Introduction to manganese panel discussion

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African Mining Indaba
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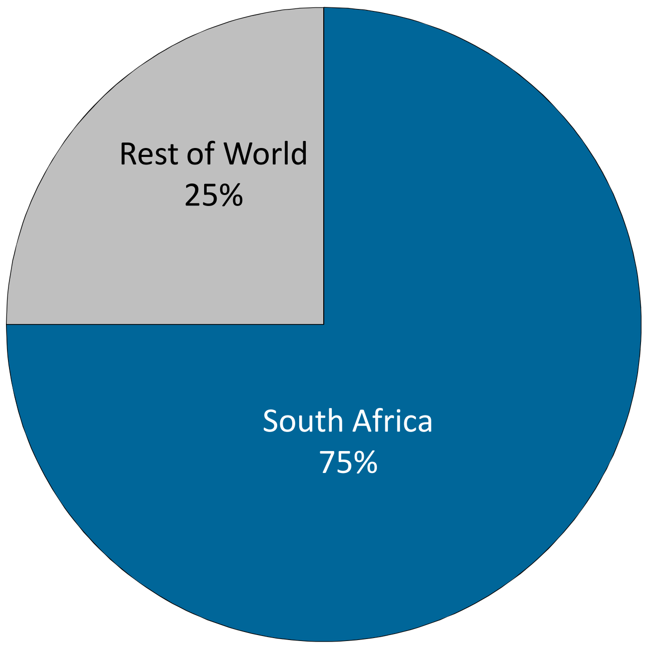
AlloyConsult
www.alloyconsult.com

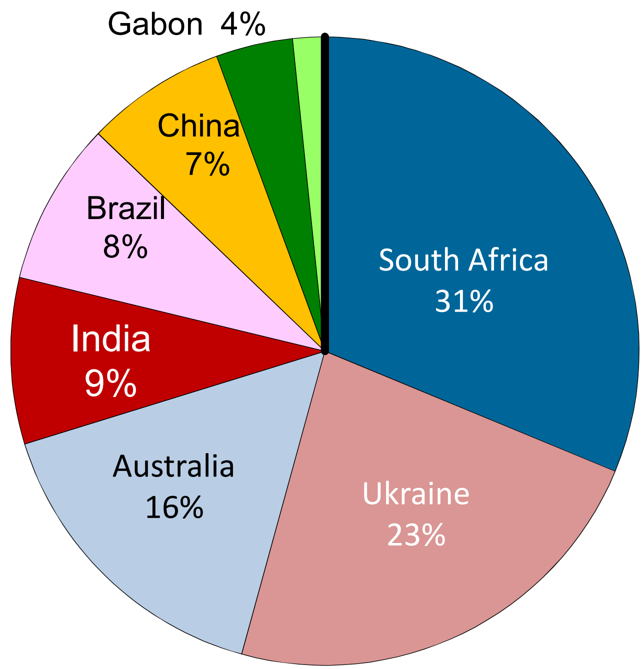
World Mn reserves & resources

Known world Mn resources, 2015



total ~10 billion tonnes*
*(~590 years of supply**)*

Reported world Mn reserves, 2015



total ~610 million tonnes*
*(~35 years of supply**)*

Note: * contained Mn basis. ** assumes 2015 demand level
Source: Hatch, USGS, AlloyConsult, IMnI, company reports

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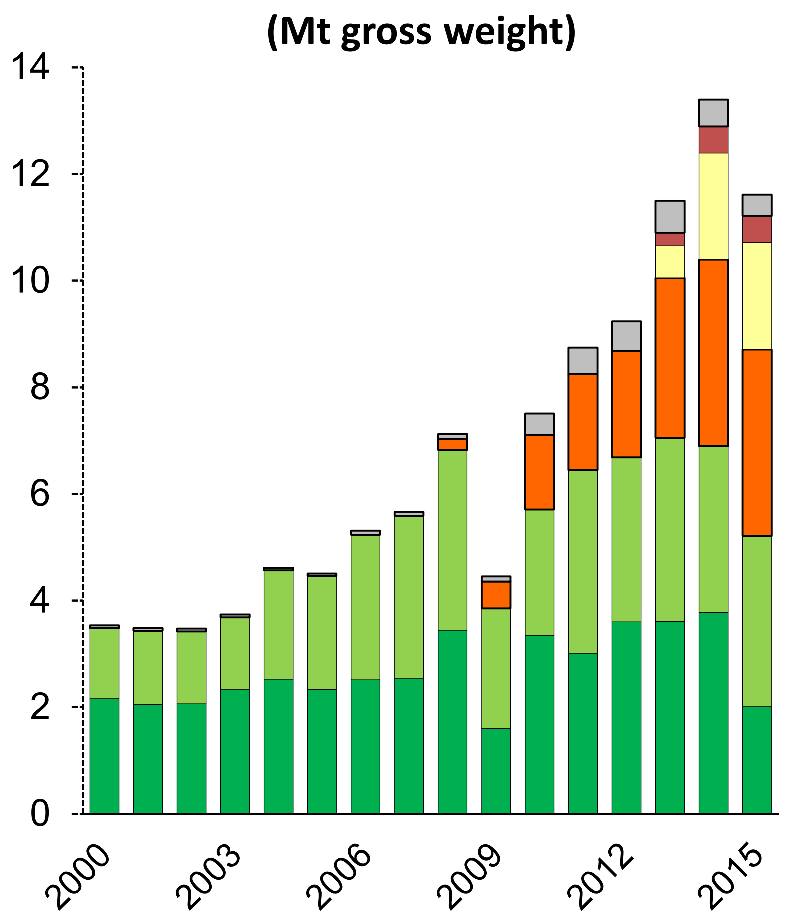
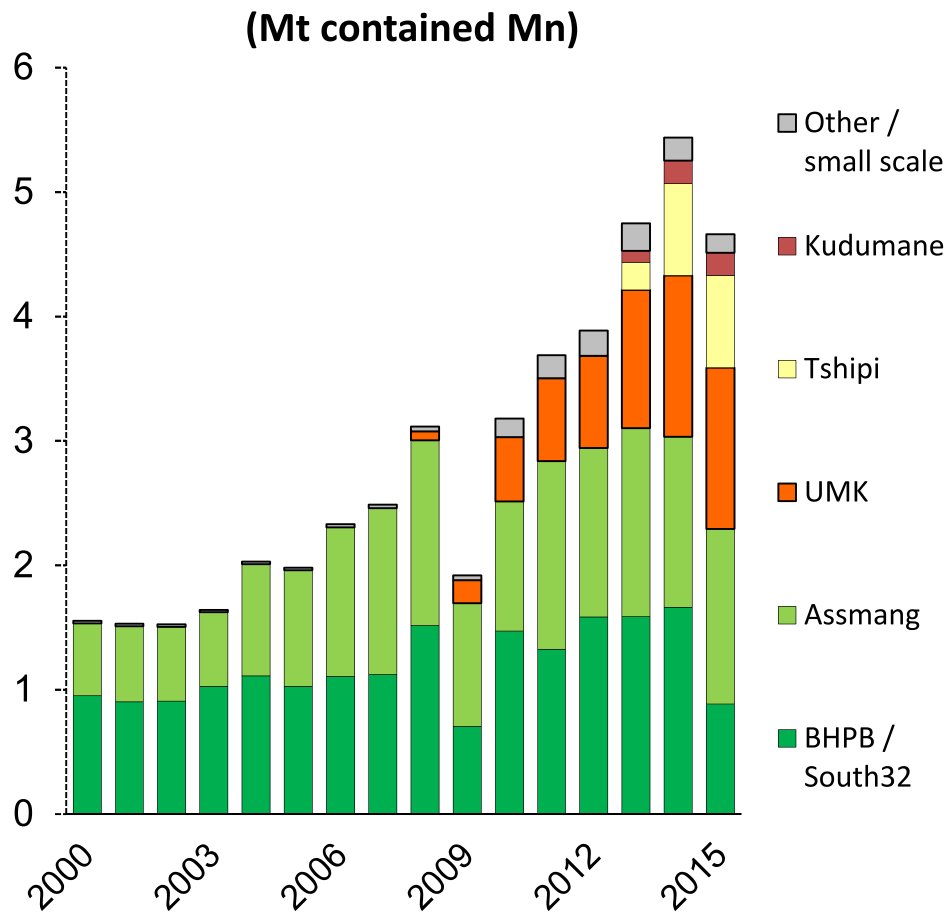
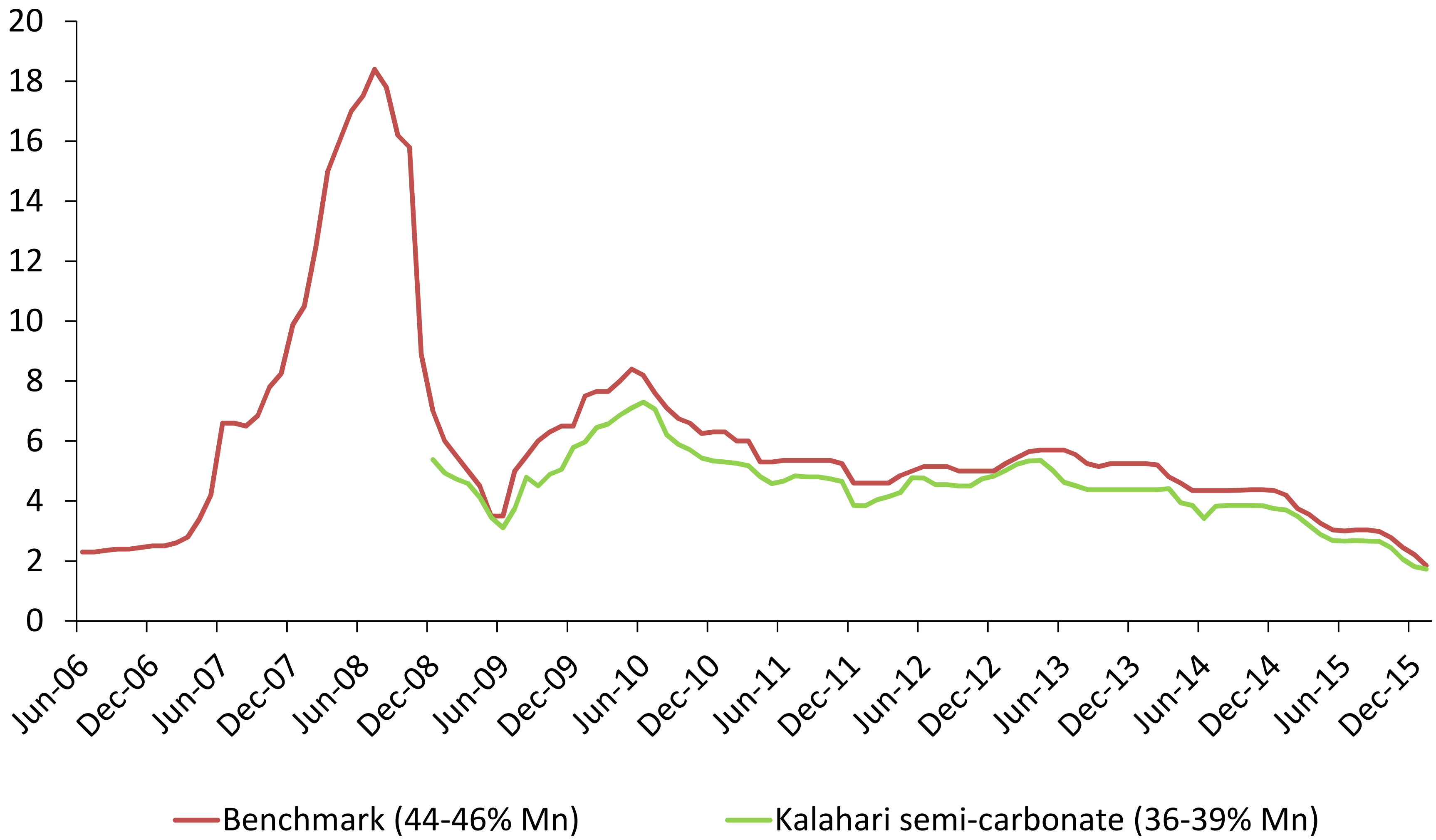
S.African Mn ore output by company 2000-2015





Mn ore prices, USD/dmtu CIF China



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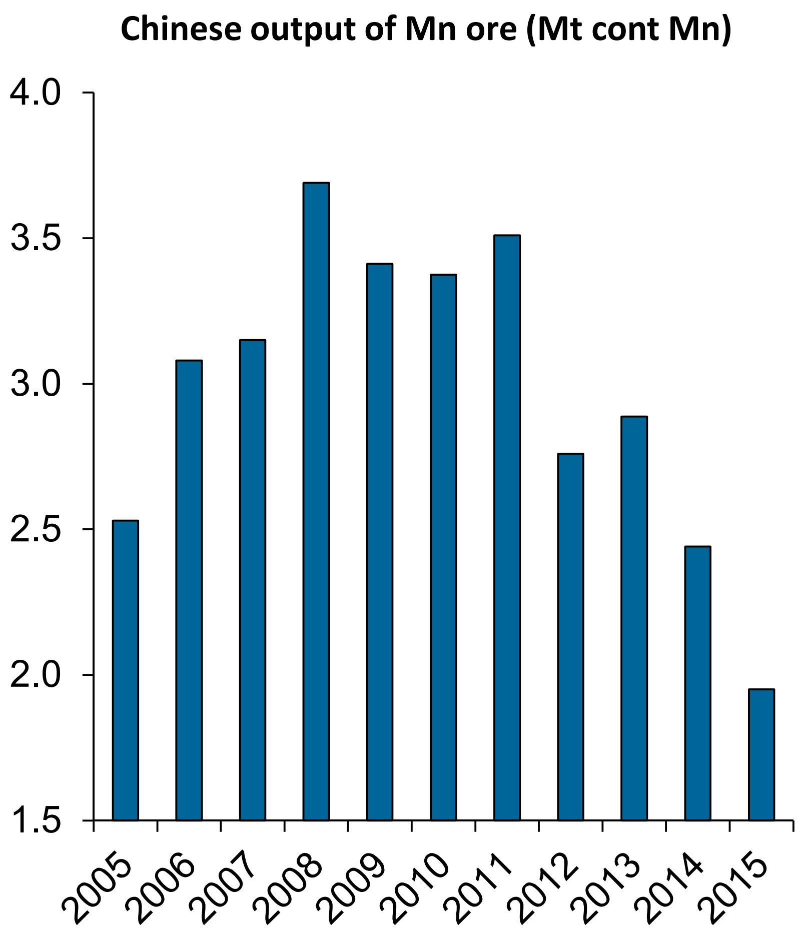
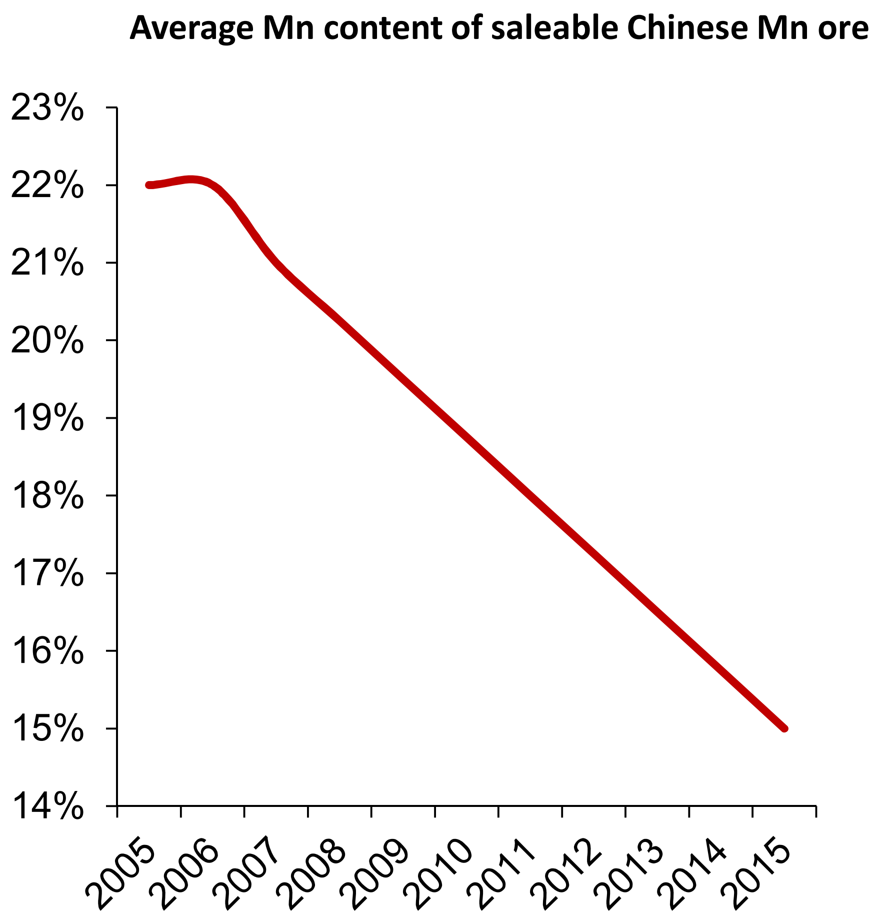
“The manganese market is oversupplied”….or is it?

	2013	2014	2015	2016	Comments
Demand	**15.9**	**17.0**	**15.9**	**15.6**	
Supply	**17.0**	**16.9**	**15.0**	**14.4**	
- S.Africa	*4.7*	*5.4*	*4.6*	*4.8*	*S32 accident, announced cutbacks*
- Australia	*3.6*	*3.6*	*3.5*	*2.6*	*CML & OMH out*
- China	*2.9*	*2.4*	*2.0*	*2.0*	*Big decline in output mirroring iron ore*
- Brazil	*0.9*	*0.9*	*0.8*	*0.8*	
- Gabon	*1.7*	*1.6*	*1.7*	*1.8*	
- Ukraine	*0.6*	*0.5*	*0.4*	*0.4*	
- Others	*2.6*	*2.5*	*2.0*	*2.0*	*Price sensitivity of marginal tonnage*
Balance	**+1.1**	**-0.1**	**-0.9**	**-1.2**	

Chinese Mn ore output 2005-2015





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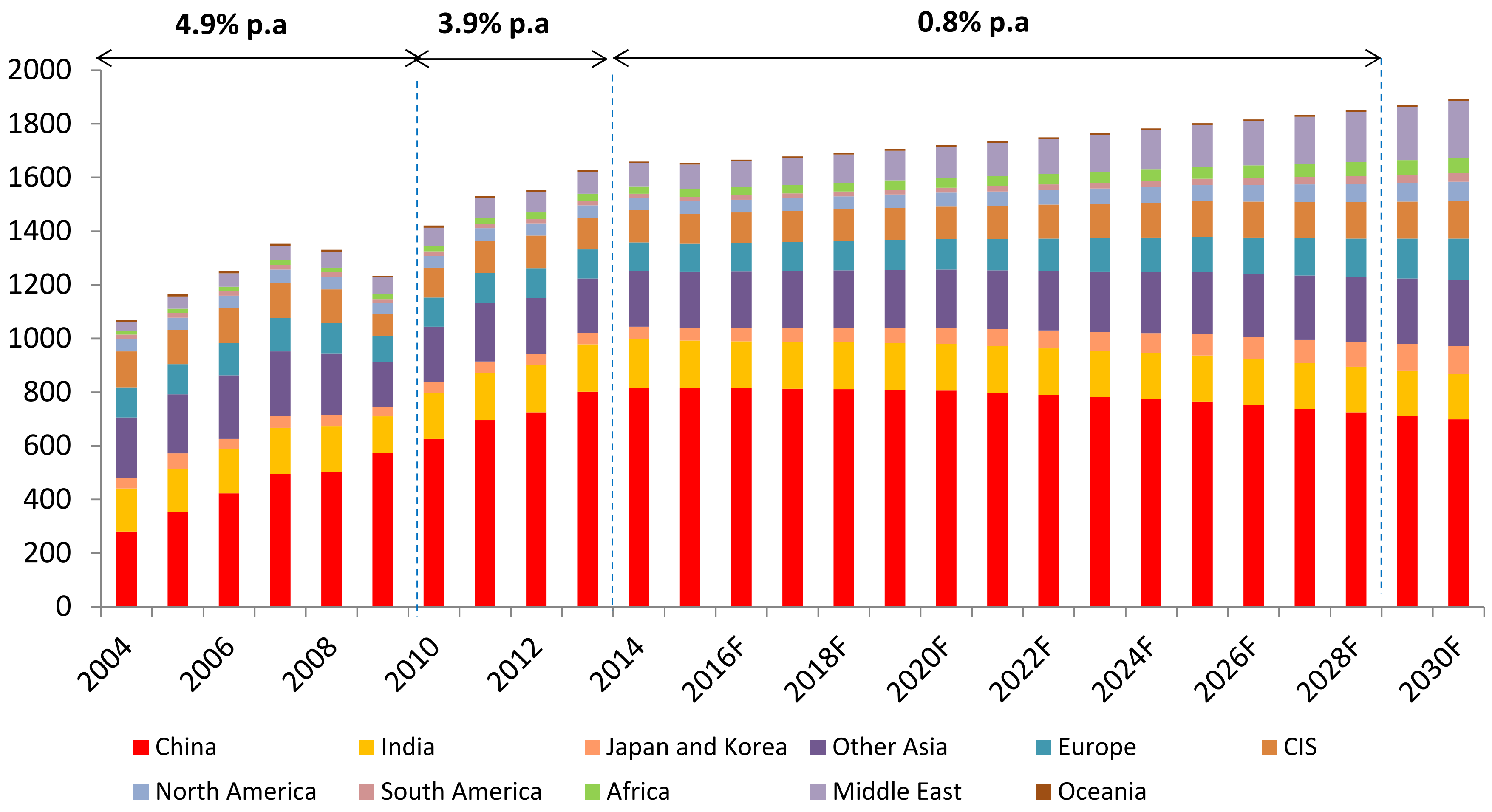
World crude steel production forecast (Mt)



Source: Hatch (Sep 2015)

Long term forecast for Mn ore requirement

Projected change in world Mn ore production by 2030 relative to 2014 (Mt contained Mn)

Country	Prod. 2014	Prod. 2030	Change	Comments
Australia	3.6	3.3	- 0.3	OM mine exhausted by early 2020s
Brazil	0.9	0.9		Stable output though fluctuates with iron ore price
Bulgaria	0.0	0.0		High cost, low grade reserve
China	2.4	1.5	- 0.9	Reserve & grade depletion
Gabon	1.6	2.0	+ 0.4	Eramet capacity + CITIC mine
Georgia	0.2	0.3	+ 0.1	Privat/GAA ongoing expansion
Ghana	0.4	0.5	+ 0.1	Privat/CML capacity
India	0.6	0.6		Stable domestic output, increasingly an importer
Kazakhstan	0.4	0.4		Stable output, high cost
South Africa	**5.4**	**8.3**	**+ 2.9**	**Required SA output to balance world market**
Ukraine	0.5	0.7	+ 0.2	Privat current effective capacity
Other	0.8	1.3	+ 0.5	B.Faso, Namibia, Indonesia, Malaysia, Togo etc
Total world production	**16.9**	**19.8**	**+ 2.8**	
World consumption	*17.0*	*19.8*	*+ 2.7*	

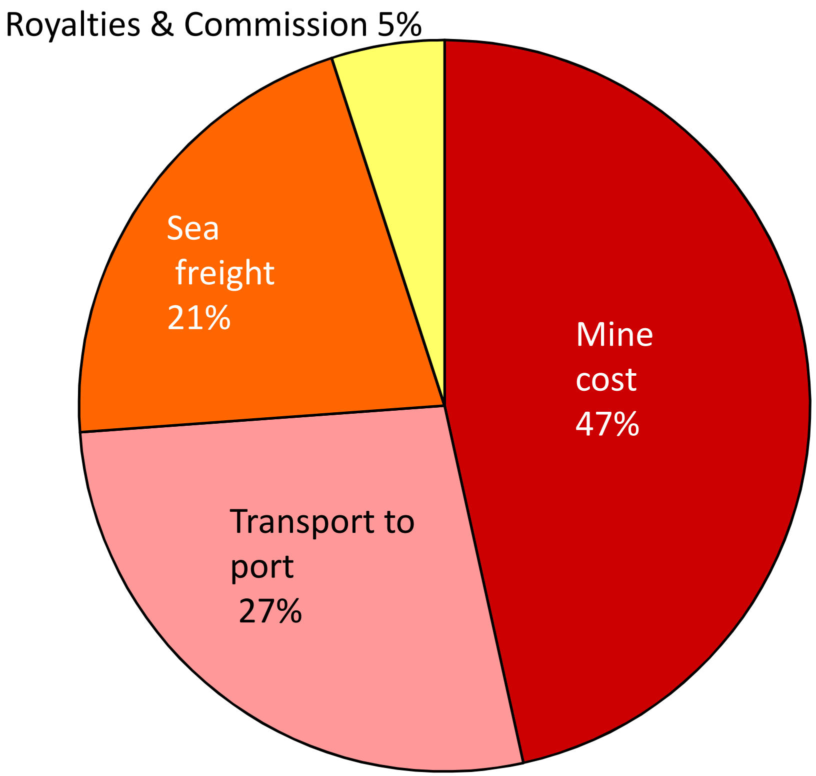
S.African Mn ore exports by route (2014 estimate)

Estimated RSA manganese ore exports by route and port, ~12.1Mt (gwt) (2014)

Port	Rail		Road	Total by port
	Sishen-Saldanha rail	Hotazel-PE rail		
Elizabeth		6000		6000
Saldanha	2095			2095
Durban			4032	4032
Total by route	**2095**	**6000**	**4032**	**12127**

Source: Hatch (Sep 2015)

Average global Mn ore production costs (CIF China, 2015)



Key drivers:

Oil price (mine cost, land transportation)

Exchange rates local versus USD (mine & labour costs)

Shipping

The decline of S.African Mn alloy output

Company	Smelter	Alloy	Capacity (ktpy)	Estimated Output 2014 (kt)	Estimated Output 2016e (kt)	Notes
South32	Meyerton	HC FeMn	350	340	90	75% of capacity idle from June 2015
		MLC FeMn	90	90	30	
		SiMn	closed	0	0	Furnaces closed in 2012
Assmang	Cato Ridge	HC FeMn	180	171	120	25% of capacity idle since 2015
		MLC FeMn	65	55	40	
	Machadodorp	HC FeMn	closed	50	0	Plant closed early 2015
Transalloys	Witbank	SiMn	190	180	20-180	Company announcement
Afarak	Mogale	SiMn	50	45	40?	

Reduced Mn alloy output in South Africa means higher Mn ore export even with no increase in Mn ore production