Virtual Hedging for Critical & Strategic Metals: A Tutorial

Washington DC, USA

October 22, 2009

Presented by John Kaiser

Rational Speculation Model: the Valuation of Pre-Production Resource Projects

www.KaiserBottomFish.com

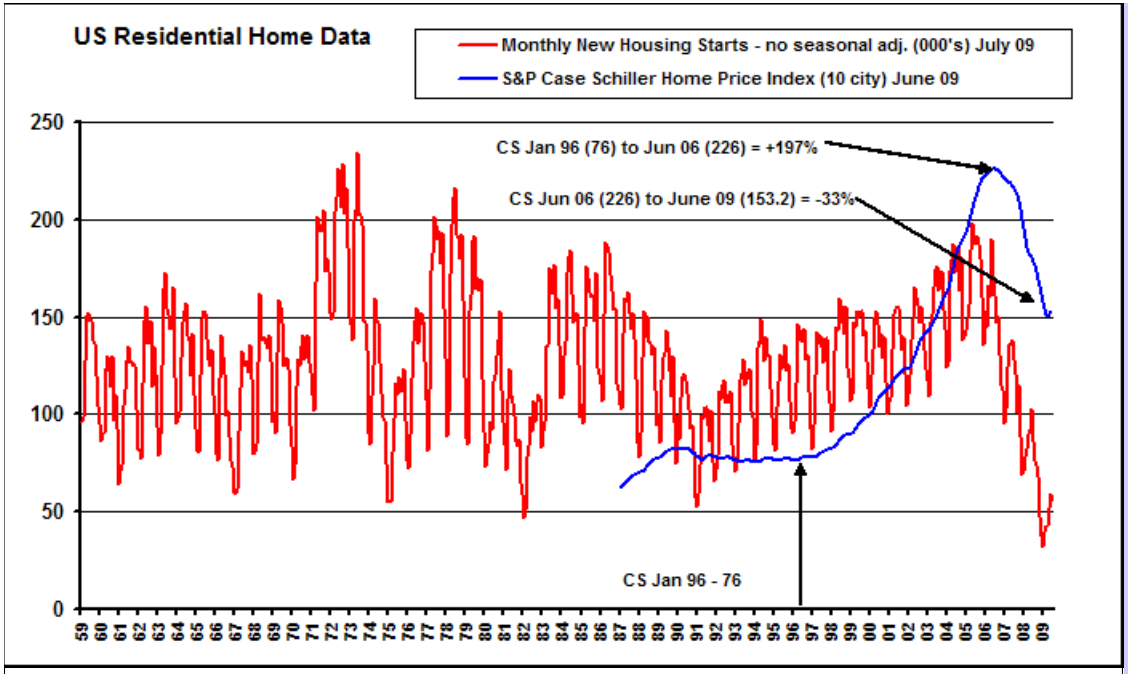
Kaiser Bottom-Fish

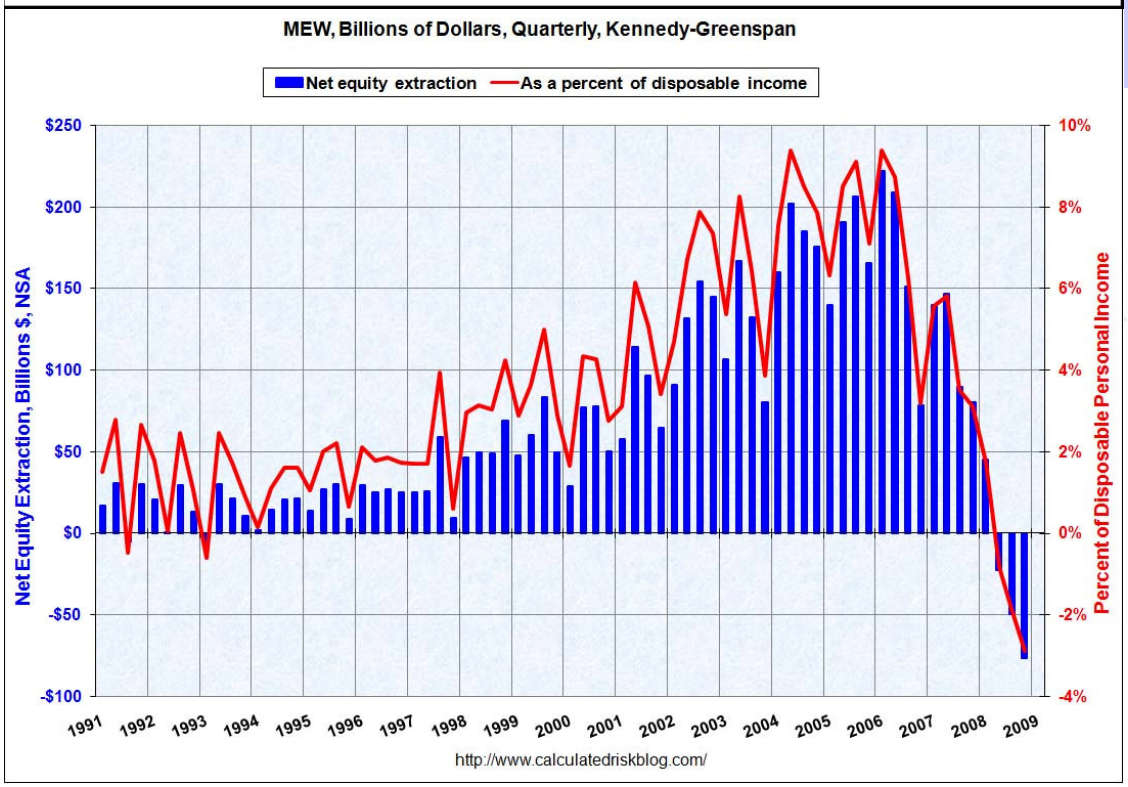
Three Crumbling Pillars

- Mortgage Securitization as Wealth Creation
- Globalization & the virtue of the China Price
- American Hegemony & the US Dollar as Global Reserve Currency

Three Implications

- A rising real price for gold as investment demand responds to currency volatility, and higher real prices for raw materials as the yuan-dollar peg is abandoned
- Fragmentation of the Global Economy as environmental protectionism leads to geographically constrained economic zones
- Strategic Logic eclipses Economic Logic in the valuation of raw material assets as Security of Supply concerns escalate





Mortgage Securitization:

Creating a Global Real Estate Bubble and a Consumption Boom by dissolving the traditional self-regulating relationship between lender and borrower. Game Over.

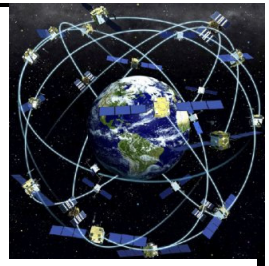
The China Price

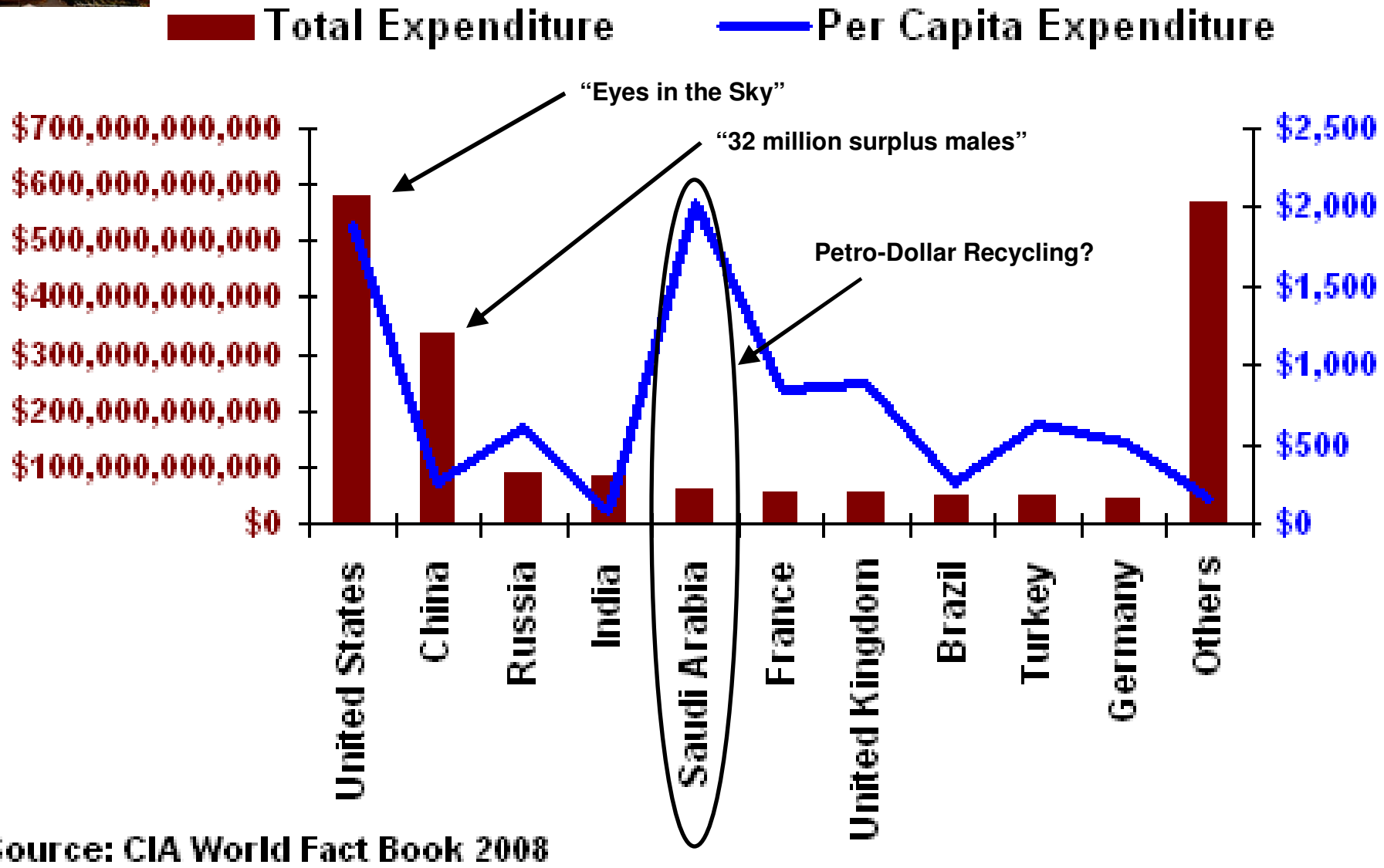
- Cheap Labor – urbanization of rural China and the dismantlement of state run enterprises
- No Health & Safety for Workers
- No environmental emission controls
- No Unions to secure medical or pension benefits
- US Dollar Peg: the devil's bargain of maintaining an undervalued yuan by bankrolling the US trade deficit through the accumulation of US treasury debt
- Piracy and Counterfeiting
- FDI: foreign direct investment and technology transfer

Made in China and Packed with Pride in America

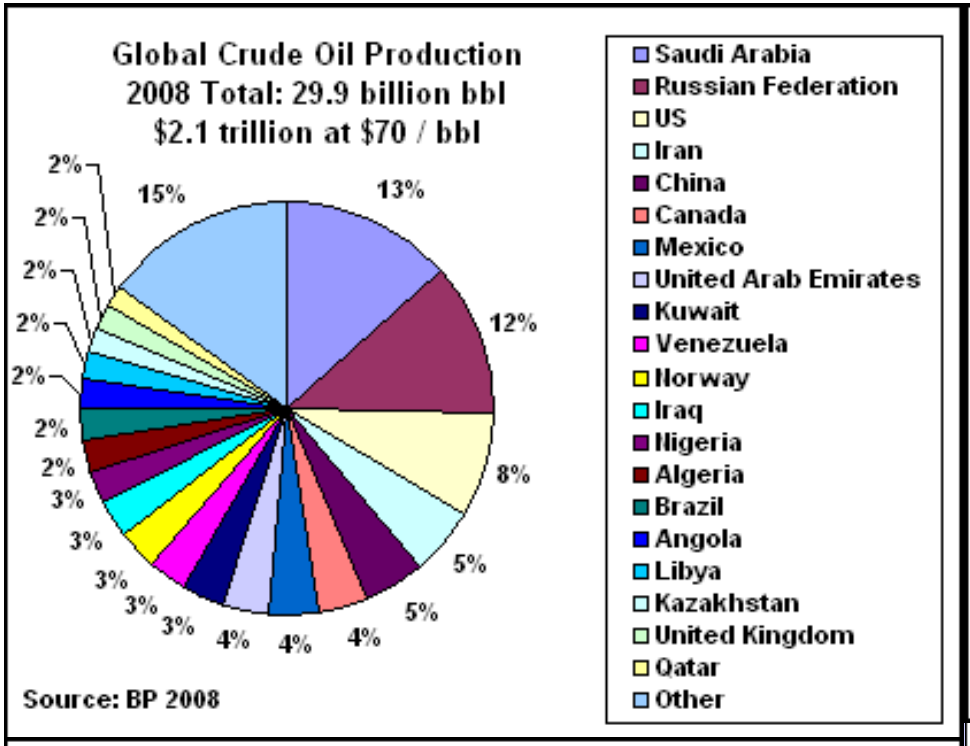
Globalization wandering towards its extinction

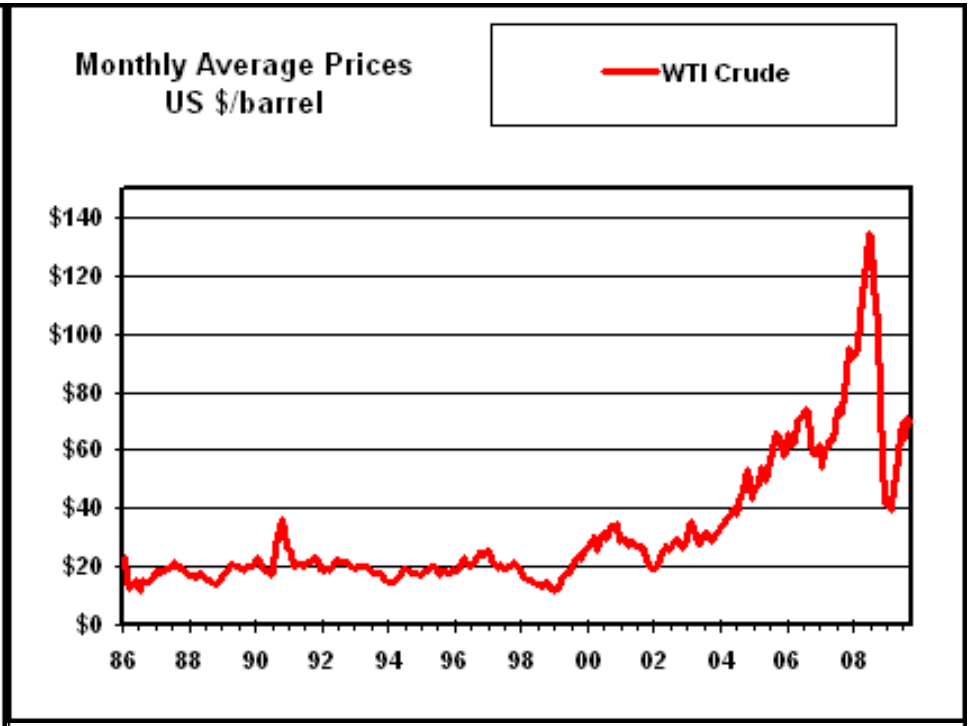
Annual Military Expenditure ($1.4 trillion)

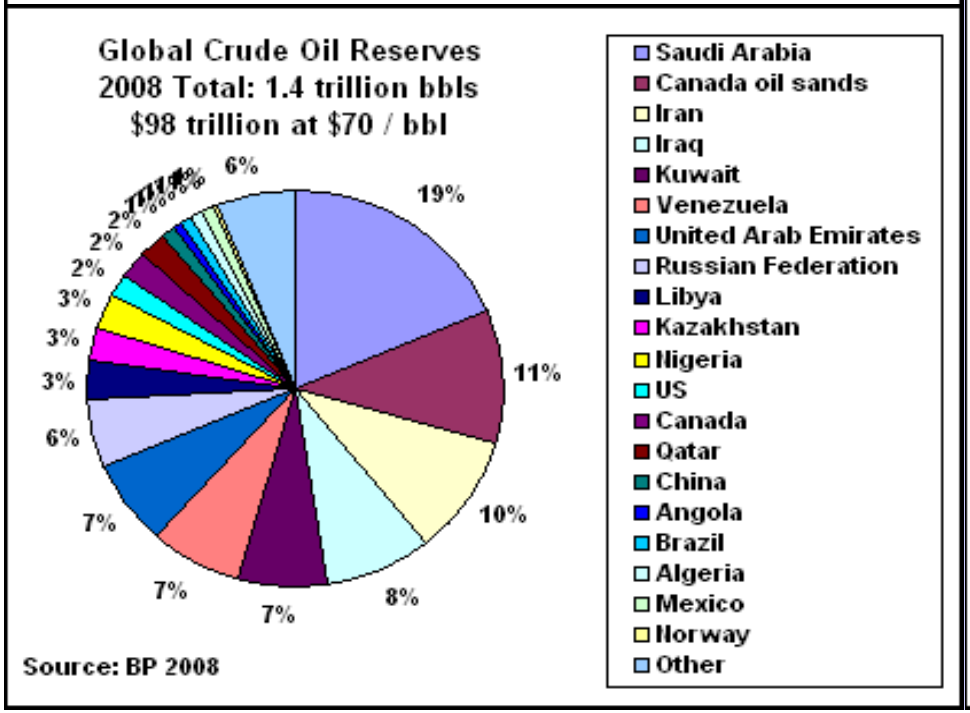


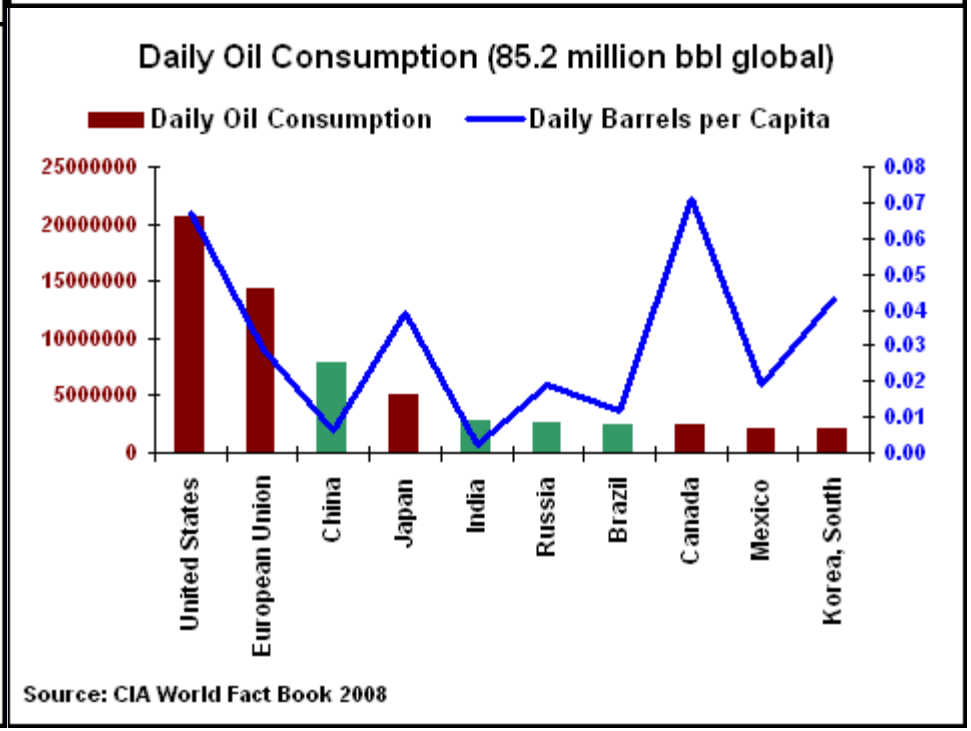


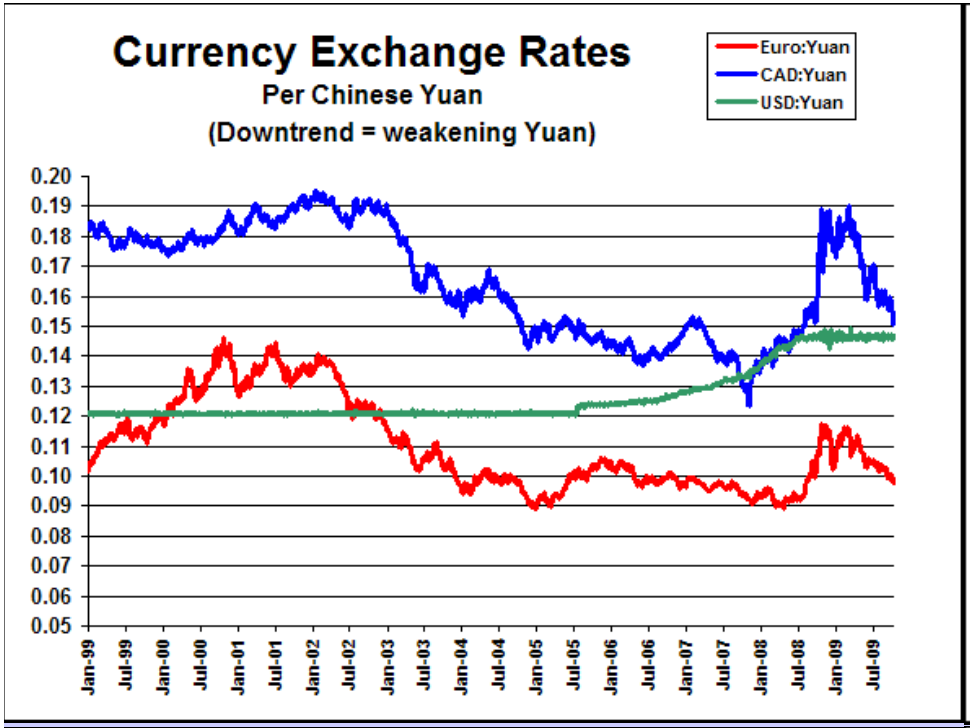
Source: CIA World Fact Book 2008

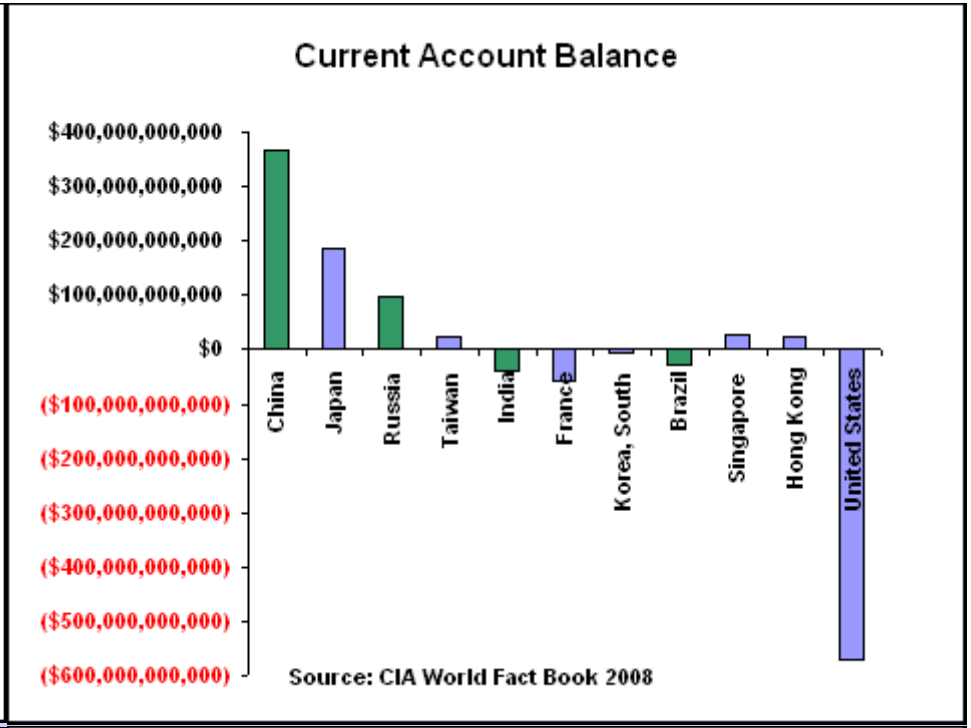

Global Crude Oil Production
2008 Total: 29.9 billion bbl
$2.1 trillion at $70 / bbl
13%
12%
8%
5%
5%
4%
4%
4%
3%
3%
3%
3%
3%
2%
2%
2%
2%
2%
2%
2%
15%
Source: BP 2008
Saudi Arabia
Russian Federation
US
Iran
China
Canada
Mexico
United Arab Emirates
Kuwait
Venezuela
Norway
Iraq
Nigeria
Algeria
Brazil
Angola
Libya
Kazakhstan
United Kingdom
Qatar
Other

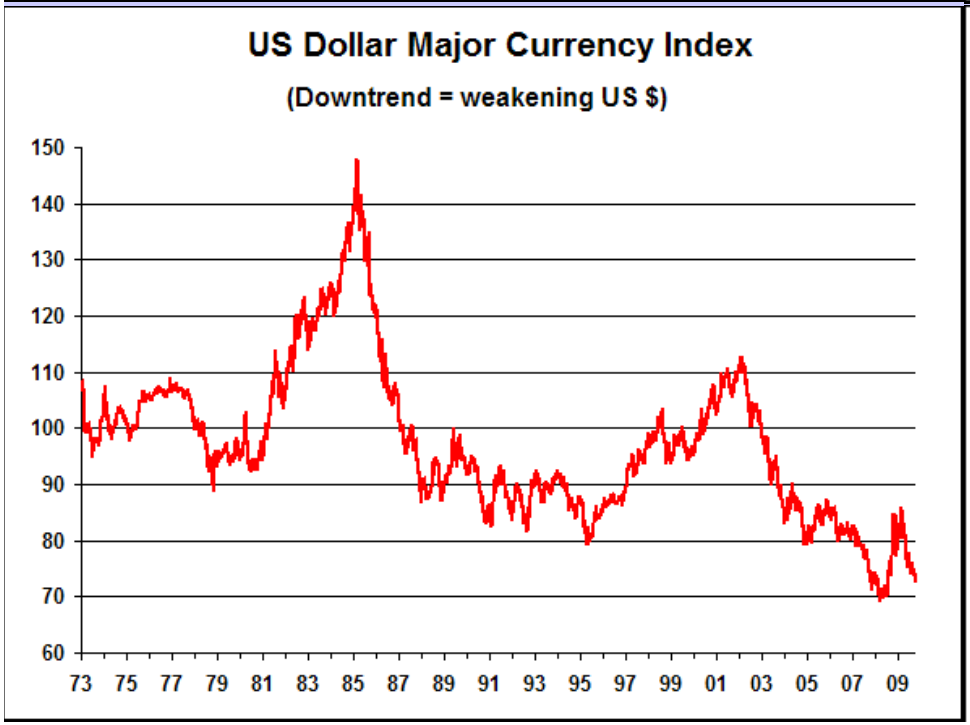

Monthly Average Prices
US $/barrel
WTI Crude
$140
$120
$100
$80
$60
$40
$20
$0
86
88
90
92
94
96
98
00
02
04
06
08

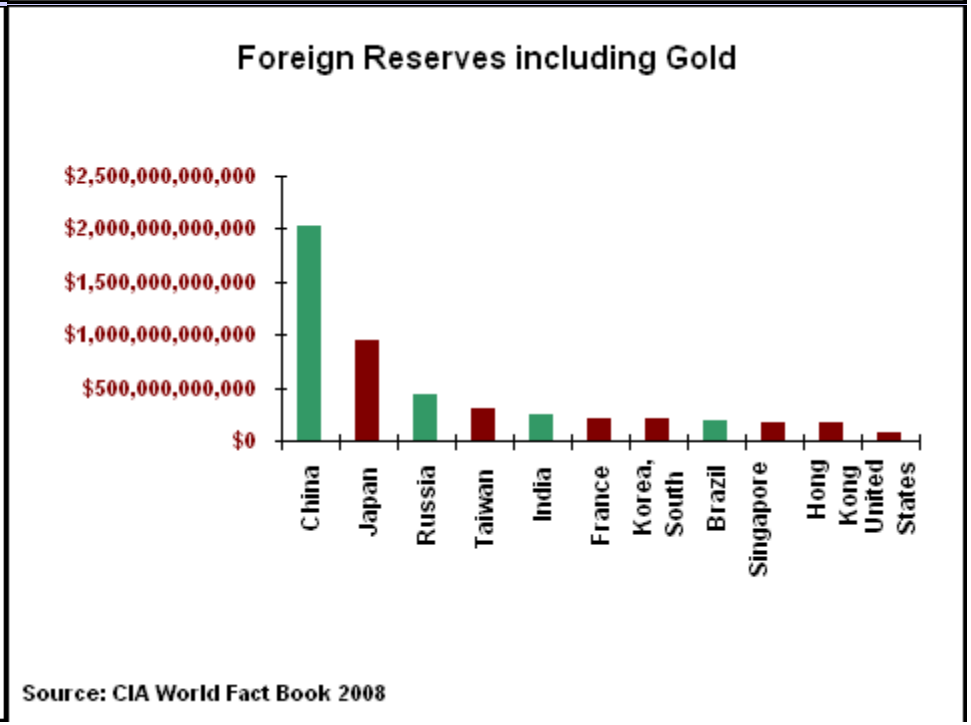

Global Crude Oil Reserves
2008 Total: 1.4 trillion bbls
$98 trillion at $70 / bbl
19%
11%
10%
8%
7%
7%
7%
6%
3%
3%
3%
2%
2%
2%
6%
Source: BP 2008
Saudi Arabia
Canada oil sands
Iran
Iraq
Kuwait
Venezuela
United Arab Emirates
Russian Federation
Libya
Kazakhstan
Nigeria
US
Canada
Qatar
China
Angola
Brazil
Algeria
Mexico
Norway
Other

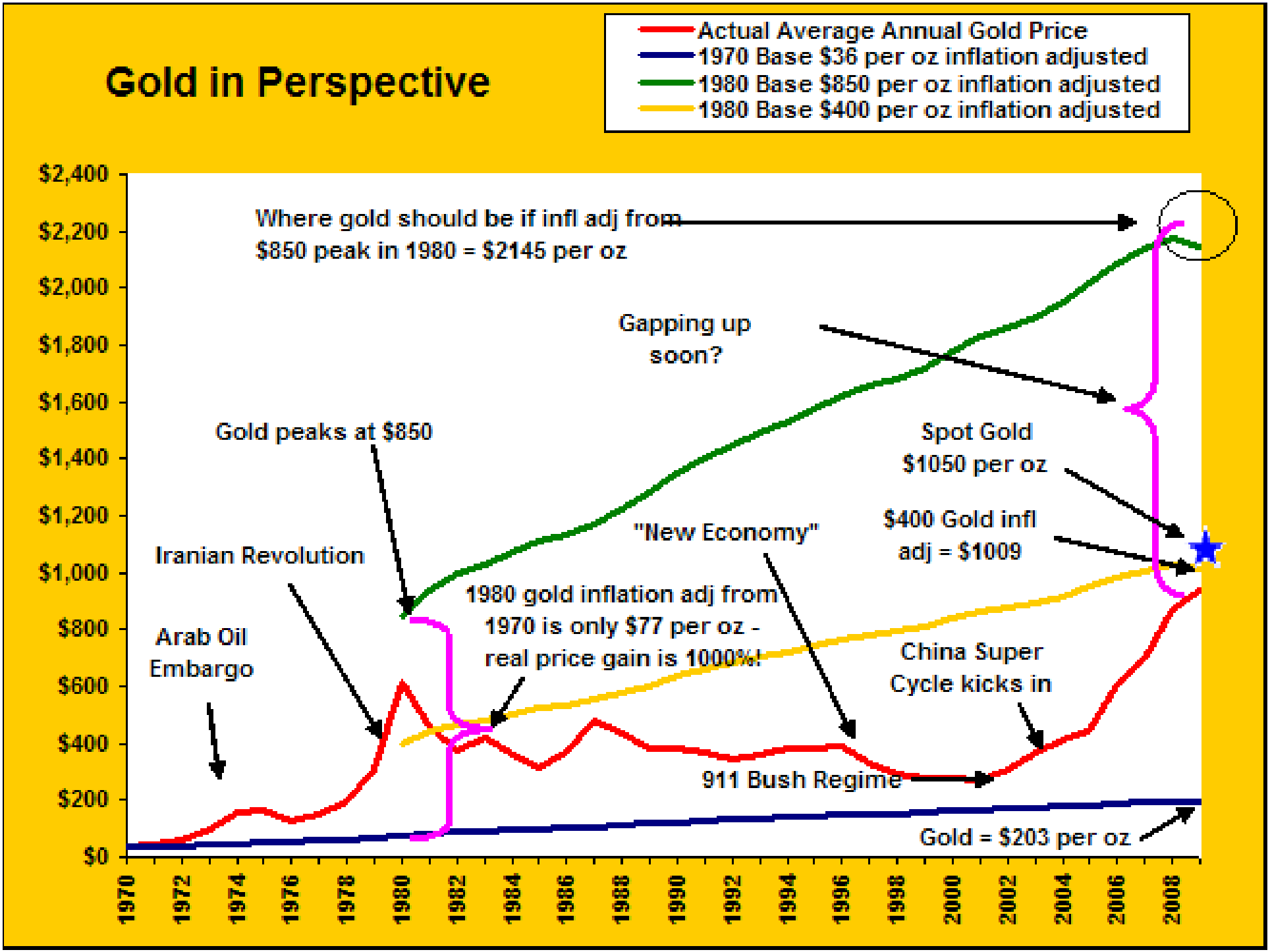

Daily Oil Consumption (85.2 million bbl global)
Daily Oil Consumption
Daily Barrels per Capita
25000000
20000000
15000000
10000000
5000000
0
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
United States
European Union
China
Japan
India
Russia
Brazil
Canada
Mexico
Korea, South
Source: CIA World Fact Book 2008


Currency Exchange Rates
Per Chinese Yuan
(Downtrend = weakening Yuan)
Euro:Yuan
CAD:Yuan
USD:Yuan
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09


Current Account Balance
$400,000,000,000
$300,000,000,000
$200,000,000,000
$100,000,000,000
$0
($100,000,000,000)
($200,000,000,000)
($300,000,000,000)
($400,000,000,000)
($500,000,000,000)
($600,000,000,000)
China
Japan
Russia
Taiwan
India
France
Korea, South
Brazil
Singapore
Hong Kong
United States
Source: CIA World Fact Book 2008


US Dollar Major Currency Index
(Downtrend = weakening US $)
150
140
130
120
110
100
90
80
70
60
73
75
77
79
81
83
85
87
89
91
93
95
97
99
01
03
05
07
09

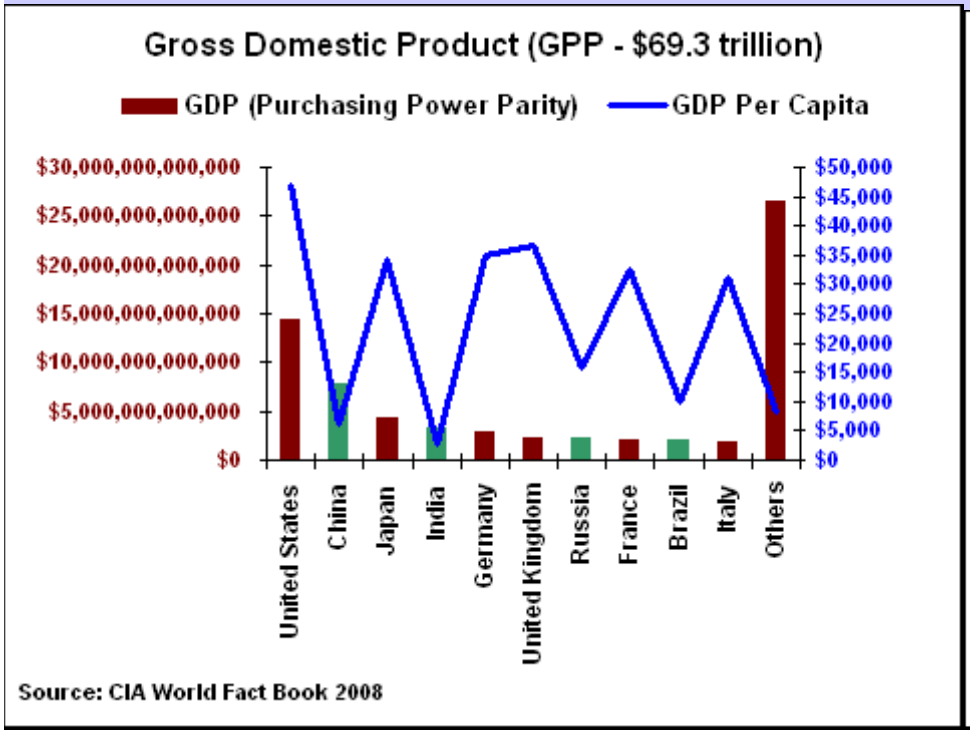

Foreign Reserves including Gold
$2,500,000,000,000
$2,000,000,000,000
$1,500,000,000,000
$1,000,000,000,000
$500,000,000,000
$0
China
Japan
Russia
Taiwan
India
France
Korea, South
Brazil
Singapore
Hong Kong
United States
Source: CIA World Fact Book 2008

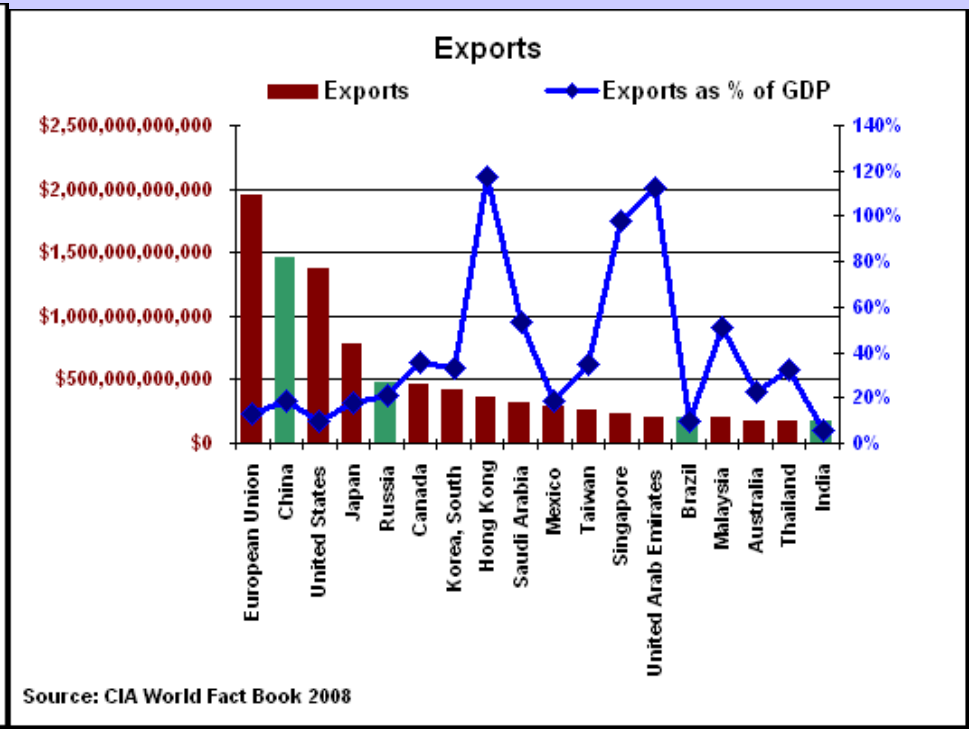

Gold in Perspective
Actual Average Annual Gold Price
1970 Base $36 per oz inflation adjusted
1980 Base $850 per oz inflation adjusted
1980 Base $400 per oz inflation adjusted
$2,400
$2,200
$2,000
$1,800
$1,600
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Where gold should be if infl adj from $850 peak in 1980 = $2145 per oz
Gapping up soon?
Gold peaks at $850
Spot Gold $1050 per oz
$400 Gold infl adj = $1009
"New Economy"
Iranian Revolution
1980 gold inflation adj from 1970 is only $77 per oz - real price gain is 1000%!
Arab Oil Embargo
China Super Cycle kicks in
911 Bush Regime
Gold = $203 per oz

In a New World Order where military power is impotent, one-way trade in IOUs is no longer an option, and the China Price remains cheapest:

What will Americans do that is of value to the rest of the world?

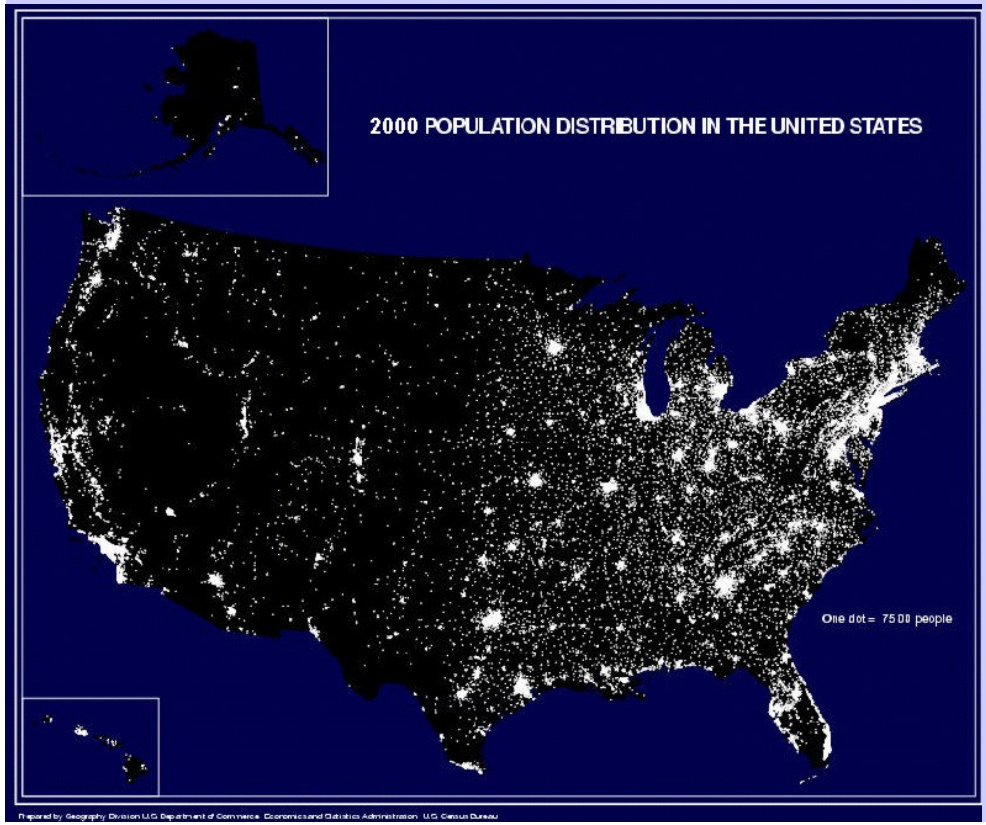
What will the Chinese do to keep their economy growing?

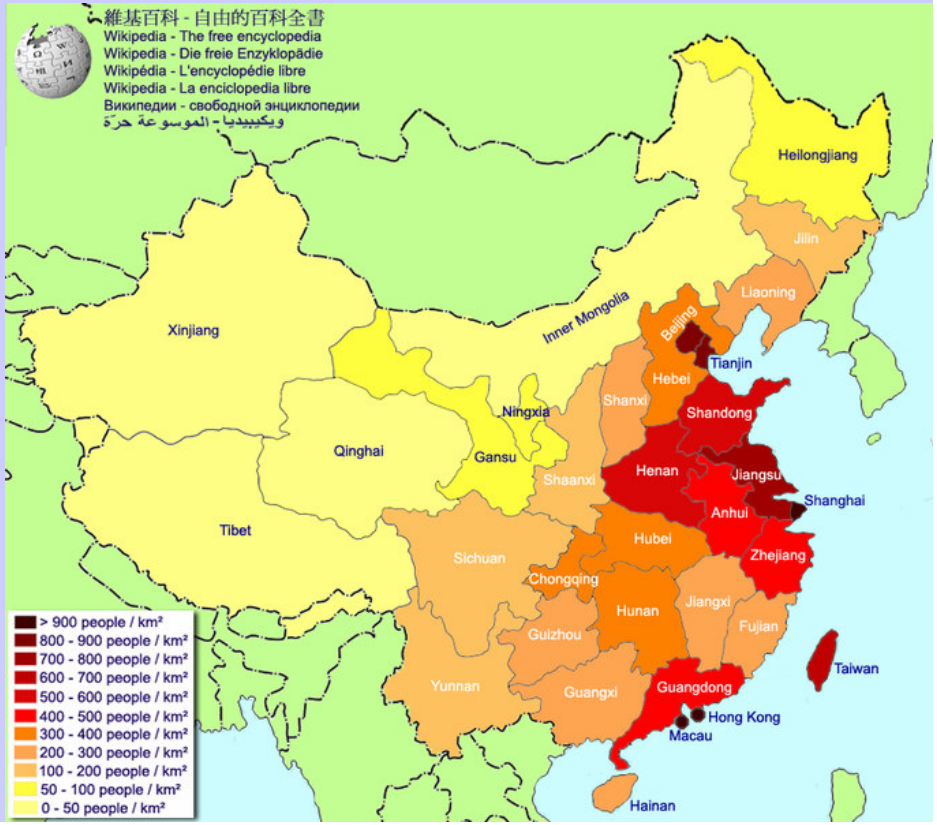




China's Solution: Borrow a chapter from American History

- Extend infrastructure into the hinterland to boost its domestic economy, reduce dependency on exports, and defuse the social tension between the coastal "haves" and the inland "have nots" – cost = $585 billion
- Develop "clean" energy and transportation infrastructure so that China can enjoy its "manifest destiny" several decades from now.
- Gradually convert its US paper assets into title to hard assets around the world.
- Develop a powerful navy to control shipping lanes in the Australasian Triangle

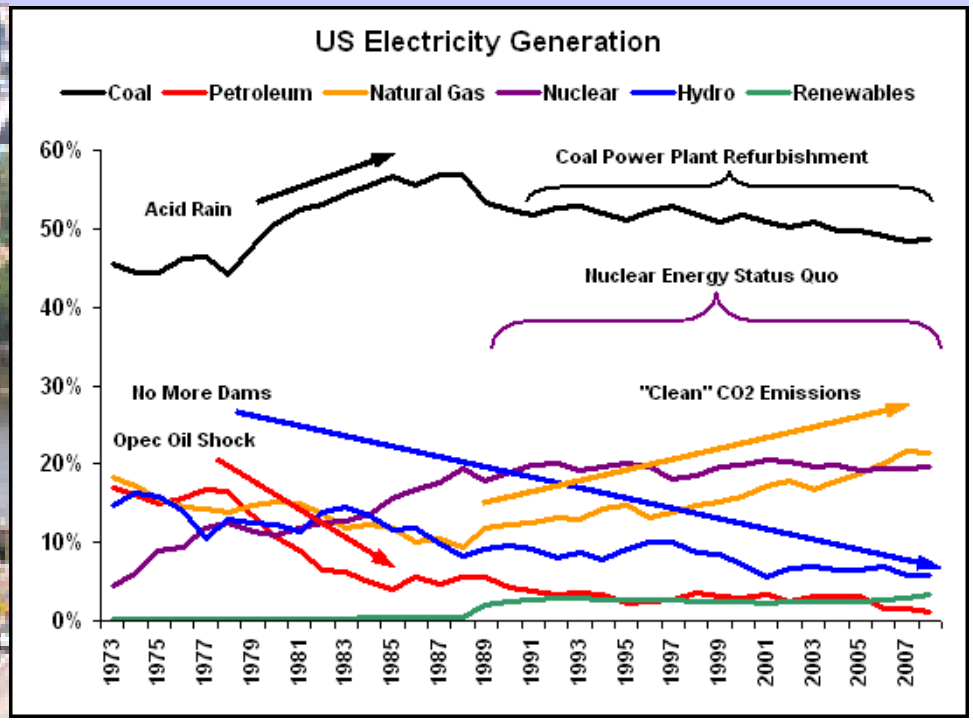




America's Solution: Transformative Infrastructure Renewal

- Footprint Consciousness as a response to the end of debt fueled consumption
- Repatriation of manufacturing through green protectionism – carbon trading
- Indebting future generations by creating legacy rather than looting for the benefit of boomers
- R&D boom in materials science and process engineering
- "Infrastructural" consumption by buying efficient, durable and lower impact goods while shunning "disposable" consumption
- Reduce oil dependency through electrification of transportation

American Society of Civil Engineers estimates $1.6 trillion needed over next 5 years just for infrastructure maintenance!



Footprint Consciousness & the Green Economy

Footprint Reduction Strategies

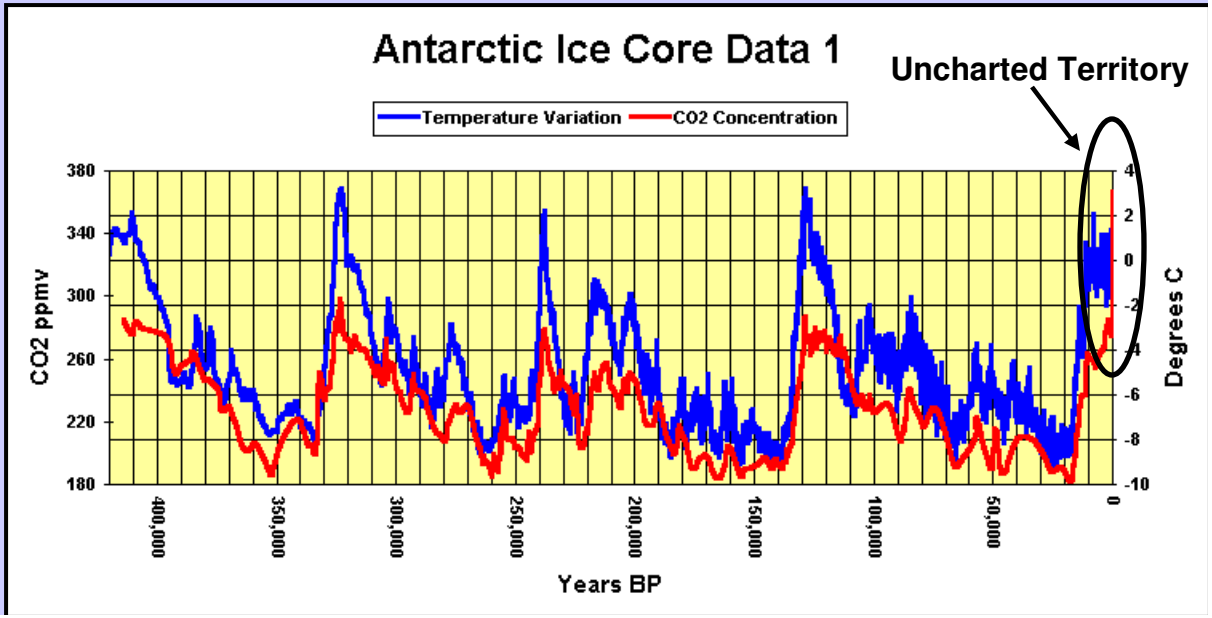
- Reduce
- Re-Use
- Repair
- Renewables
- Recycle
- Rethink
- Relearn

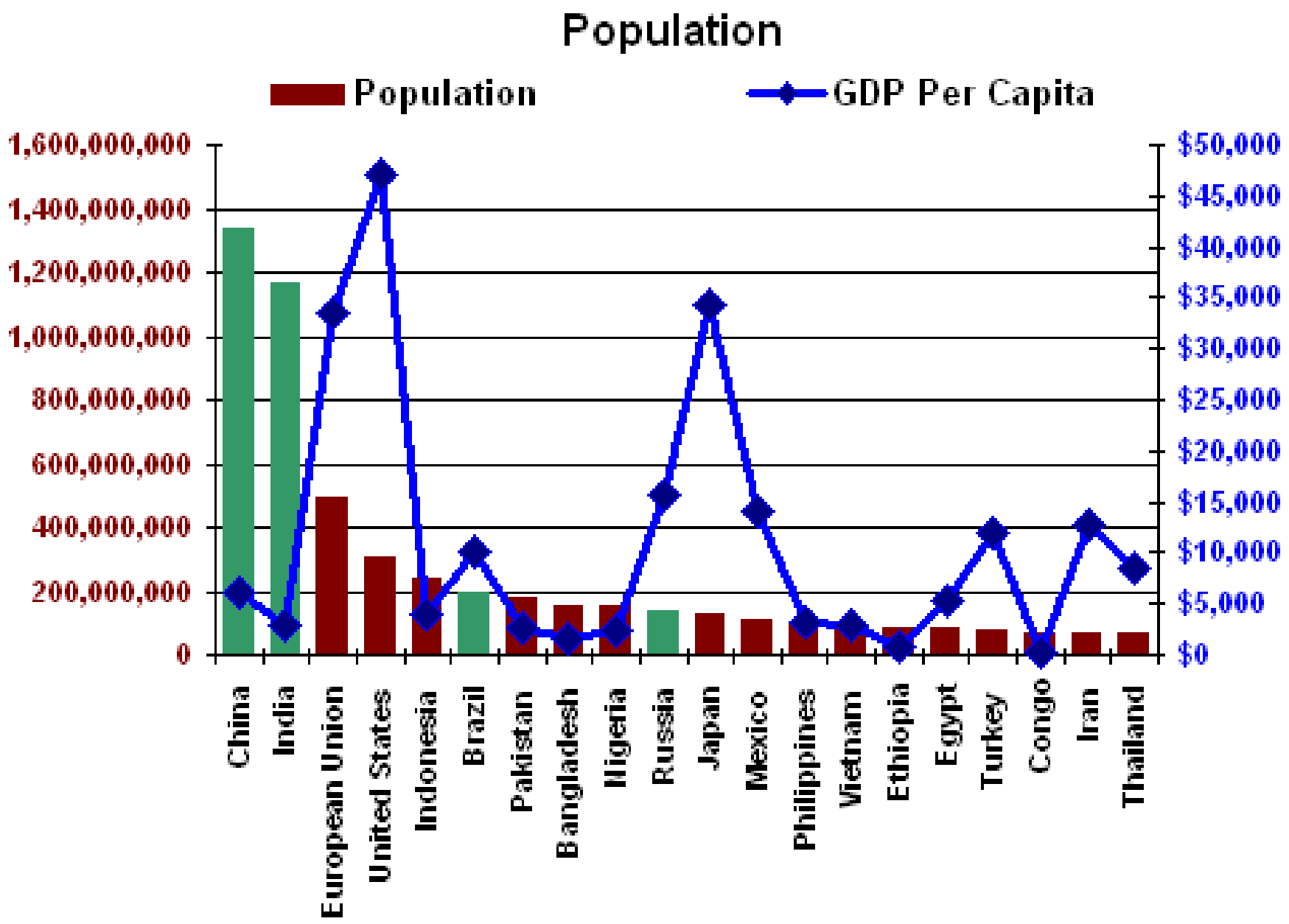
Footprint Transformation Strategies

- Quality over quantity
- Durability
- Efficiency

Changing Me into Us

- Net Giver
- Zero Summer
- Net Taker



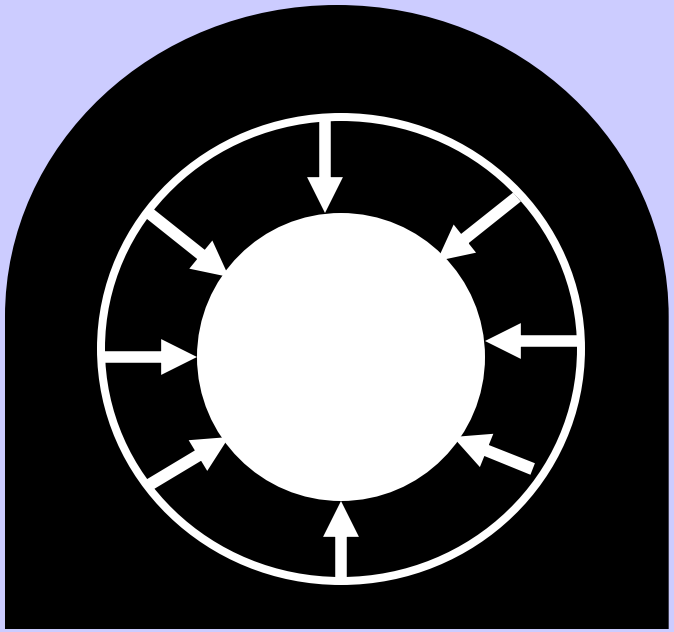


Source: CIA World Fact Book 2008

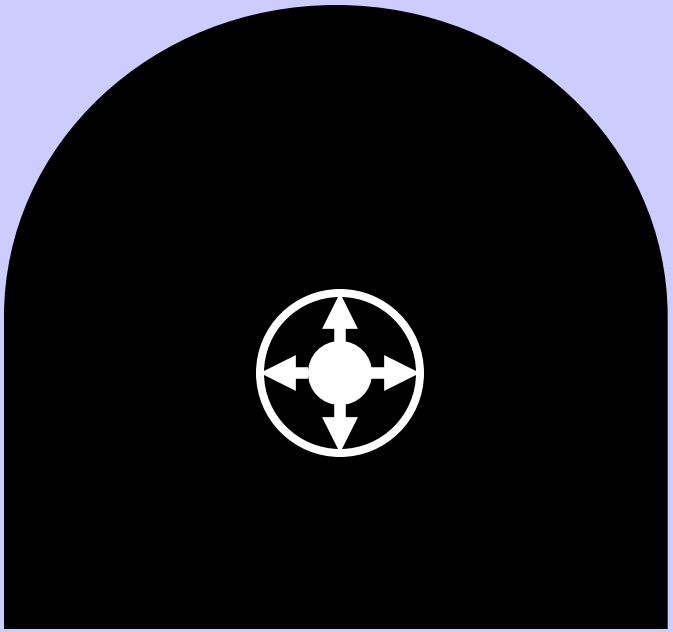
A Matter of Perspective

Is your standard of living shrinking or growing?

Is your footprint growing or shrinking?

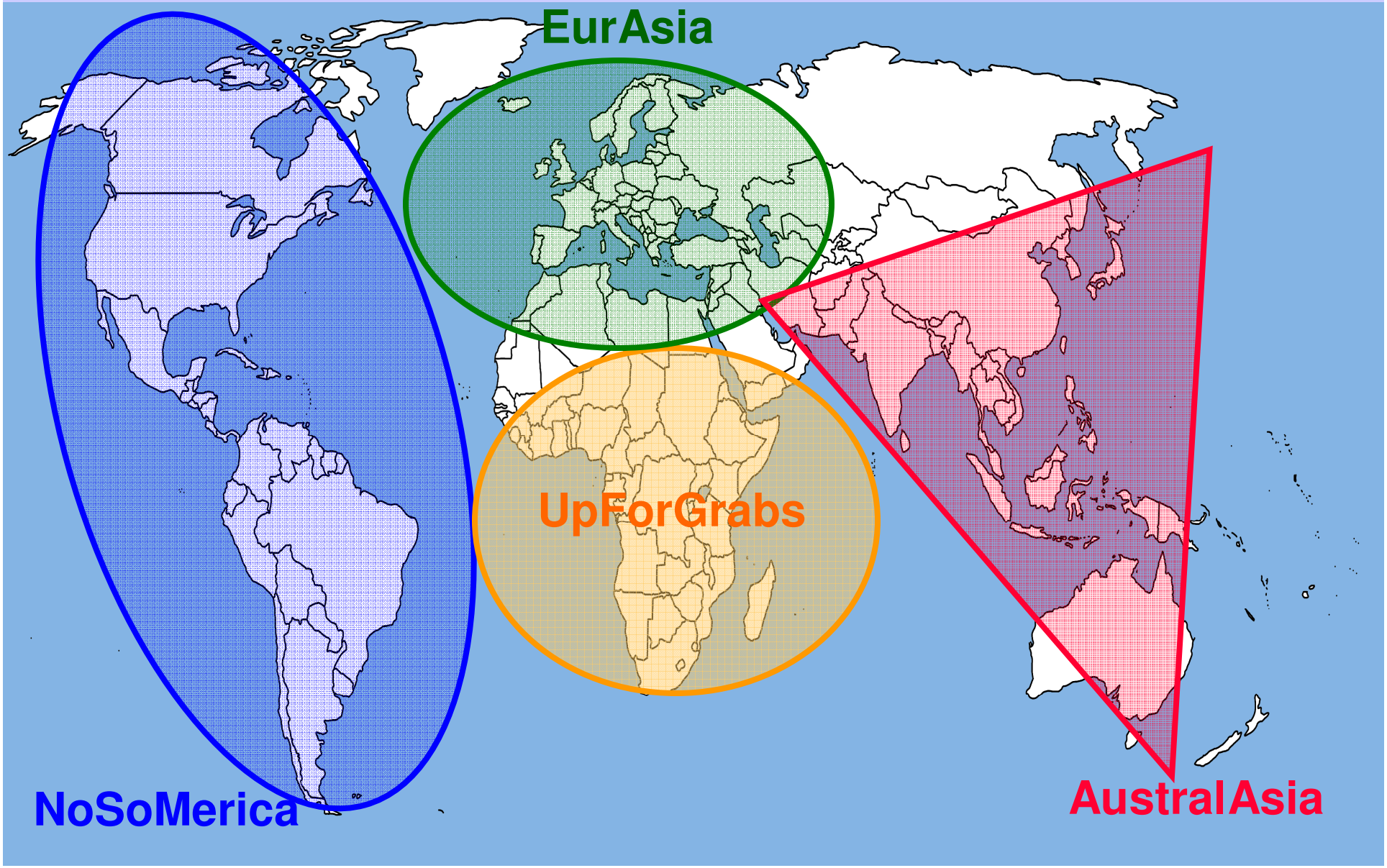


1 Billion OECD



3 Billion BRIC

Post-Globalization Economic Zone Fragmentation



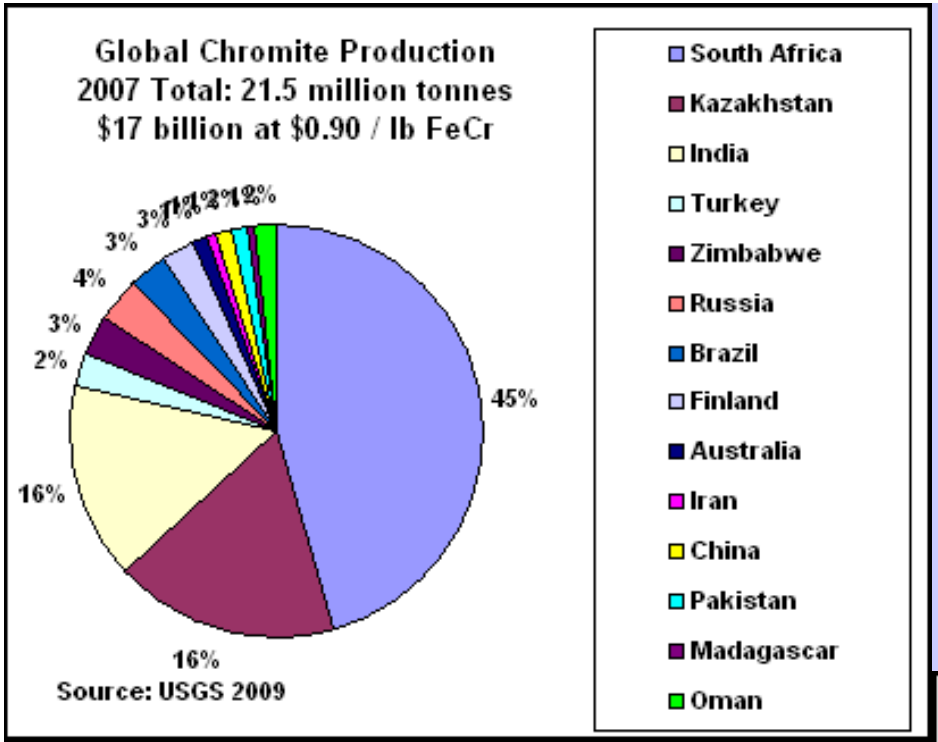
Implications of the Collapse of Globalization and the loss of US dollar reserve currency status for the global economy

- Price discovery through futures commodity markets becomes chaotic
- Cost structure in so far that self-sufficiency within a closed system has not been achieved becomes unpredictable
- Economic analysis involving discounted value of future cash flows becomes pure guesswork
- Central command decision-making seeks to shape order out of chaos
- The survivors will be those who have title to the means of production and security of supply with regard to the raw material inputs
- The global system will gravitate towards an equilibrium established through diverse and localized production

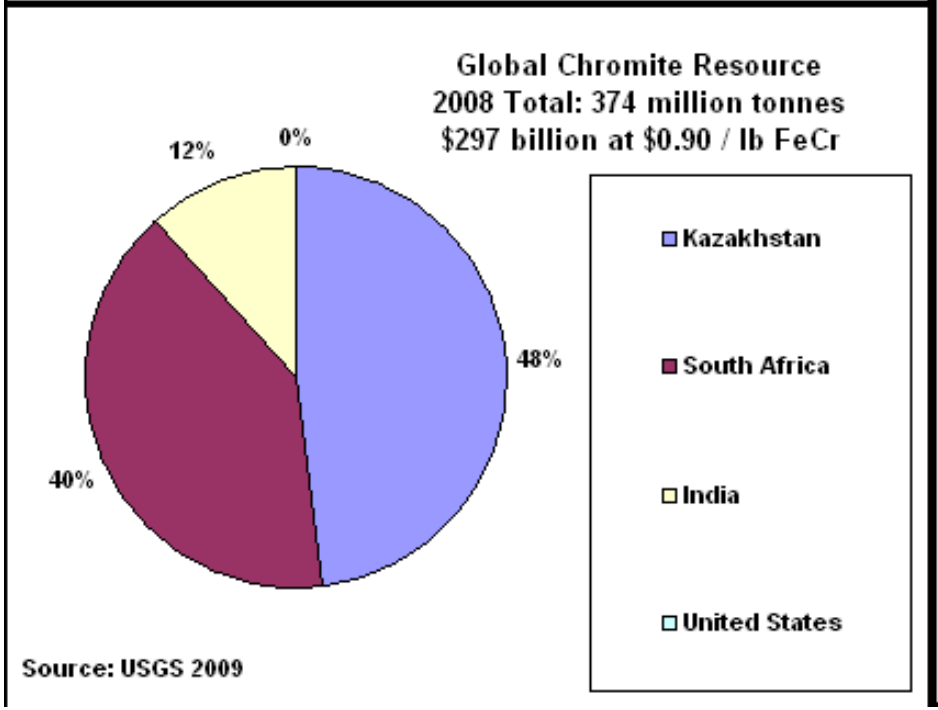
Economic vs Strategic Logic

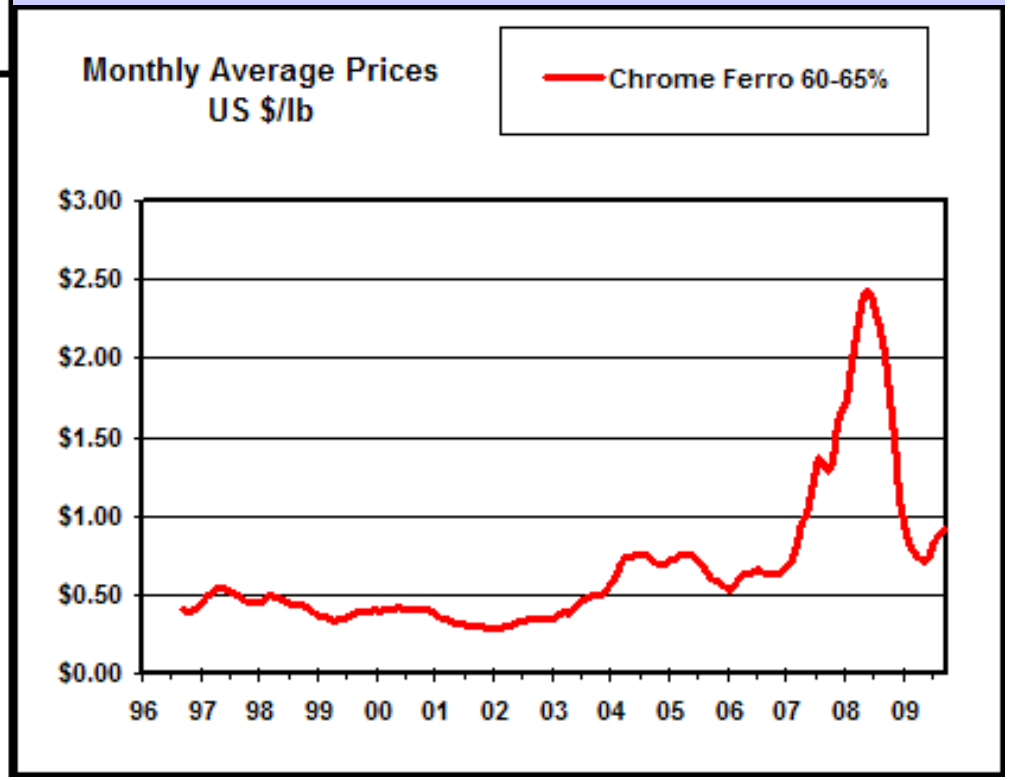
- Is it a pure commodity play?
- Is there a security of supply problem in terms of limited geographical sources?
- Is the metal a critical but incremental input to downstream products with a substantially larger value?
- Could an unexpected supply glut expand market demand by encouraging aggressive product innovation and marketing with minimal negative impact on metal price?
- Would control of secure supply with surplus potential give a fabricator a competitive advantage in downstream products?
- If so, what strategic premium might such a project command?

If strategic logic can come into play, add a strategic premium to the net present value of the project.

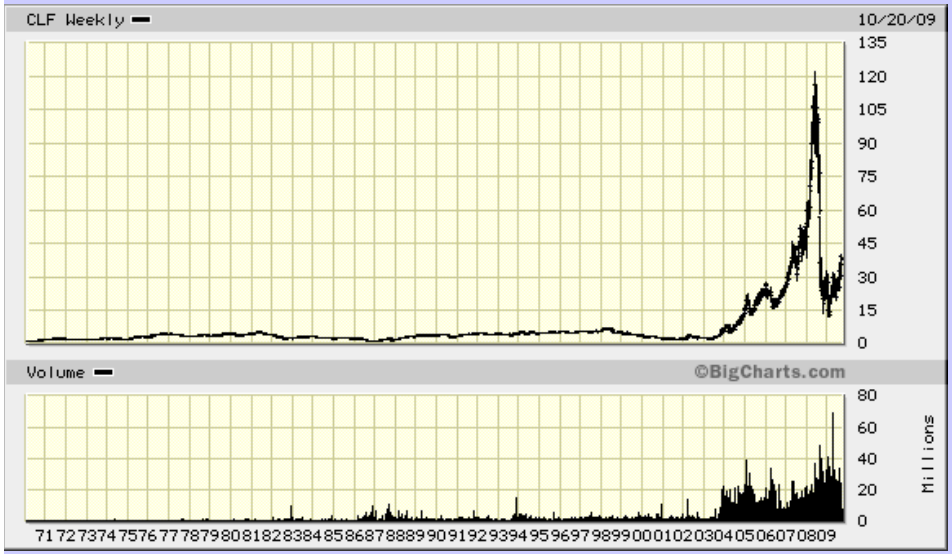


- Global reserve base "sufficient to meet conceivable demand for centuries" (USGS)
- China lacks chromite resource
- US has 54% import reliance
- No substitute for chromium in stainless steel production
- South Africa pushing to restrict chromite ore export, dominant producer of ferro chrome
- Kazakhstan unreliable supplier





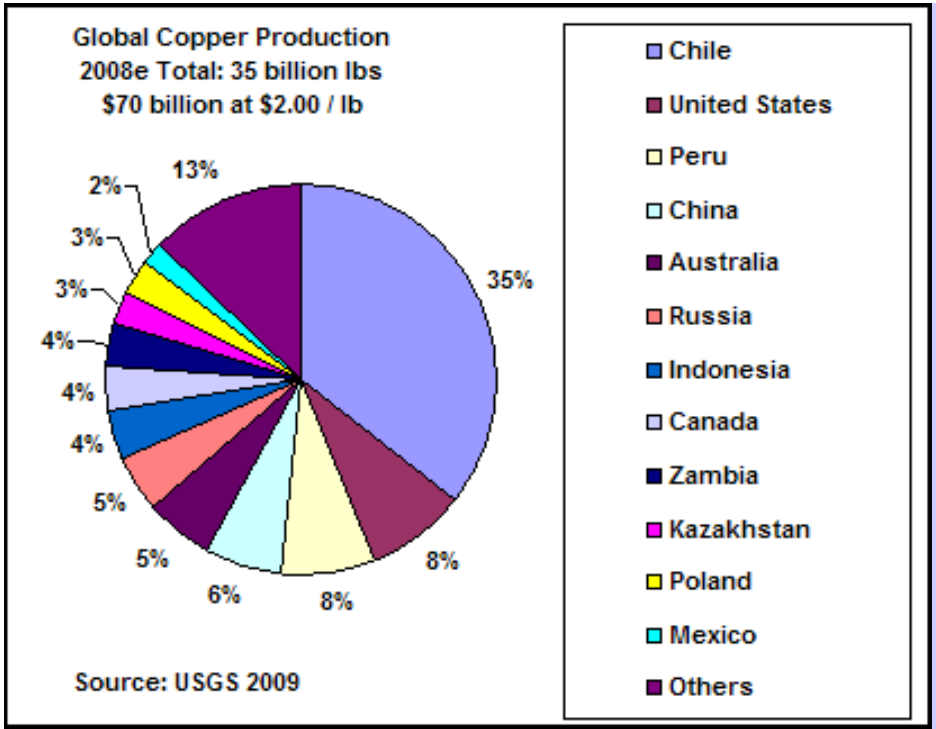
Cliffs Natural Resources Inc

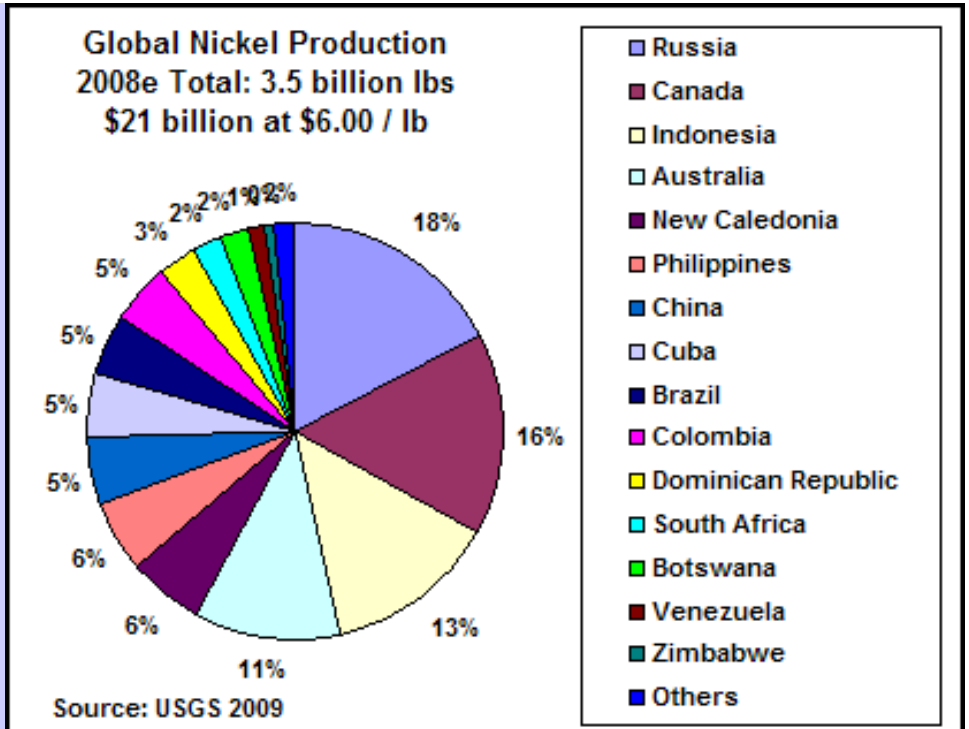


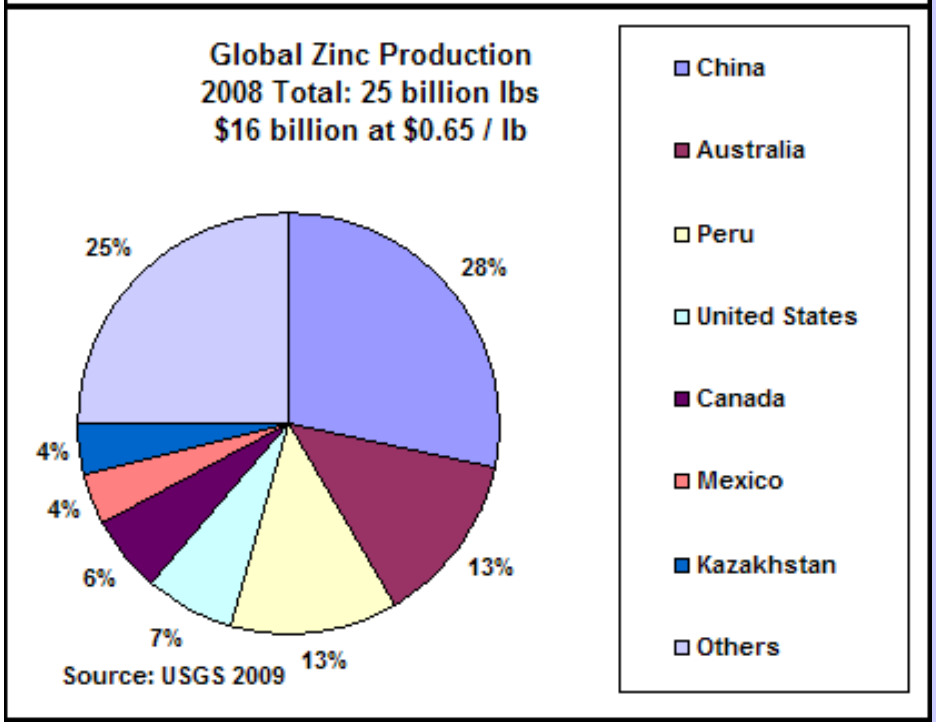
- NYSE listed producer of iron ore pellets and coking coal
- 2008 revenues of $3.6 billion
- Significant NA operations
- Supplies US steelmakers
- Market capitalization of $5 billion
- Invested $5 million in Freewest to acquire 7% equity stake

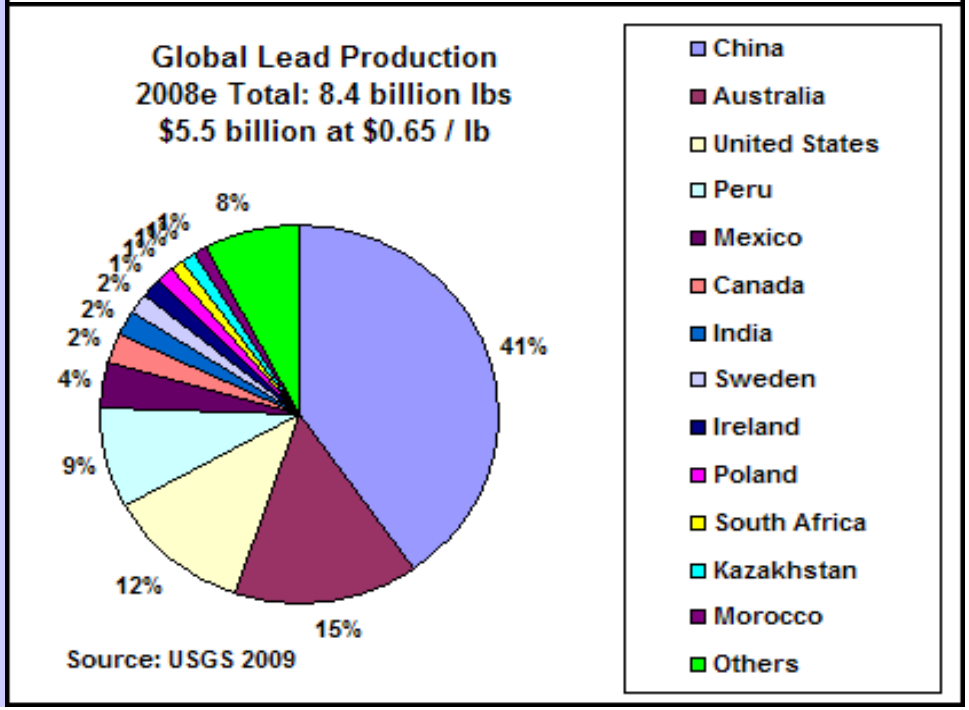
Freewest Resources Canada Inc

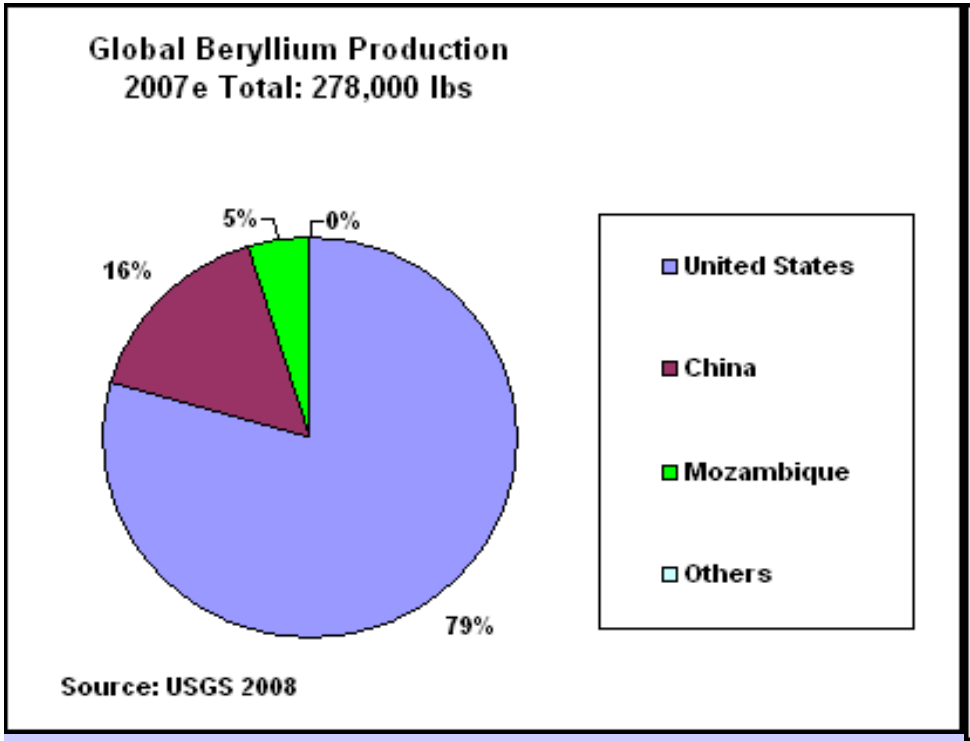
- TSXV listed resource exploration junior
- Zero revenues and no prospect of such
- Marjet cap of $122 million
- Owns 100% of Black Thor chromite discovery and 40% of Big Daddy in northern Ontario
- 100 million tonne open-pittable footprint, grade range 25%-45%, below South African standard
- Estimated $1.5 billion capital cost
- Subject of hostile paper bid by other junior

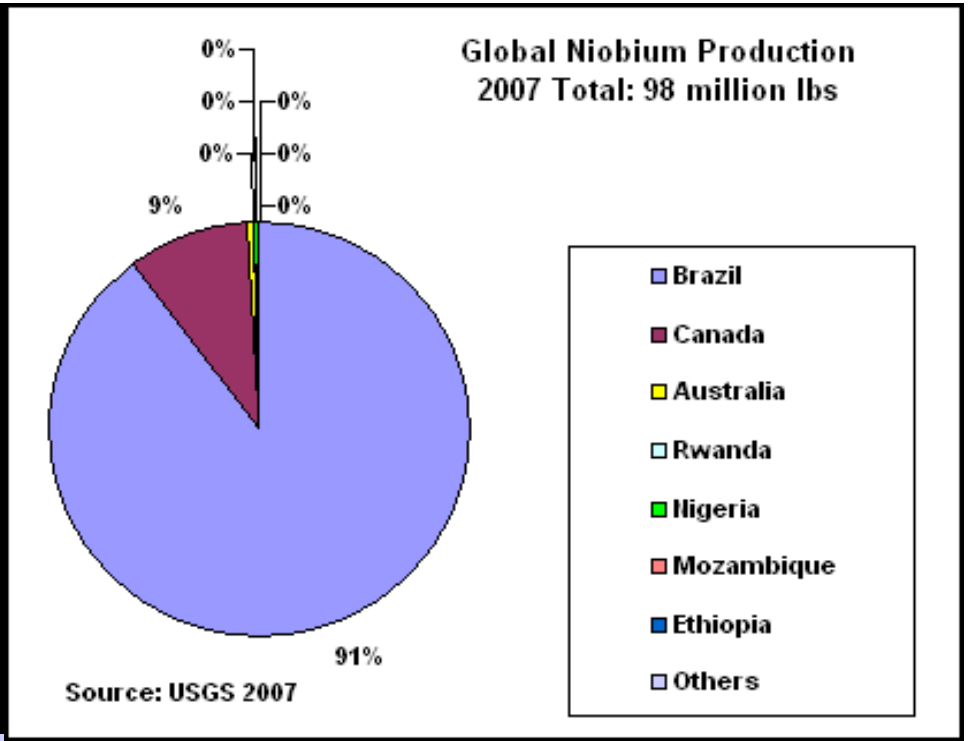

Global Copper Production
2008e Total: 35 billion lbs
$70 billion at $2.00 / lb
35%
8%
8%
6%
5%
5%
4%
4%
4%
3%
3%
2%
13%
Source: USGS 2009
Chile
United States
Peru
China
Australia
Russia
Indonesia
Canada
Zambia
Kazakhstan
Poland
Mexico
Others

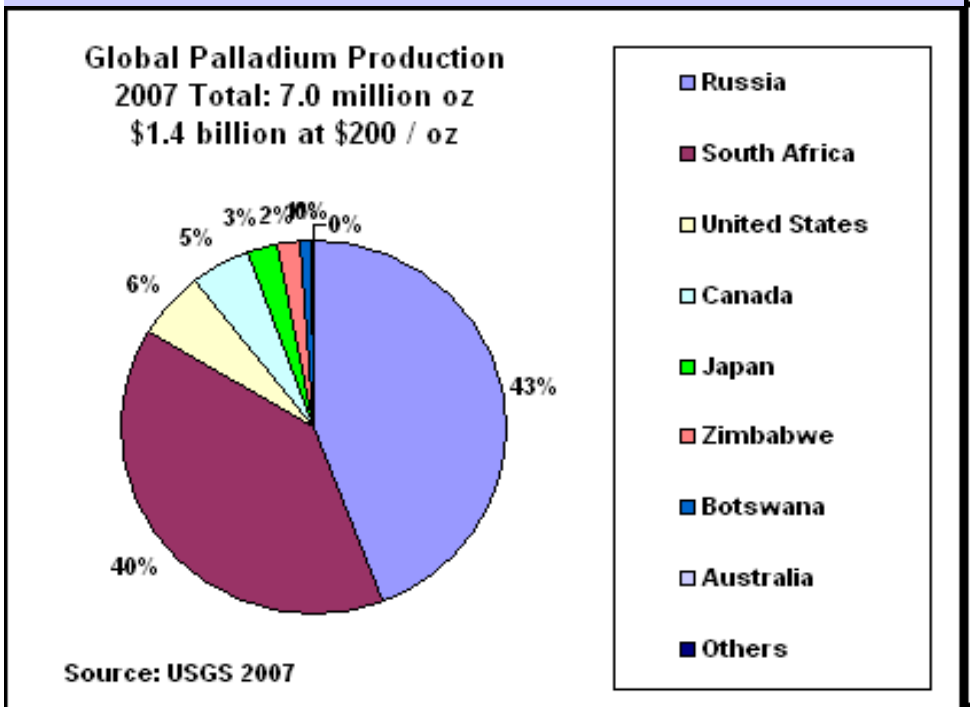

Global Nickel Production
2008e Total: 3.5 billion lbs
$21 billion at $6.00 / lb
18%
16%
13%
11%
6%
6%
5%
5%
5%
5%
3%
2%
Source: USGS 2009
Russia
Canada
Indonesia
Australia
New Caledonia
Philippines
China
Cuba
Brazil
Colombia
Dominican Republic
South Africa
Botswana
Venezuela
Zimbabwe
Others

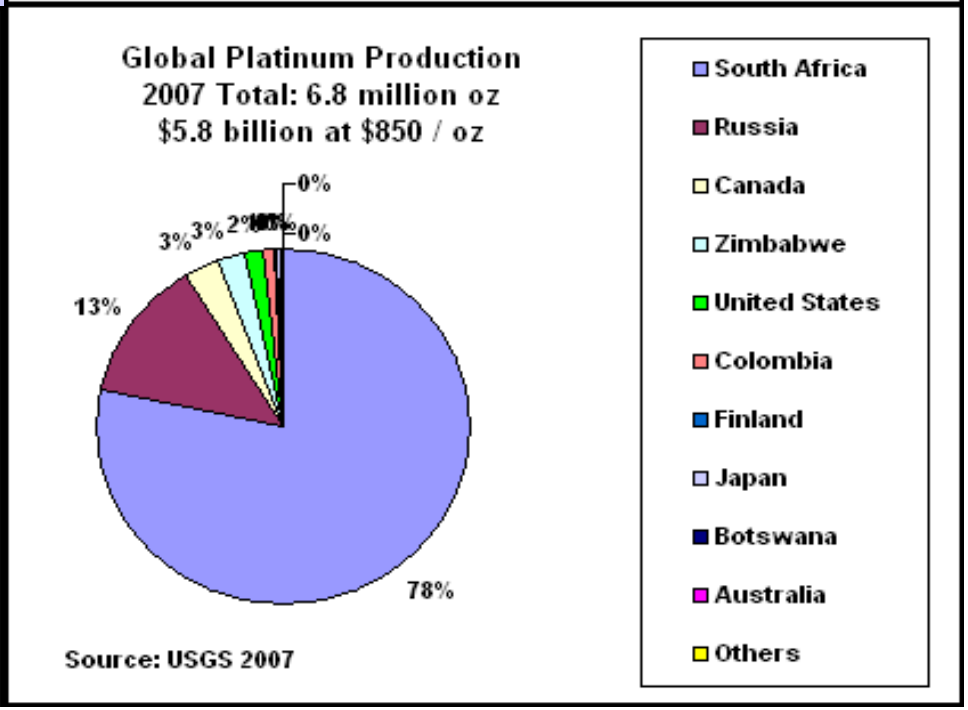

Global Zinc Production
2008 Total: 25 billion lbs
$16 billion at $0.65 / lb
28%
13%
13%
7%
6%
4%
4%
25%
Source: USGS 2009
China
Australia
Peru
United States
Canada
Mexico
Kazakhstan
Others

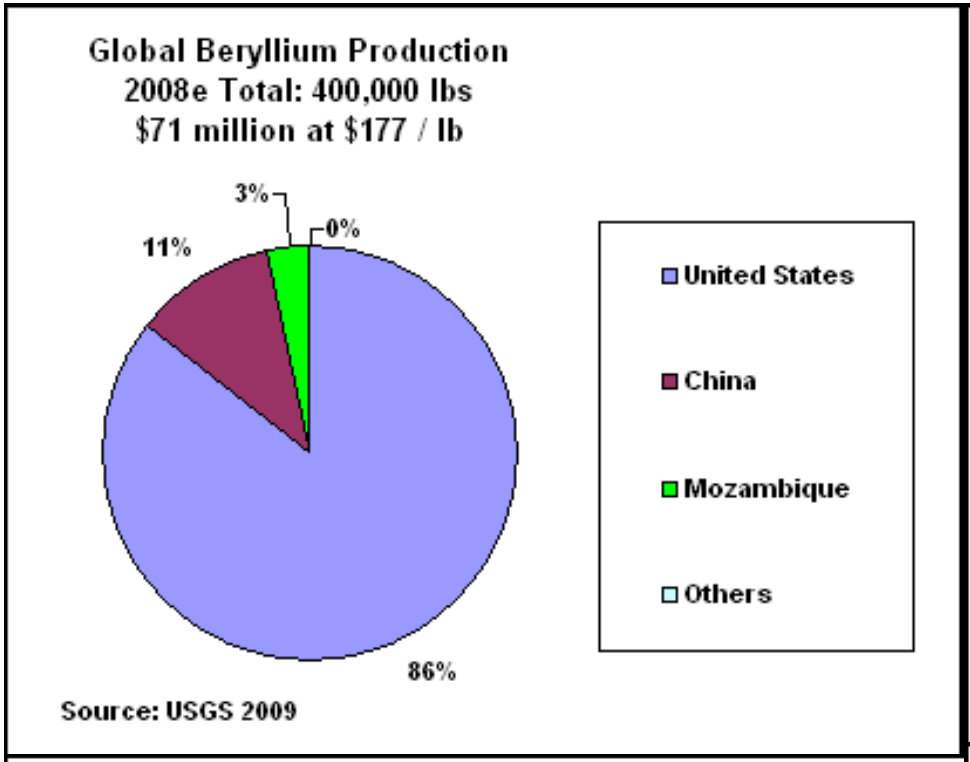

Global Lead Production
2008e Total: 8.4 billion lbs
$5.5 billion at $0.65 / lb
41%
15%
12%
9%
4%
2%
2%
2%
1%
8%
Source: USGS 2009
China
Australia
United States
Peru
Mexico
Canada
India
Sweden
Ireland
Poland
South Africa
Kazakhstan
Morocco
Others

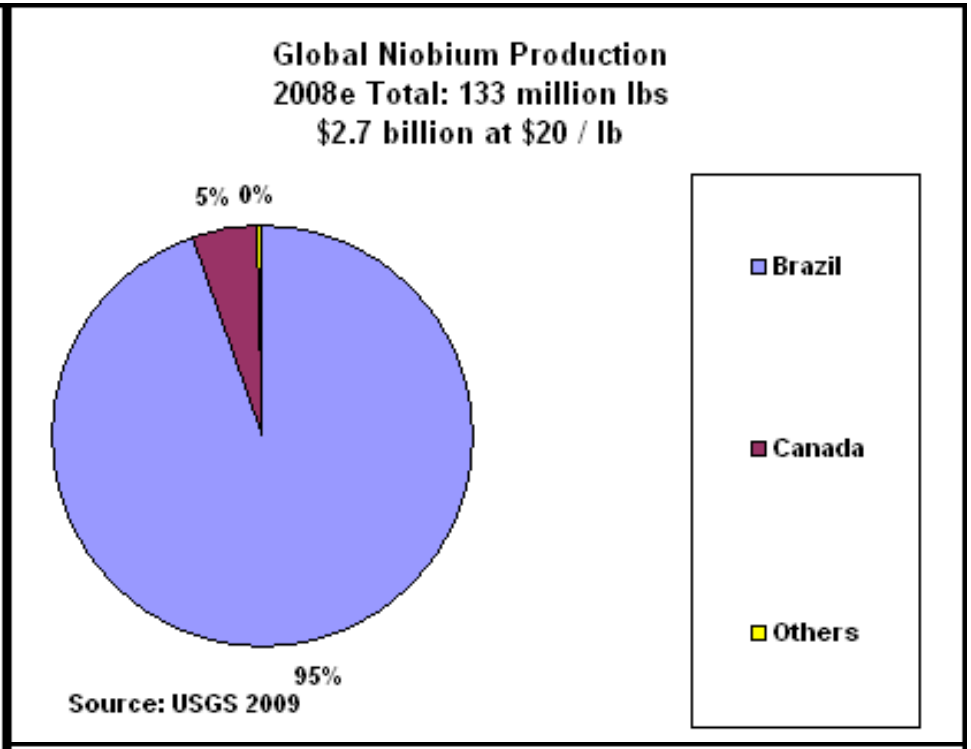

Global Beryllium Production
2007e Total: 278,000 lbs
5%
0%
16%
79%
United States
China
Mozambique
Others
Source: USGS 2008

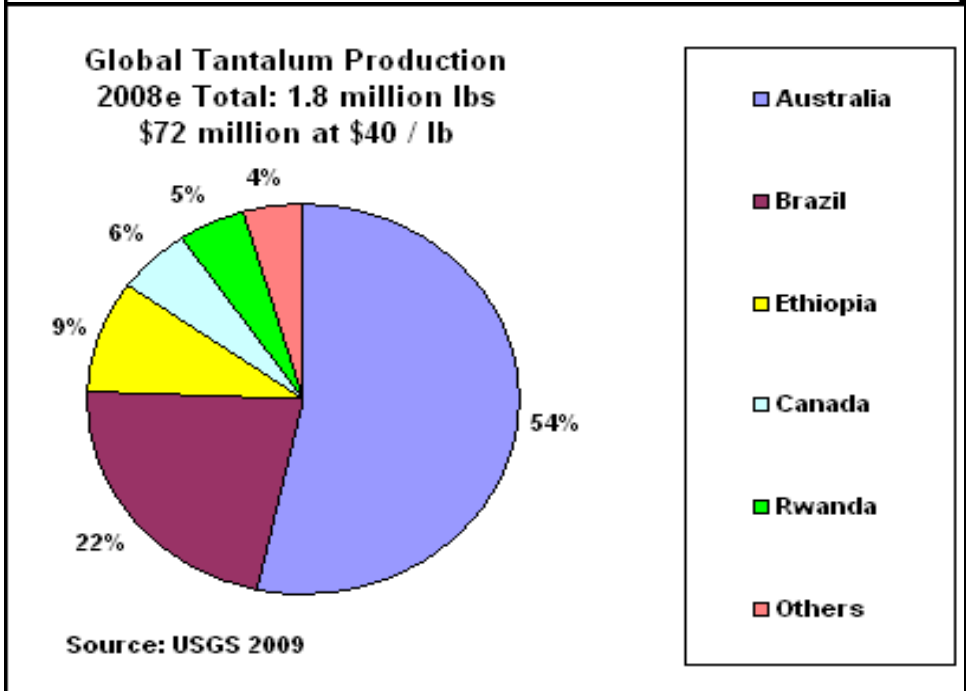

Global Niobium Production
2007 Total: 98 million lbs
0%
0%
0%
0%
0%
0%
9%
91%
Brazil
Canada
Australia
Rwanda
Nigeria
Mozambique
Ethiopia
Others
Source: USGS 2007

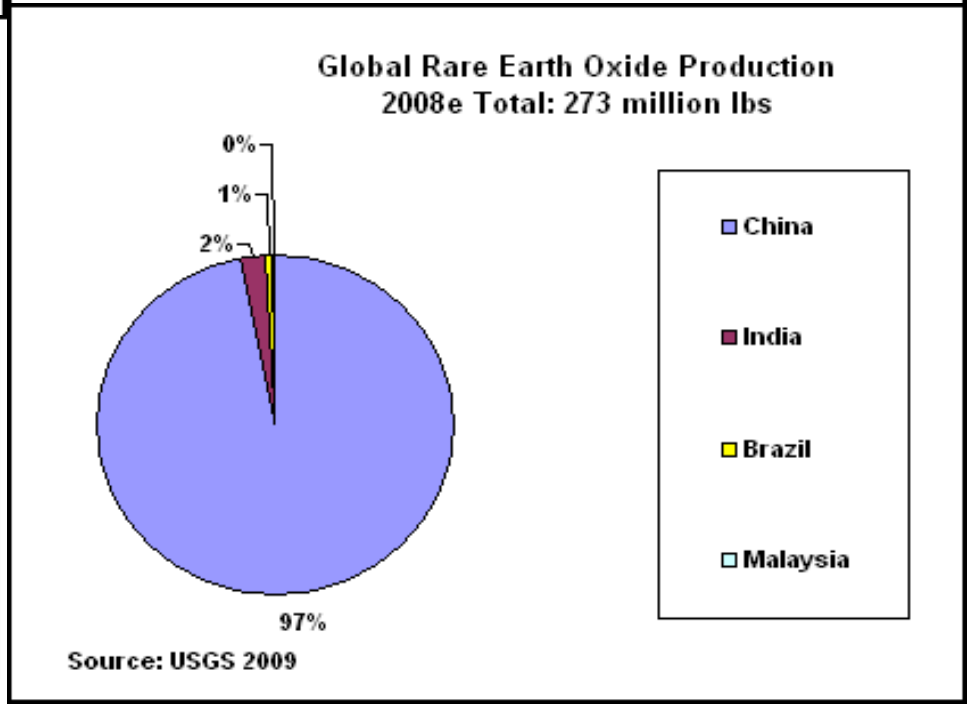

Global Palladium Production
2007 Total: 7.0 million oz
$1.4 billion at $200 / oz
3%
2%
0%
5%
6%
43%
40%
Russia
South Africa
United States
Canada
Japan
Zimbabwe
Botswana
Australia
Others
Source: USGS 2007

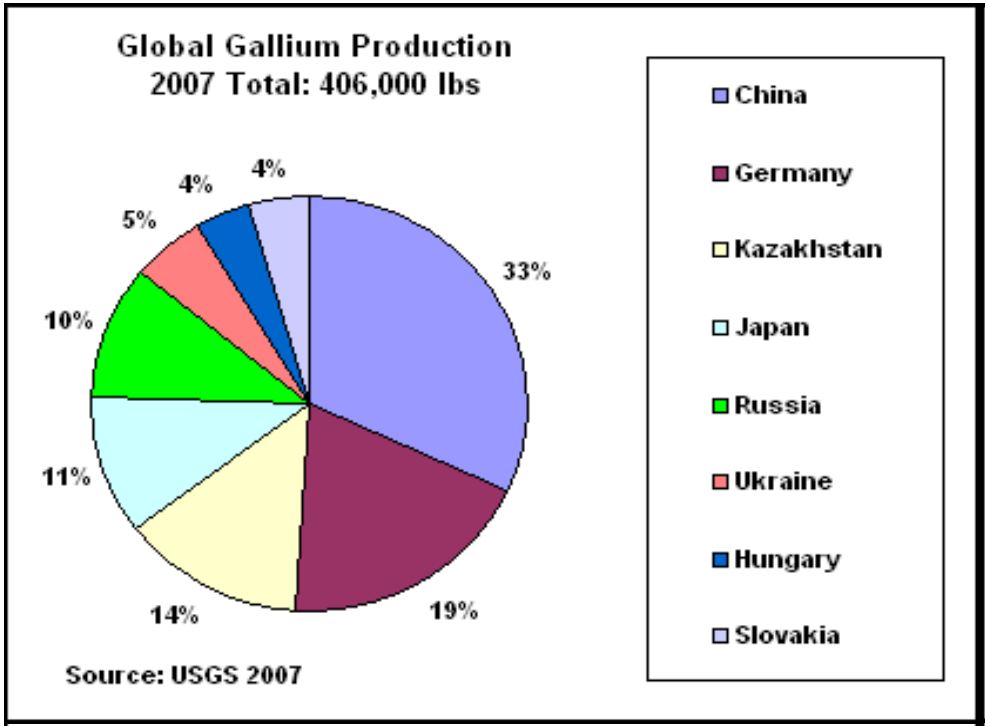

Global Platinum Production
2007 Total: 6.8 million oz
$5.8 billion at $850 / oz
0%
3%
3%
2%
0%
13%
78%
South Africa
Russia
Canada
Zimbabwe
United States
Colombia
Finland
Japan
Botswana
Australia
Others
Source: USGS 2007

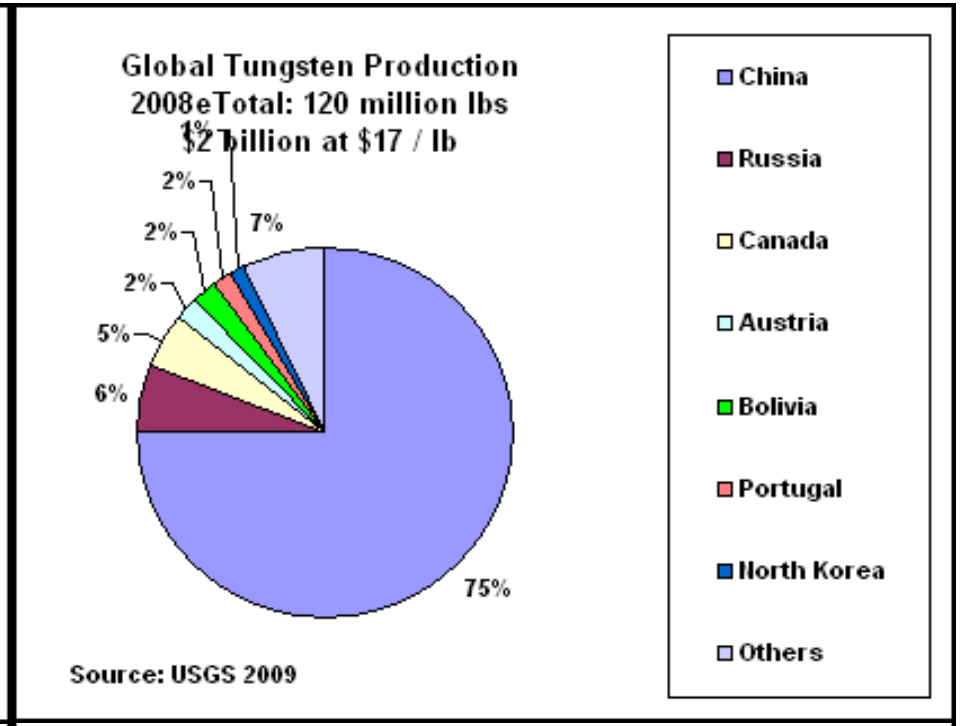

Global Beryllium Production
2008e Total: 400,000 lbs
$71 million at $177 / lb
3%
0%
11%
86%
United States
China
Mozambique
Others
Source: USGS 2009

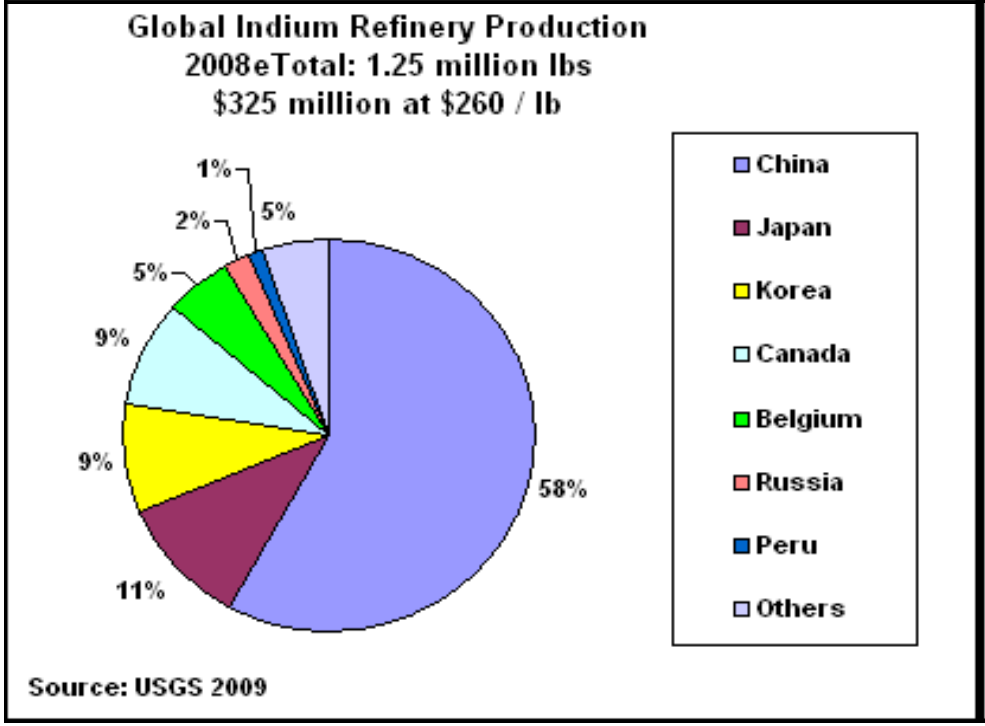

Global Niobium Production
2008e Total: 133 million lbs
$2.7 billion at $20 / lb
5%
0%
95%
Brazil
Canada
Others
Source: USGS 2009

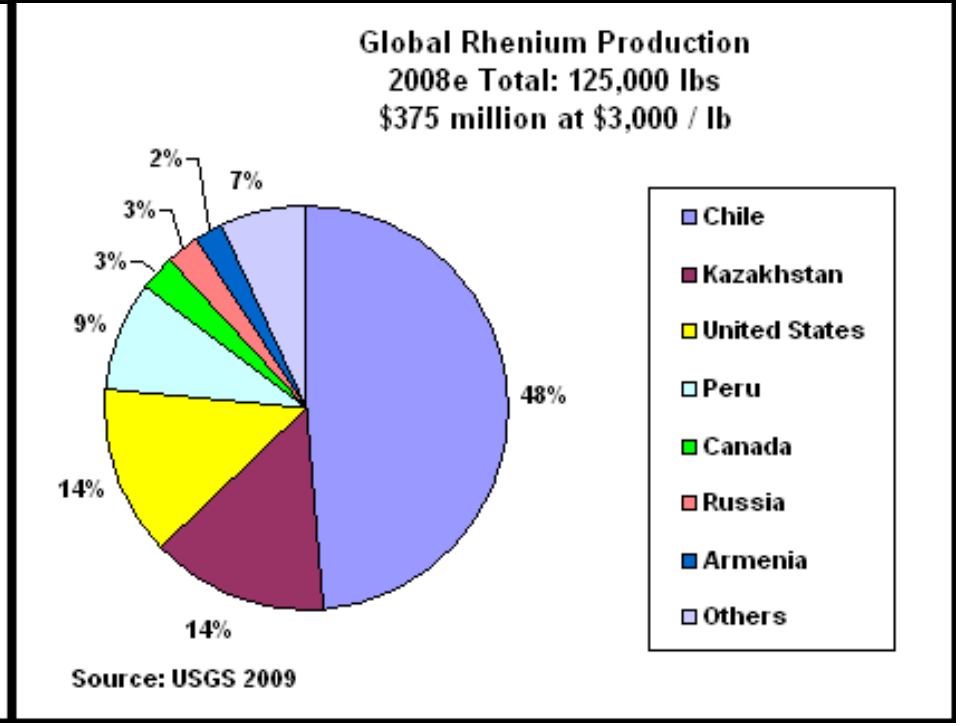

Global Tantalum Production
2008e Total: 1.8 million lbs
$72 million at $40 / lb
4%
5%
6%
9%
54%
22%
Australia
Brazil
Ethiopia
Canada
Rwanda
Others
Source: USGS 2009


Global Rare Earth Oxide Production
2008e Total: 273 million lbs
0%
1%
2%
97%
China
India
Brazil
Malaysia
Source: USGS 2009


Global Gallium Production
2007 Total: 406,000 lbs
33%
19%
14%
11%
10%
5%
4%
4%
China
Germany
Kazakhstan
Japan
Russia
Ukraine
Hungary
Slovakia
Source: USGS 2007


Global Tungsten Production
2008eTotal: 120 million lbs
$2 billion at $17 / lb
75%
6%
5%
2%
2%
2%
1%
7%
China
Russia
Canada
Austria
Bolivia
Portugal
North Korea
Others
Source: USGS 2009


Global Indium Refinery Production
2008eTotal: 1.25 million lbs
$325 million at $260 / lb
58%
11%
9%
9%
5%
2%
1%
5%
China
Japan
Korea
Canada
Belgium
Russia
Peru
Others
Source: USGS 2009


Global Rhenium Production
2008e Total: 125,000 lbs
$375 million at $3,000 / lb
48%
14%
14%
9%
3%
3%
2%
7%
Chile
Kazakhstan
United States
Peru
Canada
Russia
Armenia
Others
Source: USGS 2009

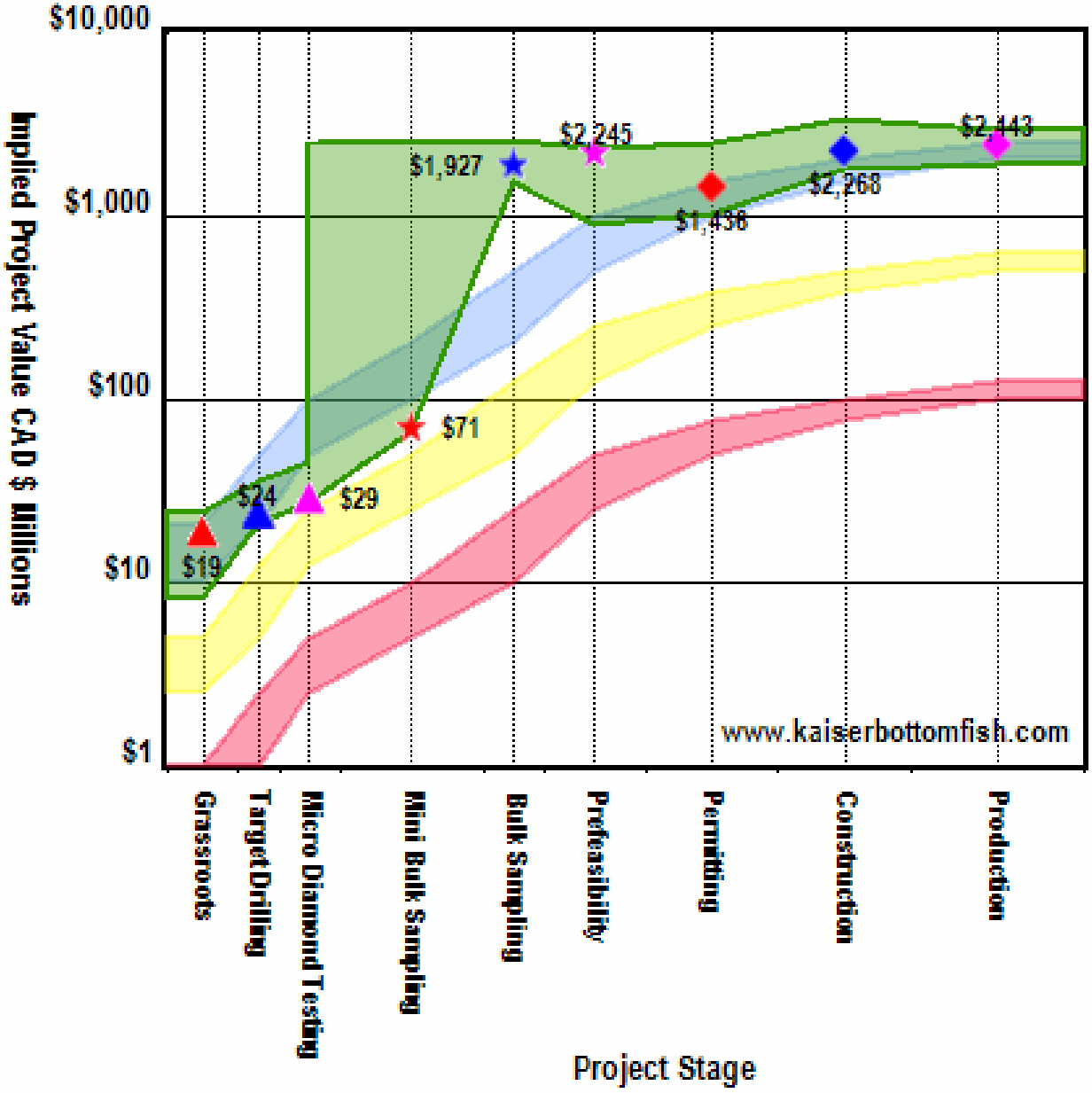
Diamond Industry Example

- Initially De Beers controlled rough diamond supply through CSO cartel
- In 1980's Ashton develops own diamond supply channel for Argyle production
- During 1990's additional supply channels that evade the CSO emerge via conflict diamonds from Angola/Sierra Leone, Russian destocking after Soviet Union collapse, and discovery of major diamond deposits in Canada: De Beers abandons cartel
- Kimberley Process emerges to neutralize "blood diamond" controversy and pre-empt synthetic diamonds by requiring source certification
- Diamond Supply Chain: $8 billion for rough, $12 billion for polished, $60 billion at retail counter – seizing the markup from polished to retail becomes the target for producers and retailers
- Downstream retailers such as Tiffany swim upstream and do offtake deals to secure certain diamond supply in exchange for major equity investments in Aber (Diavik) and Tahera (Jericho), but strategy fails due to special circumstances
- BHP Billiton develops own downstream marketing channel and buys out minority partner Dia Met for $2.2 billion implied value
- Rio Tinto buys out Ashton to obtain Argyle marketing channel for Diavik production
- Aber buys out Harry Winston luxury retailer but this strategy has not yet paid off for special reasons
- Mountain Province renegotiates joint venture with De Beers on Gahcho Kue to secure diamond marketing rights and thus packages itself up for buyout by upstream or downstream members of supply chain
- De Beers is the only major producer not to wander downstream, but has settled US anti-trust and civil lawsuits related to its old industrial diamond conspiracy with GE, and has opened De Beers luxury retail outlets, so perhaps it is just a matter of time, especially when the major diamond mines deplete in 10 years.

Because the diamond is an end in itself, it makes more sense for producers to wander downstream than retailers to wander upstream.

Ekati Exploration Cycle (Time Bound)

Thursday, February 26, 2009



Dream Target Channels

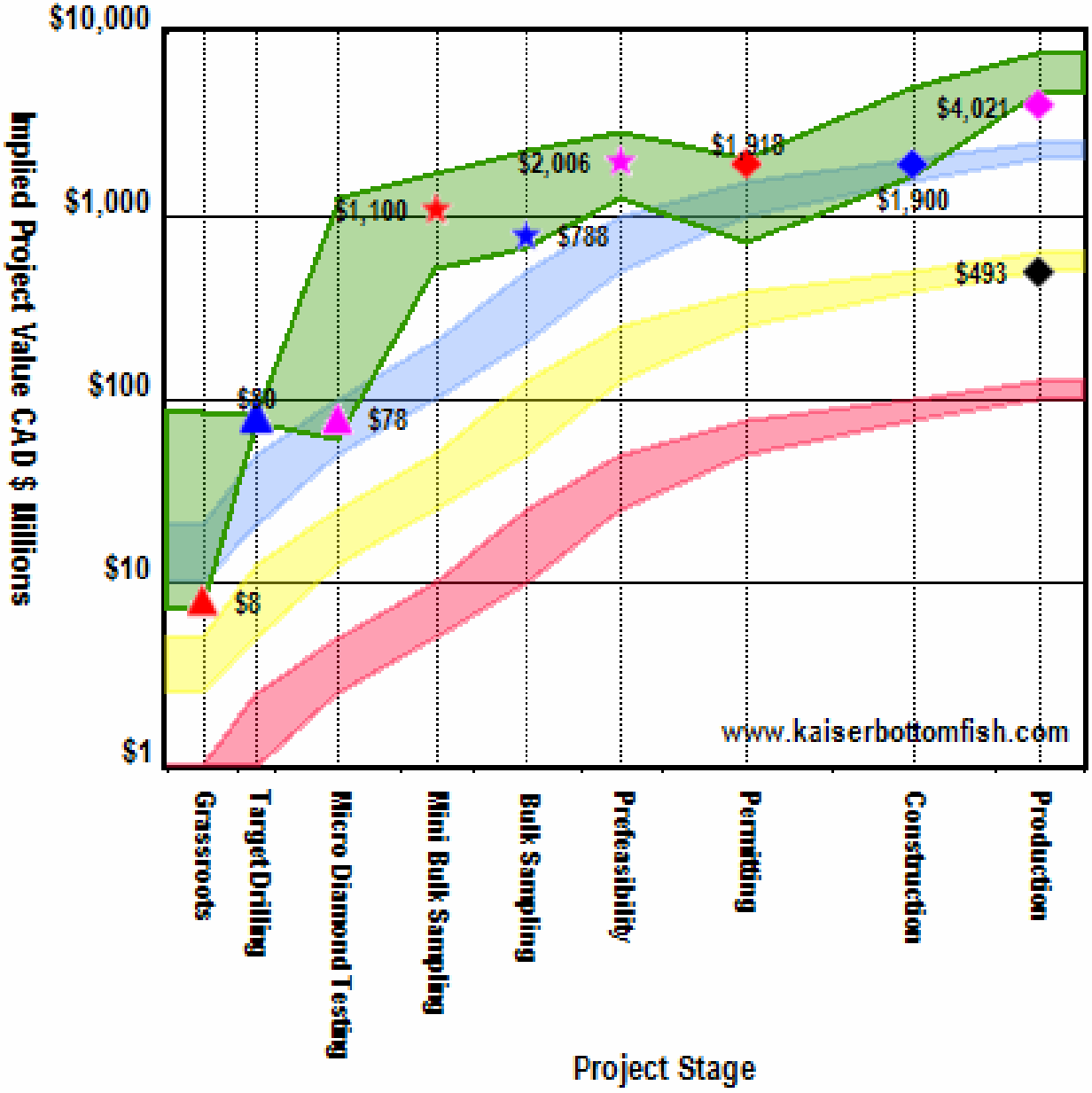
- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target
- Diamet Historic IPV Range

IPV at Start of Stage

- 1 - Grassroots
- 2 - Target Drilling
- 3 - Micro Diamond Testing
- 4 - Mini Bulk Sampling
- 5 - Bulk Sampling
- 6 - Prefeasibility
- 7 - Permitting & Feasibility
- 8 - Construction
- 9 - Production

Diavik Exploration Cycle (Time Bound)

Thursday, February 26, 2009



Dream Target Channels

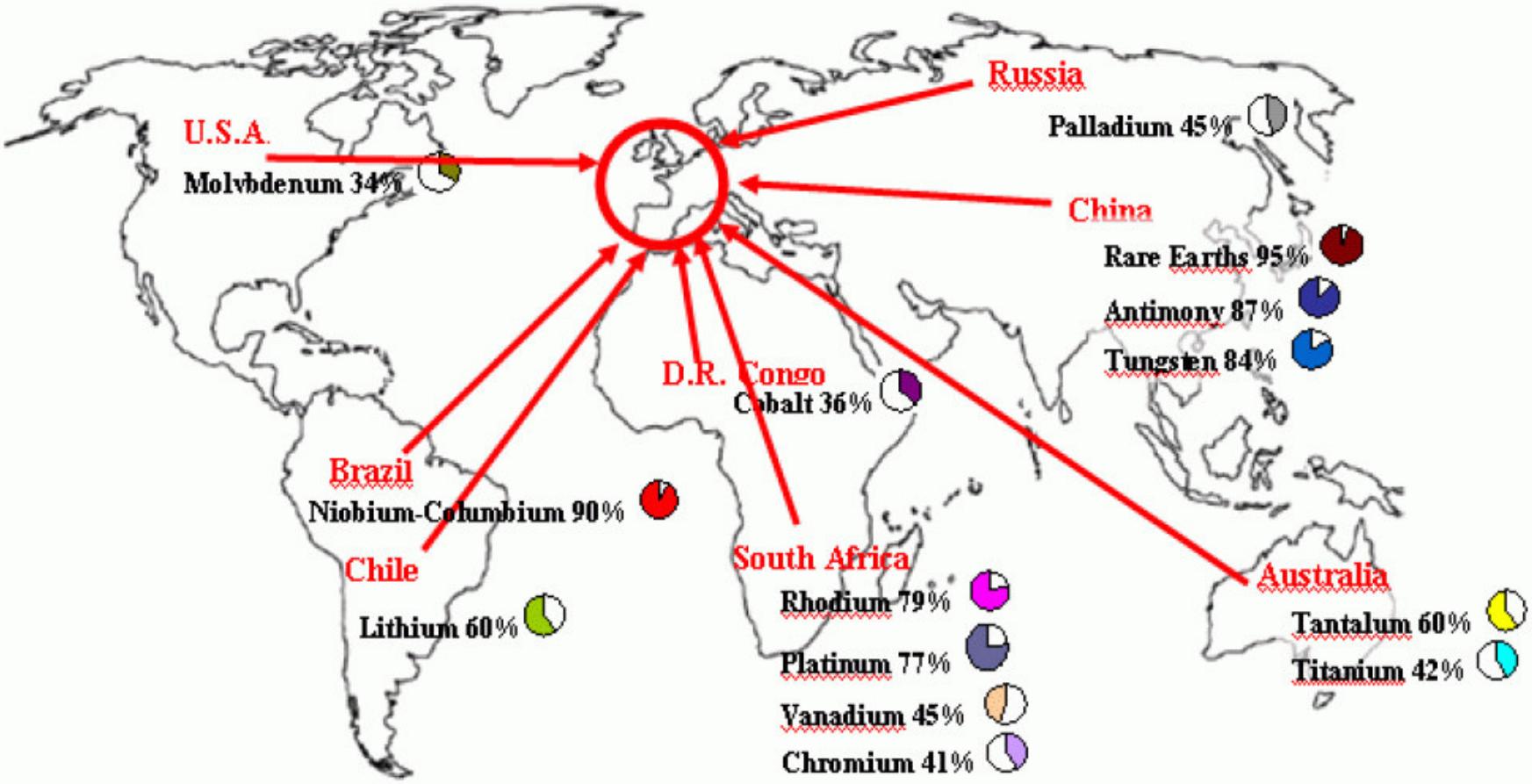
- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target
- Diavik Historic IPV Range

IPV at Start of Stage

- 1 - Grassroots
- 2 - Target Drilling
- 3 - Micro Diamond Testing
- 4 - Mini Bulk Sampling
- 5 - Bulk Sampling
- 6 - Prefeasibility
- 7 - Permitting & Feasibility
- 8 - Construction
- 9 - Production

- Harry Winston - Diavik today

Security of Supply for Critical Materials is becoming an issue for Europe, Japan and the United States as China moves to secure its own needs.



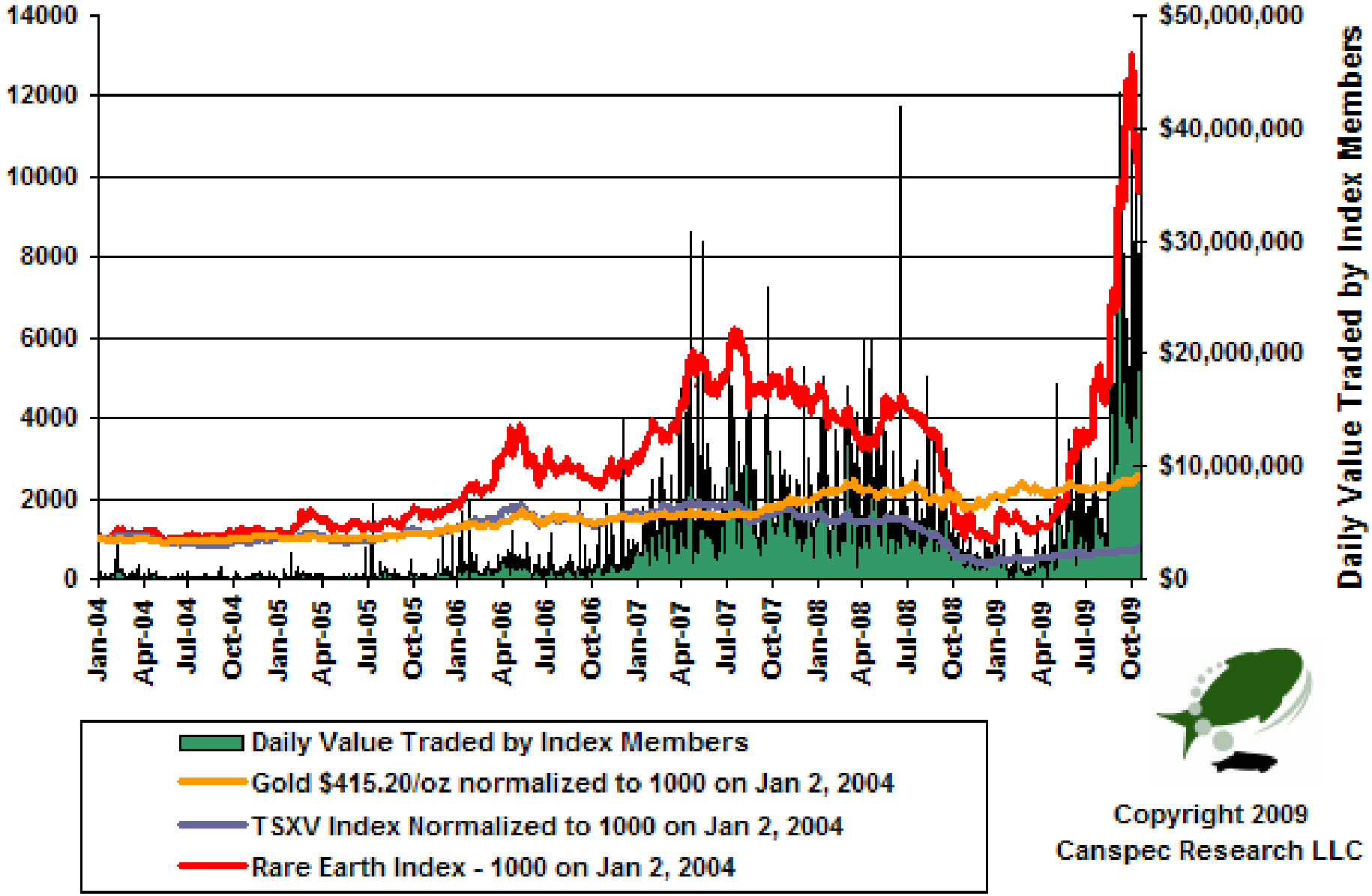
Source: EC Commission – The Raw Materials Initiative

Critical & Strategic Metals

- Chinese trend is for state controlled entities to make investments in raw material supply around the world which often go hand in hand with parallel infrastructure investments and which are guided by long term security of supply rather than profit goals
- Free markets in which metals go to the highest bidder will become thinner and less reliable for just-in-time procurement strategies
- Mainstream mining companies are unlikely to invest in primary specialty metal mines such as rare earth deposits, and will at most add circuits to recover them as by-product metals from existing base metal mines
- Volatility in currency exchange rates and energy costs rule out long term price based contracts while lack of transparency and poor price discovery mechanisms make spot market pricing unreliable
- End users with large downstream markets at stake will need to make upstream equity and/or debt investments in resource juniors which raise risk capital to acquire and advance specialty metal deposits
- Rare earth producers will either need to be owned and operated by a consortium of downstream users, or the producers will need to own downstream operations which add value to the mined raw materials
- Profits will reside in the downstream products for which metals are a critical but incremental input, not in the margin between mining cost and market price

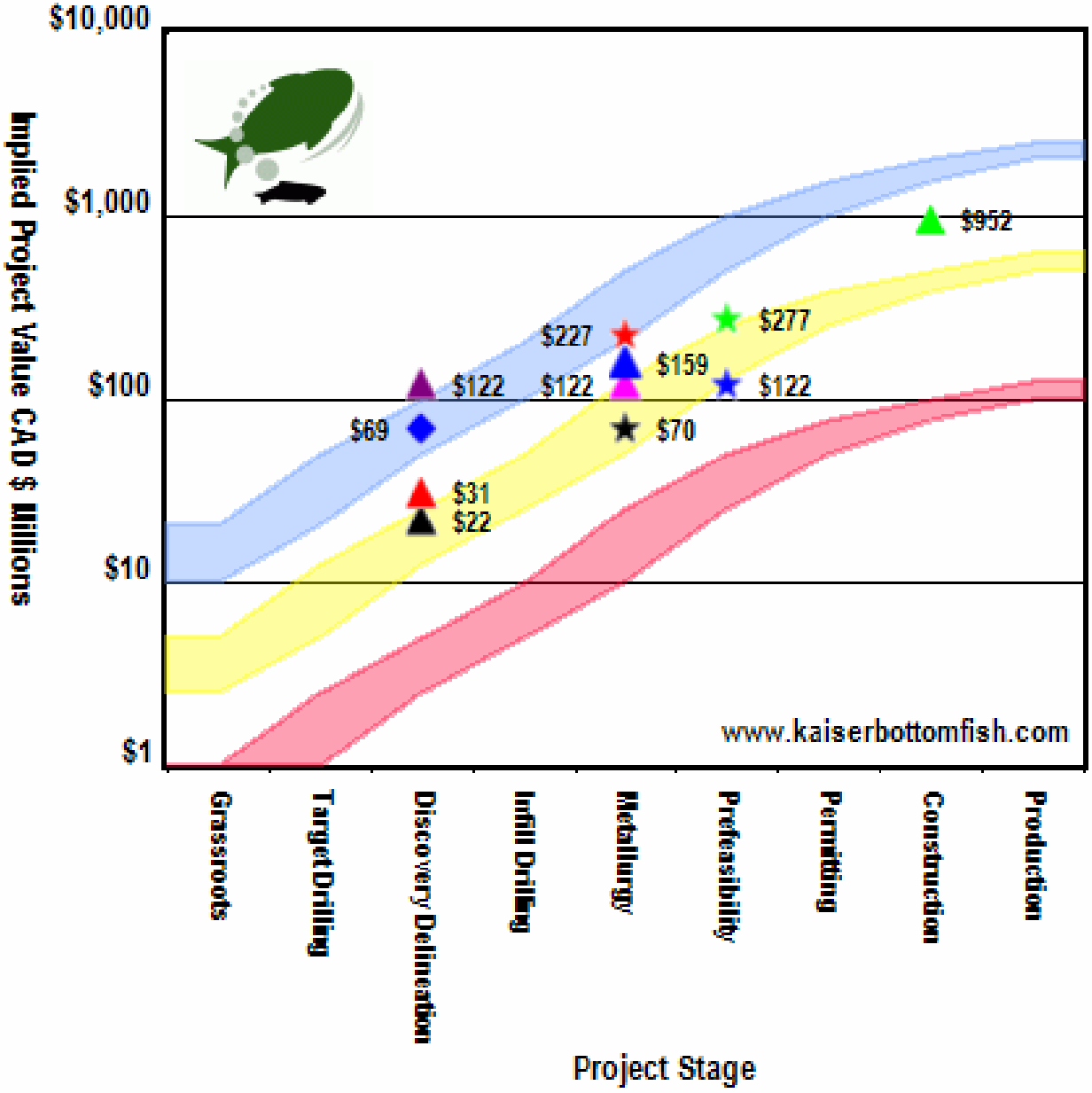
KBFO Rare Earth Index

October 20, 2009



Rare Earth Index Project Valuations

Tuesday, October 20, 2009



Dream Target Channels

- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target

Key Company Projects

- Alkane - Dubbo
- Arafura - Nolans Bore
- Avalon - Nechalacho
- Great Western - Hoidas Lake
- Greenland Mnrls - Kvanefjeld
- Hudson - Sarfartoq Carbonatite
- Lynas - Mt Weld
- Matamec - Zeus-Kipawa
- Quest Uranium - Strange Lake
- Rare Element - Bear Lodge
- Ucore - Bokan - Dotson Ridge

Rational Speculation Model

A formal system for valuing a spec stock

Three Steps

- Outcome Analysis – what is the dream target and the key assumptions behind it?
- Probability Analysis – where in the exploration cycle is the project and what is it “worth” now?
- Risk-Reward Analysis – is it a good, fair, or poor bet?

Outcome Analysis Questions

Visualizing the Fundamentals

- What kind of deposit style is it?
- Can you name a deposit similar to your target?
- What is the analogue worth?
- What is the physical footprint of your target?
- How many tonnes does that represent?
- What grade are you looking for?
- Are there metallurgical issues that affect recoveries or costs?
- What are your long term metal price assumptions?
- What is the rock value at these grades and prices?
- What would the in situ value be?
- Where is the project located?
- Are there infrastructure issues such as transportation, water supply and power?
- What is such a deposit worth in DCF and comparable market valuation terms?

More Outcome Analysis Questions

- Who operates the project, for how long, and what is their agenda if it is not you?
- When do you vest and what ownership related deadlines apply?
- How are you funding the exploration cycle?
- What is the timeline for your exploration cycle?
- What is the size of the market for your metals?
- Do your target metals require marketing or offtake arrangements?
- How far downstream will you process non-commodity metals?
- Are there any title issues?
- Are there any geopolitical risk issues?
- Are there any local or aboriginal issues?
- Are there environmental risk issues?
- Are there any specific permitting obstacles?
- What is being done about any of these obstacles?

Increase the DCF discount rate to adjust the dream target value downwards for extra risks!

The footprint: is there room for your dream target?

- do you have targets or just the right geology?
- what all defines your target: surface geology, geochemical anomaly, geophysical anomaly, drill defined mineralized zones, or structural geology?
- what are the tonnage implications of your targets?
- what are the grade implications?

What would the dream target look like?

Orebody Arithmetic

- Figure out geometry of the target or zone – simplify into rectangular blocks
- Calculate rock volume for each "zone" (in metres): Volume of rock = length x width x thickness
- Calculate tonnage = volume x specific gravity (2.6 for ordinary rock, 4.5 for massive sulphides)
- Assign grade for recoverable metals (g/t or %)
- Calculate rock value = metal price x grade
- Deposit's gross value = tonnage x rock value

Tonnage Potential: Length x Width x Depth x Specific Gravity

Outcome Analysis – Step 1

Excel Spreadsheet Rock Value Calculator

Rock Value, also known, as Gross Metal Value (GMV) per tonne, sometimes as "in situ", tells you the value of pounds or ounces in the ground before any extraction costs. This is the first calculation you should do with either a drill intersection grade or a resource estimate.

Avoid Equivalent Grades!

	A	B	C	D	E	F	G	H	I	J	K	L
1	Rock Value Calculator - US $ per metric tonne											
2												
3	Au-Ag-Pt-Pd are g/t, base metals are % per tonne											
4												
5	Metal	Gold	Silver	Platinum	Palladium	Other g/t	Copper	Lead	Zinc	Nickel	Cobalt	Other %
6	Grade	0.61	8.5	2.87	9.78	0	3.1000%	0.0000%	0.0000%	5.9000%	0.0000%	0.0000%
7	Conversion unit	31.103	31.103	31.103	31.103	31.103	2204.6	2204.6	2204.6	2204.6	2204.6	2204.6
8	Metal Price	$880.00	$16.00	$1,550.00	$375.00	$0.00	$3.10	$1.20	$1.05	$13.00	$10.00	$35.00
9	Recovery	76.00%	80.00%	100.00%	100.00%	100.00%	91.00%	100.00%	100.00%	100.00%	100.00%	63.00%
10	Gross Metal Value/t	$17.26	$4.37	$143.02	$117.91	$0.00	$211.86	$0.00	$0.00	$1,690.93	$0.00	$0.00
11	Recoverable Value/	$13.12	$3.50	$143.02	$117.91	$0.00	$192.79	$0.00	$0.00	$1,690.93	$0.00	$0.00
12	% of total GMV	1%	0%	7%	5%	0%	10%	0%	0%	77%	0%	0%
13												
14	Total Rock Value	$2,185.36										
15	Recoverable total	$2,161.28										
16												

Table 20.1 Lake Zone Mineral Resource Summary

Zone	Resource Class	Cut-Off TREO (%)	Tonnes (x1000)	TREO (%)	HREO (%)	H/T (%)
Basal	Indicated	1.60	2,186	2.14	0.43	20.0
Upper	Indicated	1.60	1,873	1.96	0.19	9.7
Total	Indicated	1.60	4,059	2.06	0.32	15.5

Zone	Resource Class	Cut-Off TREO (%)	Tonnes (x1000)	TREO (%)	HREO (%)	H/T (%)
Basal	Inferred	1.60	28,447	1.99	0.44	22.1
Upper	Inferred	1.60	32,707	2.10	0.17	8.2
Total	Inferred	1.60	61,154	2.05	0.30	14.5

Understanding an REO Resource Estimate

To convert a ppm number into decimal percentage form divide by 1,000,000

Table 17.8 Summary of Lake Zone Indicated Mineral Resource

Cut-Off TREO (%)	Tonnes (x1000)	TREO (%)	HREO (%)	H/T (%)	Y_2O_3 (ppm)	La_2O_3 (ppm)	Ce_2O_3 (ppm)	Pr_2O_3 (ppm)	Nd_2O_3 (ppm)	Sm_2O_3 (ppm)	Eu_2O_3 (ppm)	Gd_2O_3 (ppm)	Tb_2O_3 (ppm)	Dy_2O_3 (ppm)	Ho_2O_3 (ppm)	Er_2O_3 (ppm)	Tm_2O_3 (ppm)	Yb_2O_3 (ppm)	Lu_2O_3 (ppm)	Ta_2O_5 (ppm)	Nb_2O_5 (ppm)	ZrO_2 (ppm)	Ga_2O_3 (ppm)	HfO_2 (ppm)	Th (ppm)
Upper Zone – Indicated Mineral Resource																									
1.80	1,873	1.96	0.19	9.7%	843	3610	8552	986	3834	685	73	511	54	218	34	81	11	72	11	328	5114	33169	174	683	167
1.80	1,151	2.12	0.20	9.3%	865	3936	9368	1068	4136	738	78	542	55	222	33	81	11	76	11	357	5582	35411	174	749	176
2.00	723	2.26	0.20	9.1%	888	4191	10050	1134	4364	783	82	571	58	229	34	81	11	77	12	370	5858	37165	170	795	185
2.20	313	2.46	0.21	8.7%	908	4585	11156	1233	4685	849	90	612	62	243	35	84	12	80	12	406	6628	40623	161	884	196
Basal Zone – Indicated Mineral Resource																									
1.80	2,186	2.14	0.43	20.0%	2274	3374	8073	970	3937	780	95	717	104	533	93	220	31	182	25	520	5892	39610	134	829	198
1.80	1,573	2.31	0.47	20.4%	2508	3599	8696	1042	4248	849	104	783	114	587	102	244	35	203	28	563	6257	41743	128	888	202
2.00	1,054	2.52	0.53	20.9%	2825	3875	9436	1125	4587	922	113	852	128	662	116	277	40	231	32	626	6816	44644	123	972	219
2.20	731	2.71	0.57	21.1%	3068	4135	10156	1205	4917	987	121	910	139	723	127	305	44	253	35	676	7287	46710	119	1041	239
Total Lake Zone – Indicated Mineral Resource																									
1.80	4,059	2.06	0.32	15.5%	1614	3483	8294	977	3890	736	85	622	81	388	65	156	22	131	19	431	5533	36638	153	762	184
1.80	2,734	2.23	0.35	15.9%	1810	3742	8981	1053	4201	802	93	681	89	432	73	175	25	149	21	475	5970	39053	148	829	191
2.00	1,778	2.41	0.40	16.4%	2037	4003	9686	1128	4496	865	101	737	99	486	83	198	28	168	24	522	6426	41601	142	900	205
2.20	1,045	2.64	0.46	17.6%	2420	4270	10456	1213	4847	946	112	820	116	579	99	239	34	201	28	595	7089	44884	132	994	226

Recent Rare Earth Prices - $/kg oxide

Source: Metal-Pages.com, September 10, 2009
Prices are indicative and basis FOB China

Metal Oxide	Principal Uses	Price US$/kg
Lanthanum Oxide 99% min	Re-chargeable Batteries	5.40 - 5.90
Cerium Oxide 99% min	Catalyst, glass, polishing	3.50 - 4.00
Praseodymium Oxide 99% min	Magnets, glass colourant	13.50 - 14.50
Neodymium Oxide 99% min	Magnets, lasers, glass	14.00 - 14.50
Samarium Oxide 99% min	Magnets, lighting, lasers	4.25 - 4.75
Heavy Rare Earths		
Europium Oxide 99% min	TV colour phosphors: red	475.00 - 495.00
Terbium Oxide 99% min	Phosphors: green, magnets	340.00 - 360.00
Dysprosium Oxide 99% min	Magnets, lasers	107.00 - 112.00
Gadolinium Oxide 99%min	Magnets, superconductors	6.00 - 6.50
Yttrium Oxide 99.999% min	Phosphors, ceramics, lasers	10.00 - 10.50

Outcome Analysis – Step 1

Project Resource Estimate - Thor Lake - Upper Zone			
Aug 17, 2009	NI 43-101	Bruce Hudgins, PGeo, Hudgtec Consulting Ltd, Dartmouth, NS	Cutoff: 1.6% TREO

Resource Category	Tonnage	Total Rock Value	Metal	Grade	Recovery	Contained Metal	% of GMV
Inferred Mineral Resources	19,896,817	$213/t	Rare Earth Metals	2.01%	100.0%	881,671,124 lb	100%
All Categories Spot	**19,896,817**	**$213/t**	**Rare Earth Metals**	**2.01%**		**881,671,124 lb**	**100%**
All Categories LTA	**19,896,817**	**$213/t**	**Rare Earth Metals**	**2.01%**		**881,671,124 lb**	**100%**

Spot Gross Metal Value	Market Cap as % of Net GMV	Spot Prices Used
$4,240,838,105	7.5%	Rare Earth Metals $4.81/lb

LTA Gross Metal Value	Market Cap as % of Net GMV	LTA Prices Used
$4,240,838,105	7.5%	3 Year Average: Rare Earth Metals $0.00/lb

Outcome Analysis – Step 1

Project Resource Estimate - Thor Lake - Basal Zone			
Aug 17, 2009	NI 43-101	Bruce Hudgins, PGeo, Hudgtec Consulting Ltd, Dartmouth, NS	Cutoff: 1.6% TREO

Resource Category	Tonnage	Total Rock Value	Metal	Grade	Recovery	Contained Metal	% of GMV
Indicated Resources	4,400,189	$331/t	Rare Earth Metals	1.97%	100.0%	191,101,683 lb	100%
Inferred Mineral Resources	44,257,886	$295/t	Rare Earth Metals	1.94%	100.0%	1,892,863,731 lb	100%
All Categories Spot	**48,658,075**	**$298/t**	**Rare Earth Metals**	**1.94%**		**2,083,965,414 lb**	**100%**
All Categories LTA	**48,658,075**	**$298/t**	**Rare Earth Metals**	**1.94%**		**2,083,965,414 lb**	**100%**

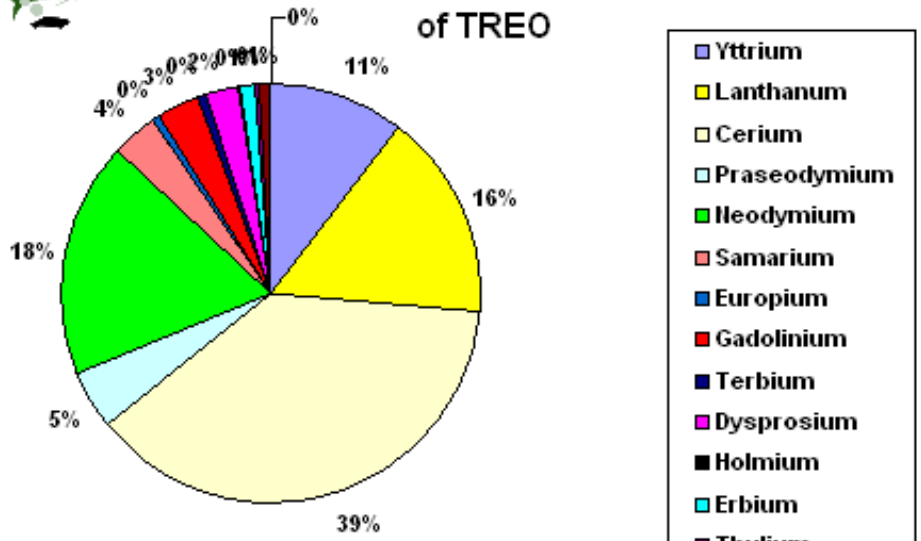
Spot Gross Metal Value	Market Cap as % of Net GMV	Spot Prices Used
$14,516,954,567	2.2%	Rare Earth Metals $6.90/lb

LTA Gross Metal Value	Market Cap as % of Net GMV	LTA Prices Used
$14,516,954,567	2.2%	3 Year Average: Rare Earth Metals $0.00/lb

KBFO Spreadsheet Used to Generate REO Content & Value Distribution Pie Charts

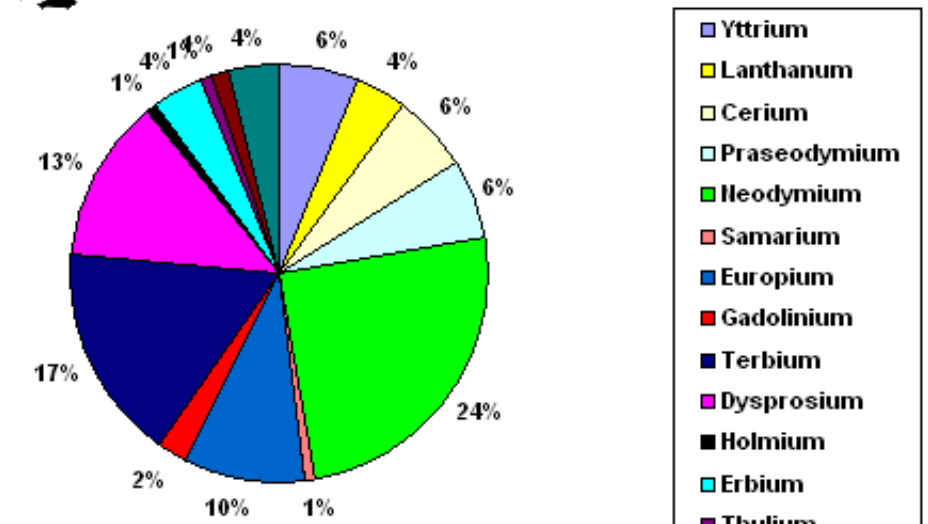
Rare Earth Analysis			4 year average		Avalon - Thor Lake Basal Zone Ind 1.6% cutoff			
Element	Oxide	Converter	Price $/kg	Name	Grade	REO Breakdown	Contained kg	Rock Value
Y	Y2O3	1.27	$8.74	Yttrium	0.2274%	10.6%	2.274	$19.87
La	La2O3	1.173	$3.57	Lanthanum	0.3374%	15.8%	3.374	$12.05
Ce	Ce2O3	1.171	$2.43	Cerium	0.8083%	37.7%	8.083	$19.64
Pr	Pr2O3	1.17	$19.45	Praseodymium	0.0970%	4.5%	0.97	$18.87
Nd	Nd2O3	1.166	$20.19	Neodymium	0.3937%	18.4%	3.937	$79.49
Sm	Sm2O3	1.16	$3.33	Samarium	0.0780%	3.6%	0.78	$2.60
Eu	Eu2O3	1.158	$321.52	Europium	0.0095%	0.4%	0.095	$30.54
Gd	Gd2O3	1.153	$10.20	Gadolinium	0.0717%	3.3%	0.717	$7.31
Tb	Tb2O3	1.151	$507.42	Terbium	0.0104%	0.5%	0.104	$52.77
Dy	Dy2O3	1.148	$76.33	Dysprosium	0.0533%	2.5%	0.533	$40.68
Ho	Ho2O3	1.146	$25.50	Holmium	0.0093%	0.4%	0.093	$2.37
Er	Er2O3	1.143	$55.00	Erbium	0.0220%	1.0%	0.22	$12.10
Tm	Tm2O3	1.142	$90.00	Thulium	0.0031%	0.1%	0.031	$2.79
Yb	Yb2O3	1.139	$25.00	Ytterbium	0.0182%	0.8%	0.182	$4.55
Lu	Lu2O3	1.137	$500.00	Lutetium	0.0025%	0.1%	0.025	$12.50
						100.0%	21.418	
LREE								
HREE					TREO		HREE/TREO	Total $/t
					2.14%		19.96%	$318.14
							Tot $/lb:	$6.74

Avalon Thor Lake - Basal Zone Distribution % of TREO



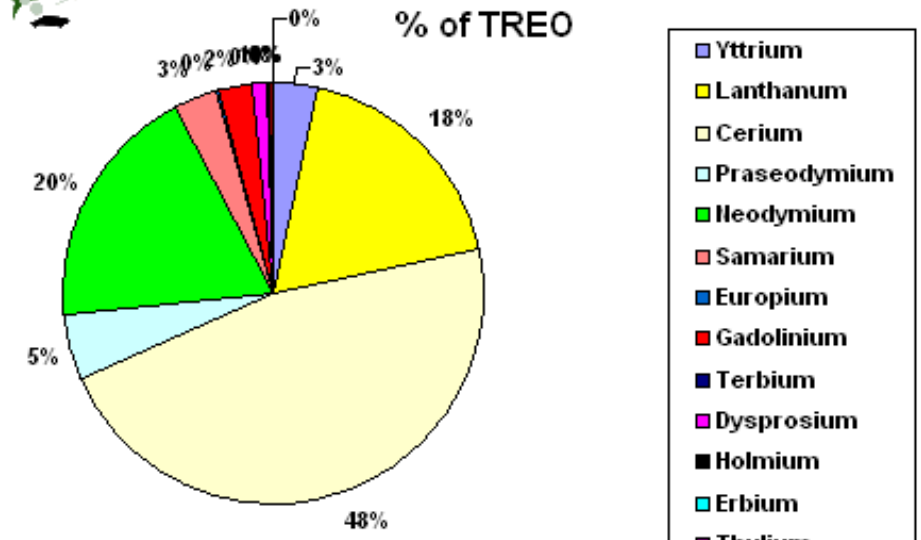
US $318/t rock value at 100% recovery, 4 year average metal price as of Feb/09, 2.14% TREO, 20% H/T, 1.6% cut-off, 43-101 ind Sept/09

Avalon Thor Lake - Basal Zone REE $/t



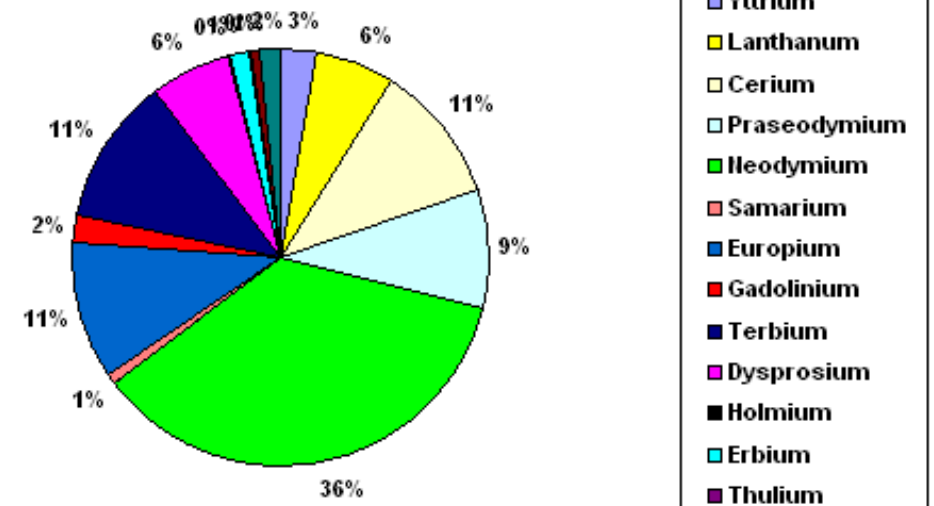
US $318/t rock value at 100% recovery, 4 year average metal price as of Feb/09, 2.14% TREO, 20% H/T, 1.6% cut-off, 43-101 ind Sept/09

Avalon Thor Lake - Upper Zone Distribution % of TREO



US $226/t rock value at 100% recovery, 4 year average metal price as of Feb/09, 1.96% TREO, 9.7% H/T, 1.6% cut-off, ind 43-101 resource Sept/09

Avalon Thor Lake - Upper Zone REE $/t



US $226/t rock value at 100% recovery, 4 year average metal price as of Feb/09, 1.96% TREO, 9.7% H/T, 1.6% cut-off, ind 43-101 resource Sept/09

What is a deposit worth?

- In situ gross metal value (GMV) – the rock value of all recoverable metals x tonnage
- Recoverable gross metal value – the rock value adjusted for recoveries using conventional metallurgical processes
- Total Cash Flow Value - usually a lot less than the gross value after deducting operating costs
- Real Value - the net present value using the discounted cash flow model

Thor Lake: 48,658,075 tonnes @ 1.94% TREO

Rock Value at $6.90/lb: $298/t

In situ GMV: 48,658,075 x $298 = $14.5 billion

What is an orebody worth?

Discounted Cash Flow Model

$$\sum_{n=1}^{m} \frac{\text{Annual Cash Flow}}{(1 + \text{Discount Rate})^n}$$

Less Capital Cost

n = year of cash
m = mine life (years of mining)

NPV

NPV(rate,value1,value2,...)

Returns the net present value of an investment based on a discount rate and a series of future payments (negative values) and income (positive values).

What are the key inputs for mining cash flow?

Revenue Inputs

Tonnage
Grade
Recovery
Commodity Price
Production Rate

Cost Inputs

Operating Cost
Taxes
Capital Cost

Annual Gross Revenue

less Operating Costs

= Operating Profit

less Taxes

= After Tax Cash Flow

Quickie Net Present Value Calculation

Simplified discounted cash flow model

Gross Revenue (Annual for 10 yr Mine)

less Operating Costs

Operating Profit

less Taxes

= After Tax Cash Flow (ATCF)

Present Value = ATCF times Discount Rate Multiplier

(Multiplier: 4 for 20%, 6 for 10%, or 8 for 5% discount rate)

Net Present Value = Present Value less Capital Cost

Economic vs Strategic Logic

- Is it a pure commodity play?
- Is there a security of supply problem in terms of limited geographical sources?
- Is the metal a critical but incremental input to downstream products with a substantially larger value?
- Could an unexpected supply glut expand market demand by encouraging aggressive product innovation and marketing with minimal negative impact on metal price?
- Would control of secure supply with surplus potential give a fabricator a competitive advantage in downstream products?
- If so, what strategic premium might such a project command?

If strategic logic can come into play, add a strategic premium to the net present value of the project.

Use reasonable input guesses to narrow the dream target to one of the following:

aka Ultimate Project Value (UPV)

- $100 million
- $500 million
- $2 billion

Bottom-line Question: what "game" applies to your play?

Probability Analysis Questions

- What exploration stage is the project at?
- What are the intrinsic odds of delivering the dream target as a mine?

How do we get to a mine?

Stage	Exploration Cycle Stage	Objective	Time Required
1	Grassroots	Conceptual, land acquisition	1 year
2	Target Generation & Drilling	Filtering for drill targets	1-2 years
3	Discovery Delineation	Defining the limits of a discovery - tonnage & grade	1-2 years
4	Infill Drilling	Producing a mineral resource estimate & scoping study	1-2 years
5	Bulk Sample & Metallurgy	Evaluating recoveries and optimal processing method	1 year
6	Prefeasibility	Produce a mineable reserve, establish a mining plan and associated costs	1-2 years
7	Permitting, Marketing & Feasibility	Securing approval, negotiating offtake, making a production decision	1-3 years
8	Construction	Building the mine	1-3 years
9	Production	Mining cash flow	10-20 years

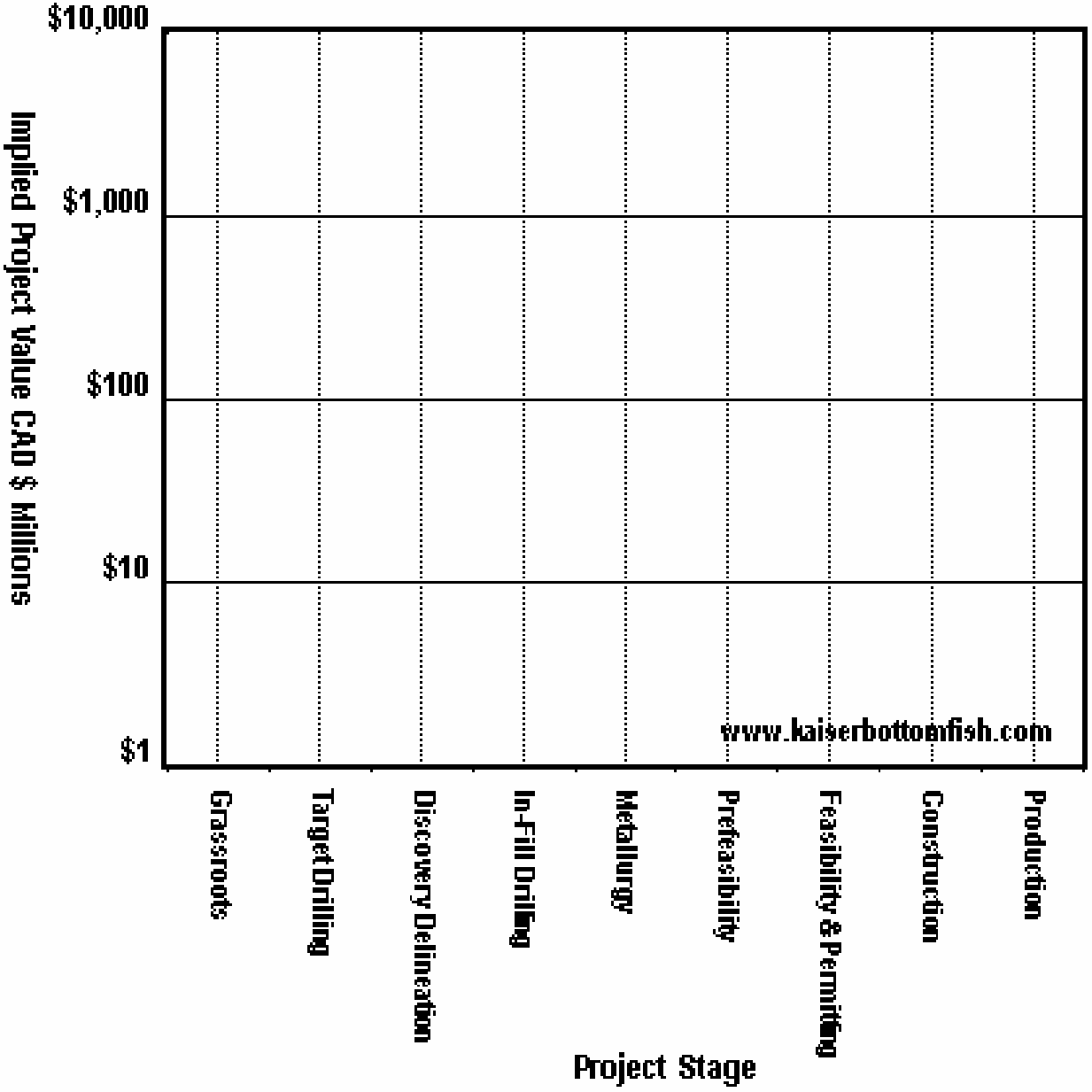
The Exploration Cycle as a Risk Reduction and Outcome Visualization Process

	Exploration Cycle Stages	Probability Ladder		
		Chance	Leverage	Odds
1	Grassroots	0.5-1%	100-200	99-199:1
2	Target Drilling	1-2.5%	40-100	39-99:1
3	Delineation Drilling	2.5-5%	20-40	19-39:1
4	In-fill Drilling	5-10%	10-20	9-19:1
5	Bulk Sample & Metallurgy	10-25%	4-10	3-9:1
6	Prefeasibility	25-50%	2-4	1-3:1
7	Permitting-Feasibility	50-75%	1.3-3	0.3-1:1
8	Construction	75-100%	1	0-0.3:1
9	Production	100%		

What is the probability of making it from the current stage to a mine?

Resource Exploration Cycle

Friday, October 16, 2009



Dream Target Channels

Step 3 – Risk-Reward Analysis

- Determine appropriate dream target
- Calculate Implied Project Value
- Assign exploration stage
- Plot onto IPV Chart
- See which probability ladder applies
- Review the target outcome from step 1
- Assess speculative value
- Note information flow timeline

Risk-Reward Analysis Questions

- What is your fully diluted?
- What is your stock price?
- What is your net project interest?
- What does the market say the project is worth right now (the “Implied Project Value”)?
- How does the implied project value compare to the ultimate project value estimated in step one?
- Does the current pricing offer good, fair or poor speculative value?

Reviewing a Basic Gambling Concept

The probability of an anticipated outcome should match the payout delivered when the outcome is achieved.

- **Fair Bet – 10:1 odds, pays 10:1**
- **Poor Bet – 10:1 odds, pays 5:1**
- **Good Bet – 5:1 odds, pays 10:1**

Definition of Speculative Value
(borrowed from gambling logic)

The degree that the return achieved through actualization of an anticipated but uncertain outcome matches or deviates from the intrinsic odds of achieving that outcome.

- Fair Bet – 10:1 odds, pays 10:1
- Poor Bet – 10:1 odds, pays 5:1
- Good Bet – 5:1 odds, pays 10:1

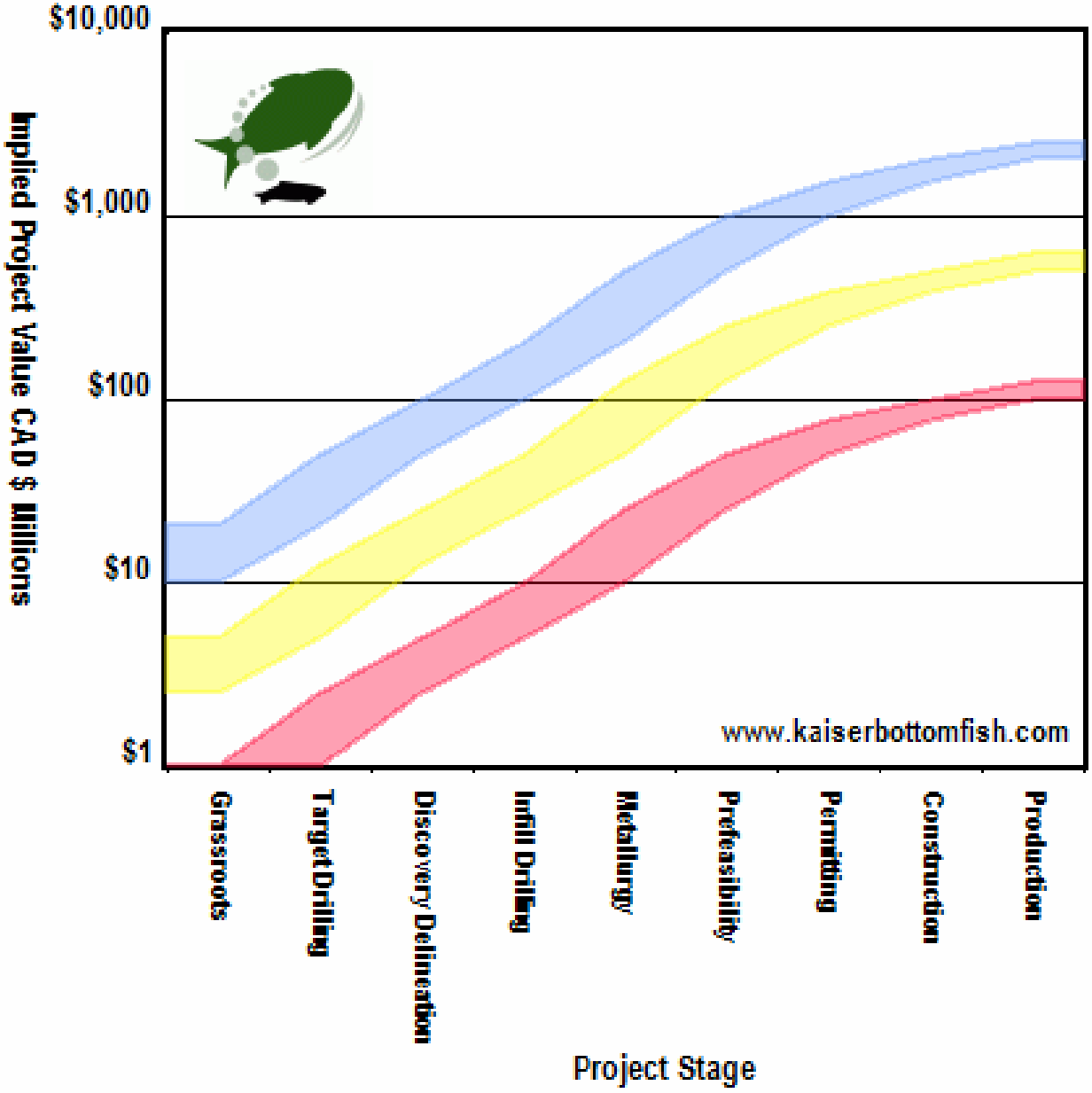
Risk-Reward Analysis – Step 3

Rational Speculation Model - Probability Ladder for Metal Projects						
Exploration Cycle Stages		Success Probability		Dream Target Fair Value Channels ($ Millions)		
		Chance	Leverage	$100	$500	$2,000
1	Grassroots	0.5-1%	100-200	<$1	$2.5-5	$10-20
2	Target Drilling	1-2.5%	40-100	$1-2.5	$5-12.5	$20-50
3	Discovery Delineation	2.5-5%	20-40	$2.5-5	$12.5-25	$50-100
4	Infill Drilling	5-10%	10-20	$5-10	$25-50	$100-200
5	Metallurgy	10-25%	4-10	$10-25	$50-125	$200-500
6	Prefeasibility	25-50%	2-4	$25-50	$125-250	$500-1,000
7	Permitting, Marketing & Feasibility	50-75%	1.3-2	$50-75	$250-375	$1,000-1,500
8	Construction	75-100%	1	$75-100	$375-500	$1,500-2,000
9	Production	100%		$100	$500	$2,000

Note: the fair value range in each exploration stage row for each dream target column is calculated by multiplying the dream target value by the success chance. ie stage 4 dream target $500: 0.05 x $500 = $25, 0.1 x $500 = $50

Mineral Exploration Cycle

Wednesday, June 17, 2009



Dream Target Channels

- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target

How is the market pricing a project?

Avalon's Nechalacho (Thor Lake)
Rare Earth Project

Calculating Implied Project Value

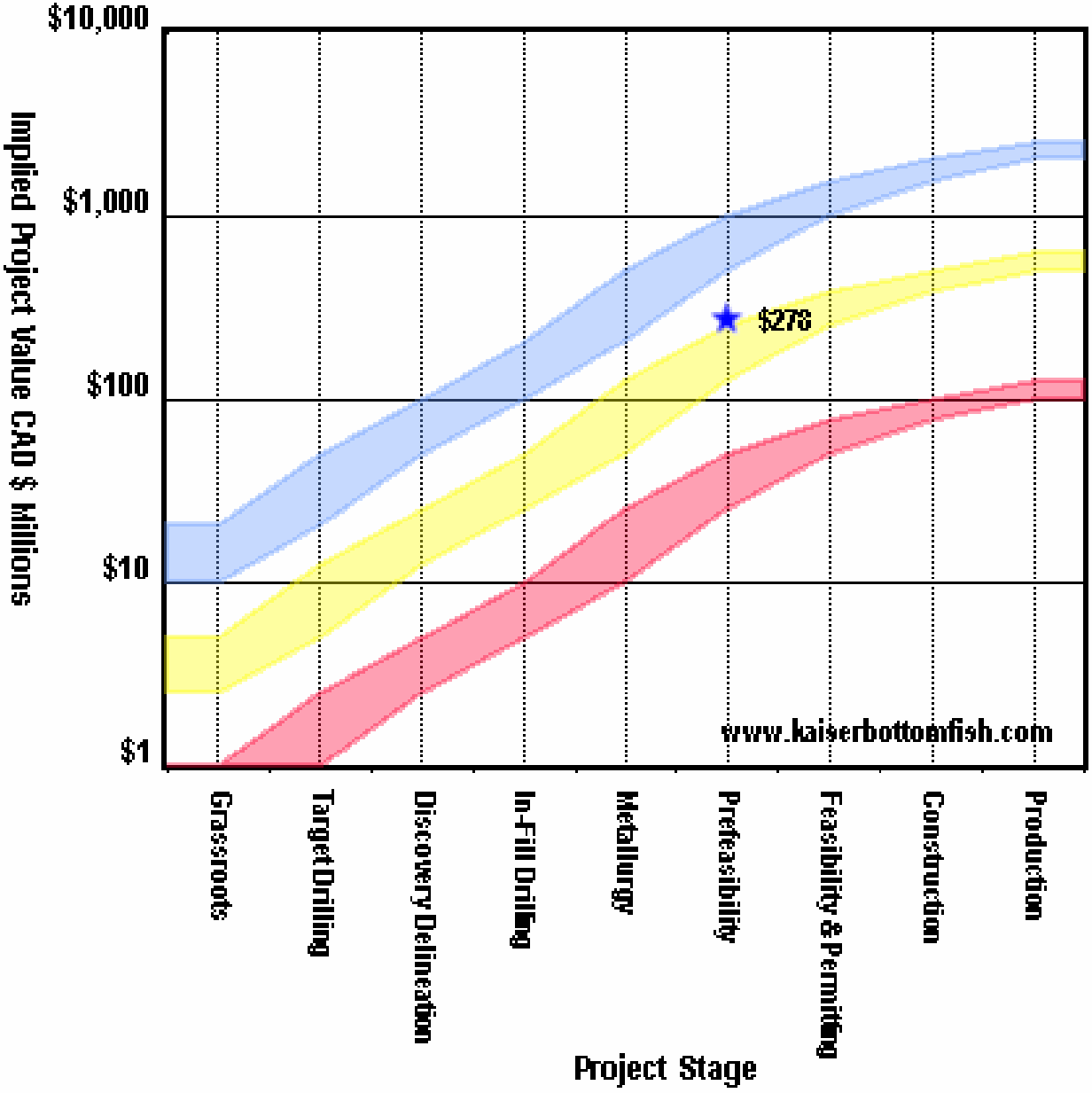
$$= \frac{\text{Fully Diluted Shares X Market Price}}{\text{Net Project Interest}}$$

$$= (86{,}973{,}198 \times \$3.11) / 1.0$$

$$= \$270{,}486{,}649$$

Avalon Project Valuation

Friday, October 16, 2009



Dream Target Channels

- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target

★ Avalon - Nechalacho (Thor Lake)

What would Avalon's stock price be if it achieved the various dream targets without suffering significant additional stock dilution?

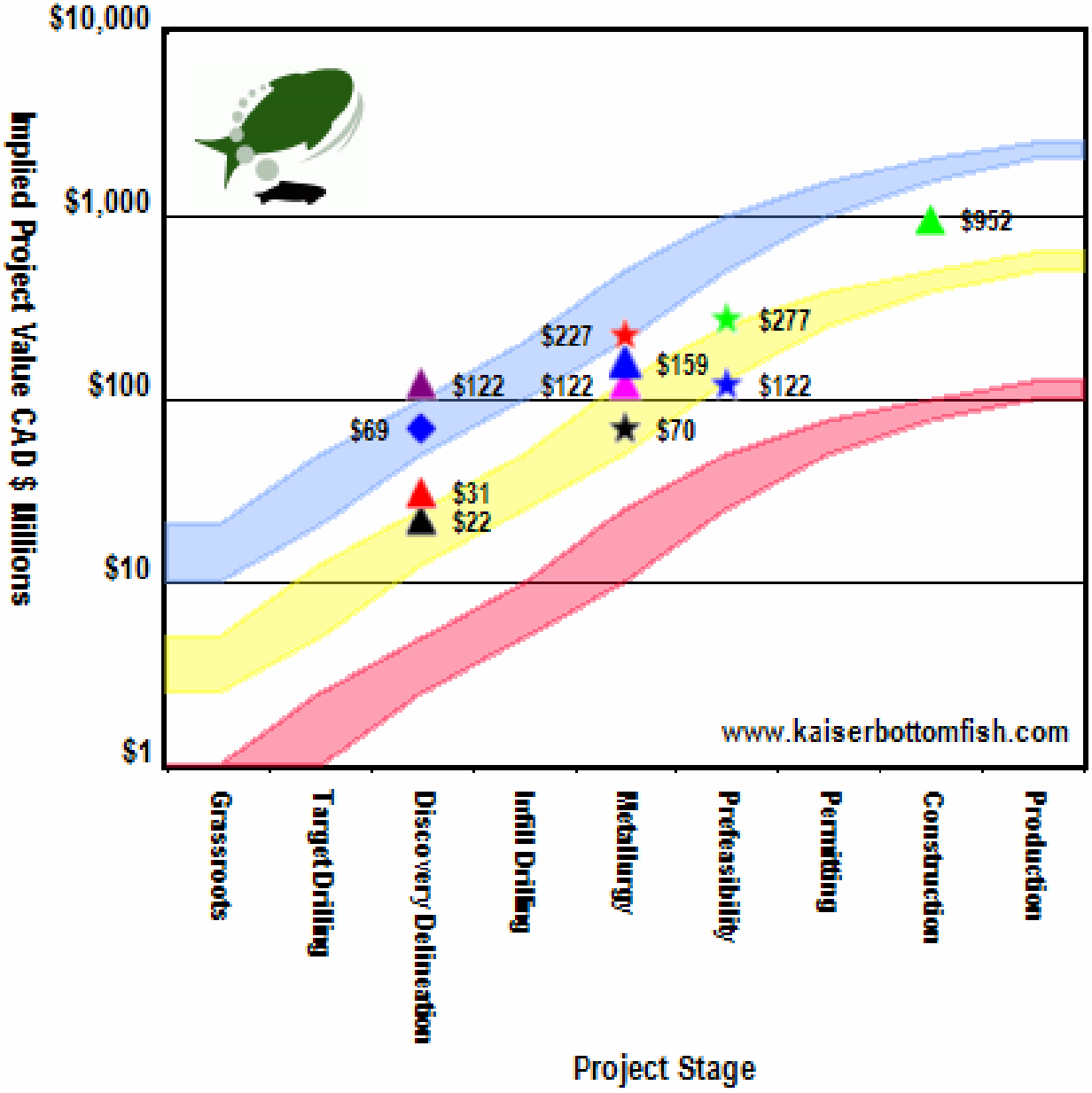
$100 million = $1.15

$500 million = $5.75

$2 billion = $22.99

Rare Earth Index Project Valuations

Tuesday, October 20, 2009



Dream Target Channels

- $100 million Dream Target
- $500 million Dream Target
- $2 billion Dream Target

Key Company Projects

- Alkane - Dubbo
- Arafura - Nolans Bore
- Avalon - Nechalacho
- Great Western - Hoidas Lake
- Greenland Mnrls - Kvanefjeld
- Hudson - Sarfartoq Carbonatite
- Lynas - Mt Weld
- Matamec - Zeus-Kipawa
- Quest Uranium - Strange Lake
- Rare Element - Bear Lodge
- Ucore - Bokan - Dotson Ridge

When key exploration results are released the market asks 3 questions:

- What do the results do to the scale and value of the dream target?
- Is the play ready to move to the next exploration cycle stage and its lower failure odds?
- What is the new fair speculative value of the project?

Profit Making Exit Strategies

- Cash Takeover by Major – Absolute Liquidity
- Paper Takeover by Intermediate – Absolute Liquidity
- Merger among Equals – Partial Liquidity
- Equity Stake Purchase by Major – Partial Liquidity
- Repricing through graduation to next exploration stage – Minor Liquidity
- Repricing through exploration driven expansion of dream target value – Minor Liquidity
- Repricing through upwards adjustment of consensus outllook for long term metal prices – Minor Liquidity
- Repricing through bigger market profile – Minor Liquidity
- Repricing through adjustment to comparables – Minor Liquidity

Limitations & Issues with the Rational Speculation Model

- **Assumes that only one project in a junior's exploration portfolio will become a mine**
- **Does not work when a junior has multiple advanced projects (infill drilling and beyond)**
- **Does not distinguish between working, partly carried and fully carried interests (ie IPV grows through equity or project dilution)**
- **It is not a decision-making blackbox – it is a decision making framework that relies heavily on fundamental analysis of the geological and economic nature of a project**
- **When a sector attains bubble characteristics, the model may signal poor speculative value for all plays; however, it is then useful for identifying relative speculative value for comparables**

Thank You

www.KaiserBottomfish.com