



# ISSUES AND PERSPECTIVES FOR THE XXIST CENTURY

## Workshop « Policies for the XXIst Century »

**WORLD MATERIALS FORUM 2015**

Nancy, June 23rd & 24th, 2015

Vincent Laflèche, CEO  
BRGM, the French Geological Survey

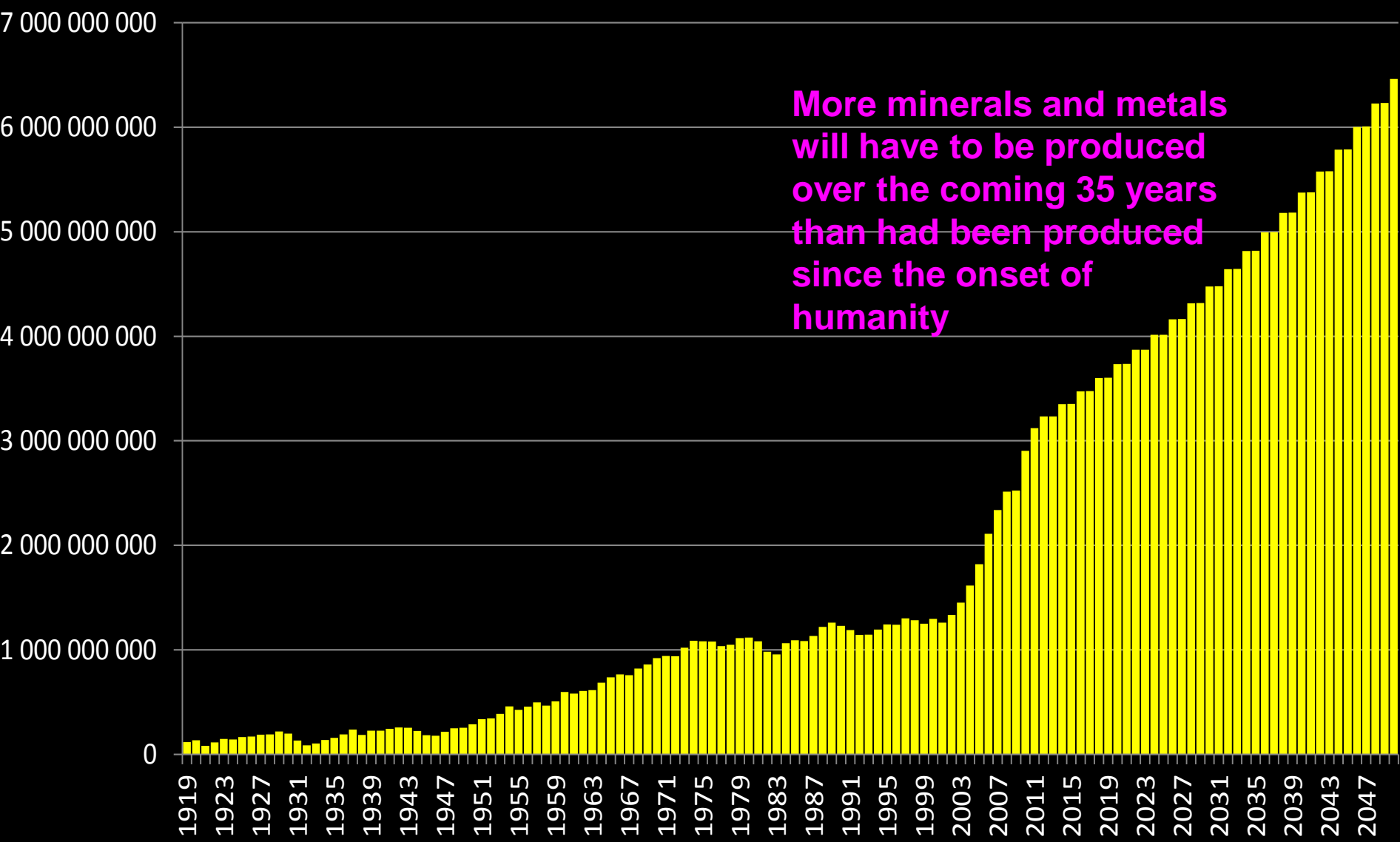
# The XXIst century will:

- > see 2 to 3 extra billion people on Earth;
- > see further reduction of poverty. From 1981 to 2013, outside of sub-saharan Africa, the number of persons living with less than 2.5 \$/ day has declined by approx. 700 million (World Bank data)
- > see further growth in urbanisation: +2.5 billion people will live in cities by 2050, according to the UN. **Chine urbanisation**
- > see growing production of energy by means of low greenhouse gas sources to combat global warming
- > see growing competition for access to natural resources

# The XXIst century will:

- > require a massive amount of minerals and metals despite all progress that can and needs to be made to shift the global economy from its current linear behaviour (extract > manufacture > use > discard) to a circular behaviour based on concepts such as resources use reduction, re-use of components, recycling, industrial ecology.

**1919-2050 production, in metric tonnes, of 14 mineral raw materials (Al, Au, Ba, Co, Cr, Cu, iron ore, K<sub>2</sub>O, Mn, Ni, phosphate, Pb, Pt, Zn) - 1919-2010: real growth - 2010-2050: 3.2% CAGR based on the average growth 1981-2010**

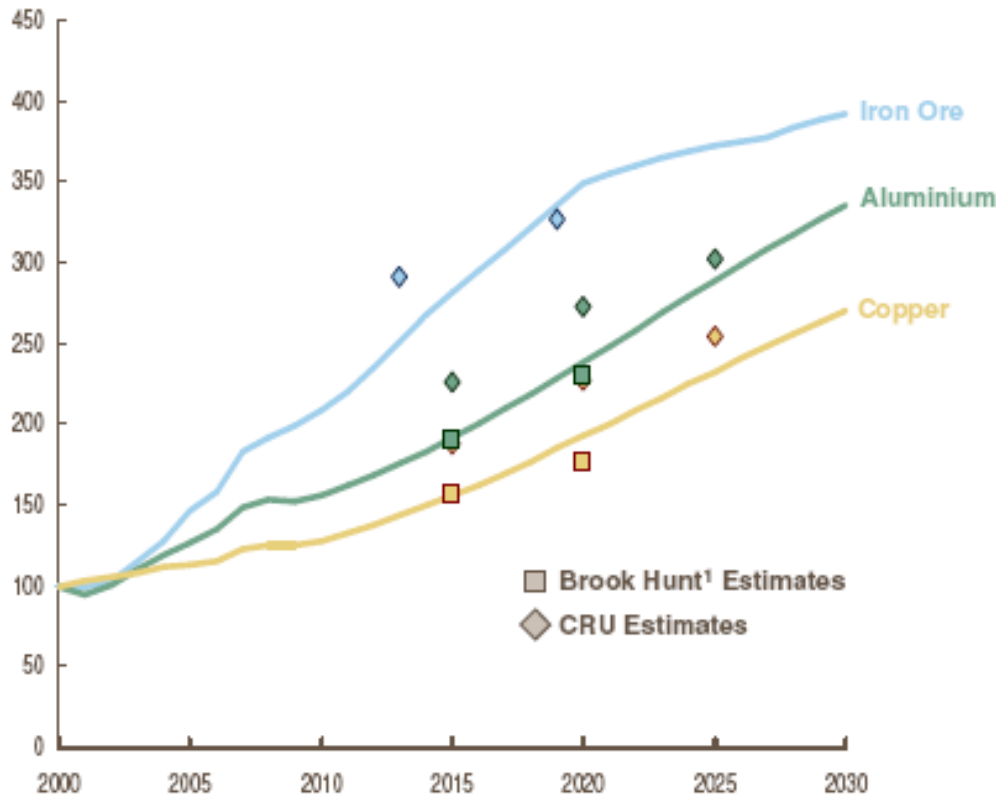


# Long Term Economic Outlook

Metals demand expected to double over the next 15 – 20 yrs requiring a significant supply response

## Global consumption of leading Rio Tinto commodities

Indexed, 2000=100



Note: cf trend of 3-6 % growth per annum for most other metals.

<sup>1</sup> Brook Hunt a Wood Mackenzie Company

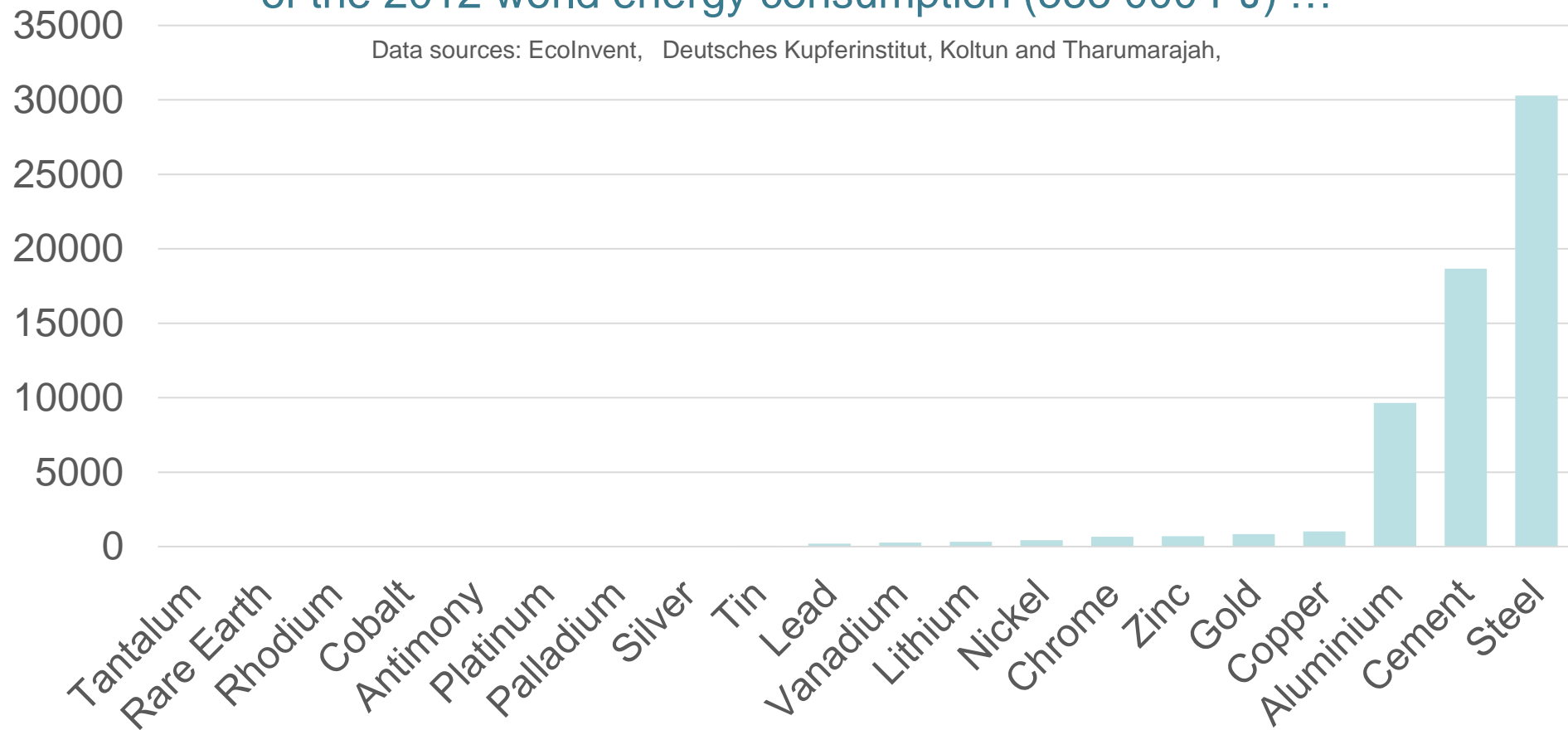
- Increasing urbanisation rates support positive longer term view
- Growth in non-OECD markets will support higher prices over the longer term
  - China is key but India is set to follow
- Underlying demand trends over the next two decades indicate that the global mining industry will need to find and develop:
  - One Pilbara system (BHPB + Rio Tinto) every 5 years
  - One Saguenay system every nine months
  - One Escondida every year

**The Australian Pilbara system is the world largest known iron ore resource (over 25% of the world's iron resources) La Escondida is the world largest copper mine. Each required multi-billion USD in investments**

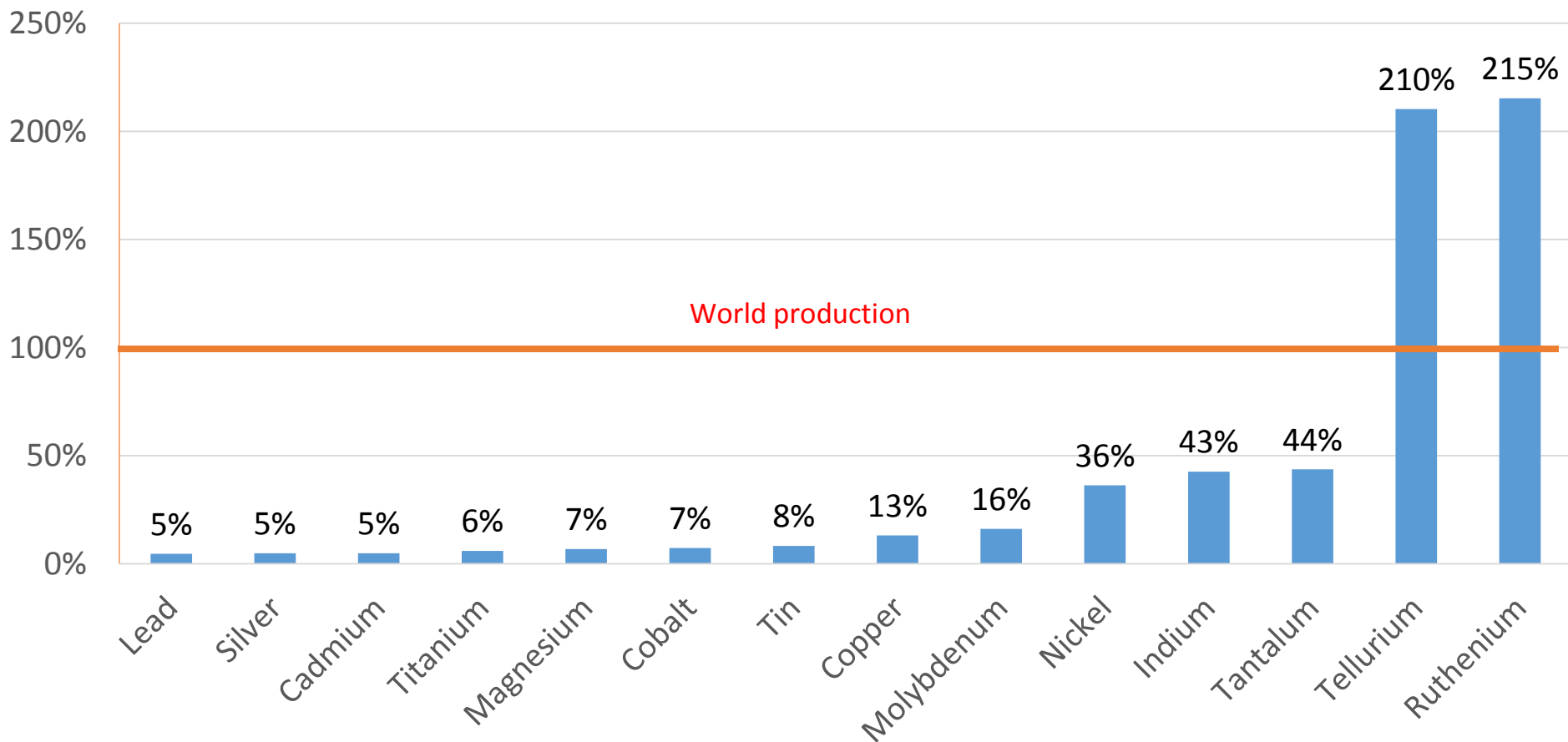
**THIS IS A FORMIDABLE CHALLENGE  
IN TERMS OF GEOLOGICAL DATA REQUIRED,  
OF KNOW-HOW, EQUIPMENT,  
SERVICES AND CAPITAL NEEDED  
AS WELL AS IN TERMS OF  
POTENTIAL NEGATIVE IMPACTS (EMISSIONS,  
WASTE ...)**

# Estimated energy used (electricity and heat) for the production of minerals and metals, in PJoules. This represents about 12% of the 2012 world energy consumption (533 000 PJ) ...

Data sources: EcoInvent, Deutsches Kupferinstitut, Koltun and Tharumarajah,



... and the production of energy will require a lot of metals: estimate of the average main yearly metals requirement, in % of the 2010 world production, needed to build the low-GHG emissions electricity production facilities needed to fulfil the International Energy Agency Blue Map Scenario 2010



Nom du service émetteur





**SKILLS ARE THE MOST PRECIOUS AND SCARCE RAW MATERIALS WITH LOOMING PROBLEMS ABOUT THEIR AVAILABILITY AS THE RATES OF NEW AVAILABLE QUALIFIED PROFESSIONALS DECLINED DRAMATICALLY OVER THE LAST DECADES**

	2 013	2016	2021
<b>TRADES AND UNDESIGNATED OCCUPATIONS</b>	<b>13640</b>	<b>20540</b>	<b>35625</b>
<b>PROFESSIONAL AND PHYSICAL SCIENCE OCCUPATIONS</b>	<b>1470</b>	<b>2260</b>	<b>3390</b>
- including geologists	500	790	1370
- including mining engineers	235	370	665
- including metallurgists	85	120	220

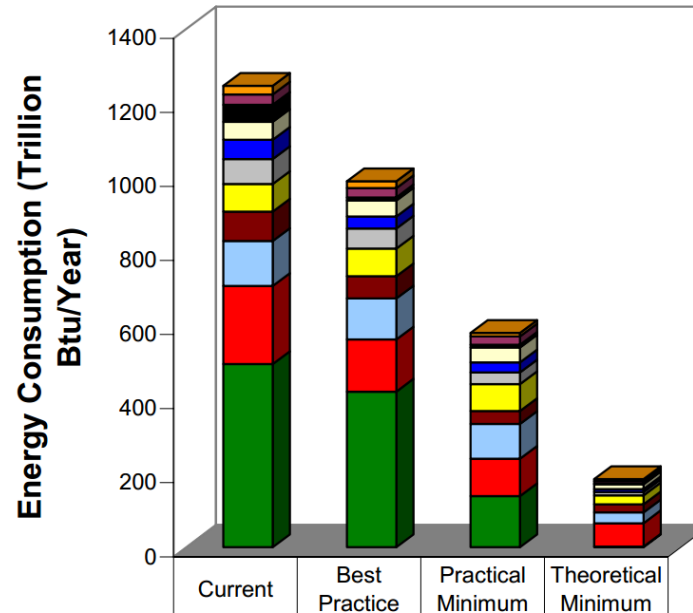
**ANTICIPATED HUMAN RESOURCES NEEDS IN THE CANADIAN MINING INDUSTRY – Source: Canadian Mining Industry Human Resources Council report 2011**



# THE WAY FORWARD (TAKE HOME MESSAGES)

# AFFORDABLE INNOVATIONS ARE ONE OF THE KEYS TO THE FUTURE; THEY ALREADY MADE THE XXTH CENTURY POSSIBLE – EXAMPLE: ENERGY SAVINGS POTENTIAL IN THE US MINING INDUSTRY

Energy Consumption and Saving Potential by Equipment Type (TBtu/Yr) – Source: BCS, Incorporated - 2007 - Mining Industry Energy Bandwith Study - US Department of Energy (Washington D.C., USA) - [http://energy.gov/sites/prod/files/2013/11/f4/mining\\_bandwidth.pdf](http://energy.gov/sites/prod/files/2013/11/f4/mining_bandwidth.pdf)



	Current	Best Practice	Practical Minimum	Theoretical Minimum
■ Blasting	24	18	10	5
■ Dewatering	28	25	23	7
■ Separations	46	8	7	2
□ Electric Equipment	48	43	40	13
■ Crushing	52	32	27	8
■ Drilling	67	54	32	9
■ Ancillary Operations	75	75	72	24
■ Digging	79	60	35	22
■ Ventilation	122	111	94	29
■ Materials Handling-Diesel	211	141	101	63
■ Grinding	494	420	138	2

## WHERE PROGRESS NEEDS TO BE MADE, AND QUITE URGENTLY, KNOWING THAT THERE IS NO UNIQUE SOLUTION TO A HIGHLY COMPLEX GLOBAL PROBLEM

- **Reduce resources (minerals, energy, water ...) use all along value chains from mining to the final product, through enhanced production processes, materials and products design;**
- **Extend products lifetime and facilitate the re-use of their still functional components;**
- **Design materials and products for recycling (move from product-centric recycling policies to material-centric ones);**
- **Design and enforce public policies that reward corporate transparency, sustainable performance accounting and reporting in line with initiatives such as the Global Reporting Initiative, the Extractive Industries Transparency Initiative, the Dodd-Frank act, the Kimberley act and discourage opaqueness and unverifiable sustainability performance;**
- **Develop education from the youngest age on natural resources issues and their management;**
- **Raise public awareness on minerals and metals related issues;**
- **Develop 3D geological data and knowledge infrastructures as well as minerals intelligence, including life-cycle data inventories (e.g. the European Platform on Life-Cycle Assessment) as public good;**
- **Foster publicity and reliability of data on minerals exploration and mine development activities, in line with the Canadian NI 43-101 regulation;**

## WHERE PROGRESS NEEDS TO BE MADE, AND QUITE URGENTLY, KNOWING THAT THERE IS NO UNIQUE SOLUTION TO A HIGHLY COMPLEX GLOBAL PROBLEM

- **Develop sustainable technologies for the discovery of new deposits, mining, ore processing, metallurgy, materials and products design aiming at providing better services AND saving natural resources;**
- **Engage in sustained cooperation with poor developing countries to help them build their geological database, their sectoral institutions, develop the human and institutional capacities they need to sustainably promote and regulate the investments and developments needed for the use and transformation of their mineral resources;**
- **Identify and promote the best practices and the best available technologies.**

**THANK YOU FOR  
YOUR INVITATION  
AND ATTENTION**