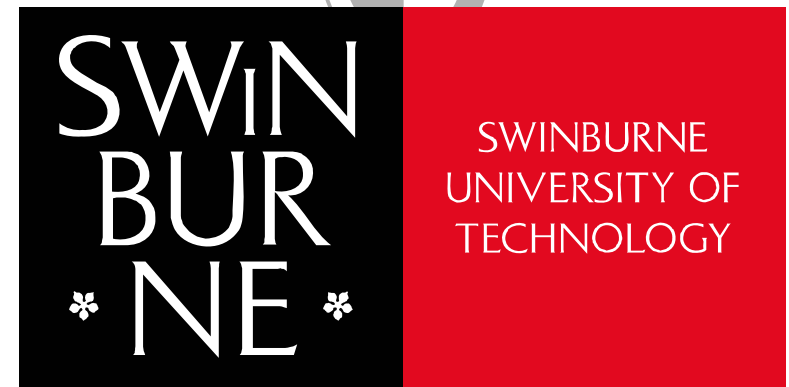


Sustainable Metals: The Challenge for Europe and Australia

Professor Geoffrey Brooks

March 2008



The Big Picture



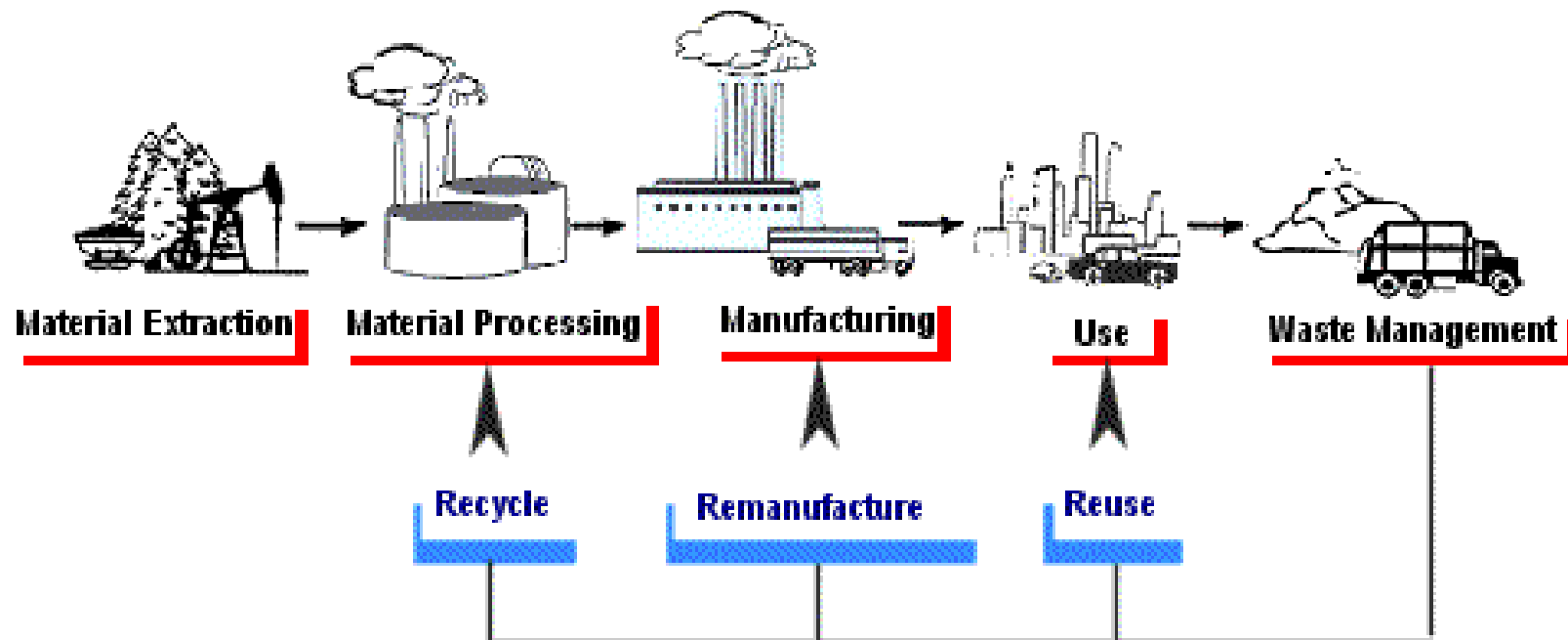
Images from magazine.voiaganto.it/img/tgv-dup1.jpg and media-cdn.tripadvisor.com/media/photo-s/00/1d

The Materials Cycle

PRODUCT LIFE CYCLE ANALYSIS

(LCA)

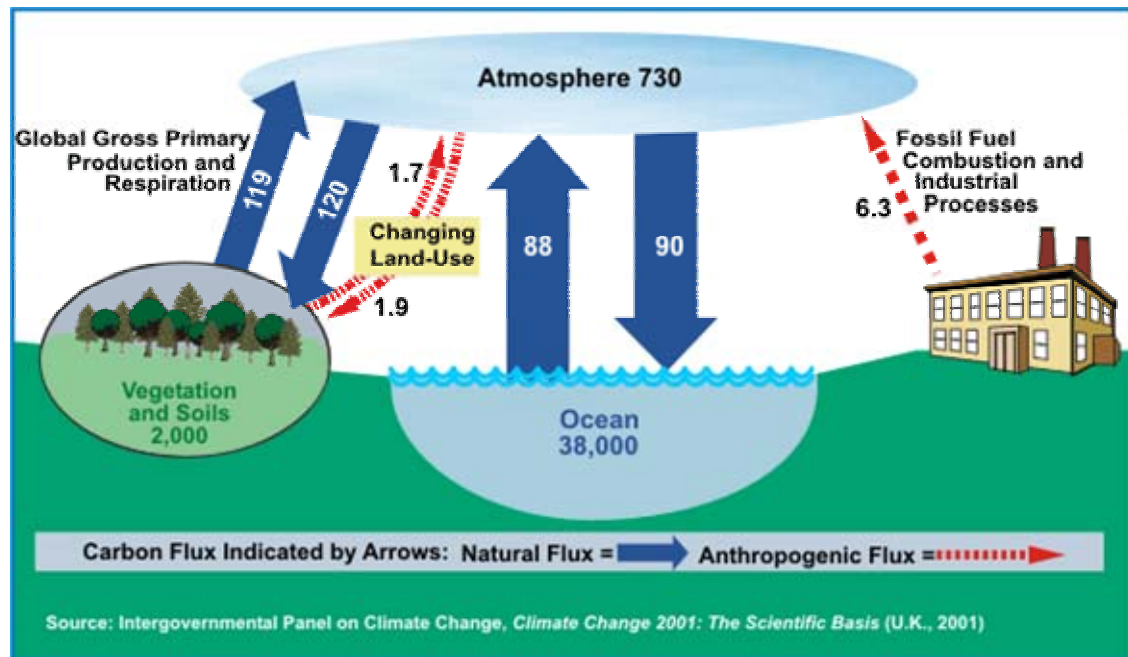
Flow of product through society



The Big Picture



**UN Climate Change
Conference 2007**
Bali - Indonesia



Export Wealth from Minerals

Major Australian Exports 2006-07 (A\$m)

Coal	21,896 (13.0%)
Iron ore	15,502 (9.2%)
Gold	10,560 (10.6%)
Crude Petroleum	7,640 (4.5%)
Bauxite/Alumina	6,279 (3.7%)
Total	168,113 A\$M

Export Wealth from Minerals

Major NSW Exports 2006-07 (A\$m)

Coal	4,825 (10.2%)
Aluminium	2,487 (9.2%)
Copper ores	1,913 (5.3%)
Refined Petroleum	1,236 (2.6%)
Bovine meat	890 (1.9%)
Total	47,202

Export Wealth from Minerals

Major Victorian Exports 2006-07 (A\$m)

Motor Vehicles	1,758 (5.6%)
Aluminium	1,601 (5.1%)
Milk and Cream	1,105 (3.5%)
Wool	922 (2.9%)
Medicaments	890 (2.8%)
Total	31,393

WORLD CRUDE STEEL PRODUCTION 1993 - 2007



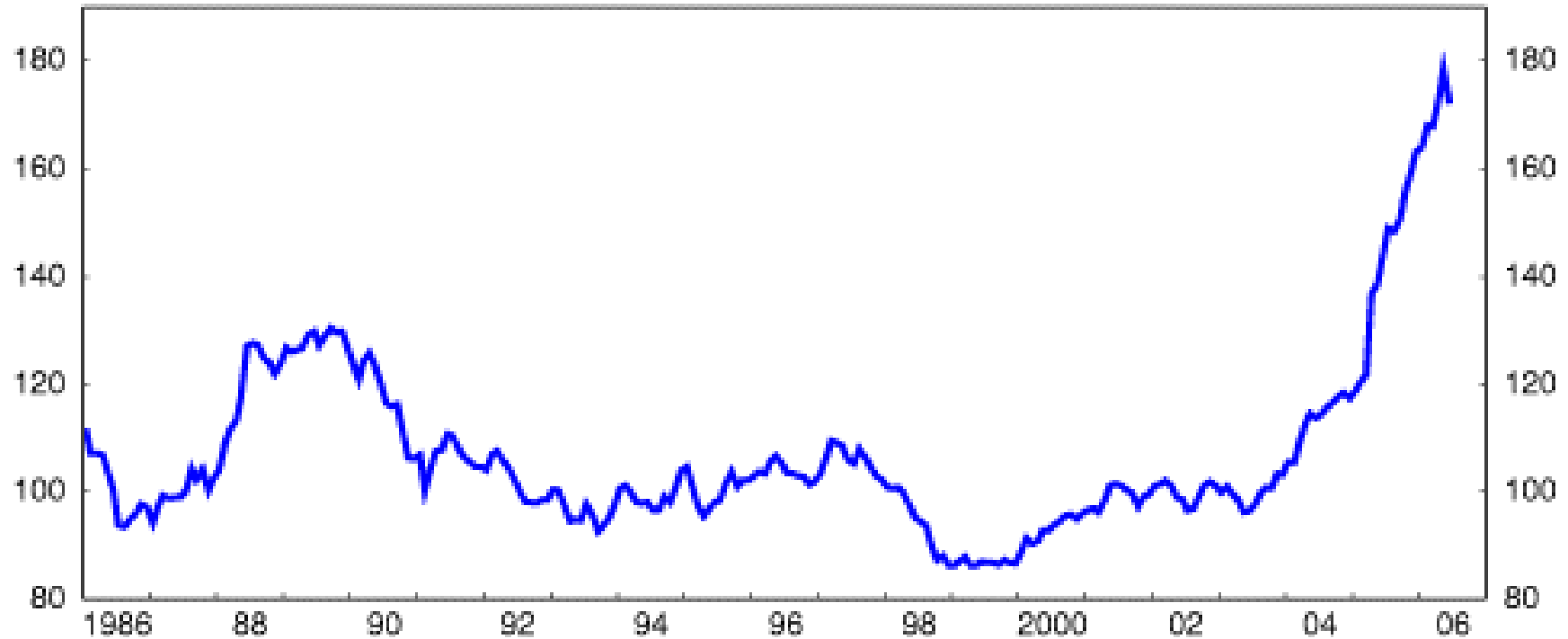
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Source: International Iron and Steel Institute

Iron and Steel Statistics Bureau

Australian commodity prices are booming

Index (SDR) for all items, 2001/02 = 100

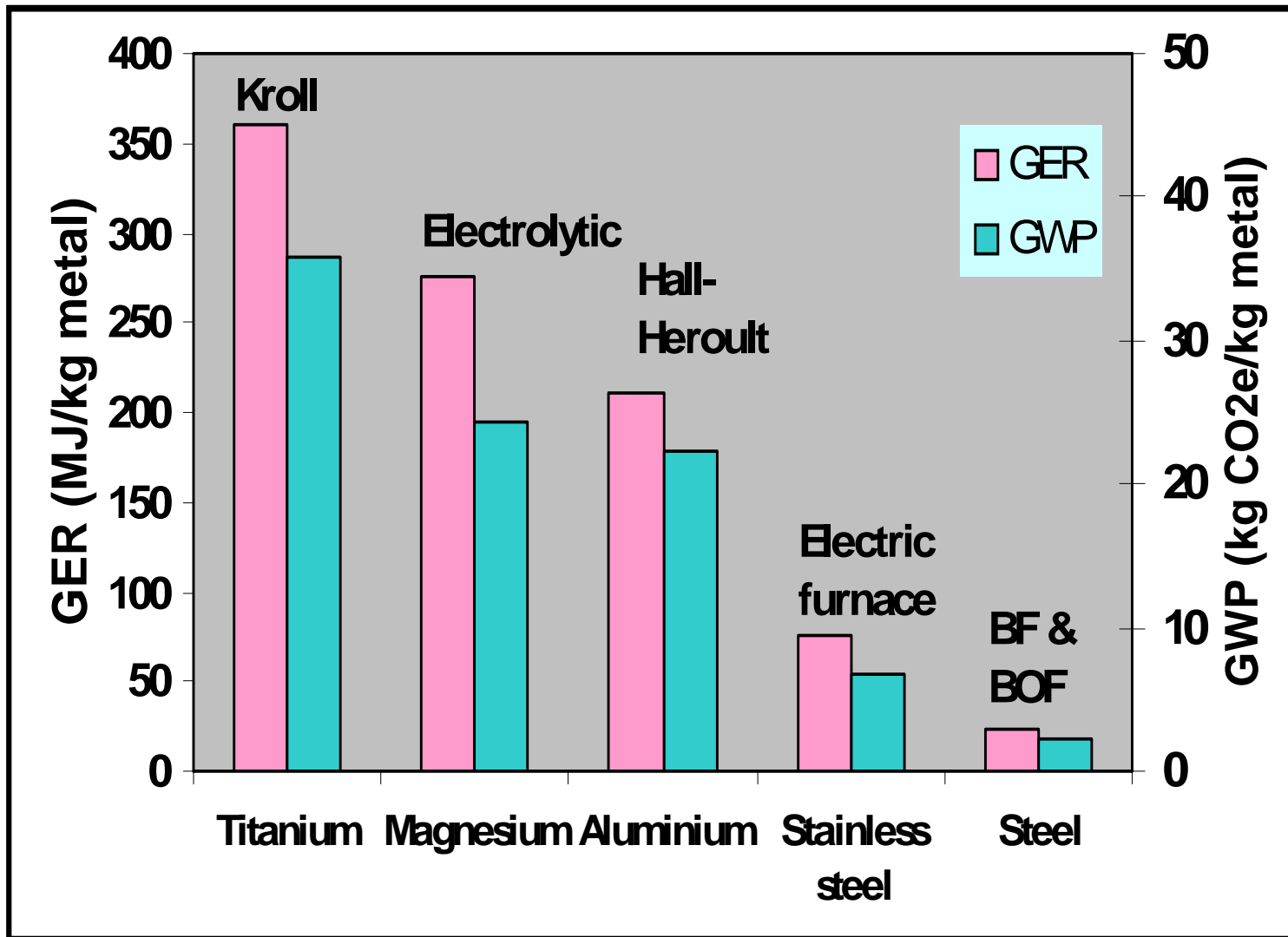


The big picture

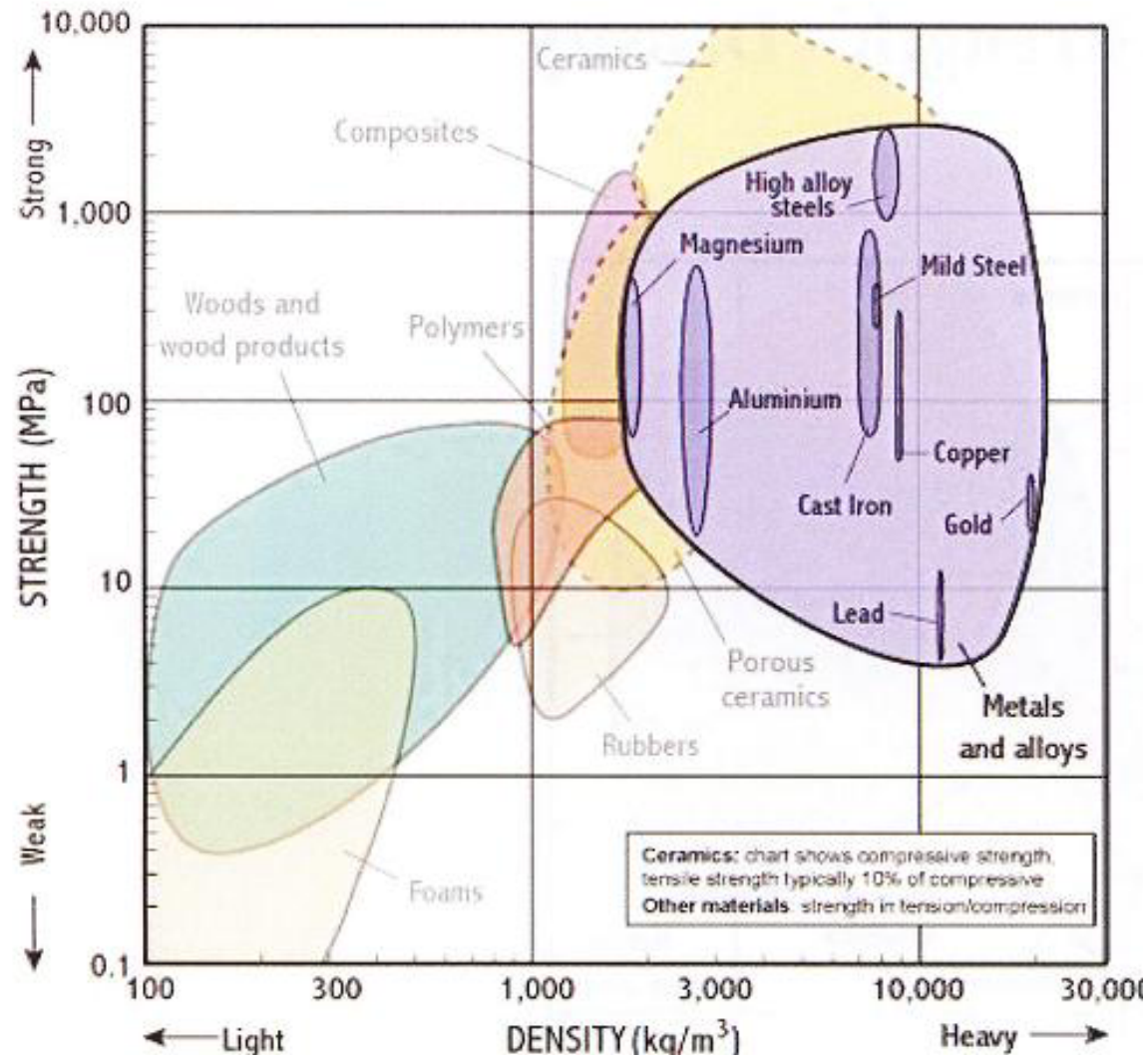
Significant reductions in world wide carbon emissions will:

- Increase pressure to lower footprint of minerals/metals production
- increase the drive to metal & materials recycling
- Increase desire for low weight materials for transport
- Drive innovation in production, design and manufacturing with metals

Greenhouse Impact of Metal Production



Strength & Weight



Lightweight Cars ?



Repercussions for Australia and Europe

- need for innovation in metal production
 - lowering footprint of existing Aluminium and Steel processes
 - new processes for Aluminium, Iron, Titanium and Magnesium
- lowering greenhouse gases associated with manufacturing
- drive to greater recycling as a proportion of total usage
- **adapting existing expertise to new challenges**

Australian Innovation

HiSmelt - new ironmaking technology

Aluminium – new cell materials and geometry

Titanium – new powder metallurgy routes

Magnesium – new high temperature routes

Top Submerged Lance (TSL) technology

Australian Innovation – TSL Technology

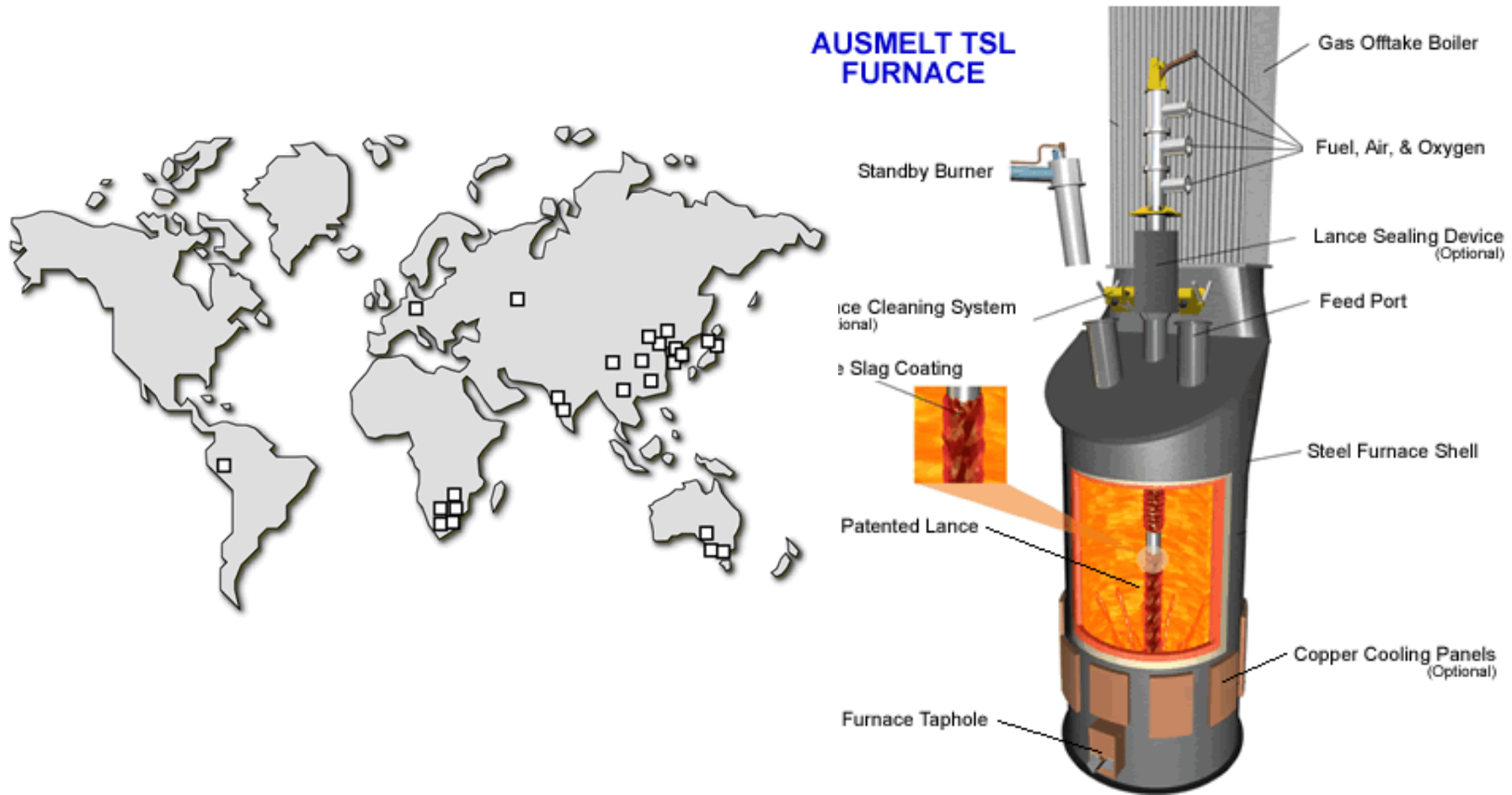


Image from www.ausmelt.com.au

© Swinburne University of Technology

European Innovation

ULCOS – Ultra low carbon dioxide steel

Titanium – Electrochemical route (FFC)

Aluminium – Cell materials and cell design

Process control and instrumentation

Sustainable design of manufactured goods

Opportunities of Australian/European Collab.

ARC Discovery and Linkage

EU Framework mechanism

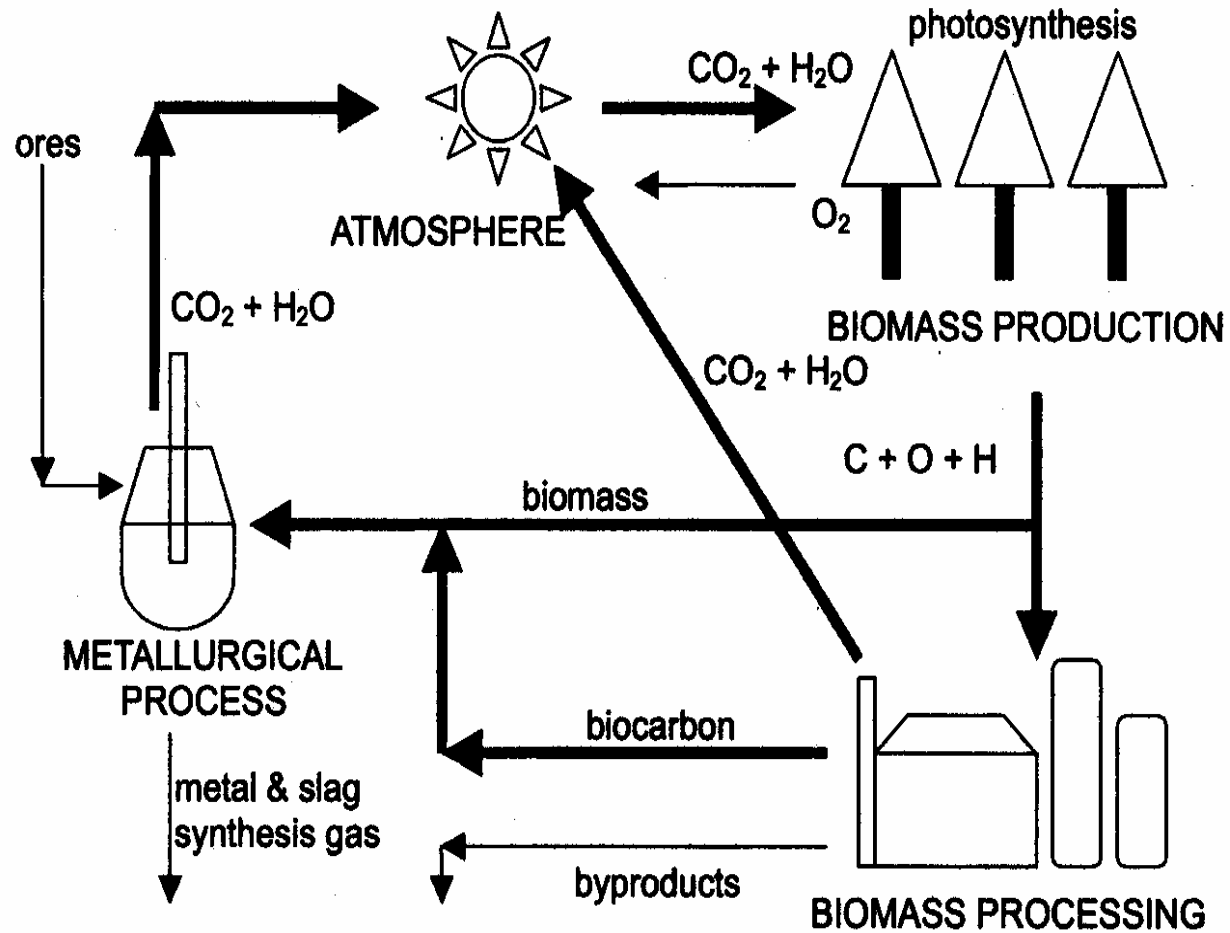
Seeding/support from FEAST

Global "Clusters" – corporate and Universities

Role of Professional Societies ?

Role of CSIRO ?

Sustainable Metal Production



Solar Metallurgy ?



Image from solar.web.psi.ch/data/facilities/images/tasc.jpg

Final thoughts

Lowering the environmental impact of metal production is a significant challenge facing the world.

Australia has a special interest in this problem because of economic and technical strengths in minerals & metals.

Europeans faces similar challenges but more at the metal/manufacturing/recycling interfaces.

CAN WE HELP EACH OTHER ?