



Canada Research Chair (Tier I) in
Sustainable Mineral Resource Development and Optimization under Uncertainty

COSMO – Stochastic Mine Planning Laboratory
Dept. of Mining and Materials Engineering

LUNCHTIME SEMINAR

“The Dragon, the Elephant and You: Resources and the Evolution of the Global Economy”

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The Dragon, The Elephant and You Resources and the Evolution of the Global Economy

Gordon R. Peeling, President and Chief Executive Officer



The Mining Association of Canada
L'Association minière du Canada



McGill University
February 23, 2011

Overview:

About MAC



- ❑ The national voice of the mining industry in Canada
- ❑ Advocacy - to advance the business of mining
- ❑ TSM Initiative – stewardship and social license
- ❑ ~30 members in iron ore, gold, diamonds, oil sands, met-coal, base metals, uranium
- ❑ ~50 members in engineering, environment, finance
- ❑ Members engaged in exploration, mining, smelting, semi-fabrication



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Overview:

Economic Impact in Canada



- ❑ \$30-40B to Canadian GDP (~4% of GDP)
- ❑ 300-350 thousand employees through the four stages
- ❑ Average weekly earnings ~\$1350 (30-60% higher than other sectors)
- ❑ ~220 producing mines, 34 non-ferrous metal smelters and refineries
- ❑ ~\$15-20B investment in mineral development
- ❑ \$6-12B paid to governments in taxes and royalties



Overview:

Exploration Expenditures



Exploration in Canada (\$M)

Type	2005	2006	2007	2008	2009	2010
Junior	801	1238	1904	2118	977	1113
Senior	504	674	927	1161	770	1049
Total	1305	1912	2831	3279	1747	2162

Exploration Worldwide (\$B)

	2005	2006	2007	2008	2009
Total	5.1	7.5	10.5	13.2	7.3



Capital Expenditures in Canada



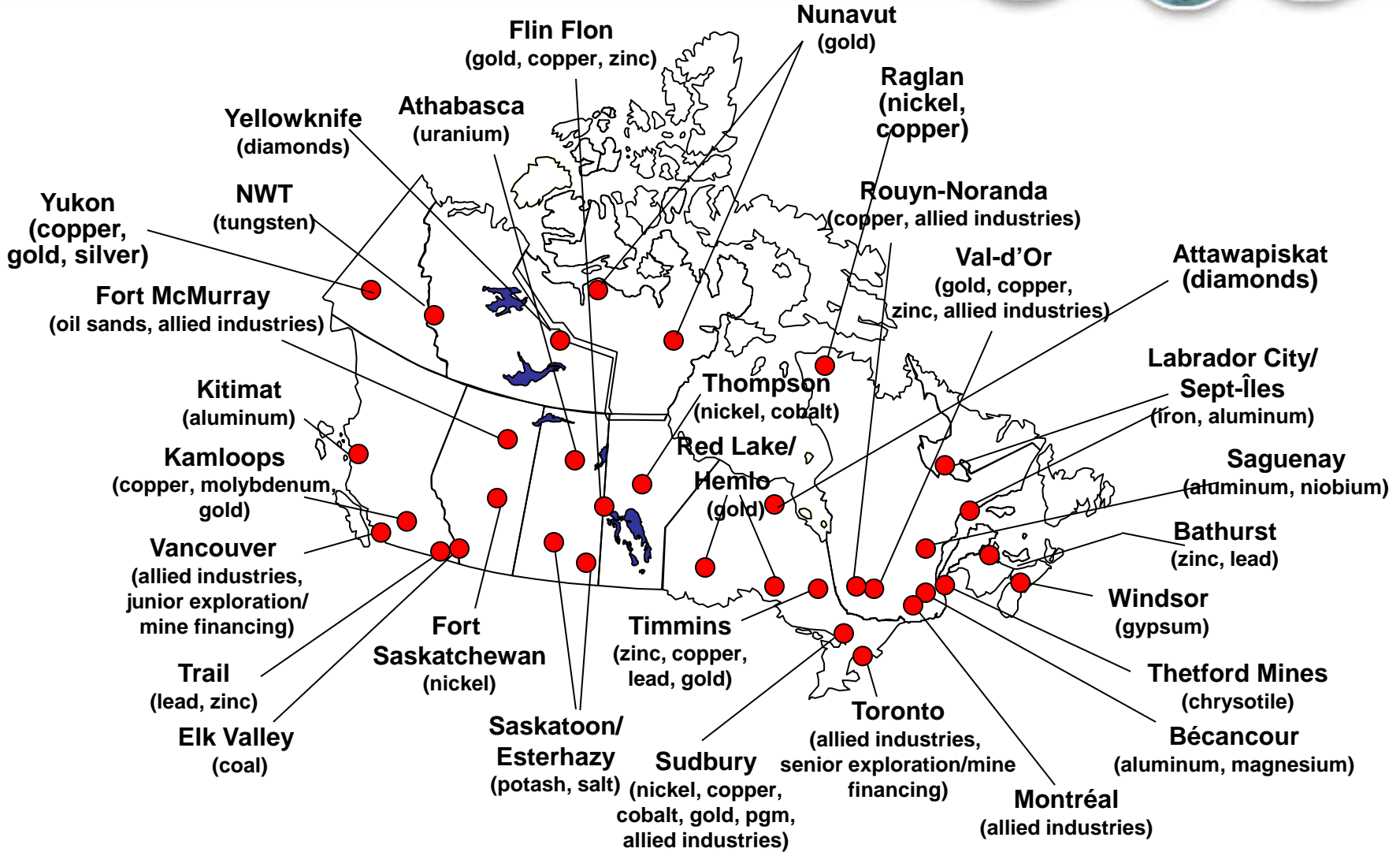
Phase	2010 Capex (\$B)
Extraction	8.6
Primary Metal	2.1
Non-Metallic Minerals	0.6
Fabricated Metals Products	0.6
Total	11.9
Oil Sands	15.0

Examples of Ongoing Projects:

- Agnico-Eagle LaRonde gold mine
- Vale Inco hydromet nickel processing plant
- Rio Tinto IOC iron ore mining and transportation project
- HudBay Lalor zinc/copper mine
- NA Tungsten Cantung tungsten mine
- Potash One Legacy potash mine
- Cameco Cigar Lake uranium mine



Canada's Mining Industry National and Regional Presence



Indirect Impacts in 2009



- ❑ 3223 companies supply goods and services to the industry, including:
 - 89 geotechnical firms,
 - 247 environmental firms,
 - 155 financial/management firms,
 - 153 drilling equipment companies

- ❑ Mining industry provides ~50% of Canada's rail freight revenue

- ❑ Over 1400 mining companies listed on TSX



Overview:

Canada's International Footprint



- ❑ \$66B in exports, accounting for ~19% of Canada's total merchandise exports
- ❑ Aluminum, nickel, copper, gold, uranium, coal, potash, zinc, diamonds, iron ore
- ❑ \$56B in CDIA, \$74B in FDIC
- ❑ "Top 5" producer of uranium, potash, nickel, cobalt, platinum, aluminum, diamonds, zinc, moly
- ❑ Around half the projects of TSX-listed companies are outside Canada
- ❑ Estimated 60% of world's exploration companies are Canadian



2) China as a Price Driver



- ❑ 30 consecutive years of 8-15% annual growth (exception '89-'90)
- ❑ China consumed 5% of world's base metals in 1980s versus ~30% today
- ❑ Shift toward feed-intensive diets (potash), nuclear power (uranium), infrastructure and manufacturing (base metals), middle-class (diamonds, gold)

Mineral Prices	2000	2007	2008	2009	2010	Jan/'11	'00-'11 (%)
Aluminum (\$/lb)	0.70	1.20	1.17	0.76	0.98	1.07	52
Copper (\$/lb)	0.82	3.23	3.15	2.34	3.40	4.25	418
Gold (\$/oz)	279	697	872	973	1225	1328	376
Uranium(\$/lb)	8.29	98.81	63.17	47.00	48.00	70.00	744
Nickel (\$/lb)	3.92	16.88	9.57	6.50	9.85	11.86	203
Zinc (\$/lb)	0.51	1.47	0.85	0.75	0.98	1.02	100

Source: Scotiabank Commodity Price Index, February 2011



The Dragon: China's Long-Term Demand



- ❑ Urban population: 560M in 2005 to 940M in 2020
- ❑ 2020-2025, China growth will still be in 6-9% range (WEF)
- ❑ Autos: 76 per 100 people in US versus 10 in China.
- ❑ Personal computers: 76 per 100 people in US versus 4 in China
- ❑ India lags China - 30% of world metals versus 3% plus an insular and bureaucratic culture. However the long-term demographics and gender balance is better.
- ❑ Next 25 years - as many minerals and metals consumed worldwide as in all of history to date



The Dragon: China will follow its own Interests



- ❑ Some 20 policy measures in China serve to reduce exports of minerals and metals – to feed domestic refineries and manufacturing needs.
- ❑ These measures affect aluminum, base metals, scrap, iron ore, coal, platinum, manganese, rare earths.
- ❑ Rare Earths as strategic resource. China (97% of world supply) cut quotas by 72% in second half of 2010 – also used as tool in sovereignty dispute with Japan.
- ❑ Portions of ~\$2.5T in foreign exchange holdings being converted to mineral assets - in Australia, Canada, South Africa, Zambia, Gabon, DRC, Zimbabwe, Uzbekistan, Peru.
- ❑ Ingrained scrap and recycling culture provides an advantage
- ❑ Investment in modernization and scale of smelters.



Dragon Risks: Risks to this “Strategic” Future



- ❑ 17% of boys born in China will not have a female partner – what is the impact of this as it filters through the system?
- ❑ Can an undemocratic political system in China be sustained as wealth, trade, investment and western exposure continue to increase?
- ❑ Can land availability and/or crop yields rise to mitigate price inflation and food crises?
- ❑ Could global mineral supply constraints cause price spikes and economic turbulence?
- ❑ Can the WTO deal with Raw Materials Protectionism?
- ❑ Asian oil demand will double by 2035 – where will this come from? Could \$100+ oil someday work to reverse “globalization”? Climate Change – any concerns?



The Elephant: The Story of the Turtle and the Hare



- 1978 – China opens, India does not until 1991
- Fiscal year 2006 - \$7.5 billion invested in India versus every six weeks in China
- Blue collar versus white collar
- India and China add more college graduates each year to their workforce than the U.S. and Europe combined



The Elephant (2)



- India is demographically younger than China
- By 2050, India's population will outstrip China's (1.59 billion to 1.39 billion)



Supply Side Constraints



- ❑ Declining mineral reserves – down 50% in Canada’s case
- ❑ Increased cost/declining success rate of exploration?
- ❑ Geopolitical realities in high-risk countries – “re-examining” contracts
- ❑ Raw materials protectionism - export barriers
- ❑ Increasing environmental and social challenges
- ❑ Remote regions, inadequate infrastructure
- ❑ Human resource/skills constraints



Human Resources and You



- ❑ Retirements - 100k new workers needed over next decade
- ❑ Skills - 65% of geoscientists will reach age 65
- ❑ Enrolment in mining engineering programs insufficient to meet industry demand (MiHR)
- ❑ Youth, women and new Canadians do not traditionally enter the mining industry
- ❑ Potential to improve Aboriginal participation
- ❑ Significant international movement and competition for workers



Thank you



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UPCOMING LUNCHTIME SEMINARS

March 30th

12:15, Adams Building, Rm 105

Metaheuristic Methods for Open Pit Mine Scheduling

Dr. Jacques A. Ferland, Université de Montréal, Département d'informatique de recherche opérationnelle, Montreal

April 13th

12:15, Adams Building, Rm 126

Real Time Modeling on Mine Operations Data - Opportunities and Challenges

Dr. Rajive Ganguli, Professor of Mining Engineering, University of Alaska, Fairbanks, Alaska