

# **Exposure Limits: Global Challenges**

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# *Overview*

- **Historical & Global Evolution**
- **OEL Setting Processes Today**
- **Challenges**

# *Historical Insights*

- Prior to the development of OELs, insights into industrial hygiene (occupational hygiene) and chemical exposure were developed
- **90-20 BC: Roman** architect/engineer Marcus Vitruvius Pollio noted lead workers had pale gray complexions
- **23-79 AD: Roman** Pliny the Elder described workers' use of sheep bladders as masks to protect from mercury dust and vapors
- **1556:** Agricola warned of “black lung” in miners (**Italian**)

# *Historical Insights*

- Prior to the development of OELs, insights....(continued):
  - **1700**: Ramazzini, “father” of occupational medicine recommended hygiene, posture, ventilation and protective clothing for workers (**Modena, Italy**)
  - **1736**: state of Massachusetts in USA prohibited use of lead in whiskey stills after fatalities of drinking alcohol from the stills.
  - **1840**: France issued a policy discouraging the use of lead as a pigment in paint
  - **1912**: Kobert of Germany published a list of acute exposure limits for 20 substances



## *Historical Insights*

**Many of the repeated exposure levels “with minimal symptoms” are considered IDHL concentration levels today!**



## ***Historical Evolution of OELs***

- **Parallels Evolution of EHS**
- **Parallels Culture's Risk Acceptance**
- **Europe—1880s**
- **United States—1920s**
- **China and India—Late 1940s**
- **Latin America—Recent**

# *European OEL Processes*

- First attempts at OEL development in Germany in **1883** on CO, NH<sub>3</sub>, HCl, etc.
- In **1938** (Germany), a list of OELs (*MAK-Werte*) proposed, but not accepted. The *MAK Kommission* was founded in **1955** and published its first list in 1956 (17 years after the first list of TLVs).
- **1930s**, Russia published first MAC list of 30 OELs.
- Later, several European countries created their own Committees to develop OELs—Sweden; Netherlands; UK; France. Often, ACGIH TLVs served as basis for their exposure standards and laws.

# *European OEL Processes*

- **1980s**—Control Banding concept first proposed.
- **1991** – First set of (27) Indicative Limit Values (ILVs) proposed by a Scientific Expert Group of the European Commission.
- **1995**-- The European SCOEL (Scientific Committee on Occupational Exposure Limits) was established.
- **1998**-- the social partner Advisory Committee for Safety, Hygiene and Health at Work (ACSHH) was formed.
- SCOEL recommendations (ILVs and BLVs) are reviewed with the Advisory Committee, made publicly available for comment and, once finalized, issued by the European Commission.





# *European OEL Processes*

- **2000** Global Harmonized System (GHS) for chemical labeling introduced into EU.
- **2005** Control of Substances Hazardous to Health Regulations (COSHH)
- **2007** Regulation on Registration Evaluation & Control of Chemicals (REACH), with prescribed DNEs often Lower than traditional OELs and including full cycle EHS risks.



# ***European Future Challenges***

- **Better efforts to establish OELs adopted in all members states and co-ordinated by SCOEL → need better cooperation between the national OEL committees.**
- **Global threat on Occupational Health (ie, Sweden, Switzerland and Italy). Lack of resources for the SCOEL is an illustration of this.**
- **In Europe, Occupational Hygiene is much less visible and known than in North America.**
- **The REACH revolution (strong political commitment & shift of responsibility from the government to private industry!).**
- **Simplified approaches—Control Banding (ILO 2002 toolkit).**



# ***United States Environment***

- **OEL Setting Within 8 Frameworks**

- **1927 Walsh Healey Act**
- **1946 ACGIH**
- **1971 OSHA**
- **1971 NIOSH**
- **1984 AIHA**
- **EPA New Chemical Exposure Limits (TSCA)**
- **State Level Efforts, More Restrictive**
- **Manufacturers**

# *China's OEL Development*

## Great Wall



Slide courtesy of Dr. Jas Singh, Golder Associates

# *China's OEL Process*

- **1950s**, People's Republic of China published first list of exposure standards.
- **1990s**, Emphasis on Occupational Disease Prevention
- **339 Conservative OELs, National Compulsory Standards**
- **Health is Primary Consideration, Strive for Economic & Technological Feasibility**

## Comparison: China's OELs, TLVs and PELs

Hazardous Agents	China' OEL PC-TWA (mg/m <sup>3</sup> )		ACGIH TLV TWA (mg/m <sup>3</sup> )	US OSHA PEL TWA (mg/m <sup>3</sup> )
Methanol	25		262	262
Lead	0.03		0.05	0.05
n-Hexane	100		172	300
Dimethylformamide	20		36	35
Crystalline Silica/ Quartz (respirable)	10%≤free SiO <sub>2</sub> ≤50%	0.7	0.025	10/ (%SiO <sub>2</sub> +2)
	50%<free SiO <sub>2</sub> ≤80%	0.3		
	free SiO <sub>2</sub> >80%	0.2		
Noise (8hr per day)	85dbA		85dbA	90dbA

# *Democratic Republic of India*



October 25, 2010

Slide courtesy of Dr. Jas Singh, Golder Associates

# *India's OEL Processes*

- **Reality—Safety Focus**
- **Huge Workforce—Unorganized Sector**
- **Lack of Occupational Disease Data**
- **Meager Spending on Public Health**
- **No Coherent National Policy**
- **Factories Act, 1948, Permissible Limits of Exposure of Chemical and Toxic Substance**



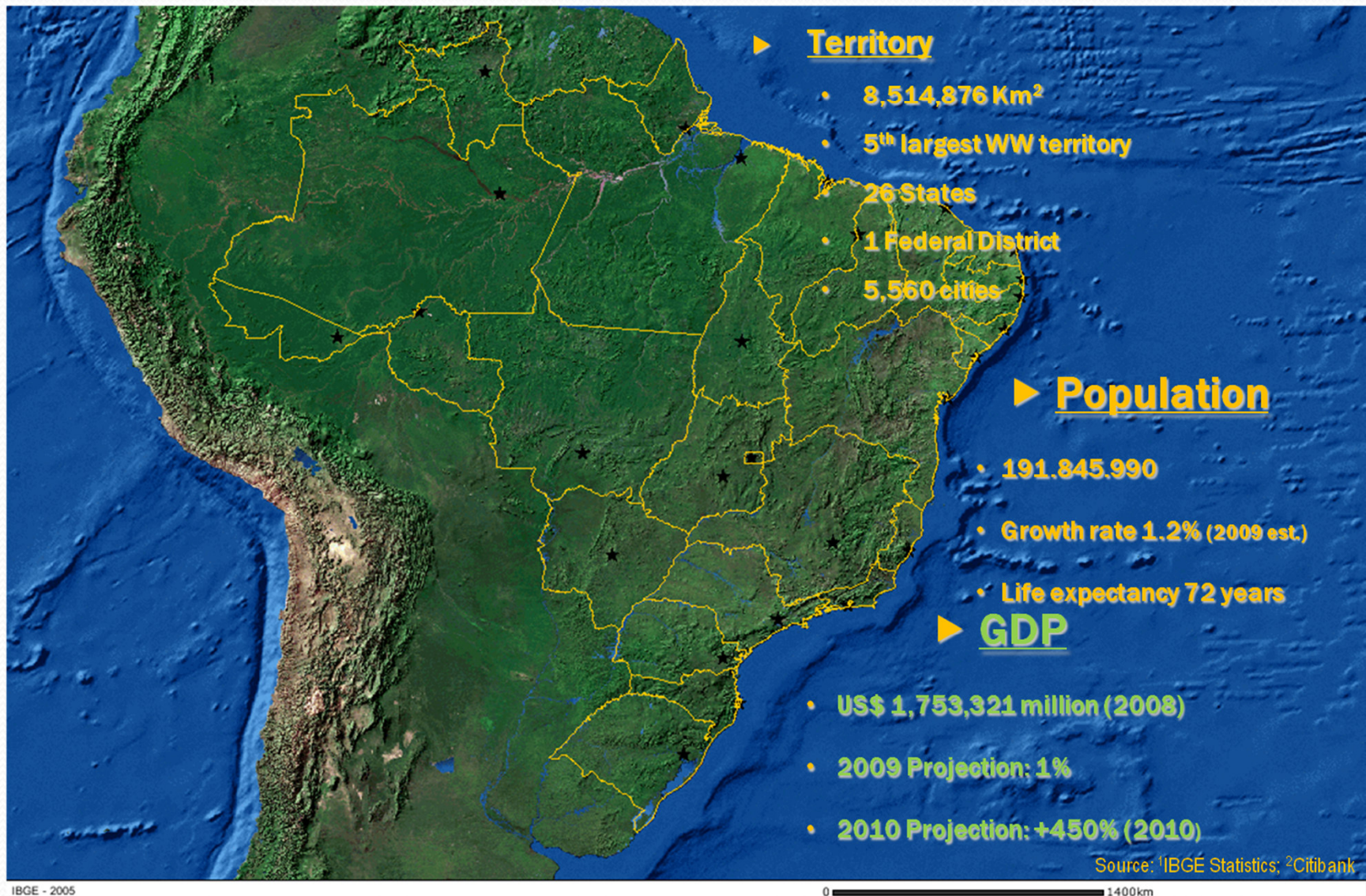
## ***India Permissible Limits of Exposure (mg/m<sup>3</sup>)***

<b>Substance</b>	<b>ACGIH</b>	<b>OSHA</b>	<b>INDIA</b>
Asbestos	0.1 f/cc	0.1 f/cc	2 f/cc
Benzene	1.6	3	30
Beryllium	0.002	0.002	0.002
Carbon Monoxide	28	55	55
Hexavalent Cr (Sol)	0.05	0.1	0.50
Hexavalent Cr (insol)	0.01		
Manganese fume	0.2	5 ©	1.0
Total Dust	10	15	10
Vinyl Chloride	2.5	2.5	10

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Slide Courtesy of Dr. Jas Singh, Golder Associates

# Latin America Overview



Slide Courtesy of Jose Pedro Dias, Johnson & Johnson

# ***Latin America General Information***

**Official Language: Spanish and Portuguese are the most spoken languages**

**Number of Countries: 43**

**Social Inequality is a major roadblock.  
25% of the population lives with less than \$2 / day.**

**Brazil is the leading country, followed by Mexico, Argentina and Colombia**

## *Latin American Countries*

COUNTRY	EXPOSURE LIMITS	DATE
BRAZIL	ACGIH	1976
ARGENTINA	ACGIH	ACTUAL
CHILE	ACGIH	ACTUAL
COLOMBIA	ACGIH	ACTUAL
MEXICO	ACGIH	ACTUAL
VENEZUELA	ACGIH	2001 (Under review)

Slide Courtesy of Jose Pedro Dias, Johnson & Johnson



## ***OEL Global Challenges***

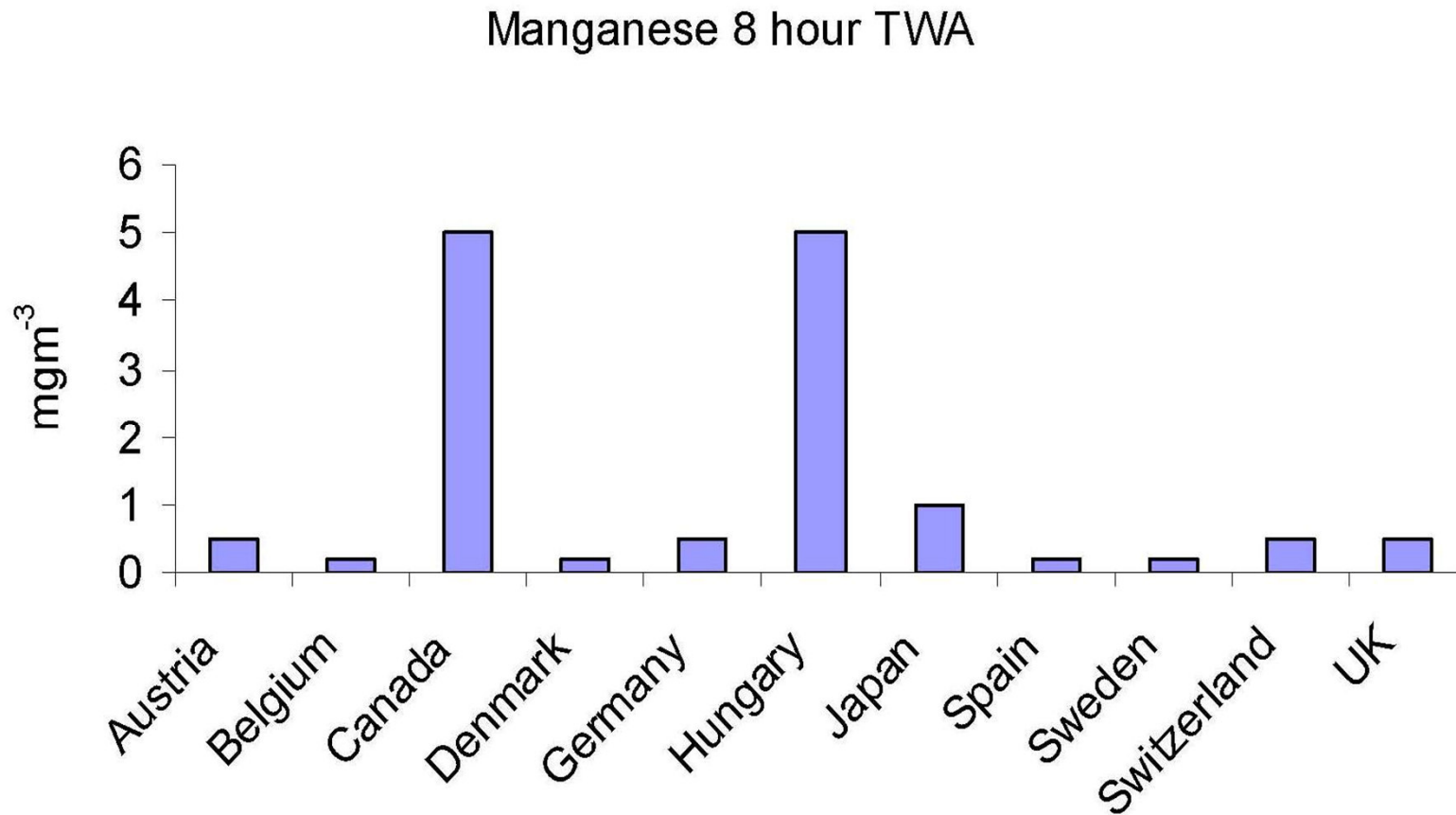
- **Number of Chemicals in Commerce**
- **OELs—Little Understanding**
- **Emphasis—Full Cycle EHS Risks**
- **Not all Value OELs**
- **Data—Quality & Reliability**
- **Resources and Expertise**



## ***OEL Global Challenges***

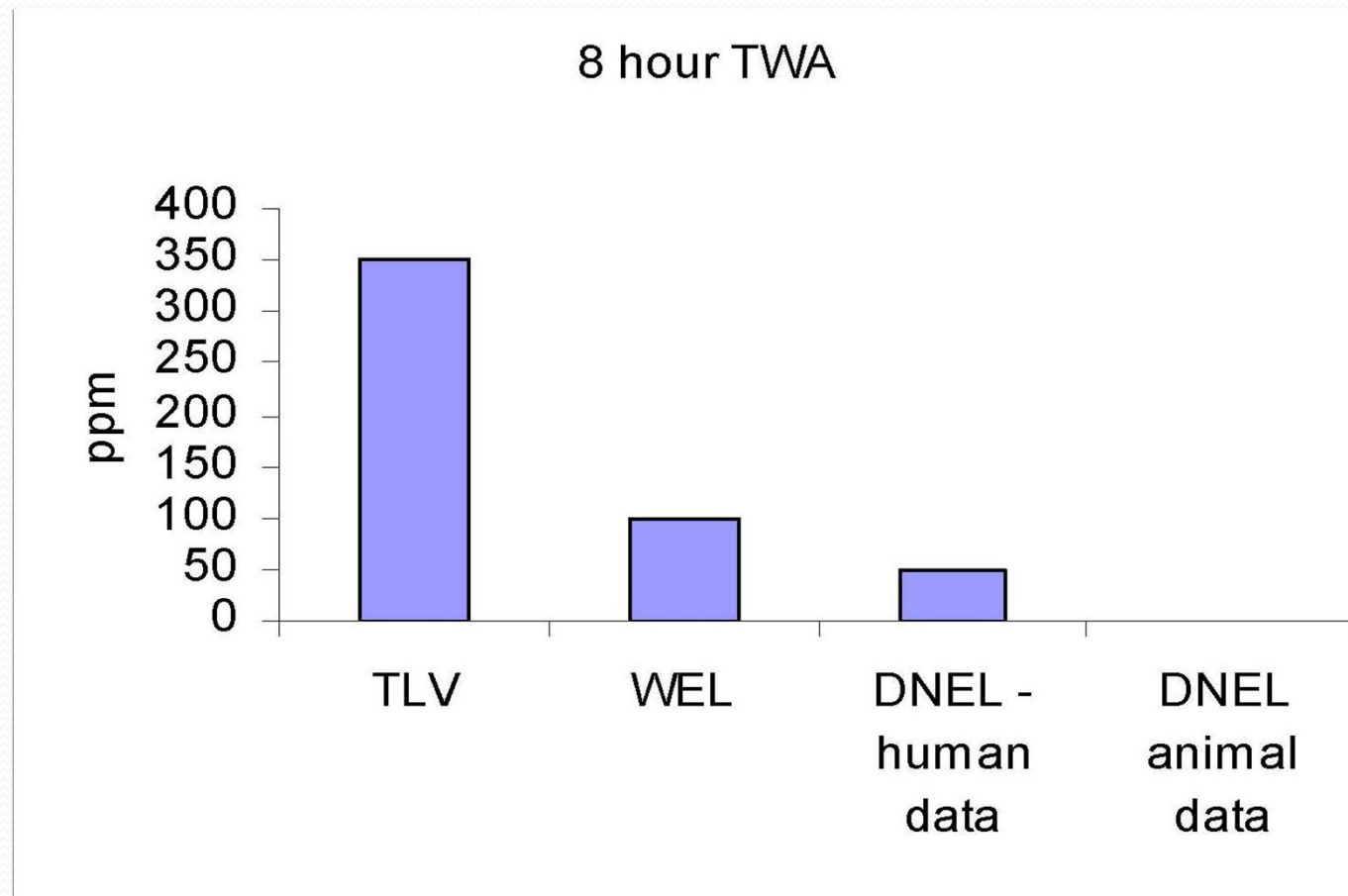
- **Varied Risk Determination Efforts, Resulting Exposure Levels and Protection Levels**
- **Few Direct Measurement Methods**
- **REACH—New Rules**
- **OELs—Acceptable Risk vs True Threshold of Toxic Risk.**

# Various OELs for Manganese



**Source:** Alison Searl, PhD, Director of Analytical Services, IOM Consulting, *Some Current Approaches to OEL Setting in the EU*, BOHS, Occupational Hygiene Conference, Thistle Hotel, Bristol, 2008.

## Derivation of DNEs: 1,1,1 Trichloroethane



**Source:** Alison Searl, PhD, Director of Analytical Services, IOM Consulting, *Some Current Approaches to OEL Setting in the EU*, BOHS, Occupational Hygiene Conference, Thistle Hotel, Bristol, 2008.





## ***Questions We Must Ask***

- **Do OELs Have Value Today?**
- **Are There Alternatives?**
- **Who Should Participate?**



## ***Do OELs Have Value?***

- **Risk Assessments**
- **Respirator Selection**
- **Exposure Priority Setting**
- **Purchase Decisions**
- **Control Recommendations for Product Consumers**



## ***Are There Alternatives?***

- **REACH DNELs and DMELs?**
- **Control Banding?**
- **Other?**



## ***Vision***

- **Common Value of Protecting Human Health May Allow for **International Sharing** of Information, **Development** of Exposure Limits and Their Documentation.**



## ***Who Should Participate?***

- **Neutral 3<sup>rd</sup> Party?**
- **International Body?**
- **Role of Organizations, Both National and Professional?**



## ***Note – Green Paper***

- **Historical Evolution of OELs**
- **OEL Setting Processes Today**
- **OELs Are Critical to Industrial Hygiene and Risk Assessment**
- **Today's World Community Challenges**
- **Future Direction?**
- **Paper available at [www.ioha.org](http://www.ioha.org).**



## *Excerpt*

“... we believe that **Occupational Exposure Limits (OELs) are absolutely critical.** We hope that this Paper will encourage our broad audience of stakeholders to discuss the critical issues, continue the dialogue and, as a call to action, help determine what the future for OELs should be. In working together, our profession can lead a way forward.”

**Thank You - Any Questions?**





# *Advocates – Green Paper*

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