

# Occupational Exposure Limits The Global Landscape



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# Presentation Highlights

- Historical Evolution
- OEL Setting Processes Today
  - Traditional, threshold approach
  - Newer ideas
    - Risk based
    - Band based

# Global Evolution

- Pre 1900
- Early 1900s
- 1940s-1970s
- Post 1970s



# Today's OEL Processes

- **US Environment (1920s start)**
  - 1927 Walsh Healey Act
  - 1946 ACGIH
  - 1971 OSHA
  - 1971 NIOSH
  - 1984 AIHA
  - State Level Efforts

# Today's OEL Processes

- **European Union**

- ACGIH TLVs a starting point
- SCOEL (Scientific Committee on OELs)
- Individual country efforts...eg UK
  - Control of Substances Hazardous to Health Regulations (COSHH) from 1988
  - 1980-2005, annual update, ~ 500 WELs
  - Since 2005, new WELs-implement IOELVs
- 2007 REACH

# REACH

- EU effort
- 2007 Regulation on Registration Evaluation & Control of Chemicals (REACH)
- Prescribed DNELs
- Include EH&S risks
- Lower than traditional OELs



# China's OEL Development

- Great Wall



# China's OEL Process

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



# Comparison: China's OELs, TLVs and WELs

Hazardous Agents	China's OEL PC-TWA (mg/m <sup>3</sup> )		ACGIH TLV TWA (mg/m <sup>3</sup> )	UK OEL TWA (mg/m <sup>3</sup> )
Methanol	25		262	266
Lead, fume & dust	0.03, fume 0.05, dust		0.05	0.15
n-Hexane	100		176	72
Dimethylformamide	20		29.9	15
Crystalline Silica/ Quartz (respirable)	10% ≤ free SiO <sub>2</sub> ≤ 50%	0.7	0.025	0.1
	50% < free SiO <sub>2</sub> ≤ 80%	0.3		
	free SiO <sub>2</sub> > 80%	0.2		
Noise (8hr per day)	85dbA		85dbA	85dbA

# Democratic Republic of India



# India's OEL Processes

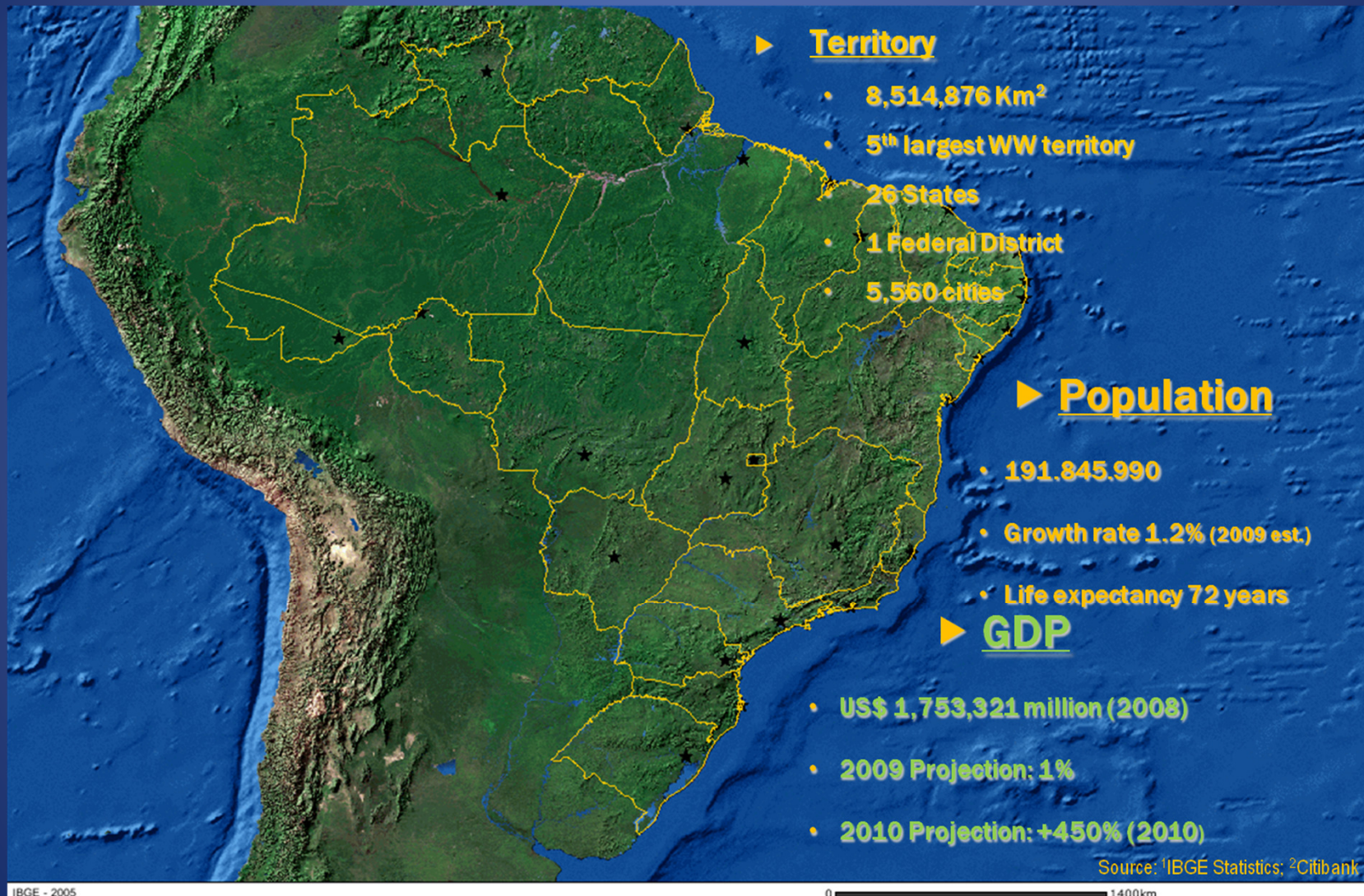
- Safety Focus and Huge Unorganized Workforce
- Lack of Occupational Disease Data
- Meager Spending on Public Health
- No Coherent National Policy
- **1948** Factories Act, Permissible Limits of Exposure of Chemical and Toxic Substance

# India's Permissible Limits of Exposure

Substance (mg/m <sup>3</sup> )	ACGIH	UK OEL	INDIA
Asbestos	0.1 f/cc	0.1 f/cc	0.1 f/cc
Benzene	1.6	3.25	1.5
Beryllium	0.002	0.002	0.002
Carbon Monoxide	28	35	55
Hexavalent Cr (Sol)	0.05	0.05	0.05
Hexavalent Cr (Insol)	0.01		0.05
Manganese fume	0.2	0.5	1.0
Total Dust	10	10	10
Vinyl Chloride	2.5	7.8	10



# Latin America Overview



# Latin America General Information

**Official Language: Spanish and Portuguese most spoken**

**Number of Countries: 43**

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

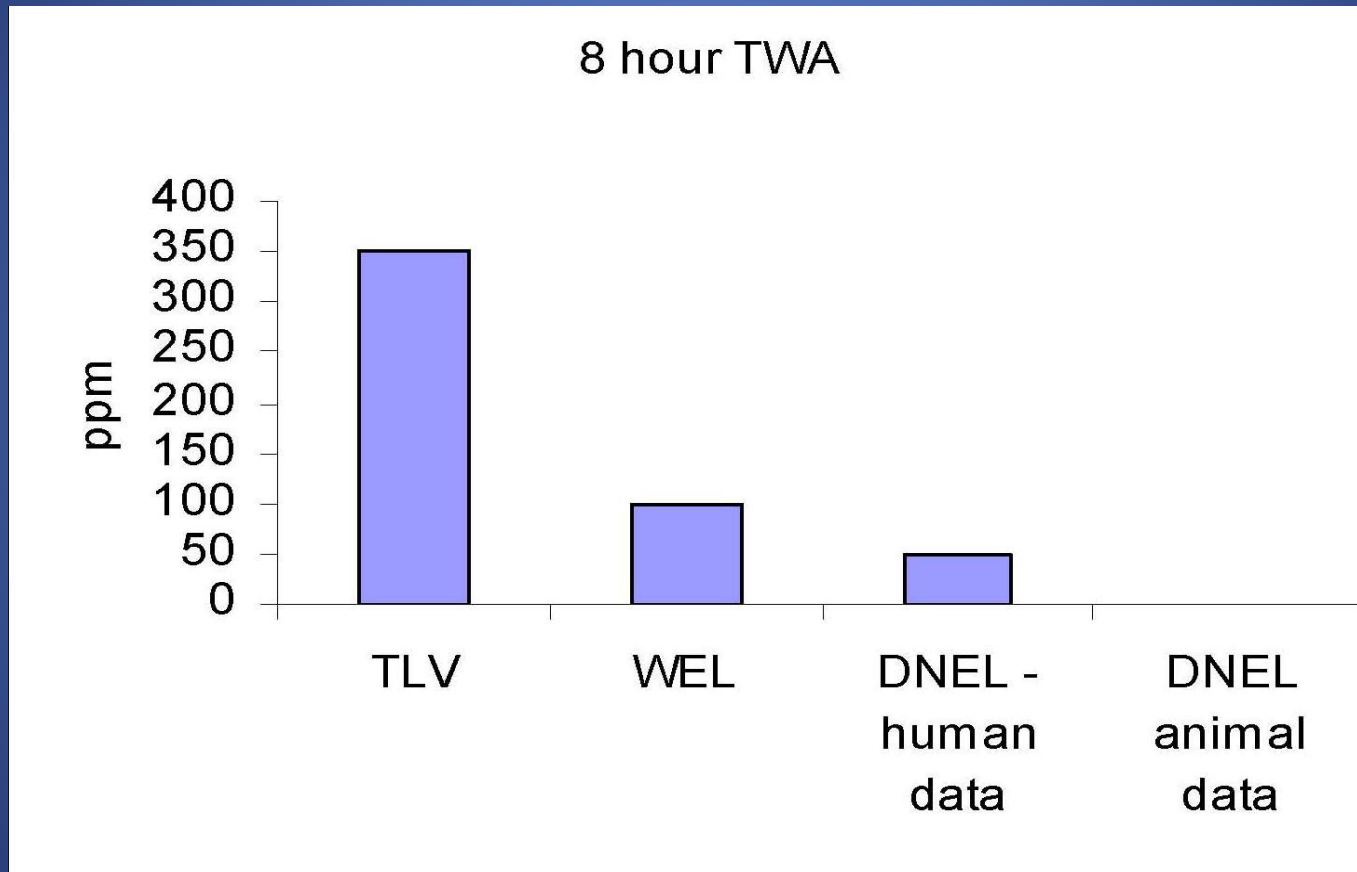
**Brazil leading country economically,  
followed by Mexico, Argentina and Colombia**



# Latin American Countries

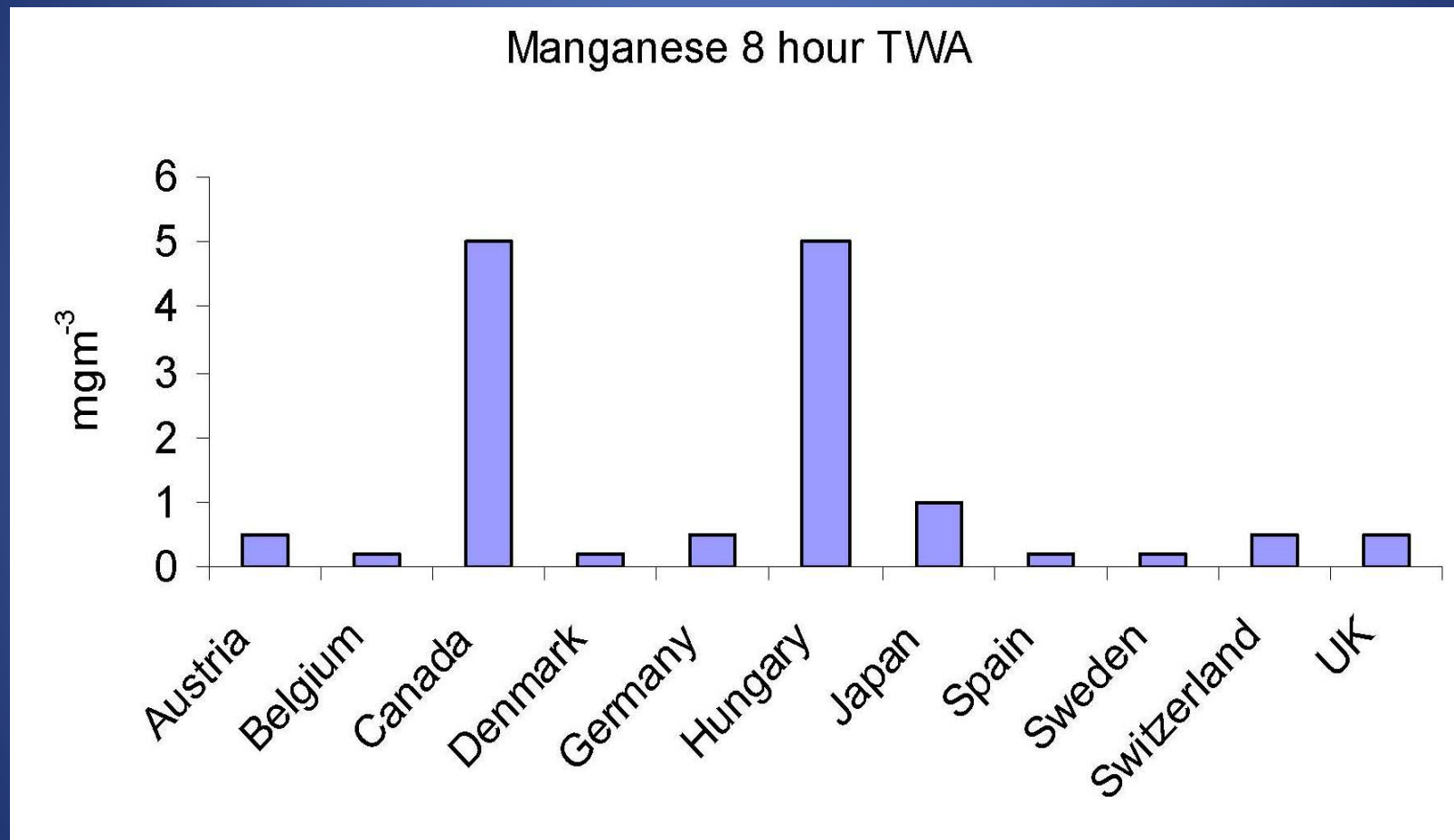
COUNTRY	EXPOSURE LIMITS	DATE
BRAZIL	ACGIH	ACTUAL
ARGENTINA	ACGIH	ACTUAL
CHILE	ACGIH	ACTUAL
COLOMBIA	ACGIH	ACTUAL
MEXICO	ACGIH	1998
VENEZUELA	ACGIH	2001 (Under review)

# Derivation of DNELs: 1,1,1 Trichloroethane



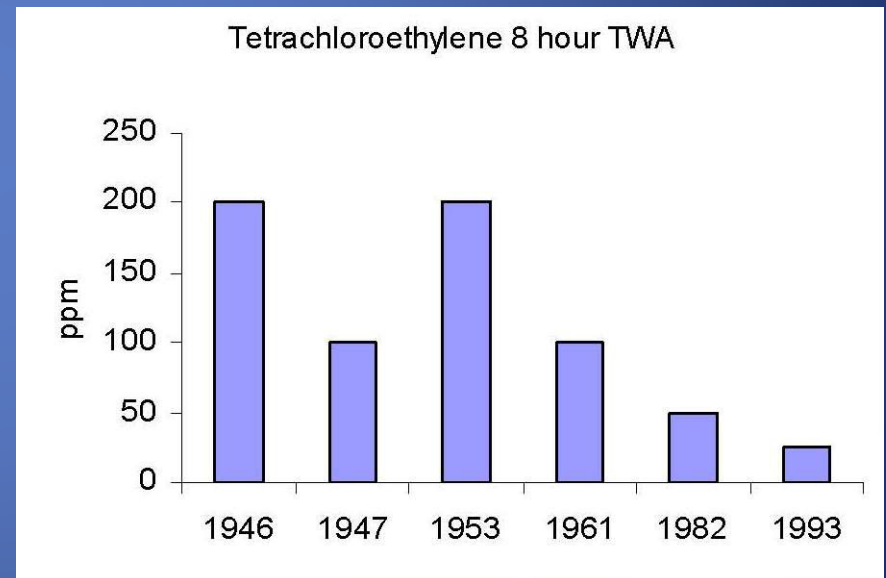
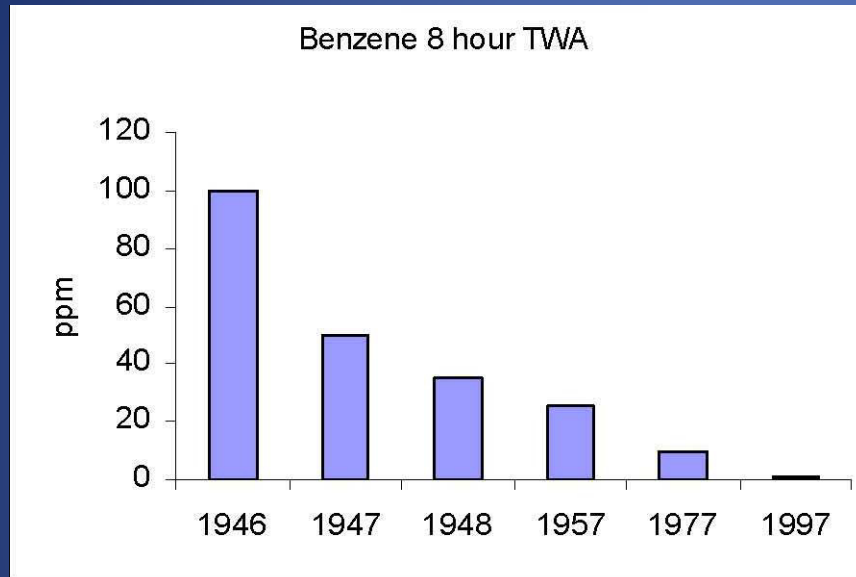
Source: Alison Searl, PhD, Director of Analytical Services, IOM Consulting, *Some Current Approaches to OEL Setting in the EU*, BOHS, Occupational Hygiene Conference, Thistle Hotel, Bristol, 2008.

# 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.

# ACGIH Threshold Limit Values



**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.

# OEL Global Challenges

- # of chemicals in commerce
- OELs not well understood
- New emphasis--full cycle risks
- Not everyone values OELs
- Basic data--quality & reliability
- Resources and expertise

# OEL Global Challenges

- Varied risk determination processes...varied protection levels
- Measurement method issues
- REACh--new playing field
- OELs not set at zero risk, but *acceptable* risk.



# Critical Questions

- Do OELs have value today?
- Who should participate in OEL setting processes?
- Are there alternatives to traditional OELs?

# Do OELs Have Value?

- Risk assessments
- Respirator selection
- Exposure priority setting
- Purchase decisions
- Control recommendations for product consumers

# Who Should Participate?

- Neutral 3rd party?
- International body?
- Role of U.S. organizations, federal agencies or professional organizations?

# Alternatives to Traditionally Derived OELs?

- Occupational Exposure Band
- Quantitative or Risk Based OELs
- Risk Based Environmental Limits

## Hazard Assessment

Identify and Define  
“*Hazard Criteria*”

- Hazard Bands (OEBs)
- Exposure Limits (OELs)
- Skin Notations,...

## Exposure Risk Assessment

Collect all relevant exposure information  
and assess exposure risk against “*Hazard Criteria*”

## Exposure Management

Define Controls &  
Programs Utilizing the  
Hierarchy of Controls

Anticipation  
+  
Recognition

Evaluation

Control  
+  
Confirm

Re-Evaluate as  
Required

# Industrial Hygiene Process

# Hierarchy of OELs

Quantitative  
Health Based  
OELs

## Health Based OELs

- Regulatory, Authoritative
- Traditional (TLVs, MAKs, WEELs, PELs, MACs, RELs)

## Working Provisional OELs

- internal company
- trade association
- vendor limits

## Prescriptive Process Based OELs (REACH DNELs/DMELs)

## Hazard Banding Strategies

- Pharmaceutical banding
- Occupational exposure banding

### Most Extensive Data Requirements

(human epidemiology studies) > quality, > certainty

### Moderate Data Requirements

(*in vitro* and animal studies and anecdotal reports of human health effects) > quality, > certainty

### Least Data Requirements

(*in vitro* and animal studies)

As more toxicological and epidemiological data becomes available, we move up the hierarchy of OELs.



# Polls—Learnings

- Today, **Suite of OEL Setting Tools** Exist Globally
- Most Chemicals Not Have OELs
- **“Hierarchy of OEL”** Processes May Bridge Risk Assessment and Management Gaps

# AIHA-PEL Advisory Group Formed

- Initial discussions, 1.5 years ago
- Presently, convening to address OSHA's request for input on the upgrading of exposure limits.
- Deadline: April 8, 2015
- Expect opportunity for input.