at the nearby Stratoni mill (and beach!) illustrated below. Eldorado reports that there are 907 employees and contractors which, for the tonnage mined, ranks this as a dreadfully unproductive operation. (I can say these things since I am retired. Your buy side broker isn't.)

Table 5 illustrates proven and probable reserves as of December 31, 2015 and 2015 zinc production.

Table 5 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Zn%	Pb%	Ag g/t
P +P Reserves	650,000	10.2	6.9	176
2015 Production	154,992	8.5	6.5	nr

nr= not reported

Eldorado indicates that production from 2016-2019 will average 13,000 T per year zinc. The mine has sufficient reserves for four years of operation but there may be some potential to convert resources into further reserves. A six year mine life is therefore illustrated in Table 6.

Table 6 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
17,531	20,632	21,123	12,000	13,000	13,000	13,000	13,000	13,000	10,000	0

Note: The British Geological Survey (BGS) reports in their 2014 World Mine Production Survey here slightly higher figures (~2,000T) for Greece for 2012-2014 so there may be a small producer lurking around in Greece that I have not caught here. The figures for 2012-2015 above are based on mined tonnes and grade provided by Eldorado with an assumed 91.5% zinc mill recovery.

After considerable delays, the Olympias mine is being redeveloped for production. The existing mill at Olympias will be upgraded and utilized at a planned 385,000 T per year rate (Phase 2) but a new mill is planned at the Stratoni site to increase milling rate to 900,000 T per year (Phase 3). After plenty of interference from regulators, it is uncertain whether this mill expansion plan will ultimately be executed. A long tunnel is being mined between the two sites for eventual ore transfer. This expansion is assumed to be commissioned after the period assessed here (post-2022).

Proven and probable reserves are:

16.1 Mt @ 7.9 g/t Au, 128 g/t Ag, 4.3% Pb, 5.7% Zn.

Eldorado expects zinc production for Phase 2 to be 12,500 T per year. The upgraded Olympias concentrator is expected to be operational in 2017 (I assume late 2017). Timing of the production ramp up has not been announced so I assume a 50% production rate in 2018 and 100% beyond. Table 7 is therefore illustrates previous and expected zinc production for Eldorado and Greece.

Table 7 Actual and Expected Mined Zinc Production for Greece

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Stratoni	17,531	20,632	21,123	12,000	13,000	13,000	13,000	13,000	13,000	10,000	0
Olympias	0	0	0	0	0	0	6,250	12,500	12,500	12,500	12,500
Total	17,531	20,632	21,123	12,000	13,000	13,000	19,250	25,500	25,500	12,500	12,500

Eldorado will also be preoccupied developing a third mine in the area during this time: the Skouries copper/gold mine. If things don't work out for Eldorado here in the long run, they could always open a Sandals Resort I guess.

References: European Goldfields Ltd., Stratoni NI 43-101, June 24, 2009 www.sedar.com

European Goldfields Ltd., Olympias Project NI 43-101, July 14, 2011 www.sedar.com

Finland

Zinc production in Finland is from three mines:

1) Pyhäsalmi (First Quantum)

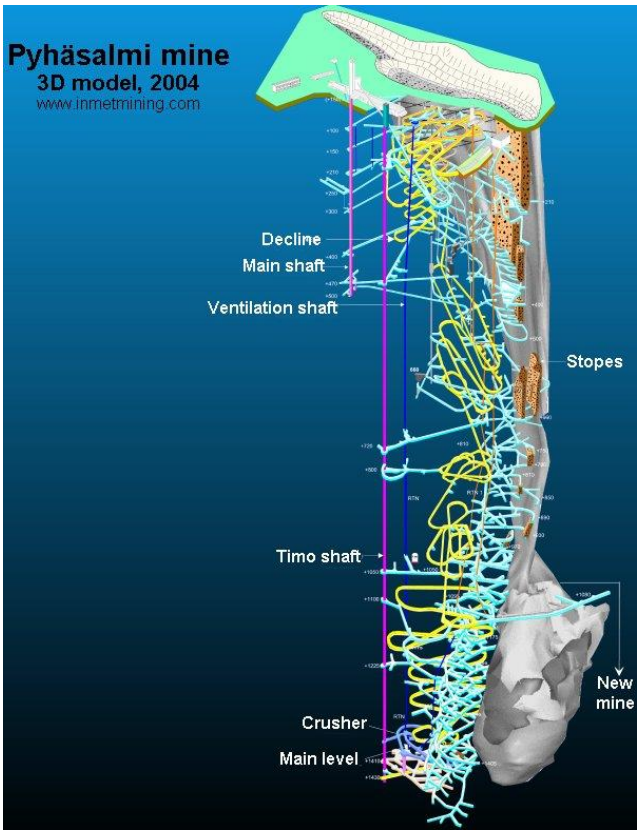
2) Kylylahti (Boliden)

3) Sotkamo (Terrafame)

The third mine listed may be better known as Talvivaara which went bankrupt in 2014 with the mine now run by the Finnish state.

Pyhäsalmi

The Pyhäsalmi mine has been in operation since 1962 and will be exhausted in mid-2019. First Quantum reports that ground conditions are deteriorating as the mine reaches exhaustion. Low cost large scale (50,000-100,000 tonne stopes) blasthole stoping has been the key to mining this low grade deposit economically. The figure below is ancient but you get the point. Damn good miners, the Finns.



Reserves as of December 31, 2015 and 2015 production is illustrated in Table 8. Table 9 lists previous and expected production rates to exhaustion.

Table 8 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Cu%	Zn%	Au g/t	Ag g/t
P +P Reserves	4,796,000	1.04	1.71	0.4	13
2015 Production	1,379,000	0.9	1.7	nr	nr

nr= not reported

Table 9 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
25,637	21,679	19,762	21,331	20,000	20,000	20,000	10,000	0	0	0

Reference: Pretty dated. FQM (Akubra Inc.) Pyhäsalmi NI 43-101, May 17, 2002. www.sedar.com

Kylylahti

Boliden acquired this small mine from Altona of Australia in October 2014. Mining commenced in 2012. Decline access is used for the mine in combination with blasthole stoping as the mining method. Proven and probable reserves as of December 31, 2015 and 2015 production is illustrated in Table 10.

Altona struggled to produce a suitable zinc concentrate and Boliden continues to struggle here reporting a concentrate grade of only 42.3% Zn with recoveries below 60%. Altona reported inferred resources in a number of satellite deposits but the grades are not awe inspiring. Boliden reported that they have not had much success with area exploration. I therefore show the mine closing in 2020 in Table 11. Seeing as it is a trivial zinc producer in the first place, zinc production here is essentially a rounding error. It appears that Boliden acquired the mine largely for the area exploration potential.

Table 10 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Cu%	Zn%	Ag g/t
P +P Reserves	2,900,000	1.4	0.5	1
2015 Production	733,000	1.7	0.7	0.75

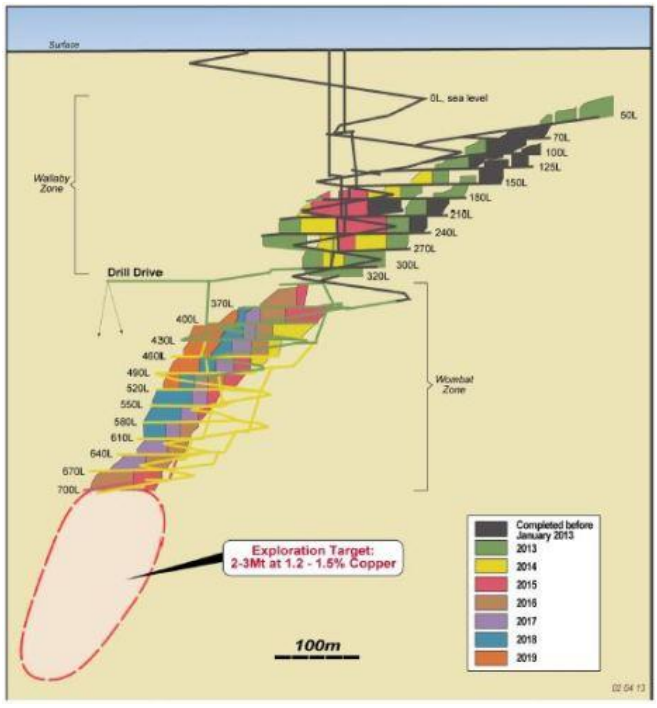


Table 11 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	1,508*	2,319*	2,189	2,000	2,000	2,000	2,000	2,000	0	0

* Financial year ending June 30.

Sotkamo

SRK completed a technical report for the mine when it was apparent that planned performance was not being achieved. The report can be found here.

This mine is the real wildcard with respect to future zinc output in Finland. This low grade nickel/zinc/copper/cobalt/uranium deposit was developed and operated by Talvivarra until they were placed into bankruptcy in 2014. The mine suffered from a number of technical and environmental issues related to bleeding edge technology combined with low commodity prices. The mine is now operated by Terrafame, a state owned company.

The mine should be essentially looked at as an open pit nickel mine using novel bioheapleaching and precipitation of sulphides. Ore is stacked on primary leach pads for nickel and zinc extraction and then moved to secondary leach pads meant (in theory) for copper and cobalt extraction. However, the ore is re-agglomerating on the primary leach pads making rehandling to the secondary pads very difficult since secondary crushing is required. The mine ran out of primary leach pad capacity and the open pit was also flooded with contaminated process and groundwater that could not be discharged to the environment. Essentially the mine was a material handling and water balance nightmare requiring plenty of capital to fix. Up to five years of leaching are required to extract +70% of the contained zinc. This is well below pilot heap leaching recoveries.

A number of companies got burned investing in this operation including Nyrstar and Cameco. Only nickel and zinc were recovered while Talvivarra operated the mine. SRK described the geology as follows:

> *The Talvivaara deposit is divided into two polymetallic deposits hosted by a black schist:*
>
> *Kuusilampi and Kolmisoppi. The main mineral assemblage in the black schist for both of the deposits is: quartz, biotite, muscovite, graphite and sulphides, with rutile, apatite, zircon, feldspar and garnets as common accessory minerals. Approximately 90% of the ore is hosted by black schist and the remainder bymetacarbonate rocks, wackes and pelites. The main ore types can be divided mineralogically into three types: fine-grained disseminated ore, sulphide brecciated ore and metacarbonate rock associated ore.*
>
> *The total sulphide content of the ore typically ranges between 15% and 25%. The sulphide assemblage is: pyrrhotite, pyrite, sphalerite, pentlandite, chalcopyrite and alabandite, with traces of galena, ullmannite and stannite. Pentlandite contains between 75%-88% of the contained nickel and pyrrhotite is the second most important mineral in terms of nickel content. Pyrite contains the main share (between 67-90%) of contained cobalt while chalcopyrite carries copper and sphalerite hosts zinc. Uranium occurs as thucholite, which is a mixture of hydrocarbons, uraninite and sulphides.*

In 2013 SRK reported a measured and indicated resource of:

1.287 Billion tonnes grading 0.23% Ni, 0.50% Zn, 0.13% Cu, 178 ppm Co and 17 ppm U

Initial plans were for the recovery of 50,000 T a year of nickel and over 70,000 T a year of zinc from the leaching of 26 MT of ore per annum. Mining and stacking rates in 2011 and 2012 were well below 50% of plan. Mining ceased in 2013 but leaching continued into 2014. Talvivarra ceased public reporting in 2014 so production levels for 2014 and 2015 are uncertain (to me at least). Mining recommenced in September 2015 and were again only 50% of original plan through September 2016.

What the ultimate end game is for Terrafame is uncertain. The company states:

> *As stated by the Ministerial Committee on Economic Policy in May 2016, the finalisation of the ramp-up of Terrafame's mine requires securing private financing by the end of 2016. The process to secure private financing is ongoing. Moreover, in accordance with the decision of the Ministerial Committee on Economic Policy, Terrafame is preparing a plan for the controlled shutdown of the mine. The ramp-up of the mine and the operations will continue as planned at least until the end of 2016.*

Table 12 assumes the mine will continue in operation but only at 50% of original design capacity during the period assessed. The outcome could equally be pending mine closure leading to no zinc mining in Finland post-2020. The water balance remains an issue but the mine appears to be largely on top of the mining and leaching issues. Whether the mine is economic is another matter. It could be a ward of the state for some time. Additional capital is required to reach feasibility study mining rates.

Table 12 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
25,867	17,418	10,000*	0*	20,000	25,000	30,000	30,000	30,000	30,000	30,000

* Estimate only-no public figures located.

Finland Summary

Table 13 summarizes the above production sources.

Table 13 Actual and Expected Mined Zinc Production for Finland

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Pyhäsalmi	25,637	21,679	19,762	21,331	20,000	20,000	20,000	10,000	0	0	0
Kylylahti	0	1,508	2,319	2,189	2,000	2,000	2,000	2,000	2,000	0	0
Sotkamo	25,867	17,418	10,000	0	20,000	25,000	30,000	30,000	30,000	30,000	30,000
Total	51,504	40,065	32,082	23,520	42,000	47,000	52,000	42,000	32,000	30,000	30,000

Sweden

Boliden and Lundin operate base metal mines in Sweden with considerable zinc output.

Boliden

Boliden operates the Garpenberg and Boliden Area mines. Boliden's production levels have ramped up steadily since 2012 but should plateau at 2016 levels going forward. Boliden is well positioned to benefit from strengthening zinc prices providing their smelters can obtain adequate external feed to make up for what their mines cannot supply. Boliden's ramp up in Sweden has countered Tara's recent decline in production in Ireland.

Garpenberg

Garpenberg is a typical volcanic massive sulphide deposit mined by blasthole stoping. Boliden acquired this asset in 1957. More information on this mine can be found here. Concerted exploration has led to a substantial increase in reserves which has allowed for a substantial increase in milling capacity. Mine production prior to 2014 was in the 1.2-1.5 MT per annum rate but has now been ramped up to the 2.5 MT per annum range. Zinc grade however has fallen from the 6-7% Zn range to the 5% range.

Table 14 illustrates proven and probable reserves as of December 31, 2015 and 2015 production. Mining grade is well above reserve grade so a gradual reduction in mined grade over time is likely. I don't expect too many surprises since Boliden has a long history here. Byproduct credits result in overall low zinc production costs. Table 15 illustrates actual and expected production rates.

Table 14 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Cu%	Zn%	Pb%	Ag g/t	Au g/t
P +P Reserves	39,800,000	0.05	3.9	1.7	113	0.3
2015 Production	2,367,000	0.1	5.0	2.1	156	0.3

Table 15 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
75,000	70,000	99,000	108,000	113,000	113,000	110,000	110,000	108,000	108,000	102,000

Boliden Area Mines

The Boliden area mines have many similarities to Canada's Flin Flon camp. Numerous, generally smaller base metal deposits have been discovered and mined over a long timeframe. The ability to replace reserves with new discoveries is still present in the area.

Current production is largely from the Renström and Kristineberg underground mines. Reserves as of December 31, 2015 and 2015 production is listed in Table 16. Boliden has recently identified significant resources at Rāvliden 2.5 km from Kristineberg and they also have a good resource base at existing mines. Table 17 lists previous and expected zinc production levels. I have assumed zinc mining grade will increase to better match reserve grade and the 2016 production rate trend of + 2 MT a year is maintained. These mines struggled economically in the past but the increased output has probably put them on very sound footing.

Table 16 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Cu%	Zn%	Pb%	Ag g/t	Au g/t
P +P Reserves	10,550,000	0.6	5.5	0.5	66	1.2
2015 Production	1,879,000	0.41	3.82	0.44	59.6	1.7

Table 17 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
30,000	35,000	45,000	56,000	71,000	75,000	75,000	80,000	80,000	80,000	80,000

2016 production is Q1-Q3 actual prorated to 12 months. 2016 zinc grade is 4.2% ytd.

Renström

Kristineberg

Lundin

Zinkgruvan

Mining commenced at Zinkgruvan in 1857 (not a typo). Capacity was increased to 600,000 T a year in the 1970's and to 900,000 T a year around 2009 by the addition of a copper circuit which can now treat zinc/lead ore also. Current capacity is being increased to 1,000,000 T and was achieved in 2015. This appears to be a well-run operation and steady cash flow generator for Lundin. Lundin reports a recent cash cost of $US0.45/lb zinc after $0.33/lb of byproduct credits.

Lundin describes the geology as such:

> *The Zinkgruvan deposit is situated in an east-west striking synclinal structure. The tabular-shaped Zn-Pb-Ag orebodies occur in a 5 m to 25 m thick stratiform zone in the upper part of the metavolcanic-sedimentary group. The orebody is 5 km long and is proven to a depth of 1,650 m below surface. A major sub-vertical fault splits the ore deposit in two parts, the Knalla mine to the west and the Nygruvan to the east.*
> *The Zinkgruvan orebodies are dominated by sphalerite and galena and are generally massive, well banded and stratiform. Remobilization of galena and silver has occurred in response to metamorphism and deformation, and is most pronounced in the lead-rich western extension of Nygruvan and in the Burkland area.*

The mine currently uses variations of blasthole stoping at depths up to 1,130 m below surface. Zinc reserves as of June 30, 2016 and 2015 production is listed in Table 18. Lundin also reports 3.5 MT of copper reserves grading 2.4% Cu. Resources are also good so the mine will likely be around for at least another 15 years. Table 19 illustrates actual and expected zinc production going forward.

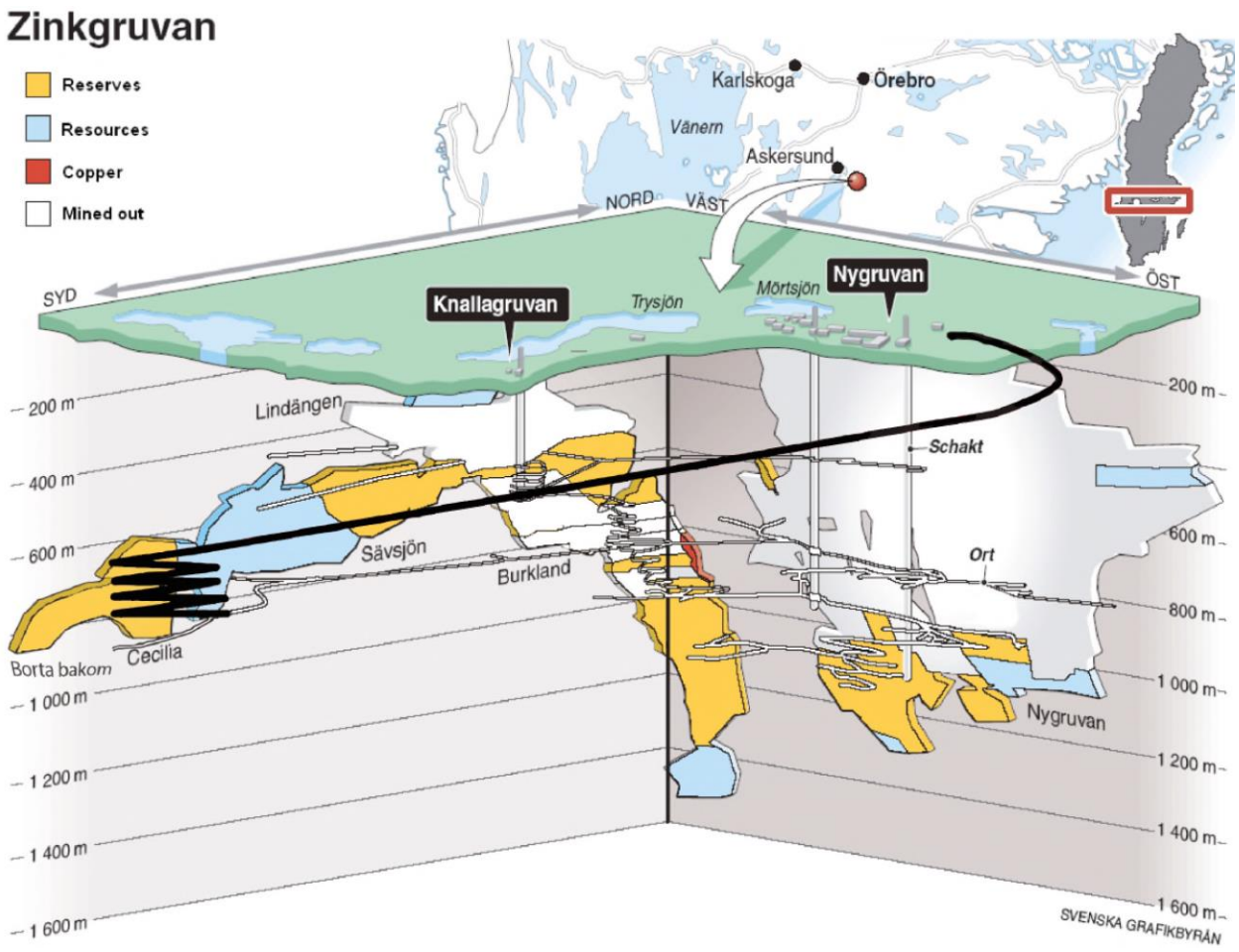
Table 18 Proven and Probable Reserves as of June 30, 2016 and 2015 Production Results

	Tonnes	Zn%	Pb%	Ag g/t
P +P Reserves	10,770,000	8.0	3.3	72
2015 Production	1,096,000	8.3	3.8	

Table 19 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
83,209	71,366	77,713	83,451	80,000	82,000	82,000	82,000	82,000	82,000	82,000

Reference: Lundin Mining NI 43-101 Report, January 2013, www.sedar.com



Sweden Summary

Table 20 summarizes actual and expected production for Sweden.

Table 20 Actual and Expected Mined Zinc Production for Sweden

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Boliden	105,000	105,000	135,000	164,000	184,000	188,000	185,000	190,000	188,000	188,000	182,000
Lundin	83,209	71,366	77,713	83,451	80,000	82,000	82,000	82,000	82,000	82,000	82,000
Total	188,209	176,366	212,713	247,451	264,000	270,000	267,000	272,000	270,000	270,000	264,000

Portugal

Lundin owns the Neves-Corvo mine which has typically been considered a copper mine. Eurozinc picked this mine up from Rio Tinto in 2004 and I did well investment wise due to Rio's poor divestiture timing. Lundin then merged with Eurozinc in 2006.

The zinc resources at Neves-Corvo have been well known for many years but the copper stream was always more profitable. Copper mining commenced in 1977 and zinc mining commenced in 2006 when a previous tin recovery plant was converted to zinc. Zinc mining rates have been patchy though with the zinc plant (1.2 MT per annum capacity) often used to process copper ore instead. It has only been since 2012 that significant zinc production from the mill, hence Portugal, has taken place.

The decision to expand this plant to 2.5 MT a year was made recently. I assume the production ramp up will be reflected in production results starting in 2019. Lundin had this to say about the expansion:

> *The Feasibility Study examining an expansion of the zinc operations at Neves-Corvo achieved substantial completion by quarter end* (Q2 2015). *The scope of the study includes underground development of the lower Lombador zinc deposits, a major underground conveying system to take ore to the existing shaft, expansion of shaft capacity to 5.6 million tonnes per year, zinc plant expansion to 2.5 million tonnes per year ore throughput, and construction of expanded water treatment, paste backfill and tailings storage infrastructure. Maximum zinc production is nominally 165 ktpa with 25 ktpa of lead by-product. The estimated capital cost, including the first full year of underground development costs, is approximately EUR245 million. The project schedule is estimated to be approximately 24 months from approval to proceed through to commissioning of the expanded facilities.*

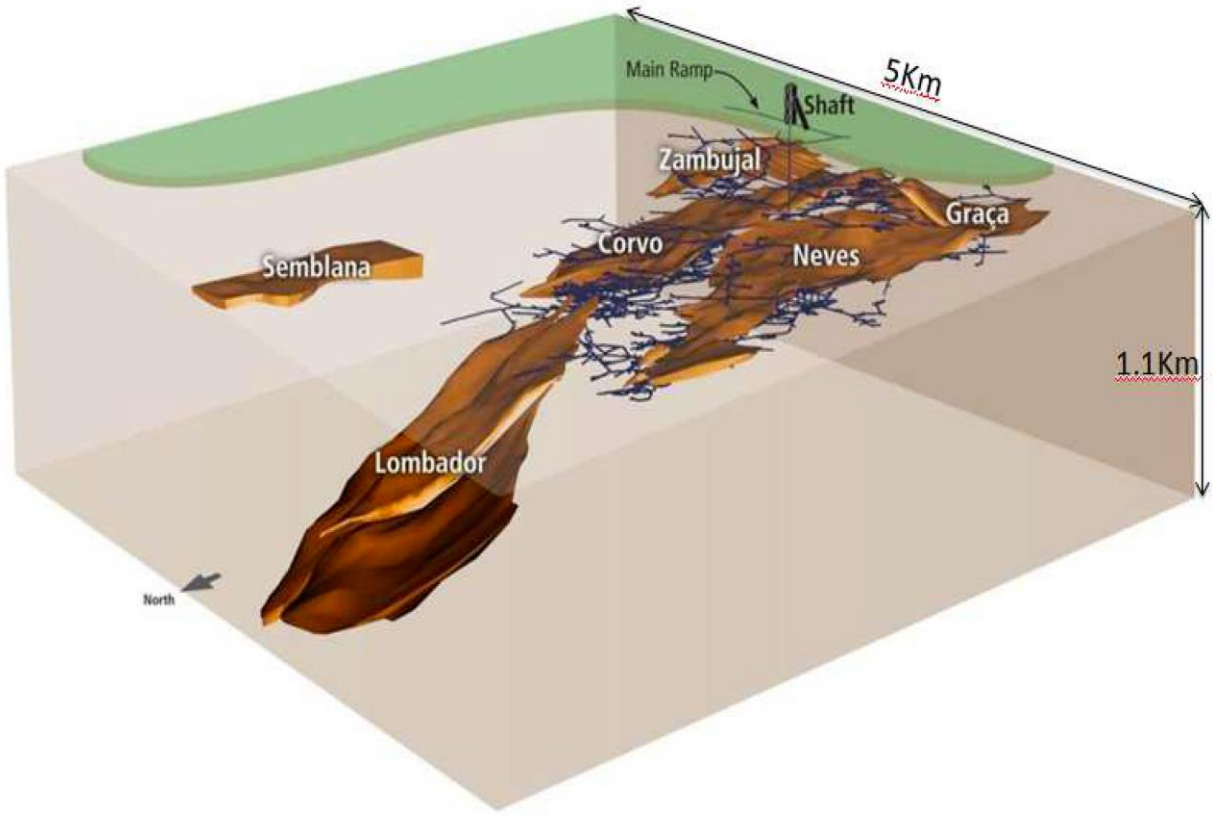
As copper grades have decreased over the years, the adjacent zinc reserves have filled the revenue void. A comprehensive 2014 corporate site presentation is here. I won't repeat the details here.

Lundin describes the geology as follows:

> *The Neves-Corvo deposits occur within the Volcanic Sedimentary Complex, which consists of acid volcanics separated by shale units, with a discontinuous black shale horizon immediately below the lenses. Above the mineralization, there is a thrust-faulted repetition of volcano-sedimentary and flysch units. The whole assemblage has been folded into a gentle anticline oriented north-west to southeast which plunges to the southeast, resulting in orebodies distributed on both limbs of the fold. All the deposits have been affected by both sub-vertical and low angle thrust faults, causing repetition in some areas.*
>
> *Seven massive sulphide lenses have been defined at Neves-Corvo comprising Neves (divided into North and South), Corvo, Graça, Zambujal, Lombador (divided North, South and East), Semblana and Monte Branco. The base metal grades are segregated by the strong metal zoning into copper, tin and zinc zones, as well as barren massive pyrite. The massive sulphide deposits are typically underlain by stockwork sulphide zones, which form an important part of the copper orebodies.*
>
> *The mineral deposits at Neves-Corvo are classified as volcano-sedimentary massive sulphide. They typically occur as lenses of polymetallic (Cu, Zn, Sn, Pb) massive sulphides that formed at or near the seafloor in submarine volcanic environments. They formed from accumulations of the focussed discharges of hot metal-enriched fluids associated with seafloor hydrothermal*

convection, typically in tectonic areas of active submarine volcanism, including rift spreading centres and island arc subduction zones.

The operation strikes me to be higher cost on a tonne mined basis and the somewhat labour intensive mining methods and perhaps worker productivity seem to be the reasons. If the Swedes had this asset on their soil they would really go to town here. Lundin states that copper C1 cash costs for 2016 are estimated at $US1.65/lb after a $0.70/lb Zn byproduct credit. This puts it in the fourth quartile for copper producers cash cost wise. Zinc mining has been moving predominantly into the Lombador orebody. The expansion is based on mining even more tonnes from the Lombador orebody.



Reserves as of June 30,2016 for the zinc stream only and zinc stream 2015 production is listed in Table 21. M+I resources inclusive of reserves are in the 100 MT range and it is only a matter of poking around to find more it seems. They are essentially picking the eyes out of a major sulphide system. Table 22 is my estimate of production going forward.

Table 21 Proven and Probable Reserves as of June 30, 2016 and 2015 Production Results

	Tonnes	Cu%	Zn%	Pb%	Ag g/t
P +P Reserves	23,449,000	0.4	7.2	1.6	67
2015 Production	1,014,000	nr	8.0	nr	nr

nr= not reported separately for the zinc stream. Mill recovery was 71.8%

Table 22 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
30,006	53,382	67,378	61,921	71,000	70,000	70,000	90,000	120,000	150,000	150,000

2016 production is Q1-Q3 actual prorated to 12 months. 2016 zinc grade is 8.3% ytd with 802,000 t milled in the zinc plant ytd. 2017-18 figures are company guidance. The expansion ramp up commences in 2019 by my estimate.

Eurozinc also bashed their heads for a while trying to get the Aljustrel mine restarted. An NI 43-101 report was issued with details and it is referenced below. I am uncertain whether all the infrastructure has been removed or not. I don't think this is a Lundin asset now. The proposed production rate was simply not supported by the reserve base. It was a classic case of a financial model run amuck from what I can recall. This is a common problem with many underground projects. There is disconnect between what the miners can reasonably achieve and what the financial whiz with the MBA actually models to get his preferred IRR to take to the Board (BHP at Jansen anyone?). This is common across all commodities and is one reason some of the majors avoid underground projects like the plague. The list of financial disasters is long. Having successfully navigated the Seven Dwarfs Mine Train at Disney World does not qualify the financial modeler to fill in the underground mining spreadsheet cells accurately ;) . (Do I sound bitter?)

References: Lundin Mining, Neves Corvo NI 43-101, January 2013. www.sedar.com

Eurozinc Mining, Aljustrel NI 43-101, May 13, 2004. www.sedar.com

Spain

Spain appears to be a good news story with respect to zinc mining. Iberian Minerals Corp. did a good job restarting the Aguas Tenidas mine in 2009 after Navan Resources closed it in 2001. Iberian Minerals was acquired by the more deep pocketed trading house Trafigura (Glencore-lite) in 2013. The 1.7 MT a year treatment plant was quickly increased to 2.2 MT capacity and has doubled to 4.4 MT a year capacity. There are two ore streams however: copper ore and polymetallic ore. This decline mine utilizes blasthole stoping. Iberian never fully explored the deposit so the extents of the working are considerably greater than illustrated in the figure below.

Iberian reported reserve grades for polymetallic ore at Aguas Tenidas (way back in 2009 in the NI 43-101) of 6.48% Zn with expected mill recoveries of 75%. This does not jive with actual zinc output though for the 2012-14 timeframe. So either grade, tonnage or recovery is less than expected, take your pick of one or more.

The mill expansion is possible by developing the nearby Magdalena mine and the shipper mine, Sotiel, 35 km away. Similar to Neves-Corvo, there are distinct copper and polymetallic zones at Sotiel which are milled separately. The Sotiel mine is also a past producer that closed around 2000. This mine produced at 3,000 T per day and mined 8.4 MT @ 4.52% Zn and 1.1 MT @ 3.27% Cu. In 2011 Iberian listed M+I JORC compliant polymetallic resources at roughly 13 MT grading 0.6% Cu, 5.5% Zn and 2.3% Pb plus some copper ore. My understanding is that Magdalena is predominately a copper resource but I could be wrong.

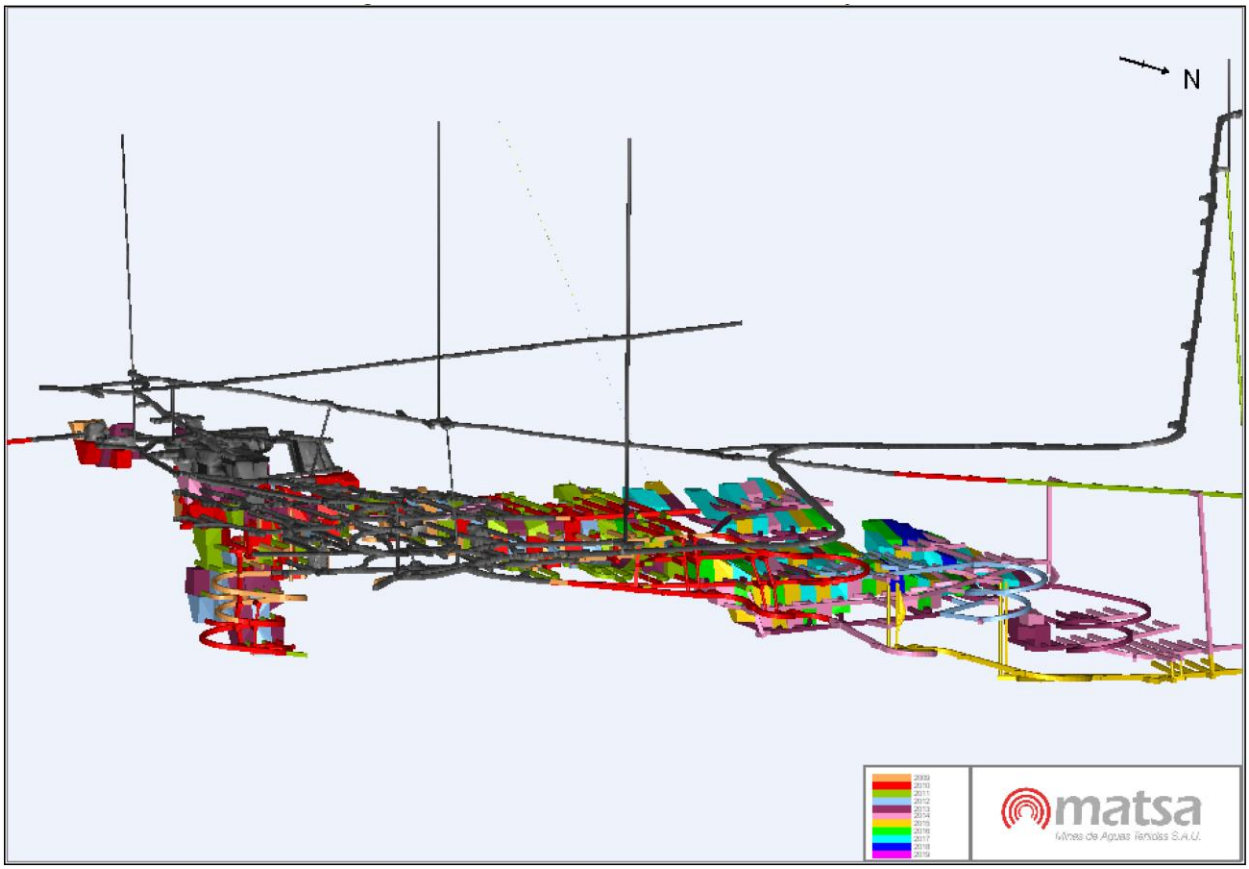
A feel good corporate brochure is here. Unfortunately, there is little detail with respect to planned output. The reserves/resources as of 2014 remain evenly split between copper and polymetallic zones so, reading between the lines I assume the mill is still evenly split tonnage wise also.

Have a look at page 56/57 in the brochure. This wild looking picture is of a blasthole stope where the ore is removed by a remote controlled LHD (low profile front end loader). Pray the operator remembered to put fuel in it at the start of the shift otherwise he/she will be trading in their muckers for running shoes and a jerry can. This variant is sometimes called bench mining or sublevel retreat mining. Drawpoints are a thing of the past now that remote controlled LHD's are standard. Atlas Copco loves to hear about a large rock falling on top of the LHD in the stope since it means another sale pending if they can't winch it out (on night shift of course after the manager has gone home). An expensive form of backfill sometimes. But I digress.

The production for 2013 listed on page 71 would be for zinc concentrate, not zinc in concentrate (usually 50%). Since I have no firm understanding of the mining grade going forward and Trafigura is unlikely to provide it, I illustrate in Table 23 a mill expansion ramp up commencing in 2015 to 2018 with double recent zinc output levels. It will take a while to ramp up the two other mines. This assumes 2 MT of polymetallic ore is milled annually at 5% Zn with 75% recovery at steady state. But this is a typical crapshoot on my part.

Table 23 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
28,037	30,907	31,570	35,000	50,000	60,000	75,000	75,000	75,000	75,000	75,000



The only other zinc resource I am aware of in Spain is Boliden's previous mine Los Frailes at Aznalcollar. The government has apparently been shopping this one around lately. This mine was the site of the famous 6.5 million m^3 tailings dam burst in 1998. Resources are stated as 37 MT grading 3.82% Zn with copper, lead and silver credits. It would take a strong stomach for someone to want to get back in here.

Reference: Iberian Minerals Corp, NI 43-101 Report Sept. 11, 2009 www.sedar.com

Turkey

Unfortunately folks, life now starts to get murky. Trying to track down the zinc miners in Turkey is like trying to find needles in a haystack. These guys have been taking lessons from the Chinese.

Ask any analyst and they will be sure to mention the Cayeli mine of First Quantum. However, this mine has traditionally produced in the range of 40,000 T of zinc a year which is only a small fraction of the 200,000 T reported annually nationally. Even the USGS has come up dry with respect to other miners. Turkey is better known for its chromite, gold and copper production. I find it very unsatisfactory to discuss one zinc operation in detail and then wave my hands in the air for all the rest in the country but this is what I am reduced to.

But one key to this mystery seems to be the considerable amount of near surface non-sulphide zinc mining that occurs on multiple properties by very small operators. Literally ma and pa sized operations. Individually, they amount to little production. Cumulatively, the output is significant. At one time, Cinkur operated a smelter in Turkey strictly for feed from these small operators. This was a Waelz kiln. It looks like this smelter closed in 1996 though. It appears now that much of this mineralization is shipped to China.

To call these operations mines would be an overstatement. Below is a typical photo of one of these past operations. A gouge in the side of a hill with the ore then hand sorted to separate it from waste is all these operators were up to. Typical ore grades were in the 25-45% Zn range. So it does not take much tonnage for this to add up. A number of these operations also have some tunneling conducted to follow the ore. Shipping the ore to China makes sense when you realize it is not much different than the vast amounts of low grade nickel laterite ore that is shipped to China annually from Indonesia (previously) and the Philippines. Currently, operators sell their ore generally to local traders. The government appears to be able to track the quantities of zinc mined through export certificates. I imagine this mining would be very price elastic similar to the scrap metal industry. In other words, ma and pa would forgo their annual trip to Wallyworld and get cousin Ahmet to work the night shift if the price of zinc was at a ten year high in order to make hay while the sun shone. We have a mining shit show on TV here in Canada called “Yukon Gold”. Someone should do a sequel, “Turkey Zinc”.

The only way I have been able to figure this out is through Canadian listed companies wanting to get in on the action and filing various reports on www.sedar.com :

Red Crescent Resources Ltd. Hakkari NI 43-101, July 26, 2013

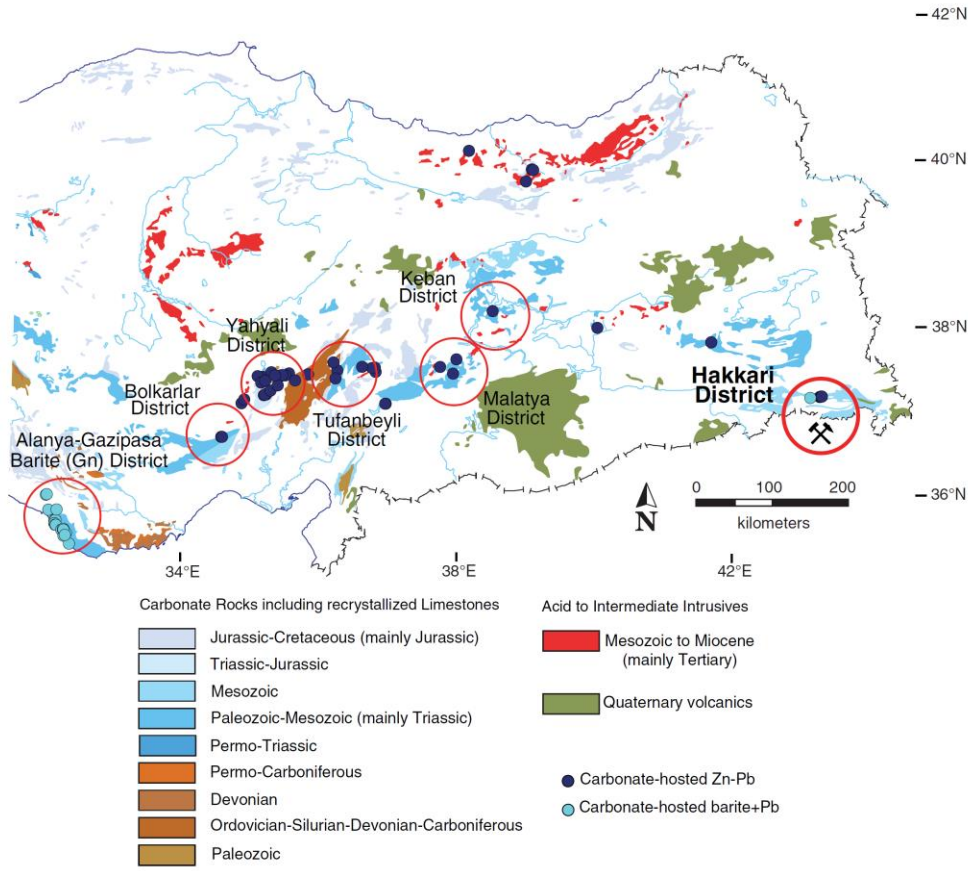
Red Crescent Resources Ltd. Tufanbeyli Zinc Project NI 43-101, July 25, 2011

Silvermet Corporation, Tufanbeyli Zinc Project NI 43-101, April 30, 2006

Pasinex Resources Ltd. Q2 2016 MD and A, filed August 26, 2016 and NR Nov 3, 2016

Pasinex appears to be nicely funding their exploration through this type of ad hoc mining. They could be my proposed TV show stars. http://pasinex.com/adana-turkey/

The oxidized portions of carbonate hosted Zn-Pb deposits are the primary mining target. The figure below illustrates the location of these occurrences. This figure is from a fine technical paper here.



OK, so I am happy that my detective work has helped crack a bit of the puzzle but this unfortunately does not provide any data on quantities.

My search uncovered a few names of zinc miners such as Dedeman Madencilik here but there is virtually no data to be found on individual mine output or resources except for Cayeli. So unfortunately, I have to leave it at that and move on.

Cayeli

Although First Quantum's Cayeli mine is slated to close mid-2019 its zinc mining days are now virtually over. This is a fact no one seems to have picked up on. This is because mining is focusing primarily on the copper rich stockwork and not the copper/zinc VMS areas. This is evident in the proven and probable reserves listed in Table 24 and the year to date results.

Falls of ground (polite language we engineers use for cave-ins) in the VMS areas are now common as the mine ages. Zinc mill recoveries have also dropped off substantially with the zinc circuit shut off periodically in 2016 (when I presume they are milling copper stockwork ore only). Table 25 illustrates past and expected production.

Table 24 Proven and Probable Reserves as of December 31, 2015 and 2015 Production Results

	Tonnes	Cu%	Zn%	Au g/t	Ag g/t
P +P	5,836,000	2.75	1.93	0.37	17
2015 Production	1,229,000	2.5	3.0	nr	nr

nr= not reported separately. Mill zinc recovery was only 54%

Table 25 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
39,995	43,097	36,218	19,808	8,700	7,000	6,000	3,000	0	0	0

2016 data is Q1-Q3 actual prorated to 12 months. 39% Zn recovery ytd at 1.7% Zn head grade.

Turkey Summary

For lack of better data I have illustrated in Table 26 a gradual increase in zinc output for Turkey apart from Cayeli. This is under the assumption that strengthening zinc prices will incentivize additional opportunistic zinc oxide mining.

Table 26 Actual and Expected Mined Zinc Production for Turkey

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cayeli	39,995	43,097	36,218	19,808	8,700	7,000	6,000	3,000	0	0	0
Others	155,798	151,928	173,934	175,000	180,000	190,000	200,000	210,000	220,000	230,000	240,000
Total	195,793	195,025	210,152	194,808	188,700	197,000	206,000	213,000	220,000	230,000	240,000

Ex-Communist Production

I have split out this production since the reader needs to understand four things:

1) The mines were never necessarily economic in the first place;
2) The mines were usually overstaffed during the communist era and this is now someone else's problem;
3) In many cases the equipment and fixed plant is clapped out and ready for the Chinese blast furnace;
4) Some of the mine sites have huge legacy environmental issues.

I am not going to spend much time here.

Poland

Poland's only zinc mine is set to close in 2017 due to reserve exhaustion based on statements made by a number in independent sources. According to BGS statistics, the ZGH Boleslaw's Pomorzany mine has been producing in the 75,000 T a year zinc in concentrate range. Room and pillar mining is used for this shallow resource and mined out areas are tight filled with sand to avoid surface subsidence in this populated area. Zinc is smelted at the nearby Boleslaw smelter. Previous mining rates and grades have been in the 2.2 MT a year range grading 4.1% Zn and 1.8% Pb but appear to have dropped off recently as mining areas likely become restricted. Table 27 is my estimate of production to closure.

There are reserves in the area but no effort appears to be underway to exploit them. Reading between the lines I assume that this mine and related smelter is a typical overstaffed, high cost, communist era situation that requires state subsidies to remain in business. Not kosher in the EU anymore.

Table 27 Actual and Expected Mined Zinc Production

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
76,700	75,900	56,000	50,000	50,000	20,000	0	0	0	0	0

Figures for 2012-2014 are from the British Geological Survey

Canada's Rathdowney Resources (part of the Hunter Dickinson group) has been assessing two zinc properties north of the Pomorzany mine but they essentially seem to be stalled at the moment. Inferred resources are 24.4 MT @ 5.5% Zn and 1.5% Pb. A PEA was completed mining 16.1 MT of mineralization grading 5.0% Zn and 1.5% Pb. Resources appear to be near fairly heavily populated areas.

My on-the-ground experience with other projects in ex-communist countries (Slovakia, Ukraine and Mongolia) illustrated that economics alone do not dictate whether a mine is viable or not. In very polite terms (google fcpa), numerous stakeholders probably have a say in whether mining will occur or not despite relevant legislation so I tend to view any cut and dried PEA in ex-communist countries with extreme caution. I am jaded no doubt but I extend my best wishes to Rathdowney anyways. Put lipstick on it and sell it to the Chinese. If anything their NI 43-101 gives you some good color on the mining in

this area. But I would put little faith in the costs or schedule since I doubt very much SRK understands the bureaucracy and worker productivities in these types of situations.

Reference: Rathdowney Resources, Olza Zinc-Lead Project NI 43-101, December 31, 2014 , NI 43-101 www.sedar.com

Ex-Yugoslavia Countries

According to the British Geological Survey recent production in countries that were formerly part of Yugoslavia is illustrated in Table 28.

Table 28 Zinc Mining Production in the Former Yugoslavia

Country	2010	2011	2012	2013	2014
Bosnia/Herz.	5,514	6,862	7,600	9,100	8,100
Kosovo	4,100	2,872	3,818	4,963	5,514
Macedonia	32,872	28,132	28,037	30,907	31,570
Montenegro	250	3,300	4,677	5,487	5,505
Serbia	2,600	3,100	6,000	5,800	7,100

I am not going to beat myself up describing each one of these mines. Macedonia appears to be the only significant producer.

Macedonia

Macedonia is probably the exception to my pessimistic ramblings in this section. Private equity firms (Orion Finance and Fusion Capital masquerading as Lynx Resources) have recently acquired the SASA lead/zinc underground mine. The mine was brought out of bankruptcy in 2005 and reopened by Solway in 2006 who then invested in a modernization and expansion program.

Historic mining grades have been in the 5% Pb, 4.3% Zn range and non-compliant reserves/resources appear ample to support a ~770,000 T per year operation for well beyond the study period (only Soviet method reserve figures were located which I don't care to reproduce here but Lynx has mentioned a 20 year mine life).

Lynx reports that annual production is 22,000 T Zn, 30,000 T Pb and 400,000 oz Ag and the mine has 700 employees.

No doubt the private equity firms are dressing up this operation with the intent of hitting a peak commodity price cycle in order to flog it off on others. My gut feel is that Solway tried to flog this onto Nyrstar during their ill-timed previous acquisition spree. The owners claim that this operation is a first quartile cash cost producer (which tells me the miners deserve a pay raise). Lynx indicated recently that modernization/sustaining capital only is being spent so I assume no expansion during the study period. Perhaps Boliden or Lundin may be interested here if there is a large untapped resource with expansion potential. I have no clue what the underground mining method is.

The difference between national figures and those reported by Lynx appears to be due to production from the Zletovo and Toranica mines. I assume they are typical communist era cluster fucks as implied here.

Bosnia and Herzegovina

The Sase mine and mill at Srebrenica apparently produces about 300,000 T a year of lead/zinc ore from underground to produce the zinc listed in Table 28. I have not found much in the way of information here but nor did I look very hard either. I have assumed it is steady as she goes. The company's website is here. Use Google Chrome to get instant translation. The parent company is Mineco of the UK. https://www.minecogroup.com/

Kosovo

The Trepaca Complex is a group of mines and smelter that Kosovo and Serbia are still fighting over as illustrated here. Once they sort out this shit show I might spend some time looking at the assets. Judging by previous employment figures (20,000) in relation to output though, this is one lost cause no matter who runs it. If I were Kosovo, I would let Serbia have it. The joke will be on them in the long run.

Montenegro

I assume the nation's production is coming from Gradir's Šuplja Stijena mine which has been redeveloped as an open pit mine. You can get a sense of the legacy issues and the mines redevelopment from the link below. I actually admire what these guys have accomplished here. Some go getters.

videolectures.net/site/normal_dl/tag=67975/outbursts_herlec_sshm_01.pdf

Serbia

Mineco also operates two small lead/zinc mines in Serbia. Most significant is the Rudnik mine which processes roughly 250,000 T a year of polymetallic ore. The tiny, 50,000 T a year Veliki Majdan mine nevertheless employs 288 people which illustrates again a key productivity issue in the region. I give Mineco great credit for perseverance though. Some recent news here.

Reservoir Minerals was actively exploring for zinc in Serbia prior to their recent takeover by Nevsun and had interesting results previously at Bobija.

For the above four nations I have assumed, in Table 29, that there will be a gradual improvement in production levels but seeing as we are starting off from a pretty tiny base, this will not have much impact on zinc supply. I don't expect everyone to sort their differences out anytime soon and I doubt very much that there is much of economic attractiveness here in the first place.

Ex-Yugoslavia Countries Summary

Table 29 Actual and Expected Mined Zinc Production for Ex- Yugoslavia Countries

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Macedonia	28,037	30,907	31,570	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000
Ex-Macedonia	22,095	25,350	26,219	28,000	30,000	32,000	34,000	36,000	38,000	40,000	42,000
Total	50,132	56,257	57,789	61,000	63,000	65,000	67,000	69,000	71,000	73,000	75,000

Ex- Macedonia includes Serbia, Montenegro, Kosovo and Bosnia and Herzegovina. 2012-2014 data is from the BGS.

Other Ex-Communist Countries

Armenia

Zinc production is from the Shahumyan (Kapan) underground gold and polymetallic mine. Dundee Precious Metals recently sold this mine to Polymetal International plc. This is a narrow vein mine producing around 500,000 T a year grading roughly 1.5% Zn as a byproduct of gold mining. There is a good resource base here. A 243 page NI 43 101 report was filed recently providing more information than you will care to know. The report illustrates an increase in production rate but a deterioration in zinc grade. So I illustrate relatively constant zinc output to 2022. It is uncertain, however, whether Polymetal will execute the expansion described.

Reference: Dundee Precious Metals, NI 43-101, March 31, 2015, www.sedar.com

Bulgaria

Quite frankly, I knew nothing of zinc mining in Bulgaria until about ten minutes ago. The USGS lists Rudmetal and Gorubso (Varba-Batantsi) as the two lead/zinc mining companies in Bulgaria. Bulgaria is capable of modern and efficient underground mining as Dundee Precious Metals has demonstrated at their Chelopech copper mine. But based on the photo gallery here, Rudmetal is still utilizing mining methods and equipment phased out a couple generations ago in North America (slushers, Cavo muckers, jacklegs and timber support). That's the best looking cap lamp man I have ever seen though. Varba-Batantsi's Maden mine was until recently your typical bankruptcy, unpaid miners on strike story as discussed here. I fail to see anything of excitement here with respect to new zinc supply in my ten minute review. Unless of course Arizona Mining has found another 100 Mt orebody that I am oblivious to.

My estimate later for Bulgaria zinc production going forward is merely a placeholder.

Romania

Romania seems to have rationally acknowledged that their communist era mining industry was not economic based upon the dated presentation here. They seem to be about the only one to admit it. Zinc in concentrate production is listed as falling from 55,300 T in 1989 to 11,800 by 2005.

Although the BGS estimates recent zinc mine production in Romania in the range of 3,000 T a year I have found no evidence that any production exists. No zinc mine is listed in the world registry of operating mines, some past producers and some prospects here (giving away more of my cross reference sources again) nor is production mentioned by the USGS.

Armenia, Bulgaria and Romania Summary

Table 30 illustrates actual and expected production for these countries

Table 30 Actual and Expected Mined Zinc Production for Armenia, Bulgaria and Romania

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Armenia	6,900	6,900	5,500	5,400	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Bulgaria	12,116	13,902	11,900	13,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Romania	8,400	2,000	3,300	0	0	0	0	0	0	0	0
Total	27,416	22,802	20,400	18,400	20,000	20,000	20,000	20,000	20,000	20,000	20,000

2012-2014 data is from the BGS.

So there you have it. This was a relatively easy module for me apart from Turkey. I would still like to have a look at Mexico, Bolivia, Russia and Africa. I will wait until the first blizzard though. You may have noticed a pretty common theme by now in the modules I have completed. Unlike copper, zinc mining is very much an underground mining business so the ability to ramp up production at higher commodity prices is limited.

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