

# **Overview of the Nickel Industry with special focus on exploration trends**

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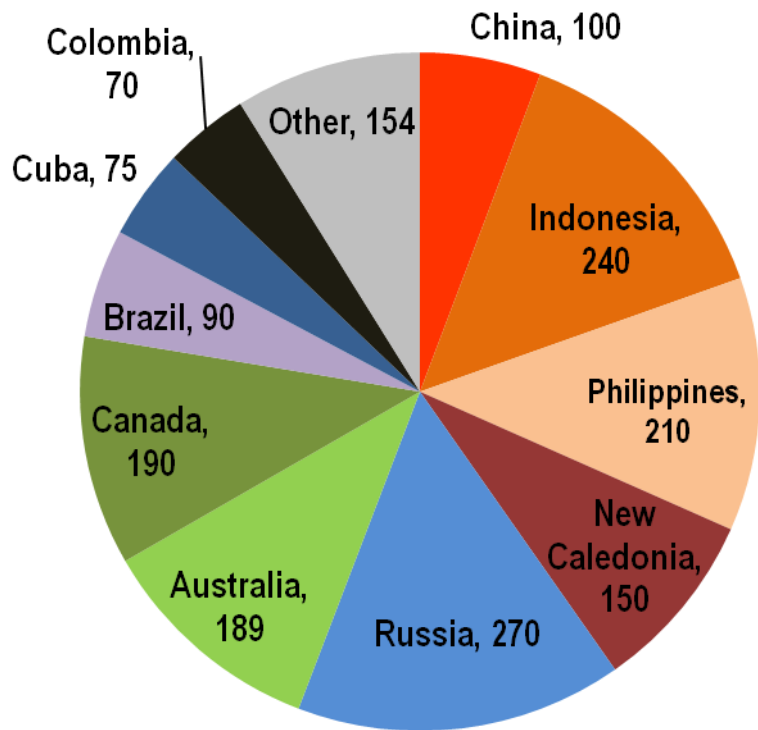
Standard Chartered Earth's Resources Conference  
23 June 2011 Hong Kong

# Overview

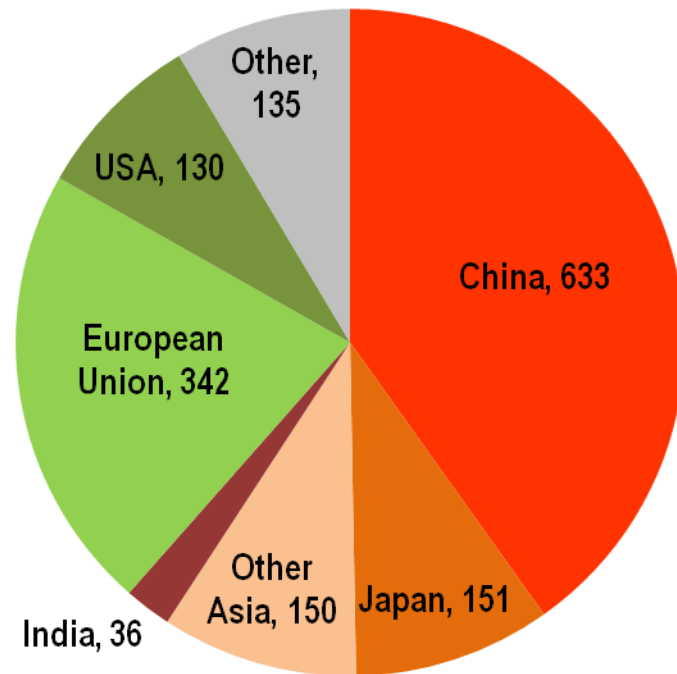
1. Supply & Demand for Nickel
  2. Prices & stocks
  3. Mining costs
    - Impact of technologies
  4. Industry profitability
  5. Discovery trends
    - Sulphides versus Laterites
    - Hot spots for exploration
- Summary

# Forecast World Nickel Supply & Demand in 2011

## Mine Supply: 1738 kt Ni



## Consumption: 1557 kt Ni



Note: Refined production is 1573 kt Ni

Source: ABARES June 2011

# Nickel Prices and LME Stocks: 2000-June 2011



Source: LME

# PROCESSING OPTIONS FOR NICKEL

# Project Economics for various Nickel Processing Routes: 2011

Technically risky

The project to watch is the bio-HL Talvivaari project in Finland

		Sulphide Ore		Laterite Ore		
		Concentrator	Heap Leach	High Pressure Acid Leach	Nickel Pig Iron (NPI)	
					existing	new BF
Ore Grade	(% Ni)	1.5 to 2.5%	1.0 to 1.2%	1.0 to 1.5%	1.4 - 1.8%	1.4 - 1.8%
Production	(ktpa Ni)	5 - 10	20 - 25	40 - 60	5 - 10	5 - 10
Capital Intensity	(\$/lb pa)	\$10 - \$20	\$10 - \$20	\$25 - \$40	\$1 - \$2 <sup>#</sup>	\$8 - \$20 <sup>#</sup>
Cash Cost	(\$ lb Ni)					
	no credits	\$5 to \$7	\$4 - \$5	\$4 - \$6	\$8 - \$10	\$8 - \$10
	with credits	\$4 - \$6	\$3 - \$4	\$3 - \$5	\$7 to \$10	\$7 to \$10
Payback period	(years)					
	no credits	2 - 7 years	2 - 4 years	4 - 10 years	>1 year	5 - never
	with credits	2 - 5 years	2 - 3 years	3 - 5 years	~1 year	5 - never

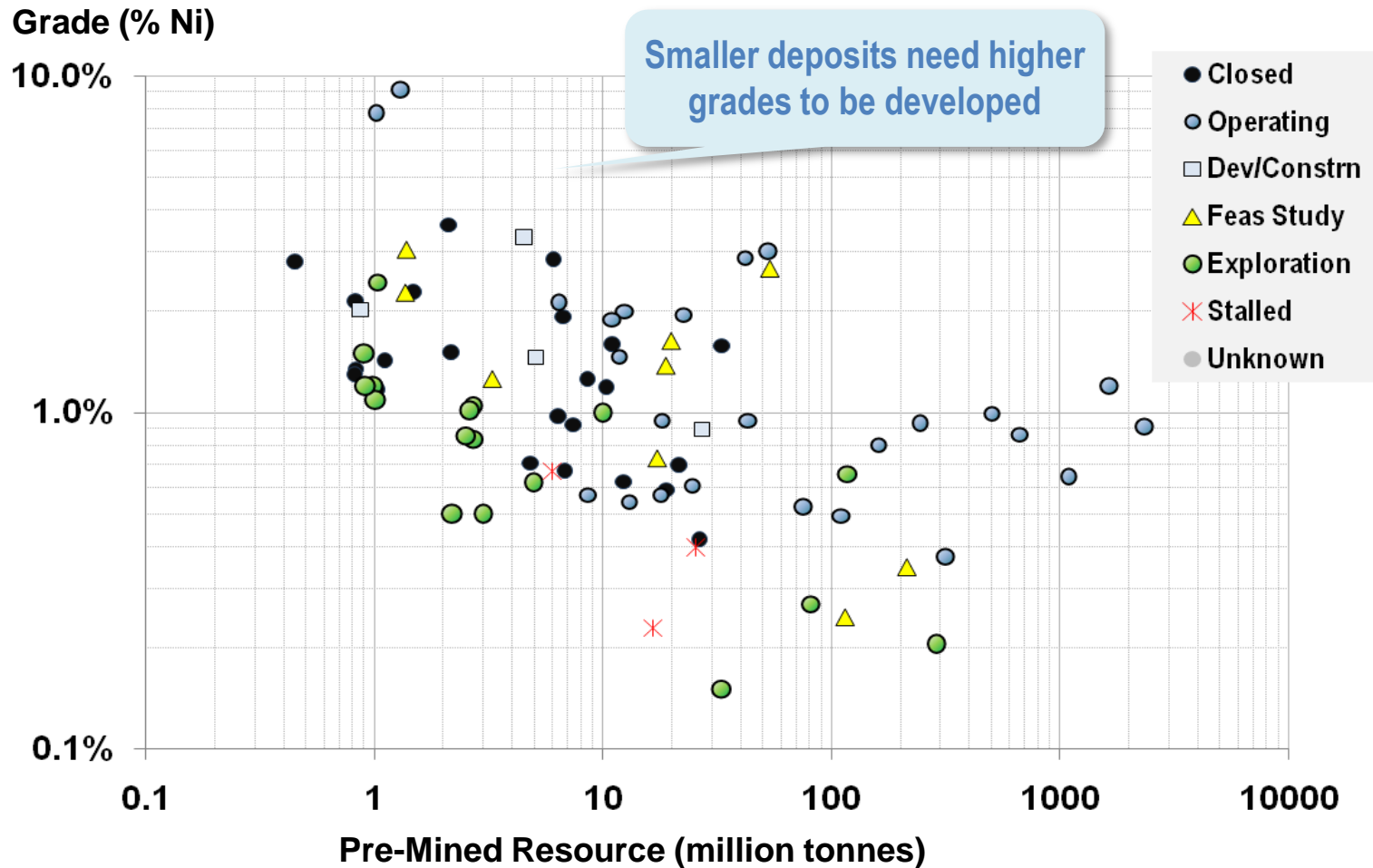
# Note: Excludes the cost of the nickel laterite mine - assumes Chinese buy in ore from third parties

Caution: Indicative numbers only

Source: MinEx Estimates June 2011

# Tonnes & Grade of primary nickel sulphide deposits

## Deposits mined using underground methods



Caution: Chart excludes value of any by-product credits in the ore

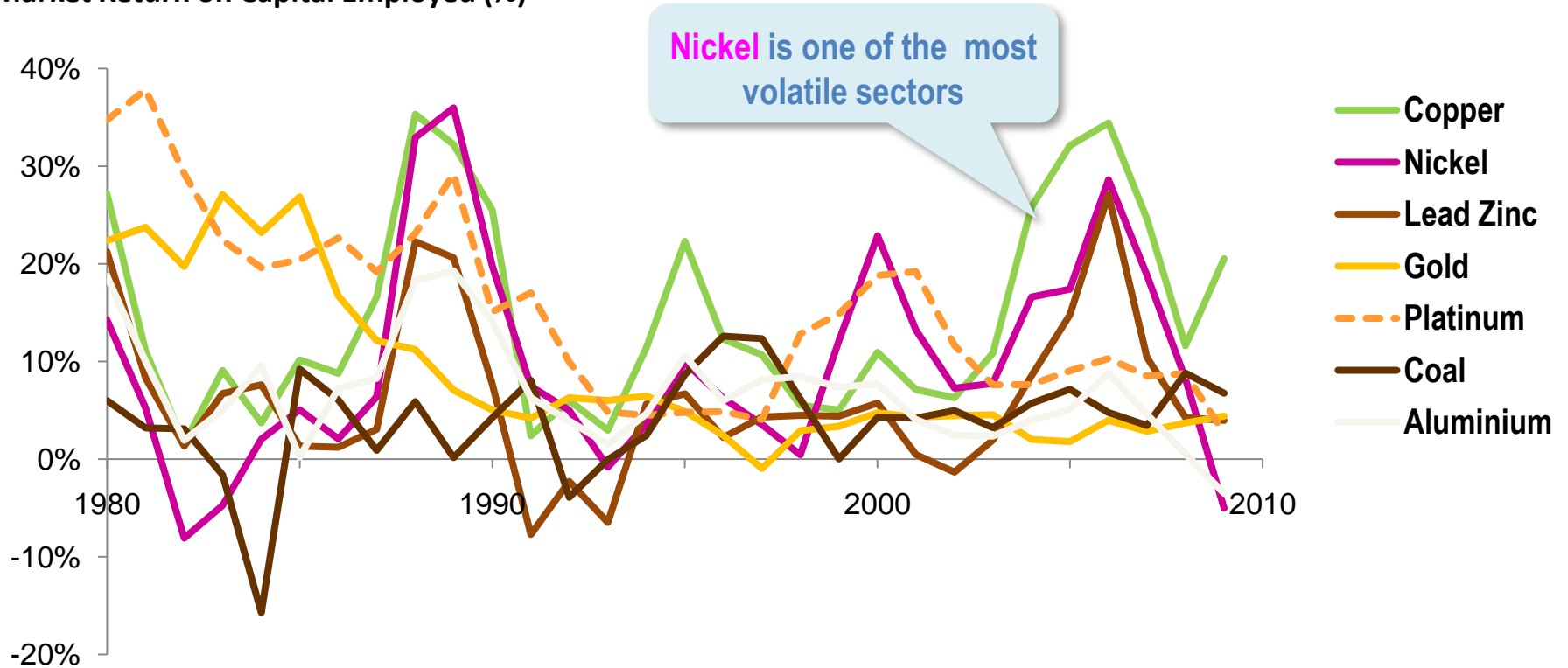
Source: MinEx Consulting Aug 2010

# INDUSTRY PROFITABILITY



# Industry Profitability

Market Return on Capital Employed (%)



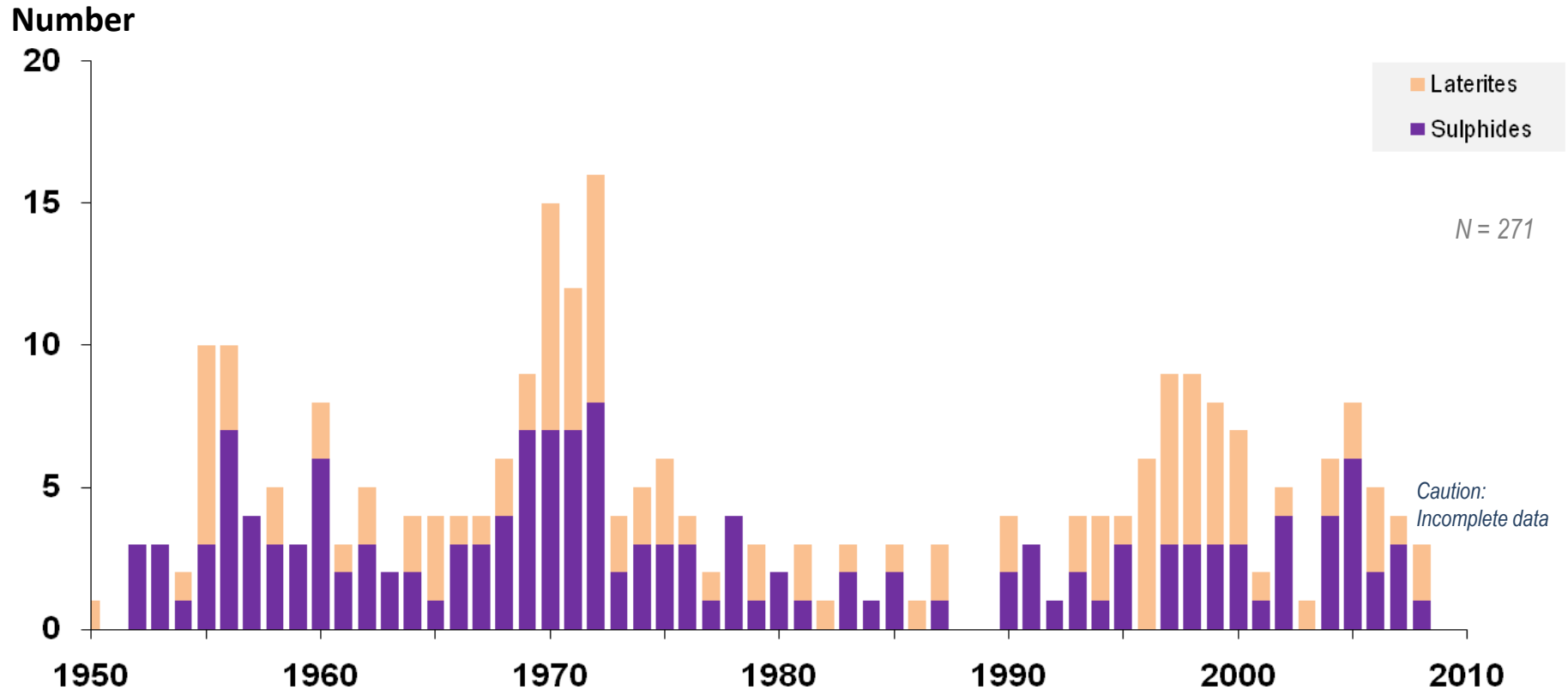
Note: Nominal returns only

Data: CRU MICA data base May 2010

# DISCOVERY TRENDS

# Number of nickel deposits found in the World

Primary Nickel deposits >10 kt found : 1950-2009

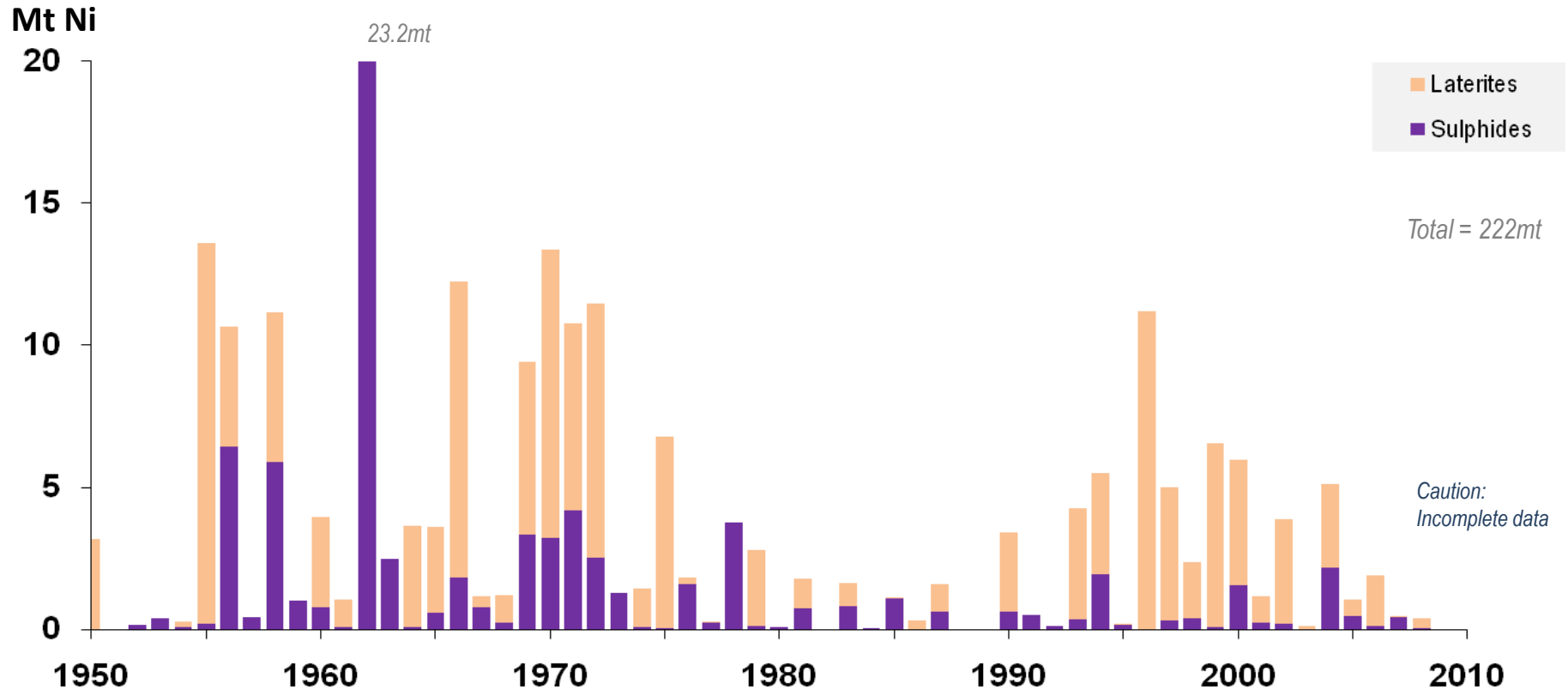


Caution: Chart excludes deposits with unknown discovery date, or deposits not captured in the database

Source: MinEx Consulting Aug 2010

# Amount of nickel metal found in the World

Primary Nickel deposits >10 kt found : 1950-2009



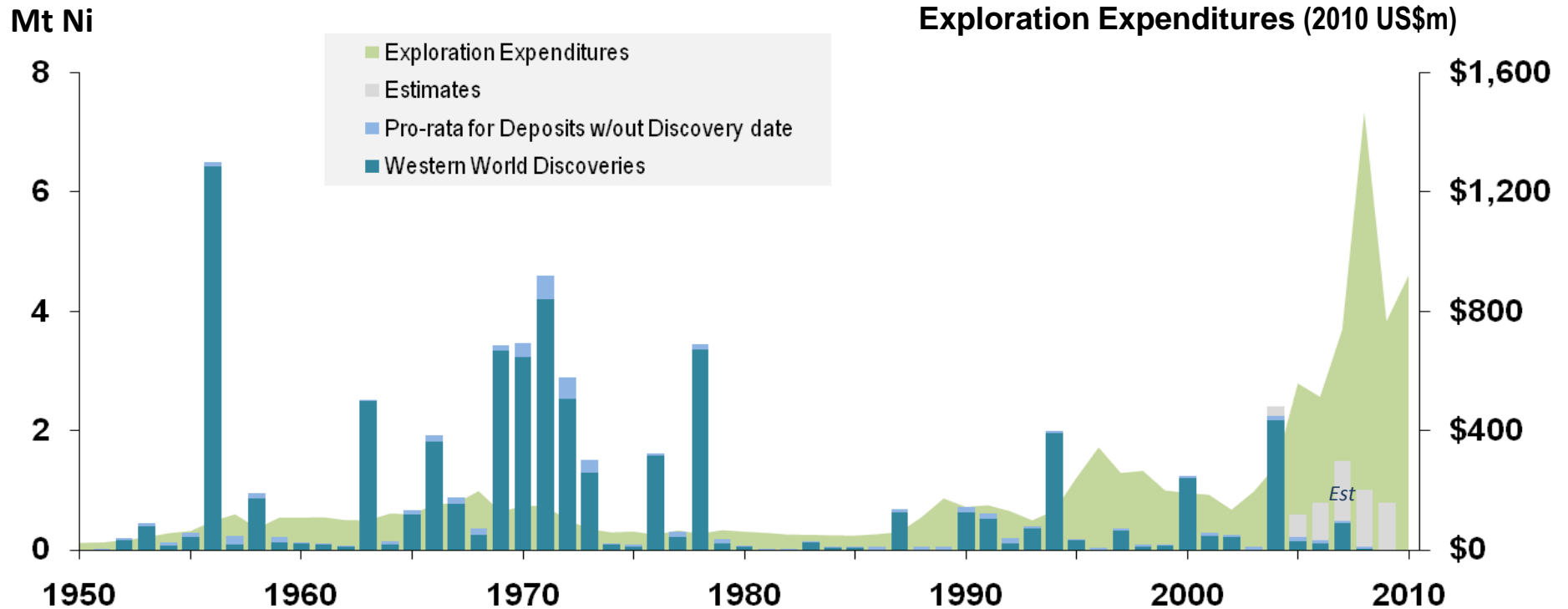
Caution: Chart excludes deposits with unknown discovery date, or deposits not captured in the database

Source: MinEx Consulting Aug 2010

# **EXPLORATION EXPENDITURES AND DISCOVERY PERFORMANCE**

# Exploration expenditures and amount of metal found

Primary NiS deposits >10 kt found in Western World: 1950-2009



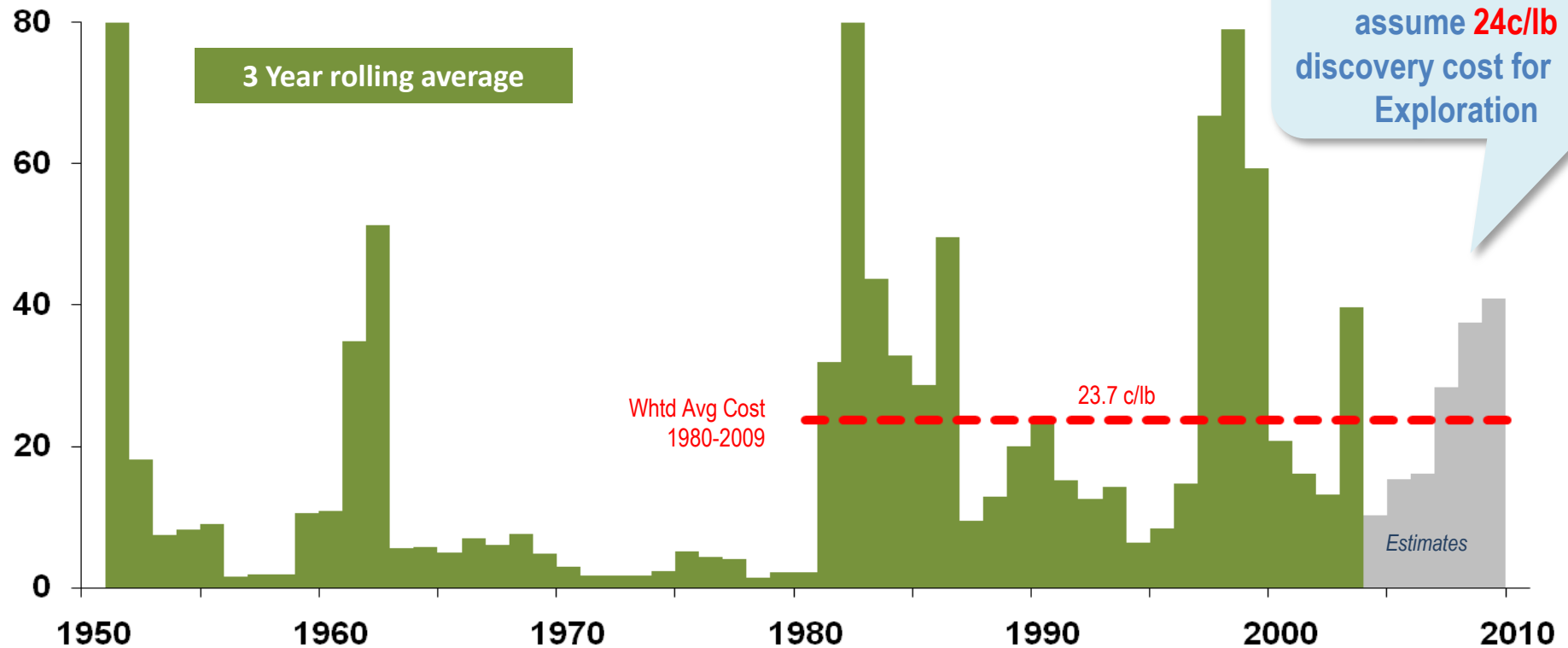
Note: Chart include adjustment for deposits missing from the database

Source: MinEx Consulting Aug 2010

# Discovery costs for NiS in Western World

Discovery costs are very cyclical

US Cents per lb Ni in 2010\$

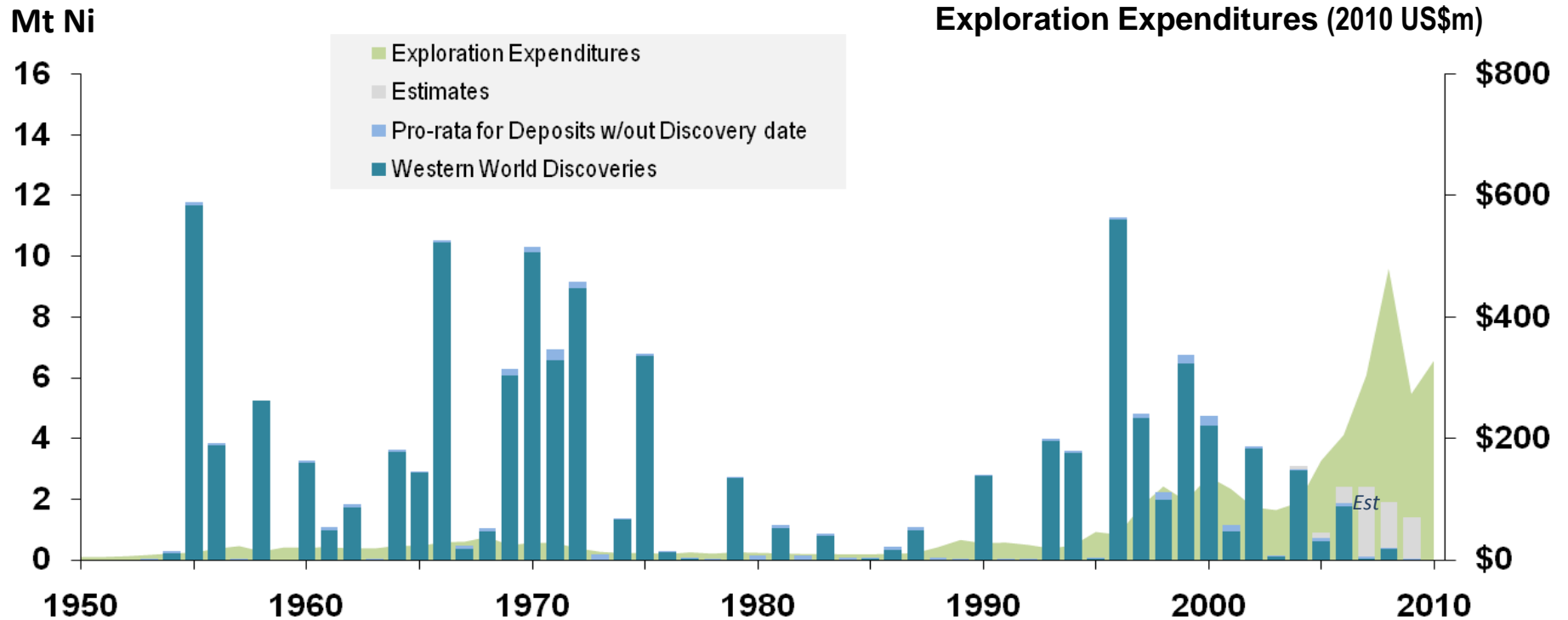


Note: The reported costs exclude credits for by-product metal  
Western World only

Source: MinEx Consulting Aug 2010

# Exploration expenditures and amount of metal found

Primary NiLat deposits >10 kt found in Western World: 1950-2009



Note: Chart include adjustment for deposits missing from the database

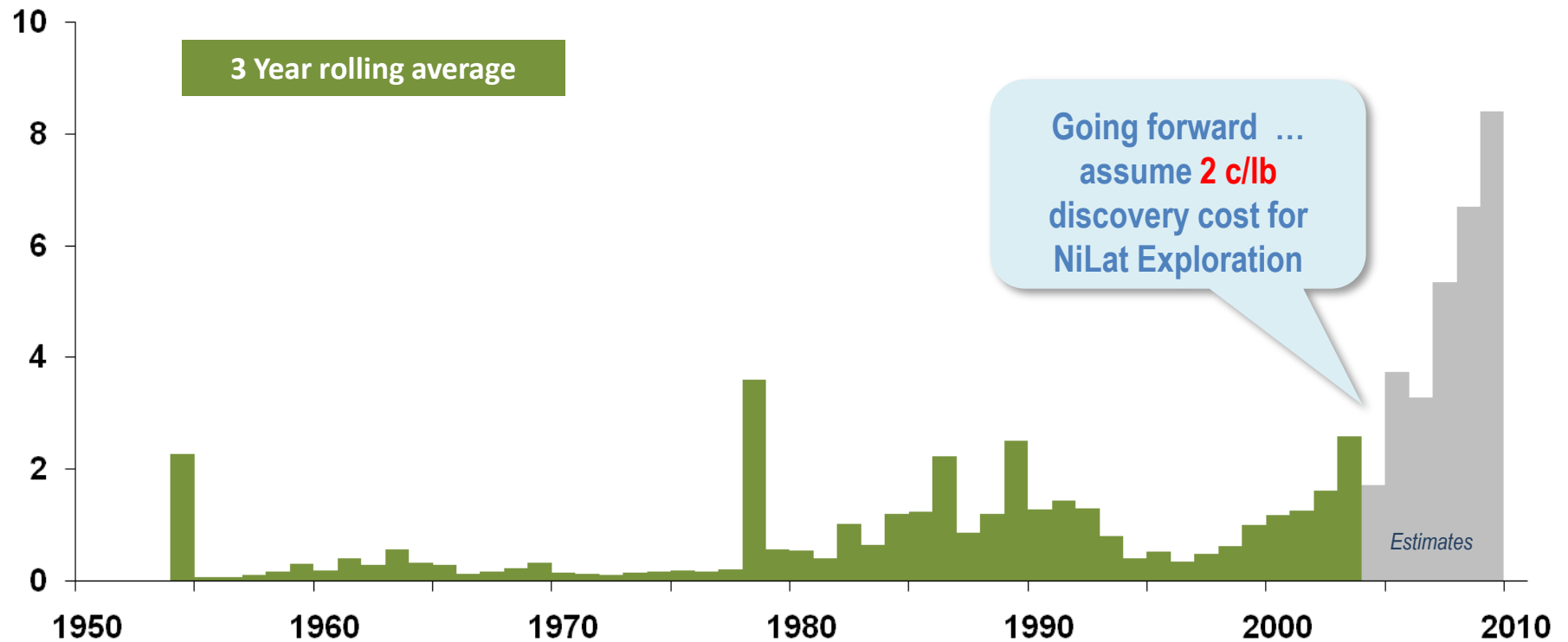
Source: MinEx Consulting Aug 2010



# Discovery costs for NiLat in Western World

Discovery costs are very cyclical

US Cents per lb Ni in 2010\$



Note: The reported costs exclude credits for by-product metal  
Western World only

Source: MinEx Consulting Aug 2010

# **WHERE ARE THE “HOT SPOTS” FOR NICKEL EXPLORATION ?**

# Location of major primary nickel deposits in the world

## Sulphides and Laterites



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : pre-1950



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : 1950-59



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : 1960-69



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : 1970-79



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : 1980-89

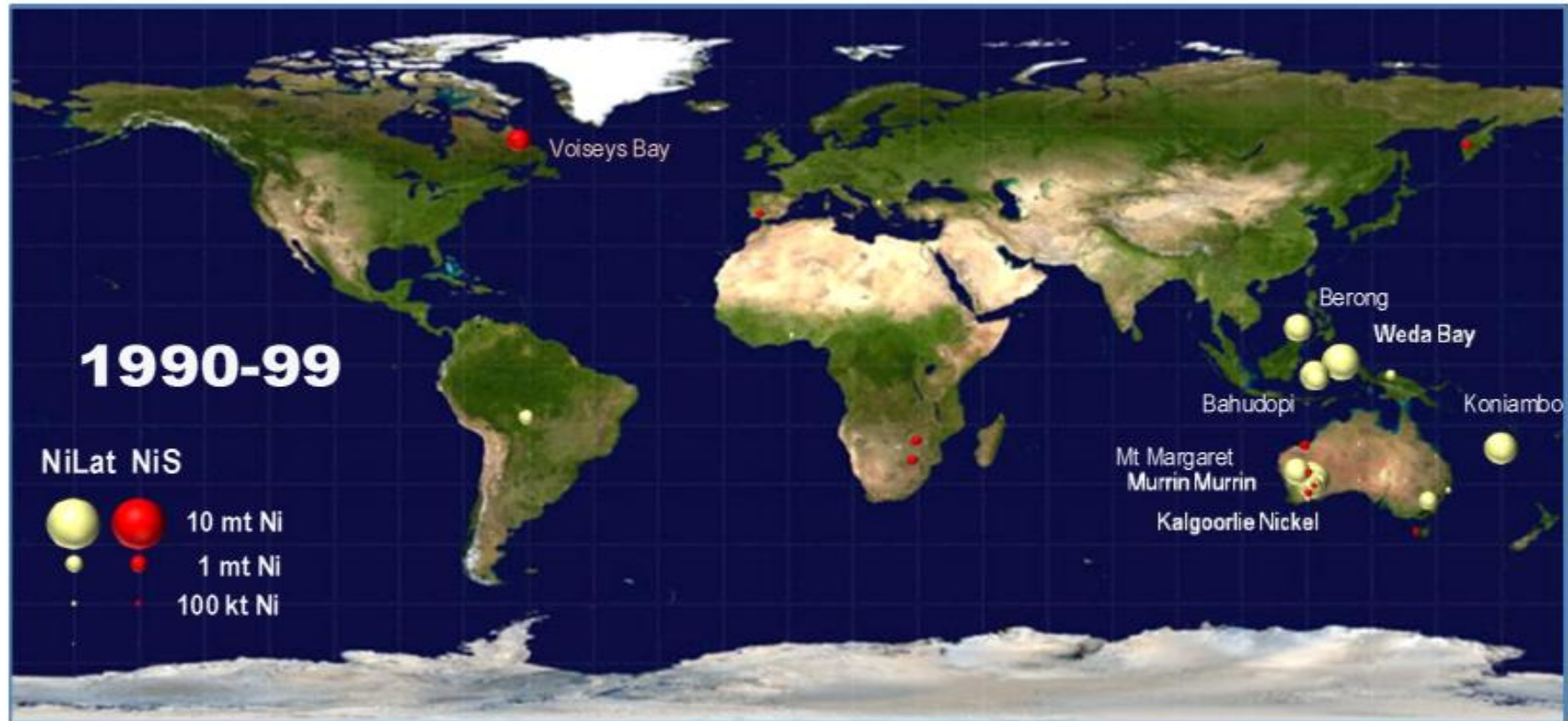


Depressed commodity prices and minimal exploration resulted in the 1980s being a "dead" decade for nickel

Source: MinEx Consulting Aug 2010

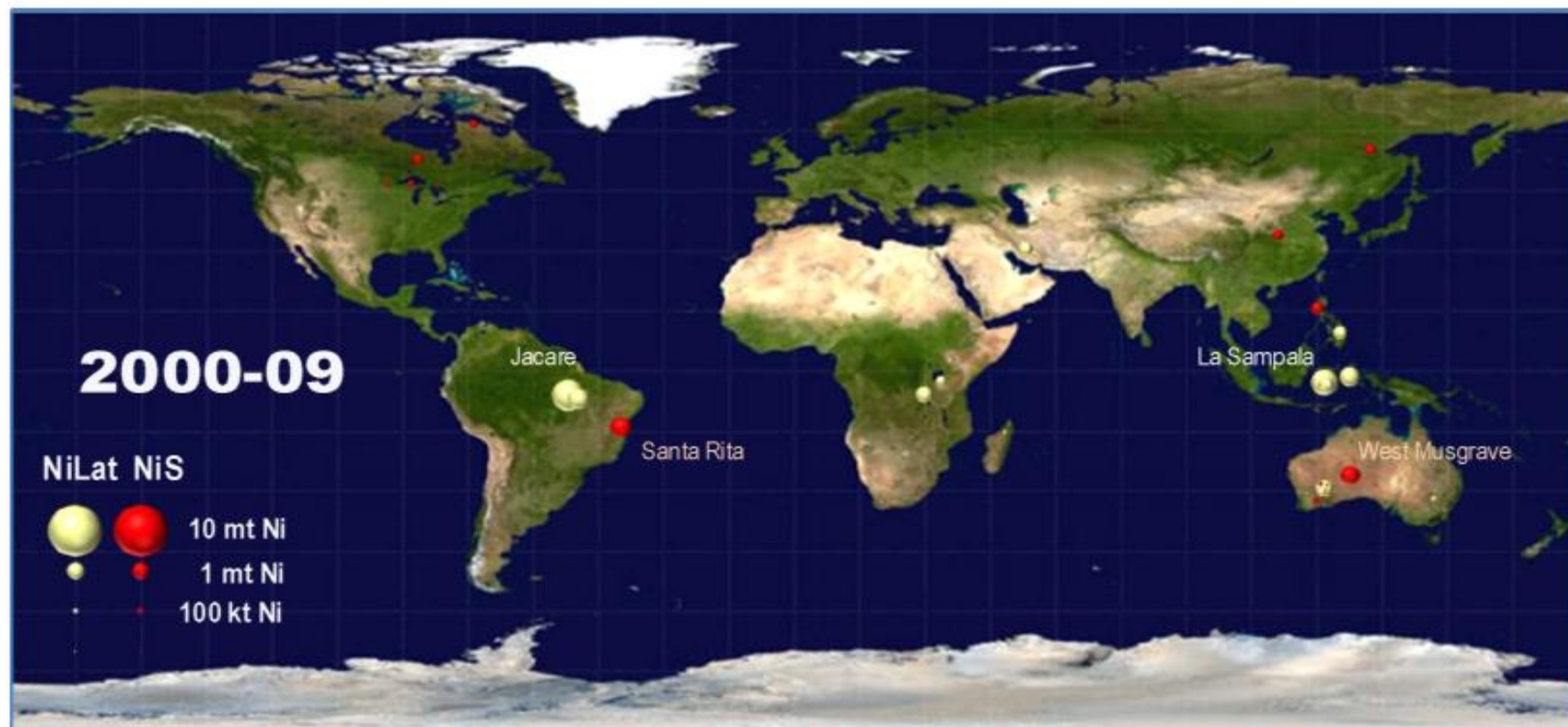


# Nickel discoveries over time : 1990-99



Source: MinEx Consulting Aug 2010

# Nickel discoveries over time : 2000-09



Source: MinEx Consulting Aug 2010

# SUMMARY

- Industry produces 1.6 mtpa of nickel worth \$35-40b
- Prices and returns are extremely volatile
- In the past most nickel came from sulphides, but most of the available resources are laterites
- Ni Lat projects are challenged by technical and capital issues
- Possible innovations in heap leaching
- Look for projects with capex costs <\$20/lb and opex costs <\$5/lb
- Majority of metal found is nickel laterites (but most of these won't be developed into mines)
- Discovery costs are ~24 c/lb for NiS and ~2c/lb for NiLat

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