

Emerging Trends in Global Aluminium Industry

December 6, 2011

D BHATTACHARYA

Hon. President, Indian Aluminium Association
Managing Director, Hindalco Industries Ltd.
Vice-Chairman, Novelis Inc.

Presentation Structure

Global and Indian Consumption Trends

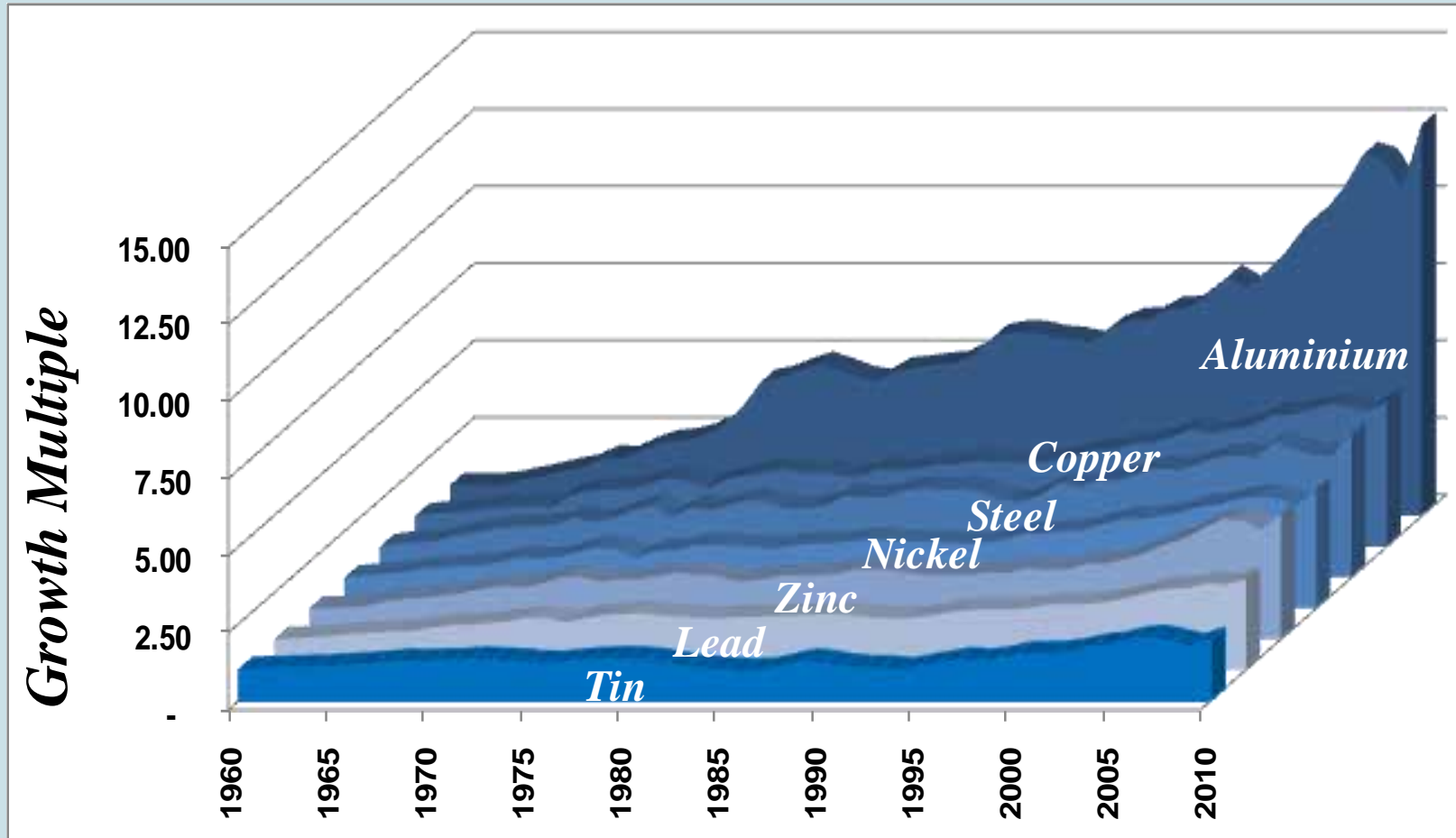
Changes in Business Environment

Trends- Challenges & Opportunities

Summing Up and Imperatives

Aluminium: Fastest growing metal

INCAL
2011

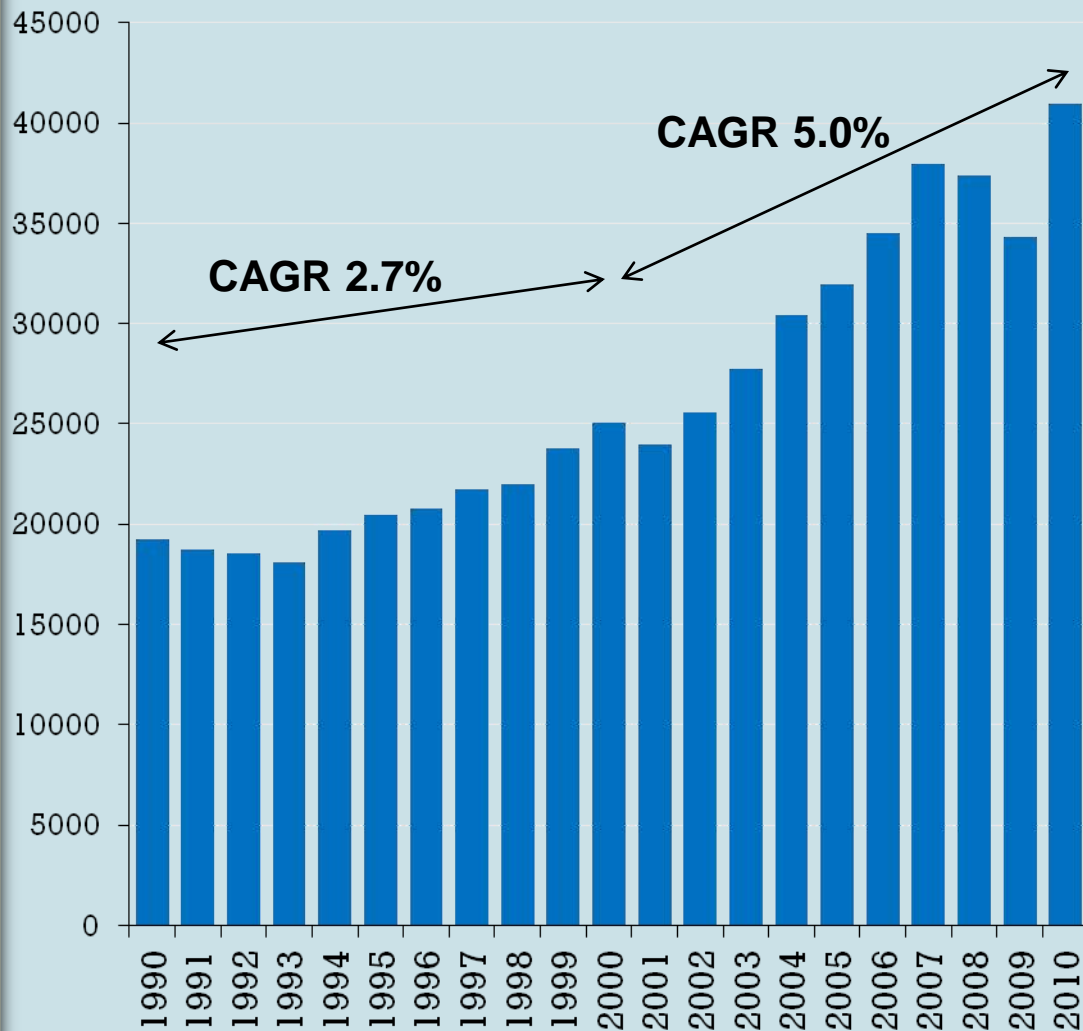


Source: Updated from Barclays Capital

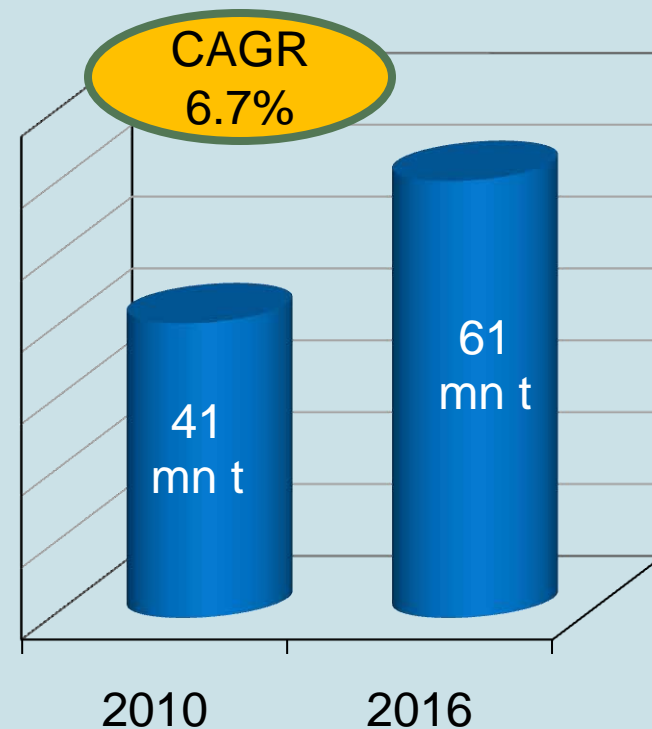
**Aluminium has grown 12.7 times
while Steel 4 times, in last 50 years**

Growth quickened in recent years

World Aluminium Consumption (kt)



Projected Consumption Growth

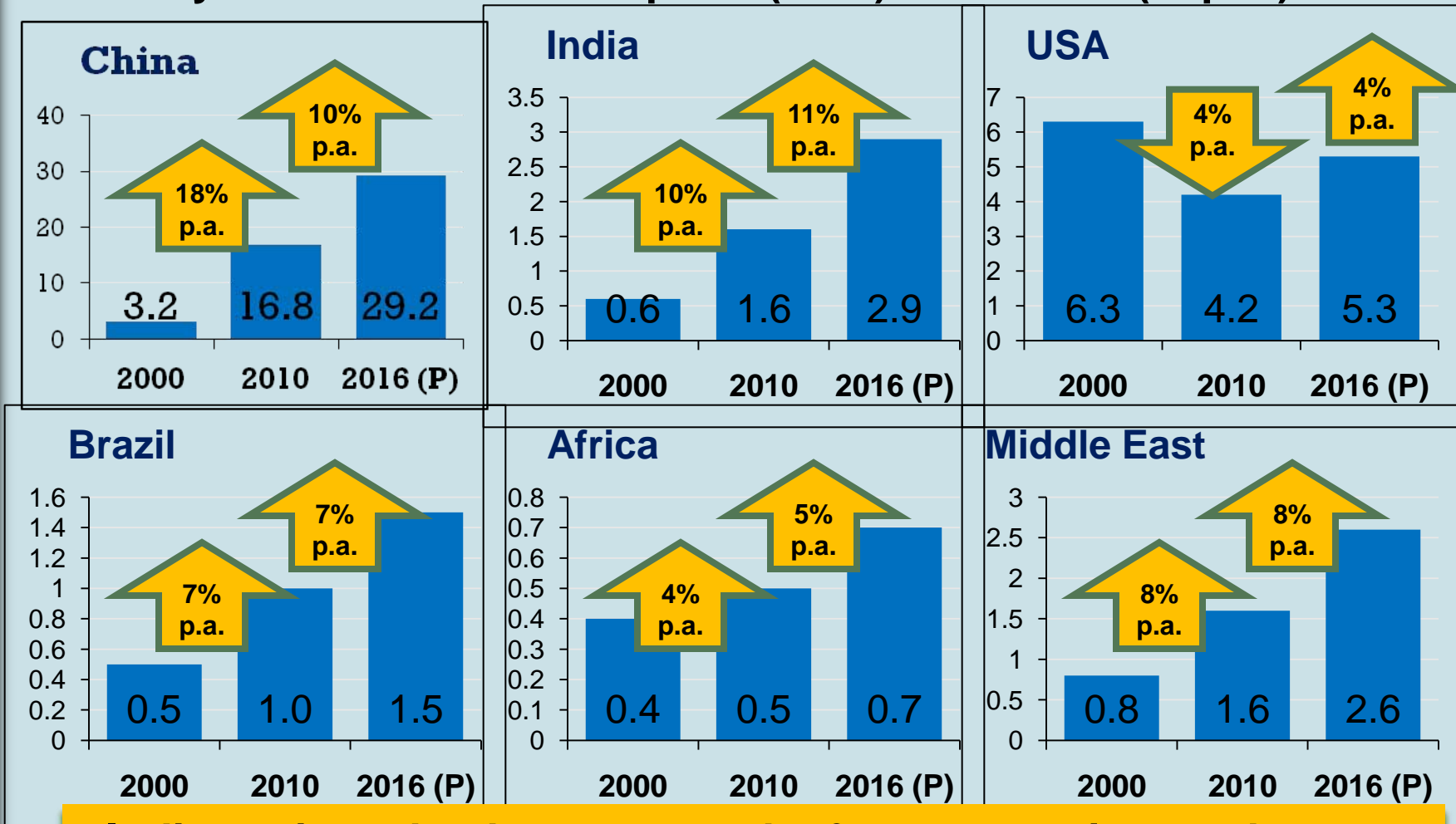


Source: Published reports

Trends in key country markets

INCAL
2011

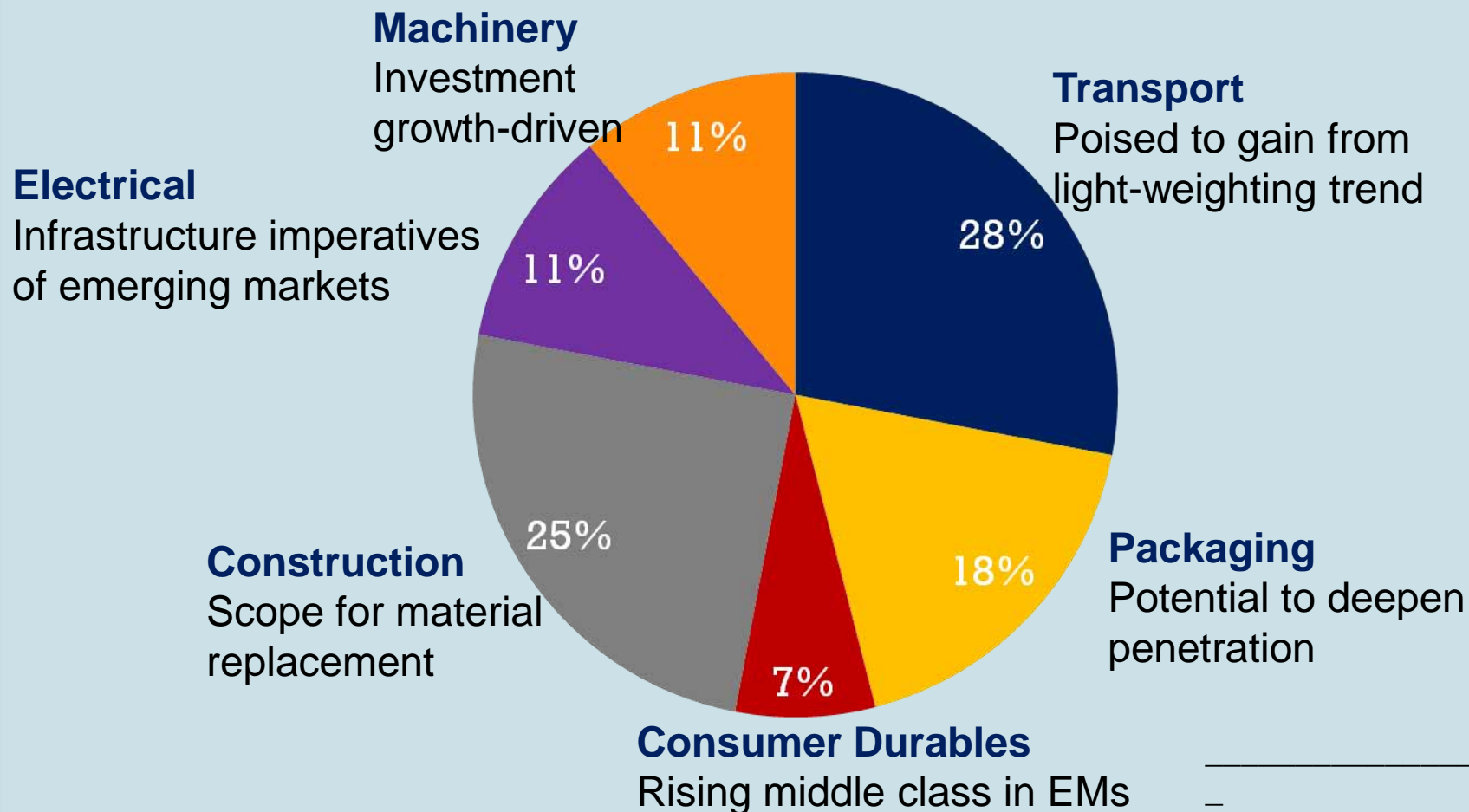
Primary Aluminium Consumption (mn t) and CAGR (% p.a.)



- India projected to be amongst the fastest growing markets
- Return of growth in the US market projected

What is driving this growth?

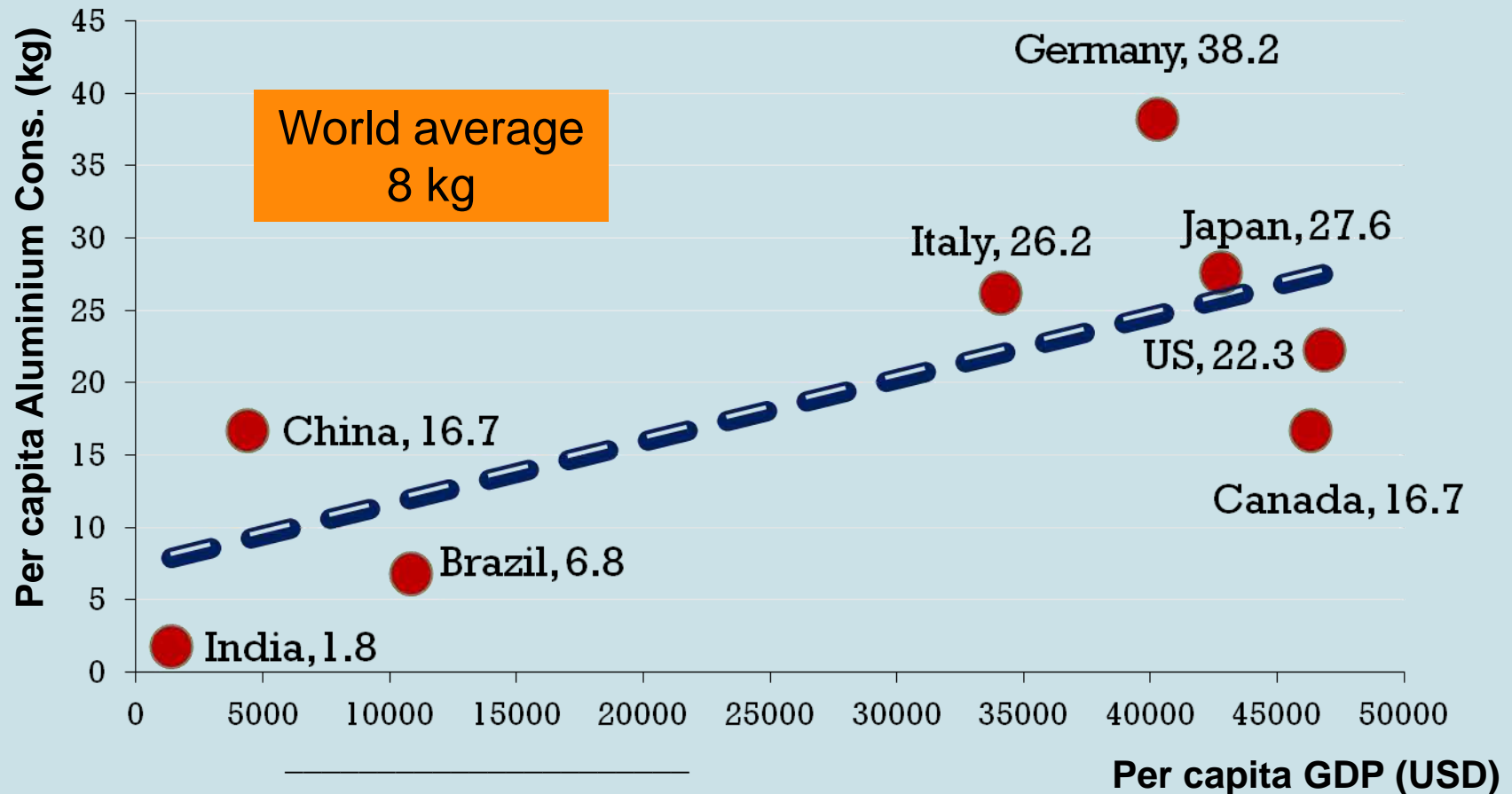
World Aluminium Consumption Pie by End-Uses (2010,%)



— Source: Industry estimates

Notwithstanding the present weak economic environment, structural trends are in favour of aluminium

Per Capita Al. Consumption



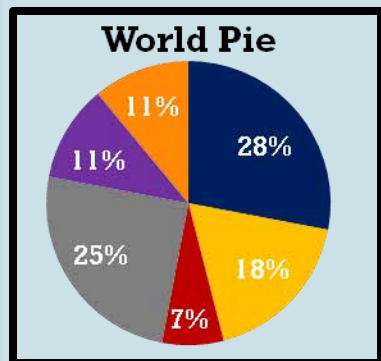
Source: IMF, Industry est.

Even if India reaches *half* the world average by 2020, it would imply aluminium consumption of 5.5 mn ton – or, >2.5x the current level

Indian Market: Still Evolving...

INCAL
2011

India Aluminium Consumption Pie by End-Uses (2010,%)



Machinery

Manufacturing policy positive

Transport

Tremendous potential due to auto growth + deepening use

Packaging

Low base; scope to grow

Consumer Durables

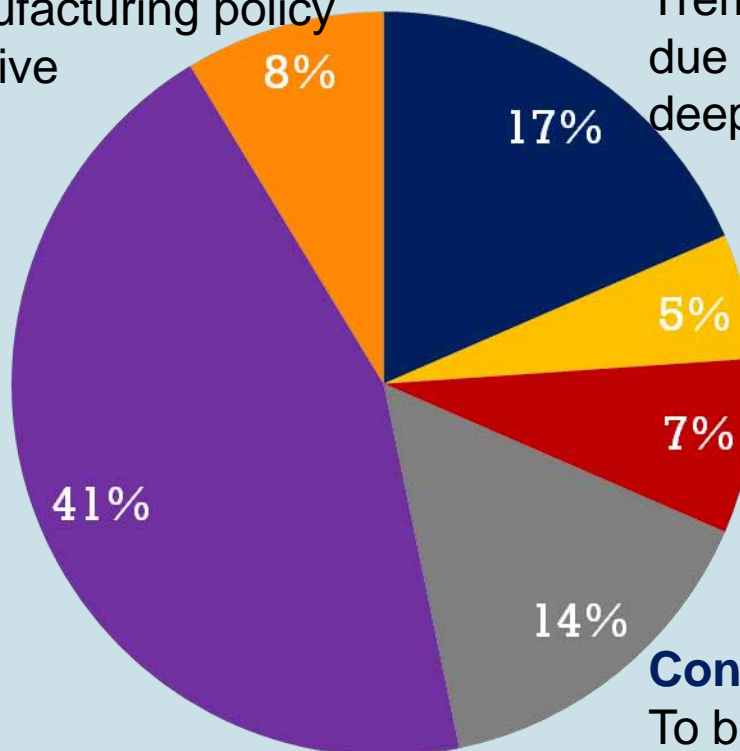
Consumption story augurs well

Construction

To benefit from urbanization

Electrical

Main-stay of Indian market; reforms and investment in electricity sector key to growth

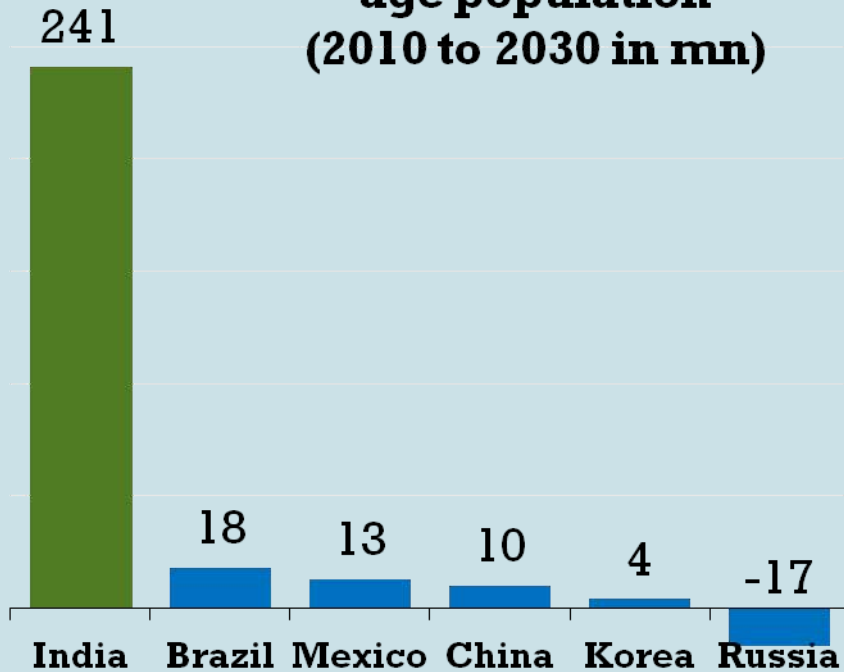


Source: Industry estimates

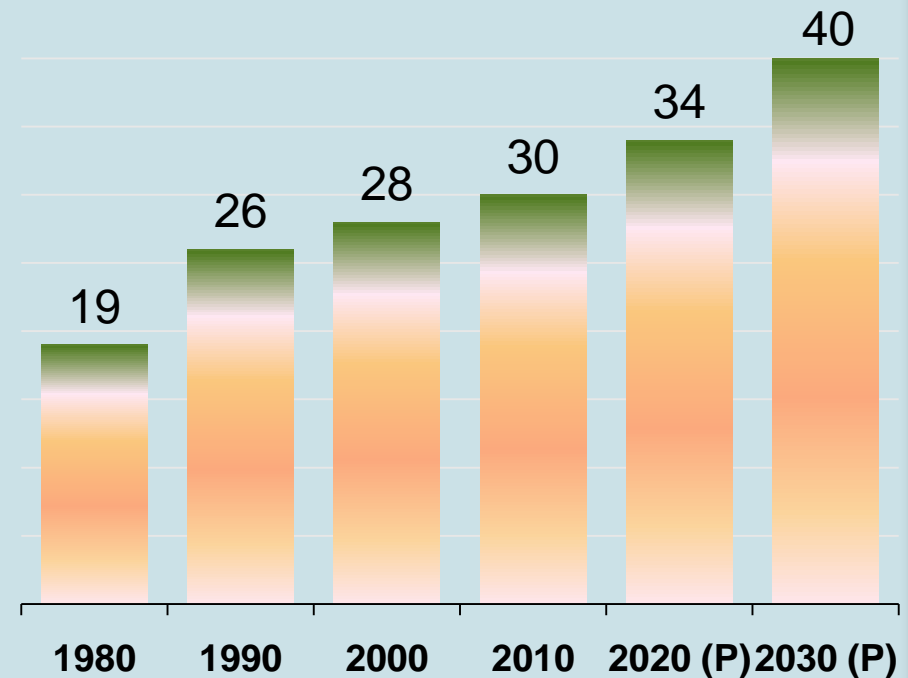
Promising medium-term prospects for every user industry

India: Favourable Demographics

Forecast change in working age population (2010 to 2030 in mn)



Urbanization trend in India (%)



China's urbanization rate moved from 30% to 40% during 1995-2005; its AI consumption rose 4x over this period from 1.8 mn t to 7.2 mn t

Source: Research reports

India: At an Inflection Point



- ✓ **Favourable demographics**
Rising middle class
Working age population
Urbanization
- ✓ **Imperatives for infrastructure investment**
- ✓ **Goal to raise share of manufacturing in GDP**
- ✓ **Low base for AI consumption**

**Consumption story is undoubtedly
robust ...**

**But Aluminium Value Chain will have to
navigate through several changes in the
business environment ...**

Presentation Structure

Global and Indian Consumption Trends

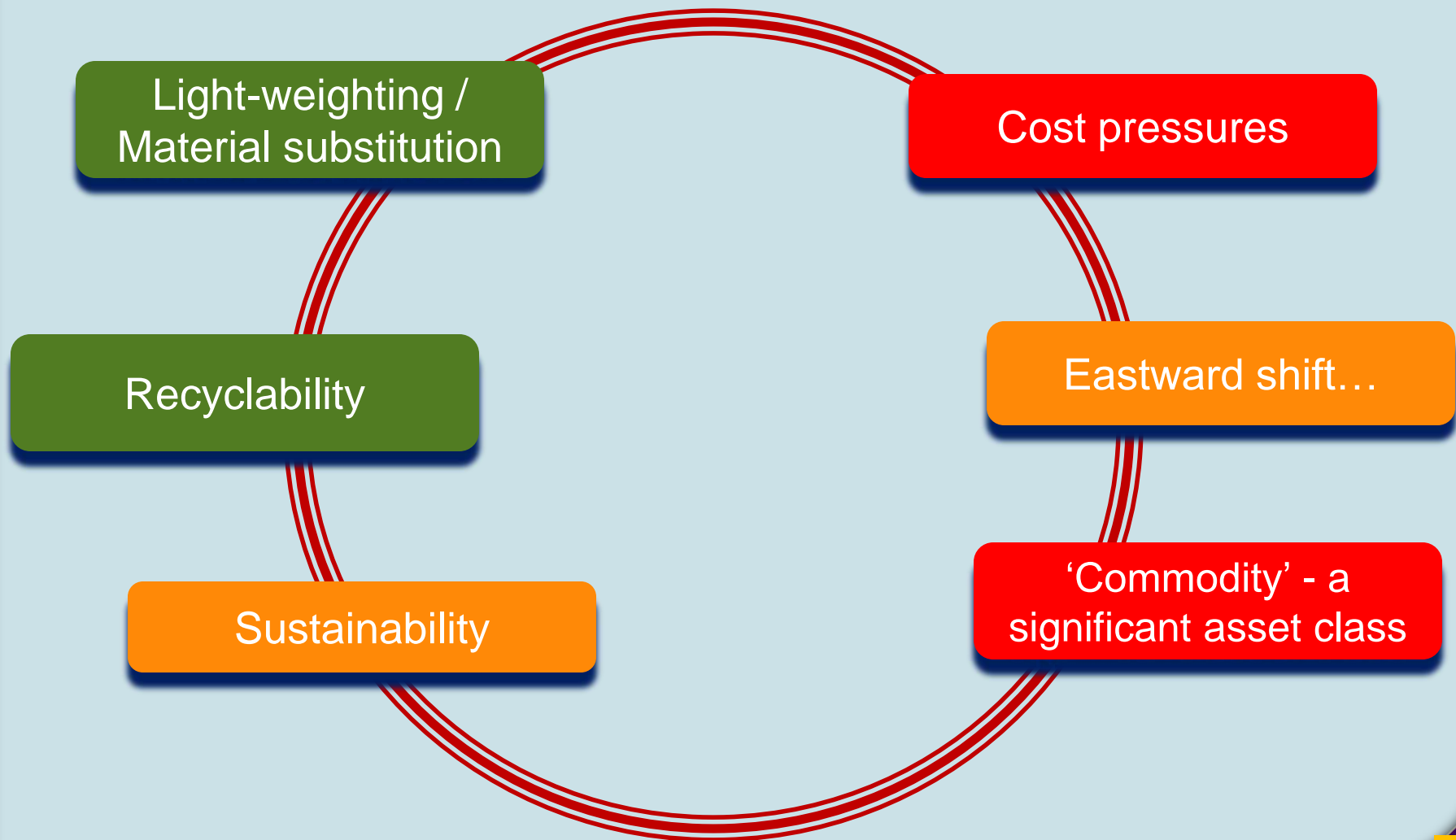
Changes in Business Environment

Trends- Challenges & Opportunities

Summing Up and Imperatives

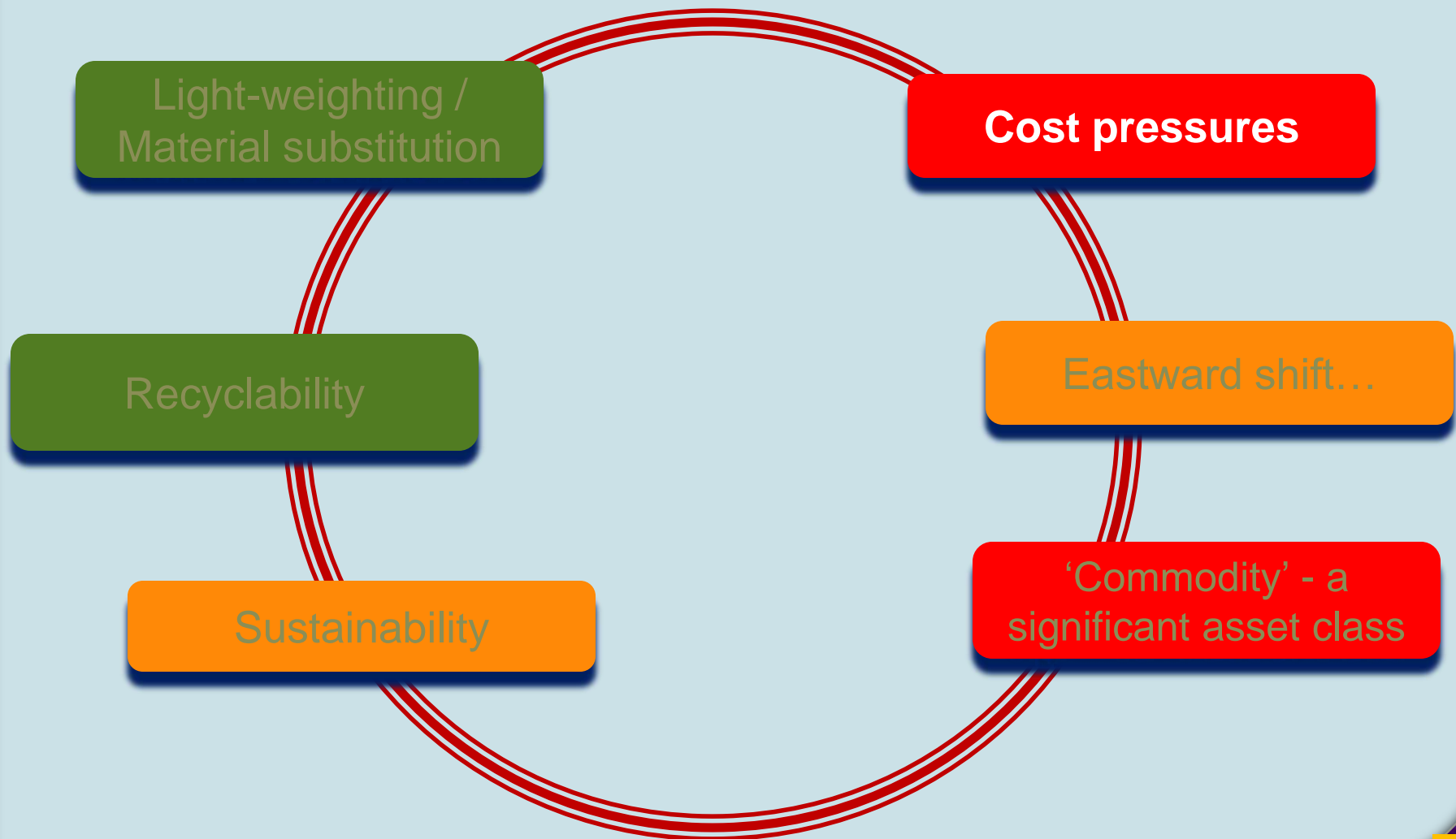
Trends... Challenges & Opportunities

Shifting trends posing new Challenges & Opportunities

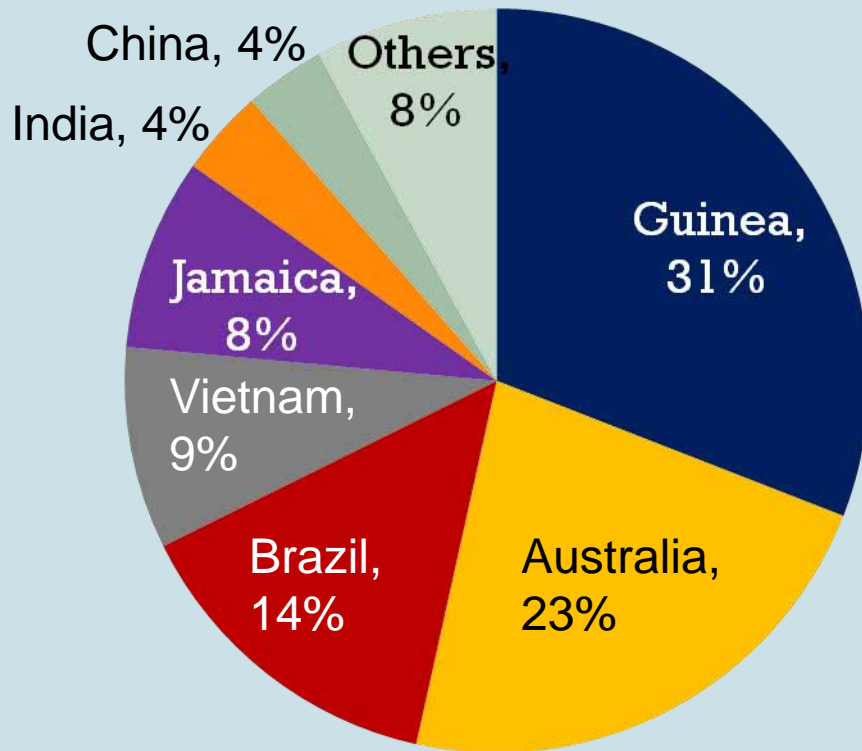


Trends.. Challenges & Opportunities

Shifting trends posing new Challenges & Opportunities



Bauxite Reserves – concentrated in few countries



2010 World Reserves ~23 bn tons

Source: Industry estimates

- ❑ Most potential lies in areas perceived to have high political risk
- ❑ Based on expected growth in mine production, **China's** reserves will last only for next 6/8 years
 - China exploring new reserves both within and outside
- ❑ **India:** Local issues creating difficulties

Natural Resource Challenges

Falling grades

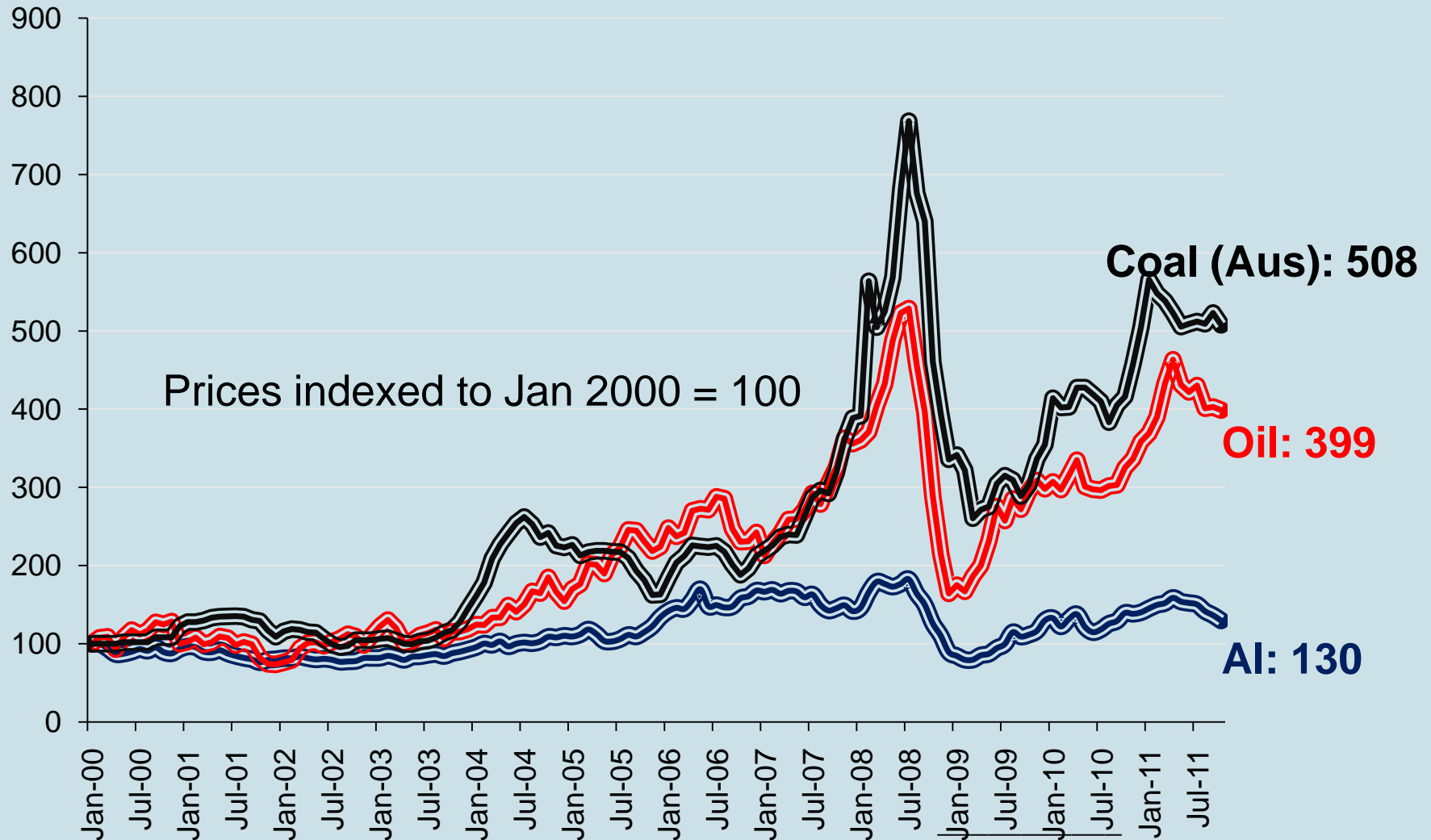
Incremental
resources in
difficult
geographies

Resource
nationalism &
heavier taxation

Clearances and
local environment

Resource challenges : A
natural corollary to rising
demand & increasing
awareness

Relatively faster energy inflation



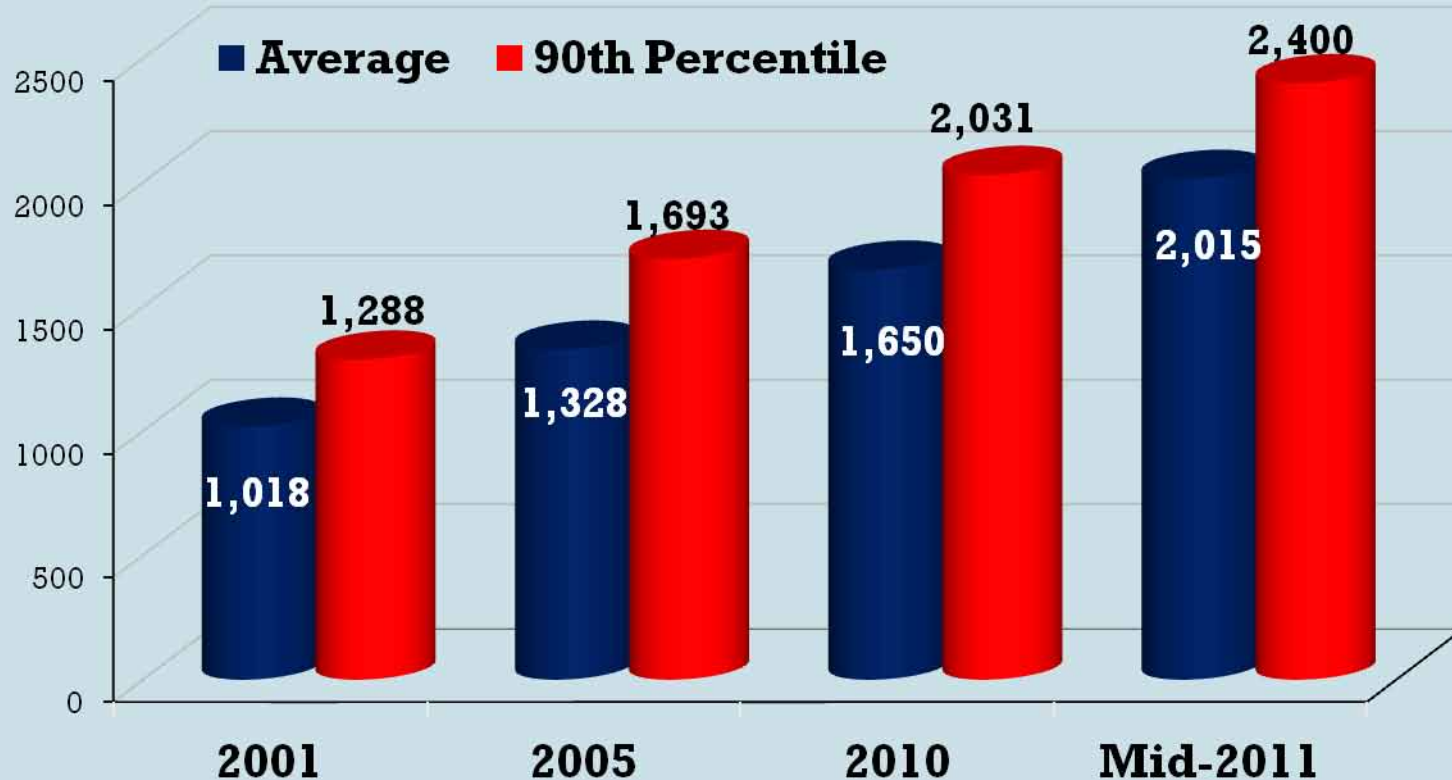
Source: IMF

Carbon Legislations getting more stringent

- ◉ Carbon tax in **Australia**
 - ❑ Metal production cost estimated to increase by \$250/ton by 2015 due to this factor
- ◉ Larger offset requirements in **Europe**
 - ❑ Smelter closures expected in central Europe due to rising carbon costs
- ◉ Possibility of a '**carbon import tax**' on products imported into Europe
- ◉ **China** phasing out old smelters to lower emissions and power consumption
- ◉ Regulatory changes in **India**
 - ❑ Perform, Achieve and Trade scheme
 - ❑ Renewable energy obligations

Cost Curve moving up

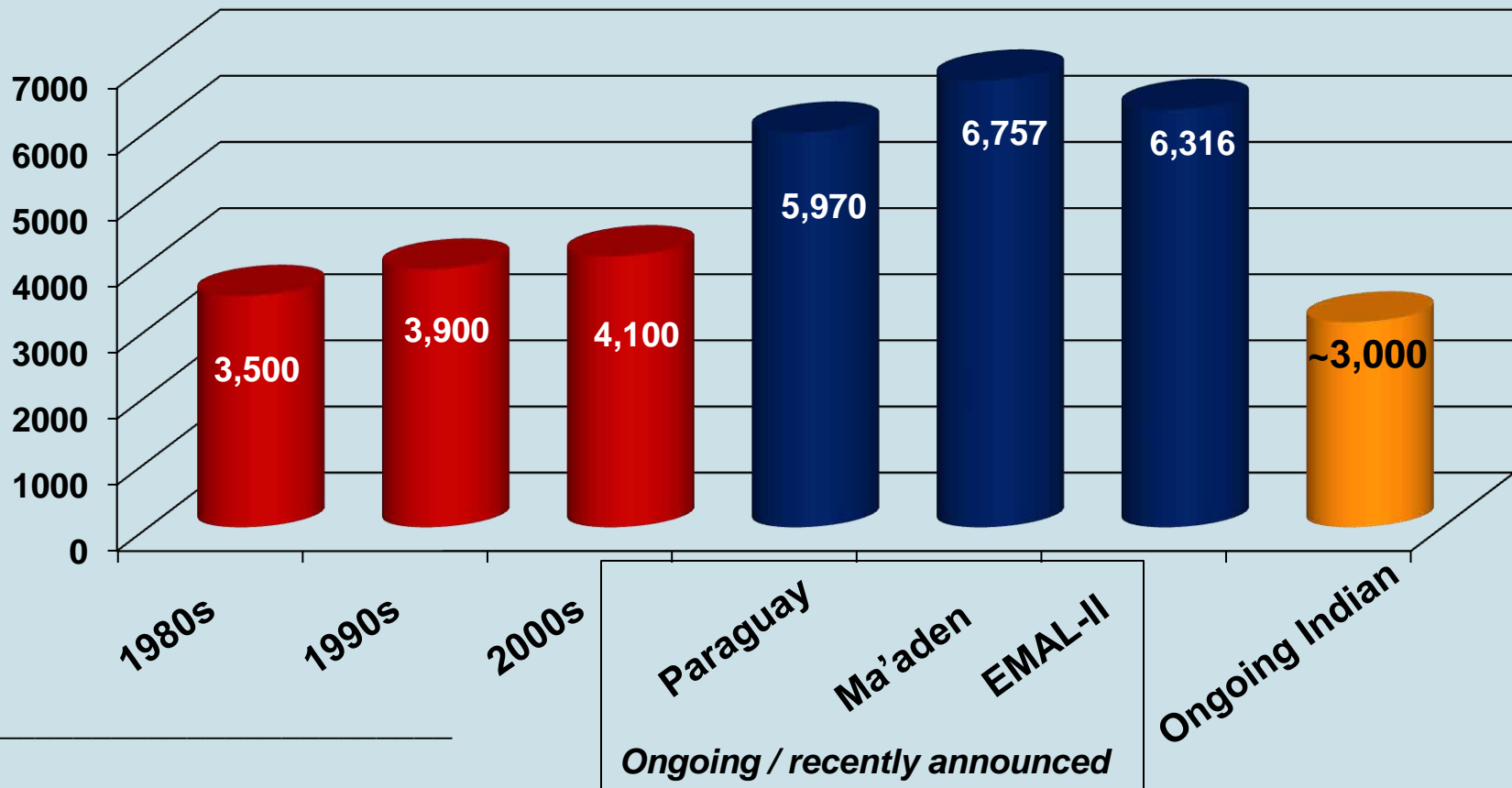
Cash Business Smelter Cost (USD / ton)



Near-doubling of costs over the decade

Capex intensity also on rise

Smelter capex intensity (USD / ton of aluminium capacity)

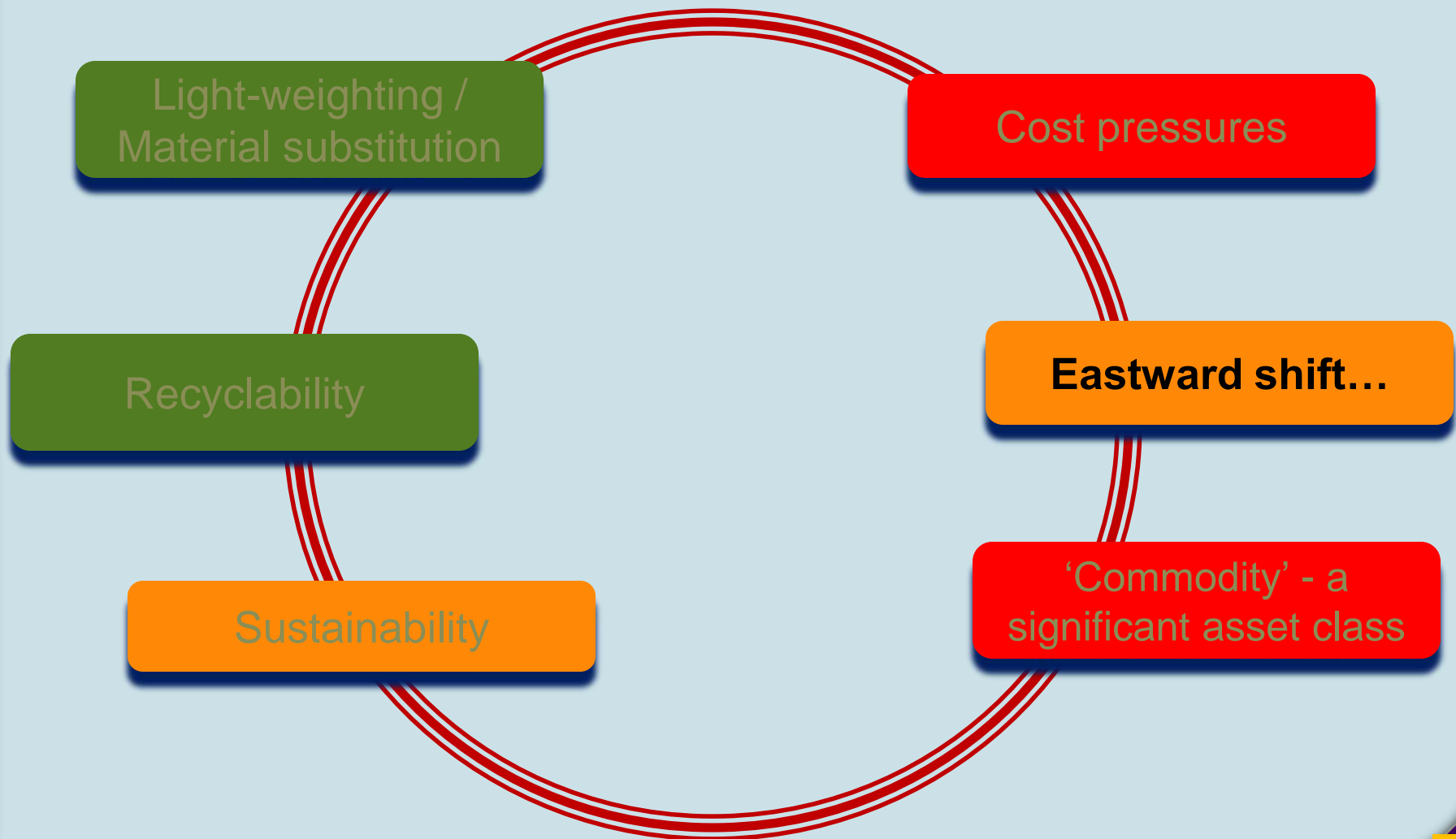


Source: Compiled from reports

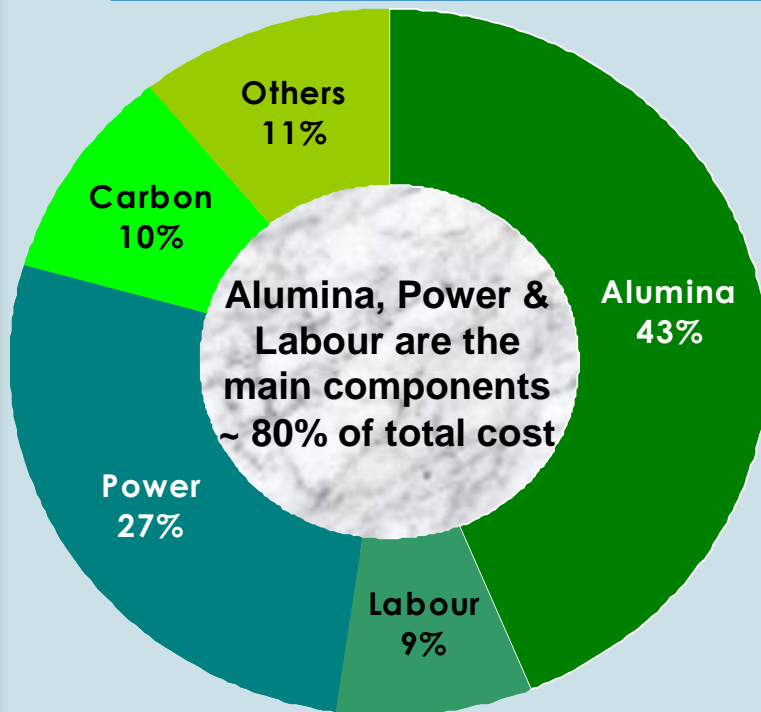
**Long-run marginal cost estimates at around
\$2,400-2,500/ton currently**

Trends... Challenges & Opportunities

Shifting trends posing new Challenges & Opportunities



Costs & demand prompting Eastward shift...

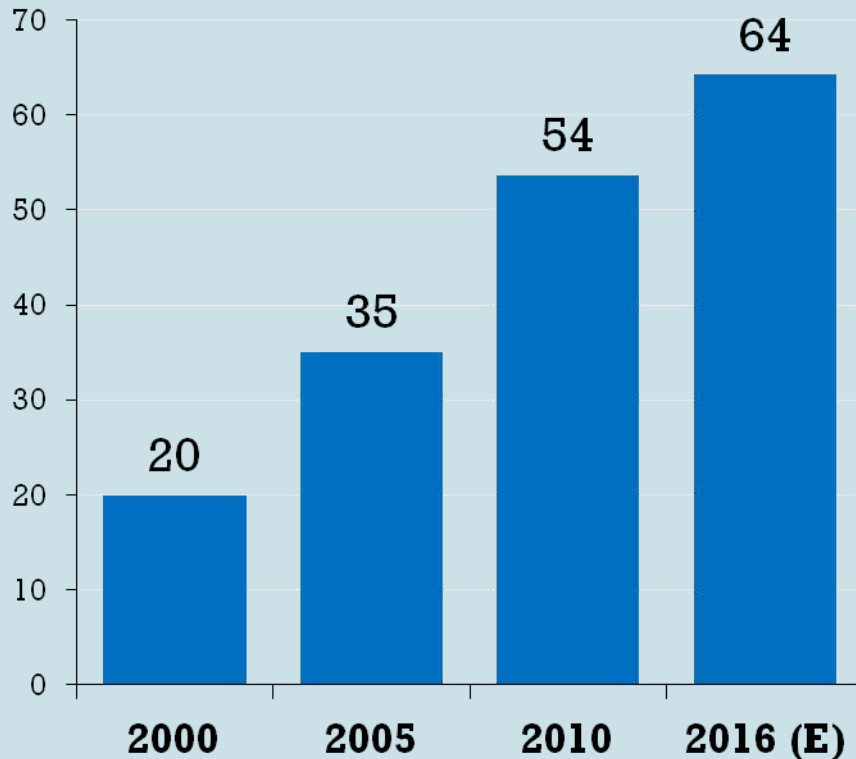


- ▶ Alumina, Power & Labor form 80% of total metal production cost
 - ▶ **Bauxite availability** key to alumina production
 - ▶ **Power costs decide** new smelter locations

- ▶ Aluminium production shifting from the west to east
 - ▶ **Rising power costs in the west**
 - ▶ **Alumina prices and logistics**
 - ▶ **Higher environment-related costs**
 - ▶ **Stagnating Demand.....**

New capacities : Asia to dominate

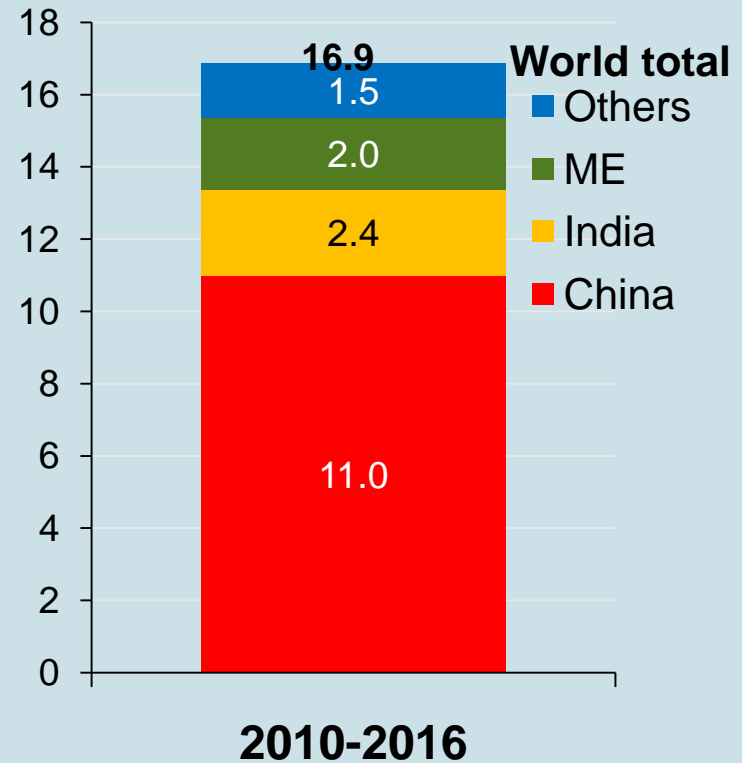
Asia's share in Al Production (%)



Shifts in production centres

China, Middle East and India to account for >90% of capacity addition during 2010-2016

Capacity addition (Mn tons)



Source: Industry estimates

But each centre has few issues to deal with ...



India

- ✓ Good quality bauxite resources and potential for coal resources

- ? Tough local environment
- ? Delays in land acquisition, clearances

China

- ✓ Local demand advantage
- ✓ Fast implementation

- ? Insufficient bauxite / alumina
- ? High power tariffs, power availability concerns

Middle East

- ✓ Cheap and abundant energy

- ? Non-availability of local alumina

Region specific peculiar issues pose challenges...

New pressure points...

Structural appreciation of currencies in these production centres

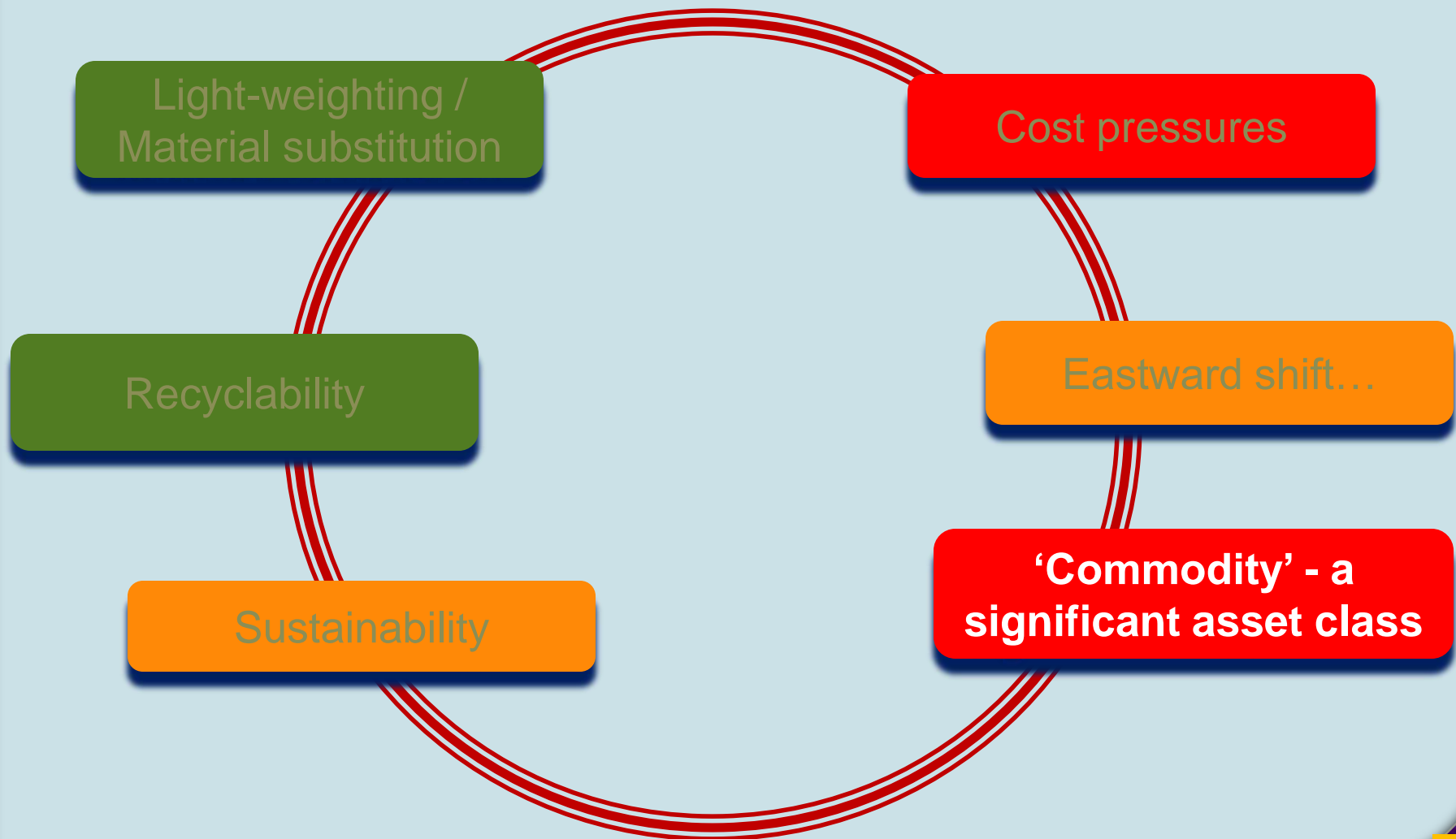


Indian and Australian currencies also have a structural appreciation bias, though have weakened at present

Trends.. Challenges & Opportunities

INCAL
2011

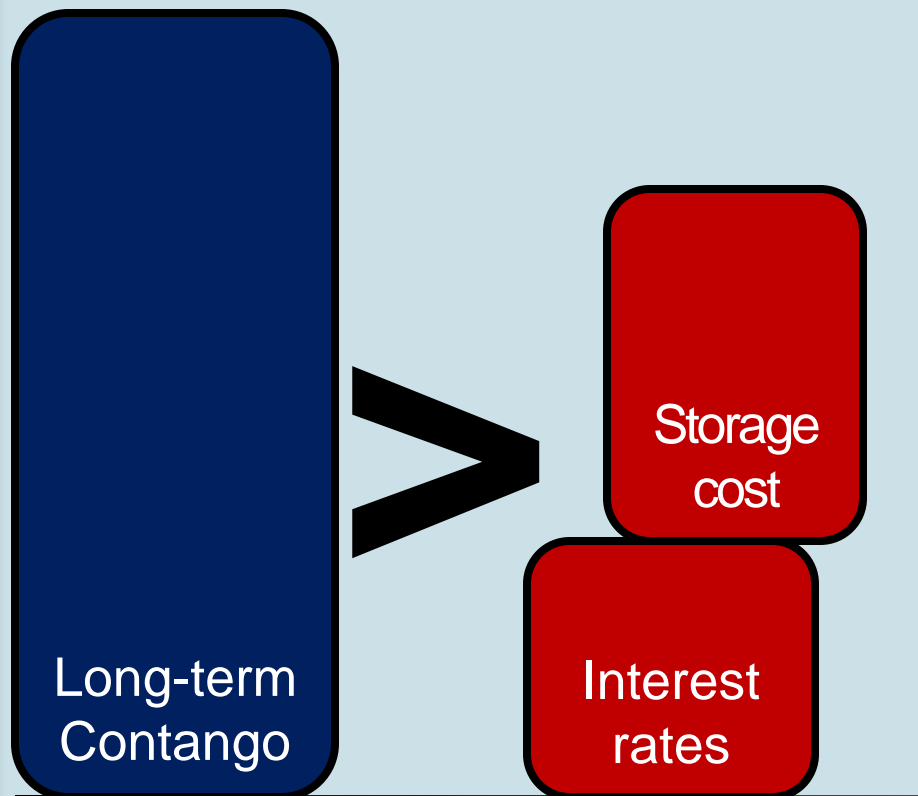
Shifting trends posing new Challenges & Opportunities



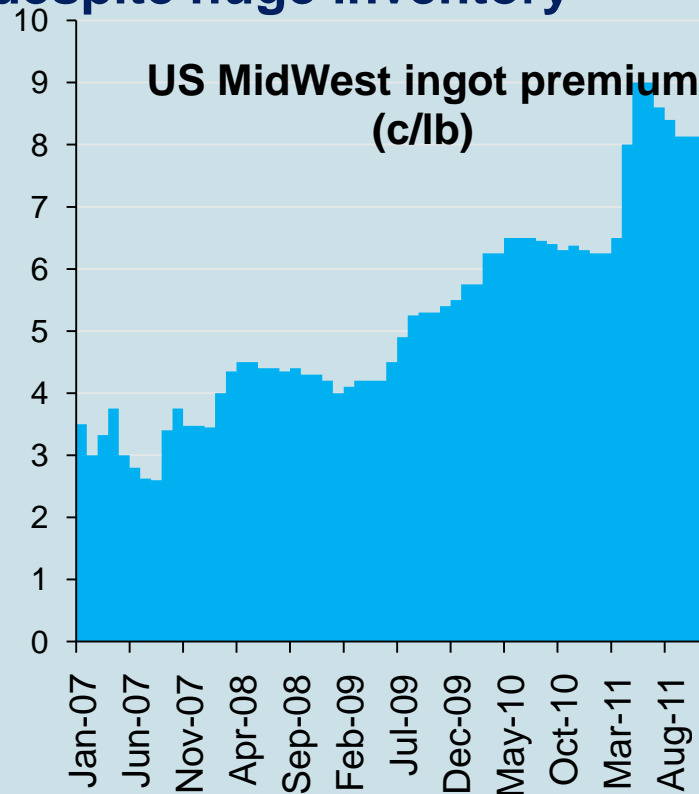
Financing Deals

INCAL
2011

Arbitrage window opened in 2009 ...



Tight physical markets
despite huge inventory



Financing deals creating a paradox...

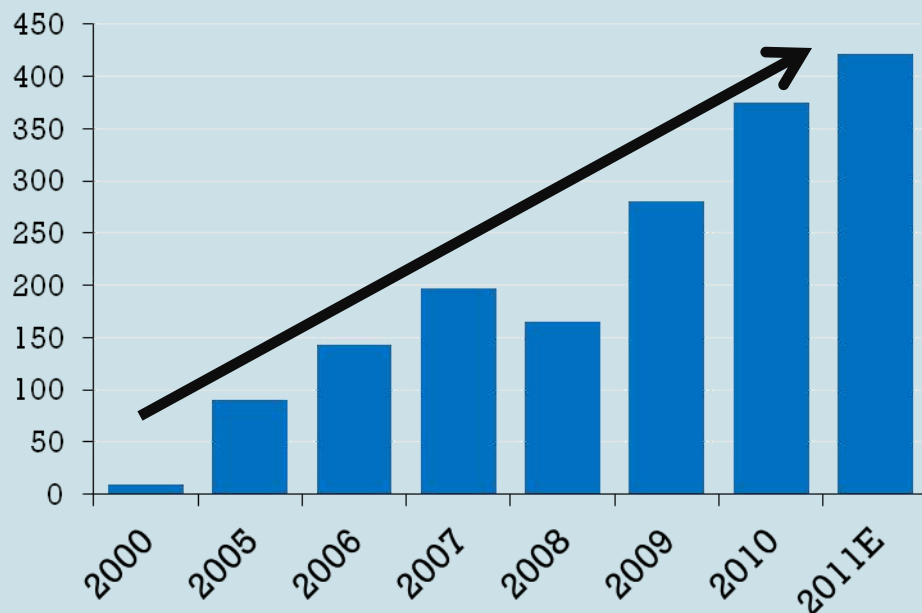
Source: Industry estimates

Impact of Financial Investors

INCAL
2011

Fund investment in commodities has gone up consistently ...

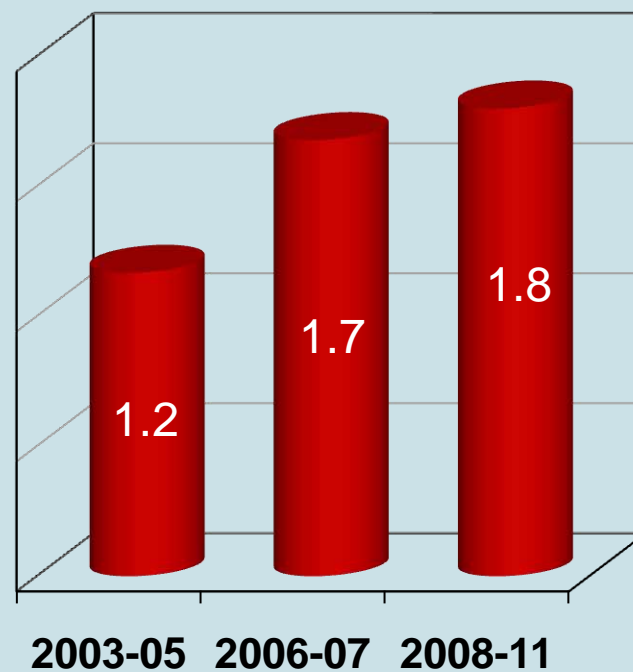
Commodity Assets Under Management (\$ Bn)



Ascent of commodity as an asset class has induced several complexities

LME has become more volatile

Std. Deviation of Daily returns on LME – Al. (%)



Source: HDFC Sec, Bloomberg

Whither fundamentals?

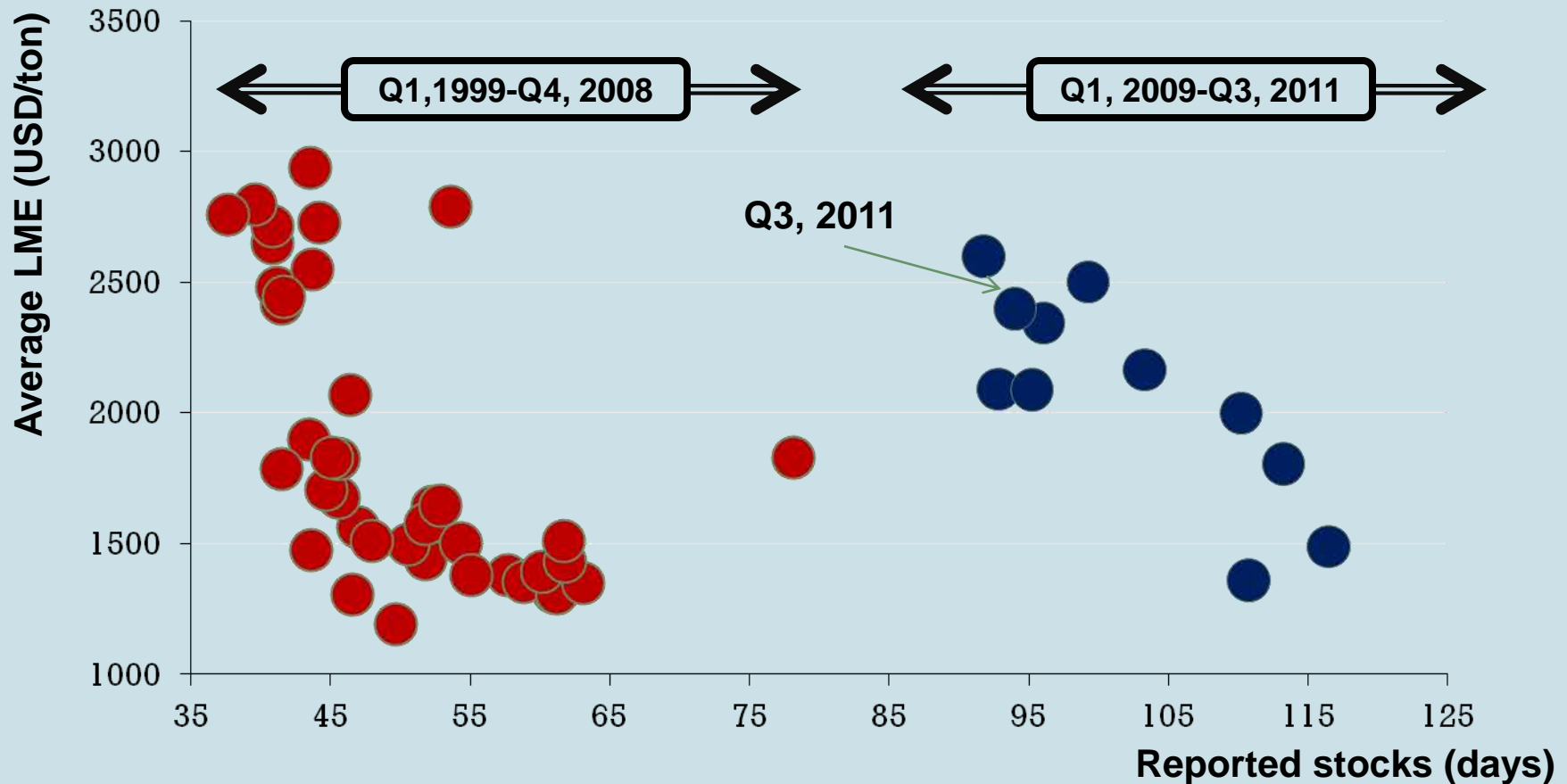
Correlation of LME with:	1999-2004	Since 2004
Surplus / Deficit during the period	-0.37	0.05
Consumption	0.75	0.55
Stock-Consumption Ratio	-0.83	-0.39

Regression of LME on stocks ratio alone explains only 20% of movement since 2004; Along with fund flow variable, 78% of movement gets explained

Source: HDFC Securities

Robust risk management systems imperative for every player in the Value Chain

Inventory – LME relationship

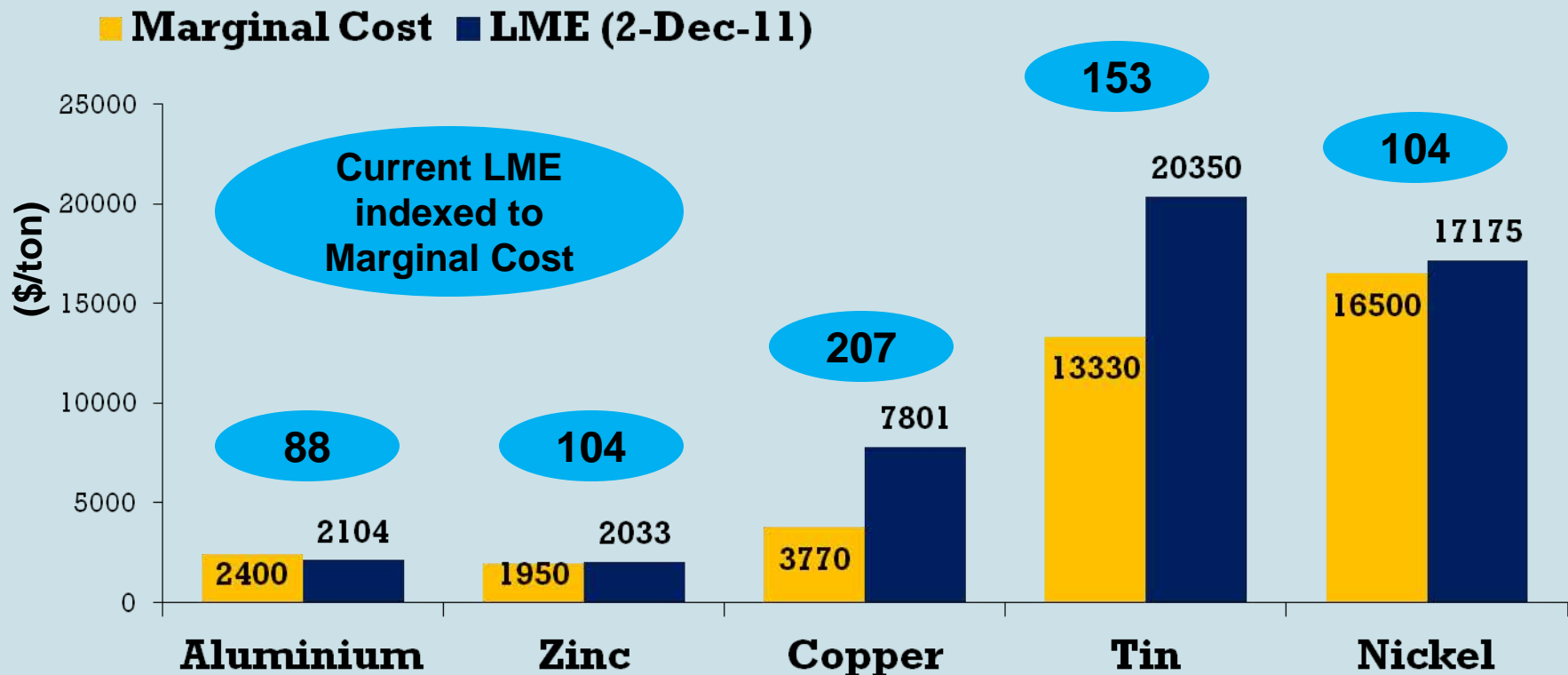


Source: Published research

‘Financing deals’ have vitiated the inventory-LME relationship in recent years

Current LME way below marginal cost

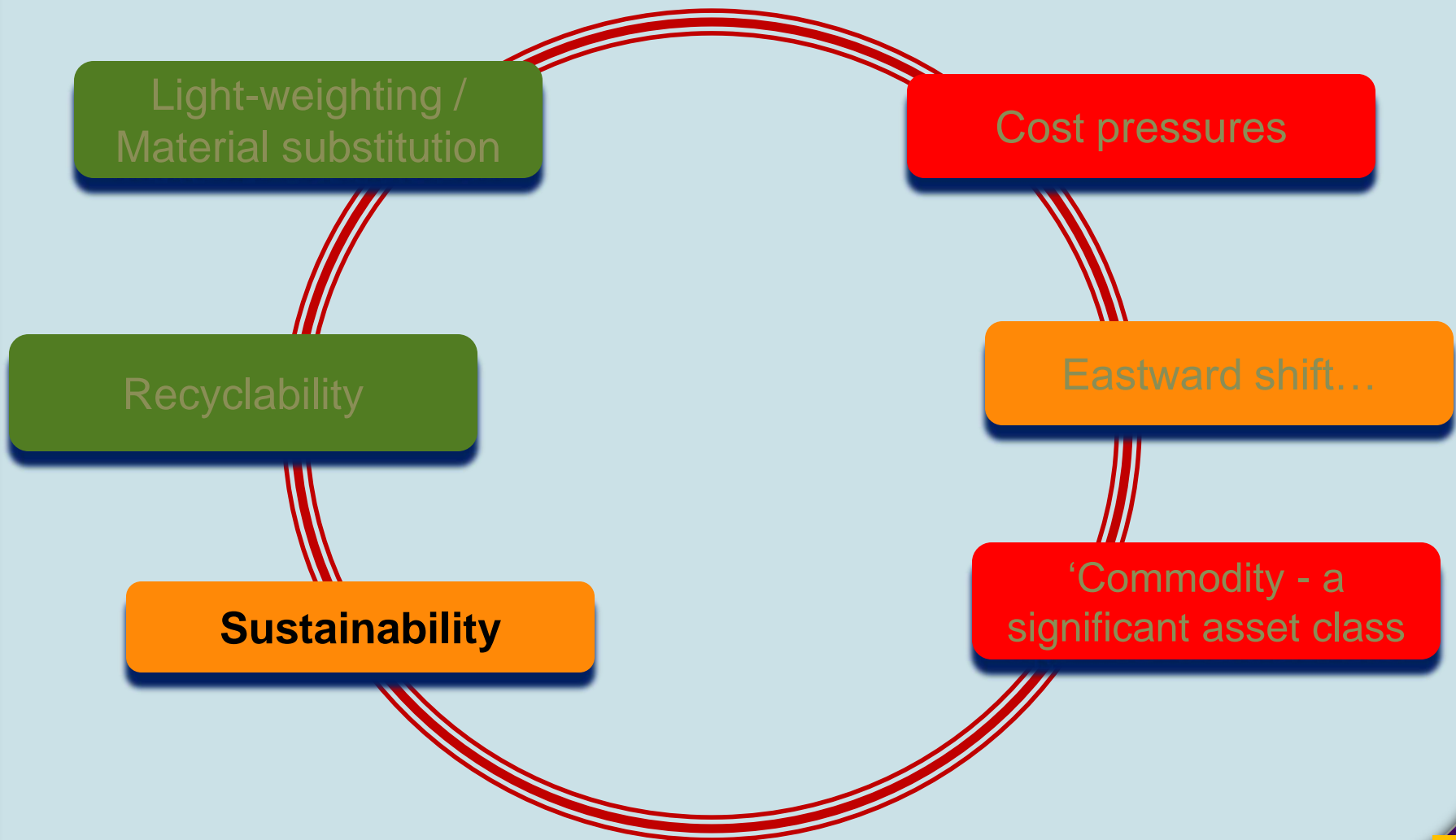
Aluminium is the only base metal that is trading below marginal cost at present ...



When will LME catch up with fundamentals?

Trends... Challenges & Opportunities

Shifting trends posing new Challenges & Opportunities



Why sustainability is crucial?

Heavy energy-intensity; ~50% smelting capacity on non-hydro energy

Generation of waste: red mud, fly ash, spent pot lining, etc.

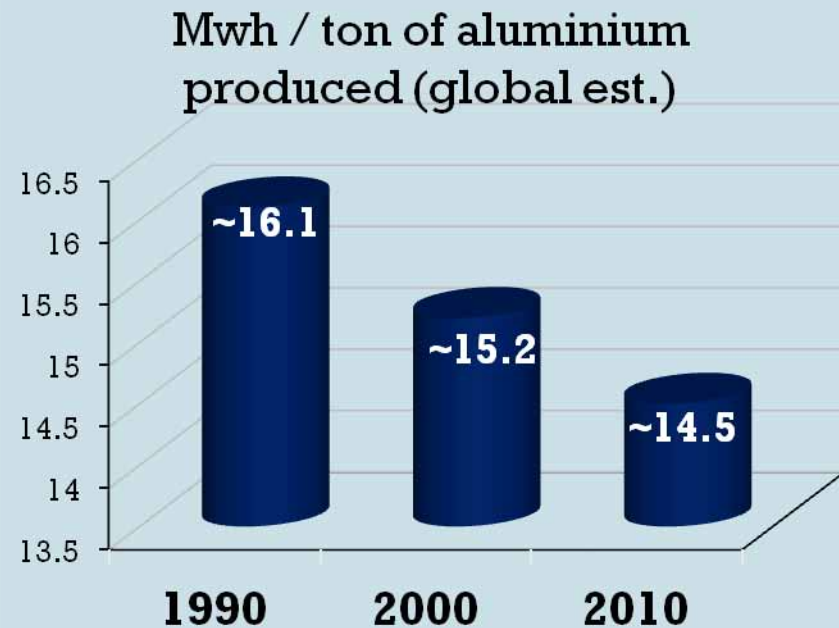
Remote locations ~ to remain close to resources



But aluminium has capability to help environment through its applications and re-use properties

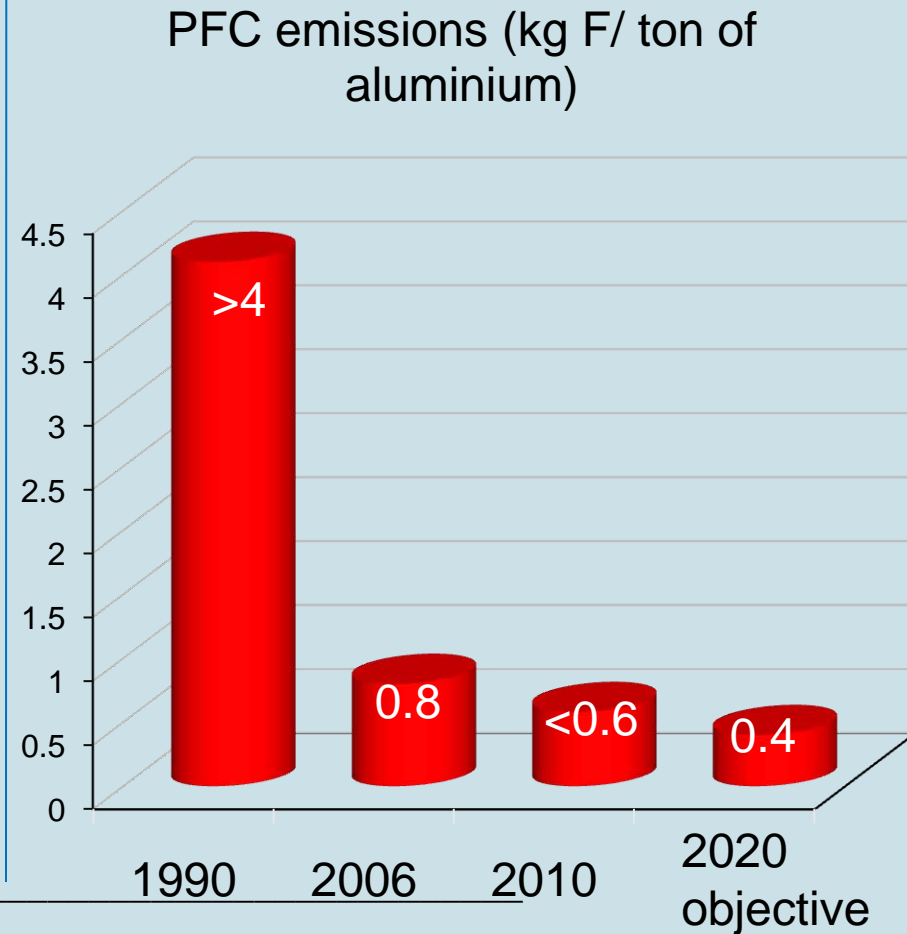
Positive initiatives by the industry...

Energy intensity in smelting has come down over years ...



Also makes enormous economic sense ...

PFC emissions have reduced sharply ...



Addressing waste disposal challenges

*Transformation of red mud pond at **Belgaum** using “bioremediation technology” in partnership with TERI*

Before



Now

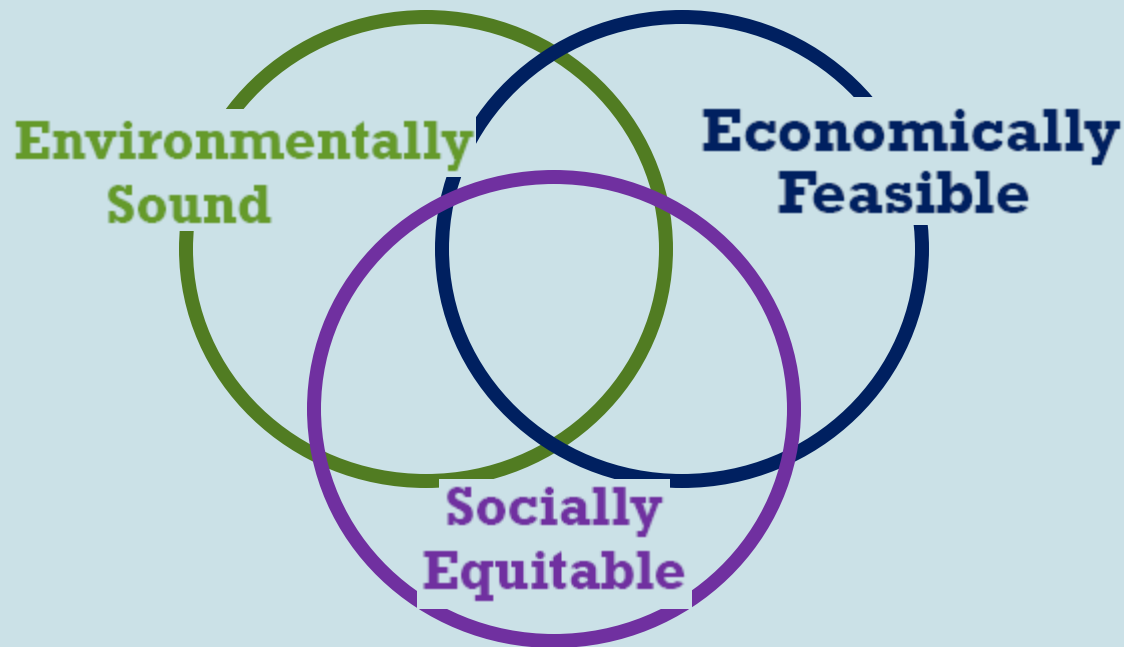


Addressing waste disposal challenges

*Transformation of Fly Ash heap at **Hirakud** into an eco park*



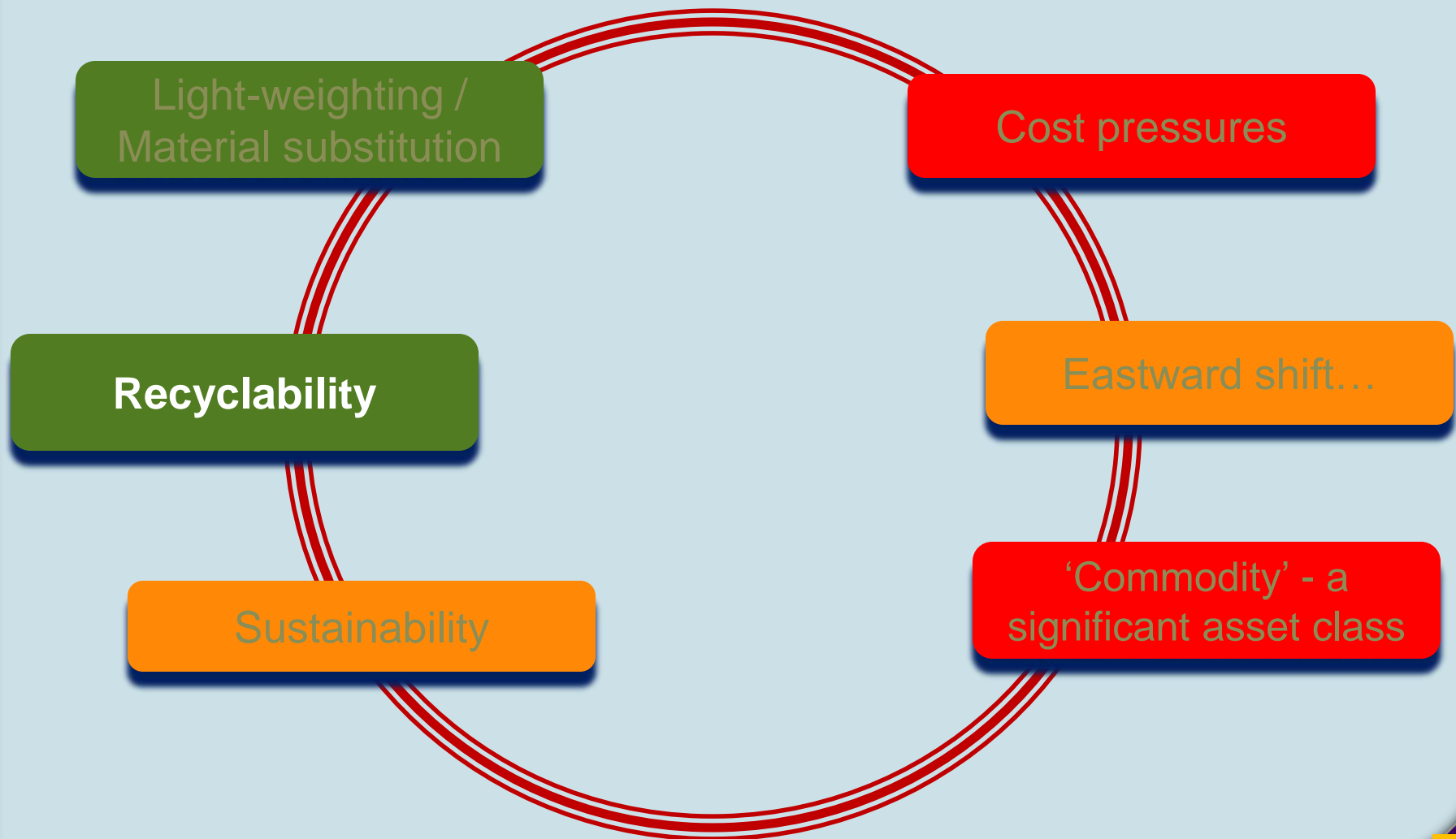
While the industry has been moving in the right direction, we will have to keep sustainability issues under focus in the years to come...



Trends.. Challenges & Opportunities

INCAL
2011

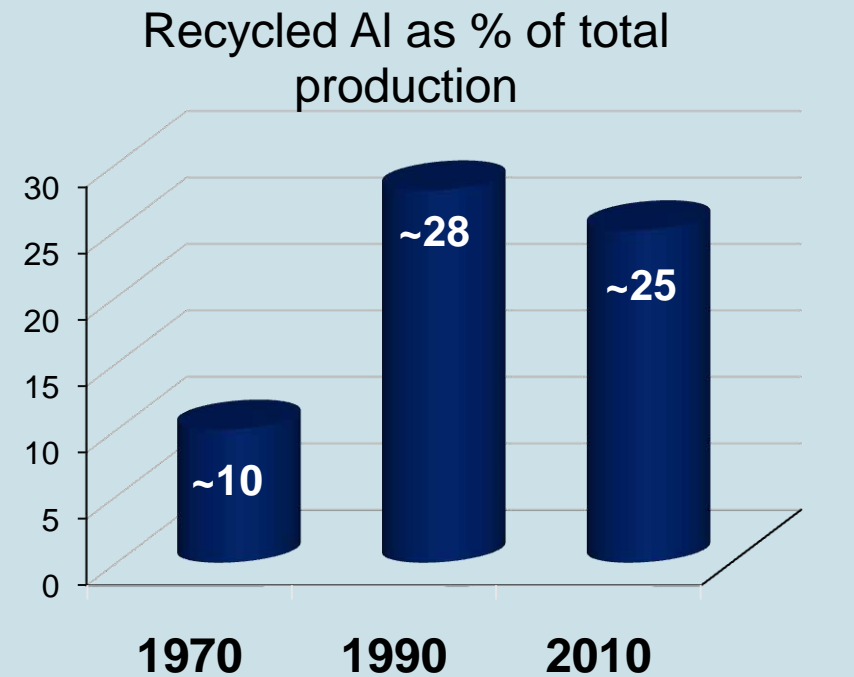
Shifting trends posing new Challenges & Opportunities



Leveraging Aluminium's Recyclability

- Aluminium can be recycled again and again without loss of its inherent properties
- Nearly 70% of aluminium ever produced still believed to be in use
- Recycling requires only 5% of energy and emits only 5% of GHGs compared to primary production

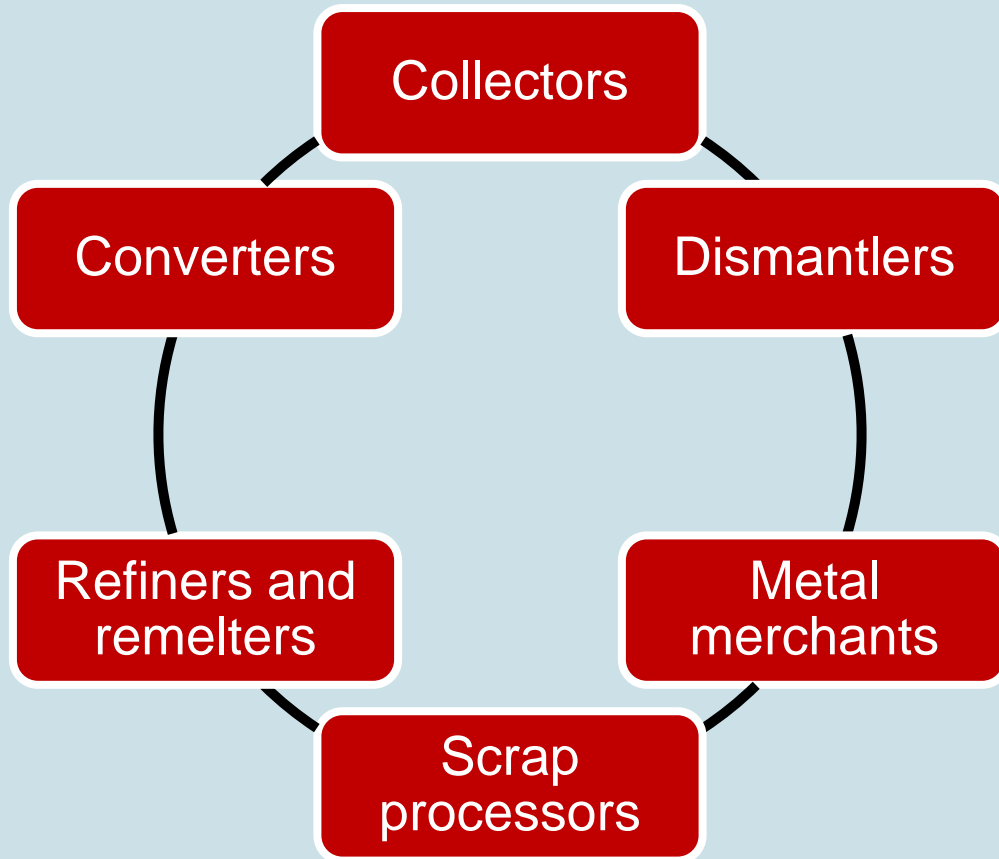
Share of recycled aluminium has, however, stalled in last two decades ...



Source: Beijing Axis, AAI

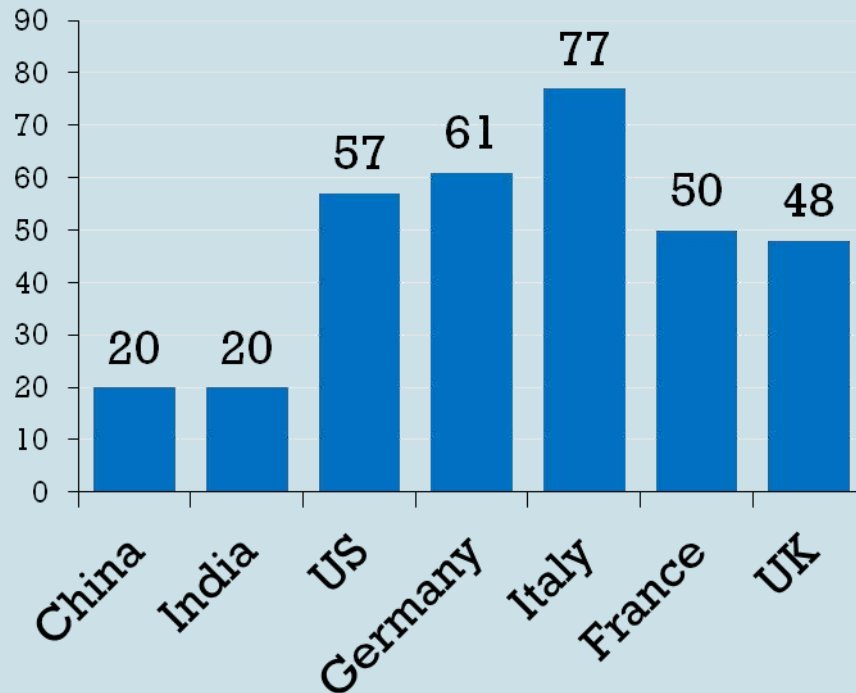
Green-consciousness likely to give a fillip to recycling in the coming decades

Recycling needs a strong infrastructure

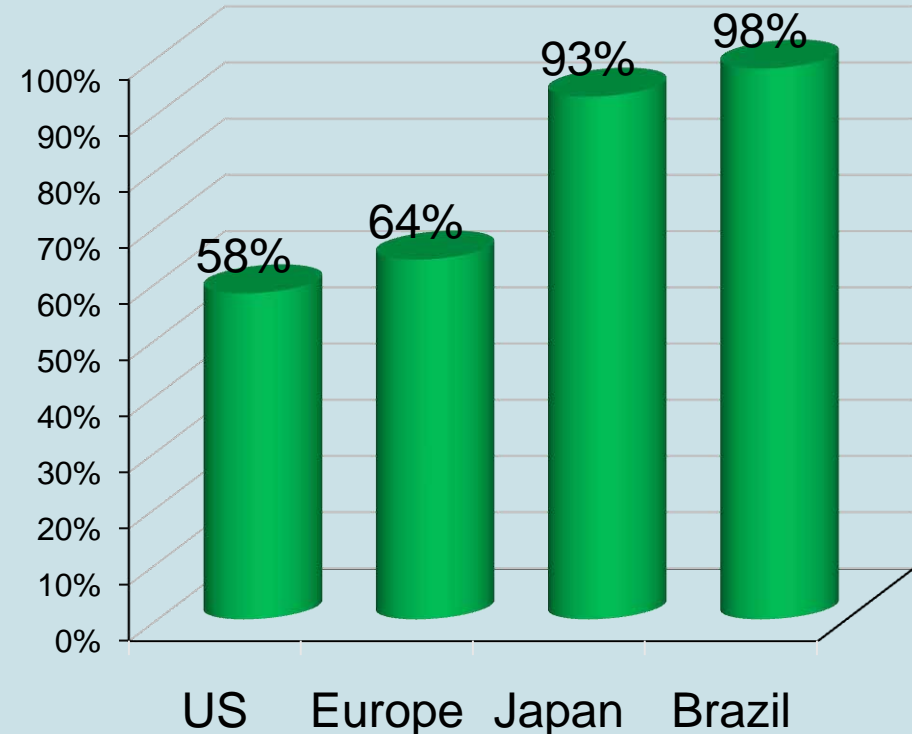


Role of Recycling uneven across markets

Contribution of secondary aluminium in total production (2010,%)



Aluminium Can Recycling Rate (2009/2010,%)



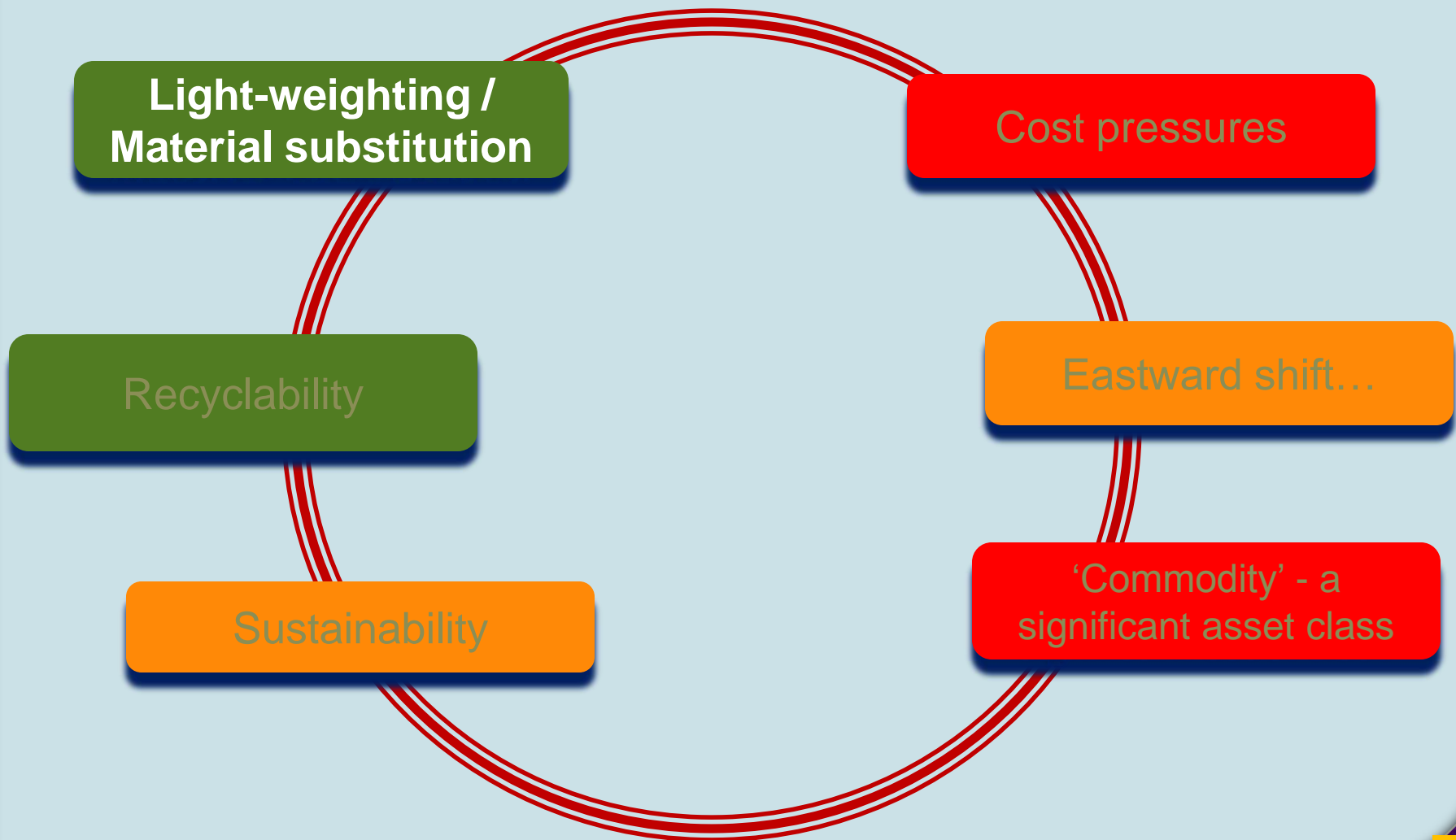
Source: Beijing Axis, Industry estimates

Recycling intensity is a function of Market maturity, Consumption profile, Recycling institutions and infrastructure; and R&D efforts of user industry

Trends..Challenges & Opportunities

INCAL
2011

Shifting trends posing new Challenges & Opportunities



The Big 'Auto' Opportunity

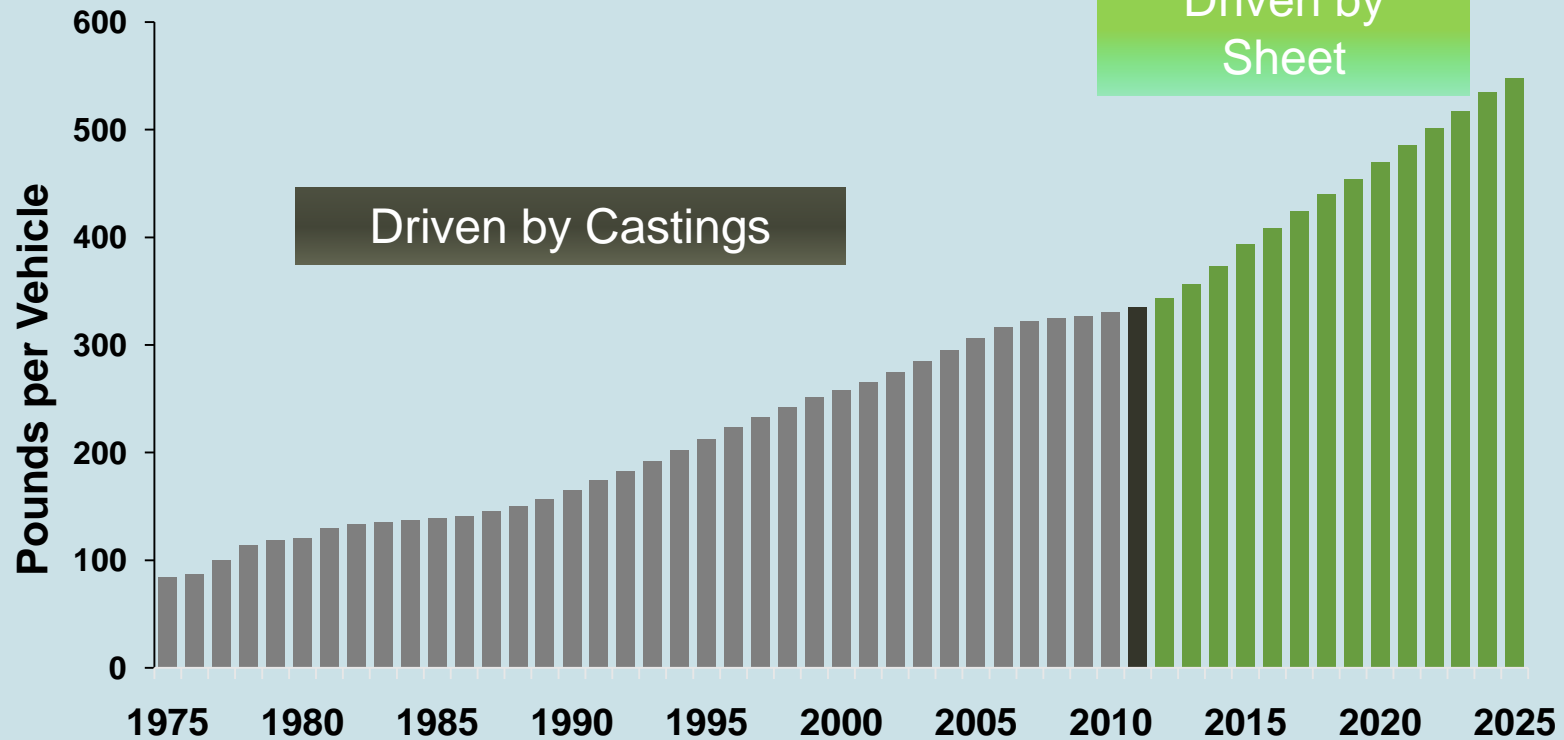
Aluminium is an asset for anything that travels ...



- ◉ **Cars:** 1 kg of aluminium replacing conventional materials eliminates 20 kg of **CO₂** over the vehicle's life
- ◉ **Railway wagons** can use up to 5 tons of aluminium / wagon; investment recovered through fuel efficiencies in 2.5 years
- ◉ Al already accounts for 60-80% of **aircraft** weight; its use deepening further

The 'light-weighting' phenomenon

North America: Al content in Pounds per Light Vehicle
- History and Forecast -



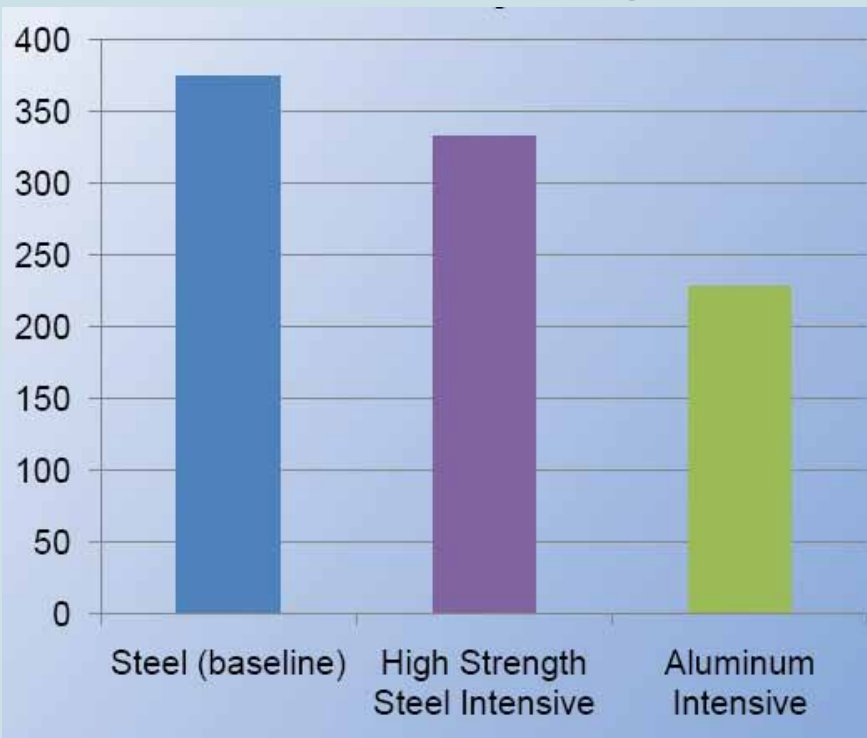
Source: Ducker Worldwide and The Aluminum Association, Oct. 2011

Government regulations driving Al usage in auto industry

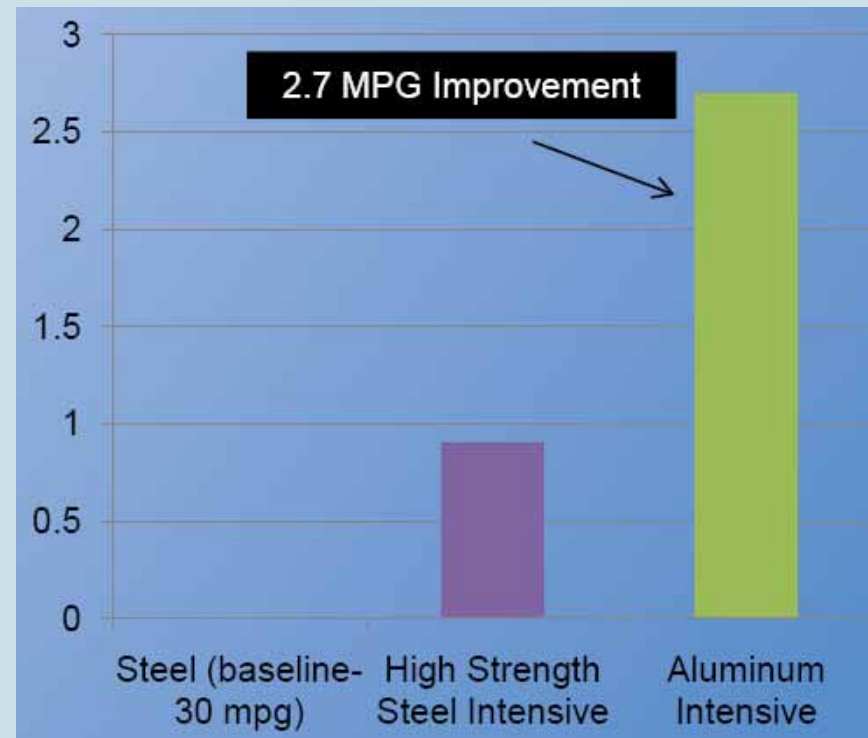
It's a 'win-win' scenario

Aluminium's advantage over steel in auto industry

**Weight of the Mass of
Body-in-white (kg)**



**Fuel economy improvement in
Miles per Gallon (MPG)**



Source: Aluminum Association

Presentation Structure

Global and Indian Consumption Trends

Changes in Business Environment

Trends- Challenges & Opportunities

Summing Up and Imperatives

Aluminium consumption poised for a bright future ...

INCAL
2011



Urbanization



Earth-friendly



Light-weighting



***Emerging
markets***



Growth will have its own challenges ...

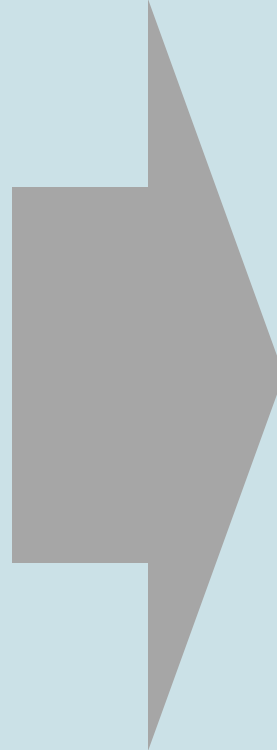
Most important priorities:

Resource challenges

Cost pressures

'Financialization'
of LME

Carbon- and
environment-related
challenges



- ❑ **Securing resources**
- ❑ **A continuous drive to improve the cost structure**
- ❑ **Enhancing sustainability of operations**
- ❑ **R&D focus on energy efficiencies**
- ❑ **Robust risk management practices**

Though Upstream industry seems to be under pressure at current LME, markets will have to eventually catch up with fundamentals

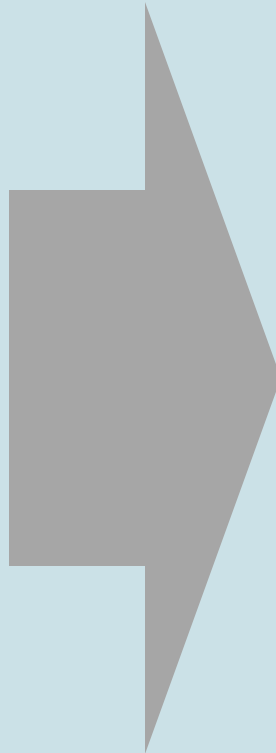
But there are also interesting opportunities

Robust structural prospects for emerging markets

Focus on sustainability in auto/construction

Light-weighting / Material substitution

Recyclability



- ◉ Aluminium's promise as '*metal of the future*' coming into play
- ◉ Most important priorities:
 - ❑ **Working with end-users to develop applications that would realize Aluminium's full potential**
 - ❑ **Recycling infrastructure and institutions in emerging markets**
 - ❑ **Focused market development, especially in emerging markets**

Downstream industry has to be proactive to leverage favourable mega-trends

India: placed at the centre of the unfolding aluminium story

INCAL
2011



*Abundant coal and
good-quality bauxite*



*Infrastructure
imperatives*



*Robust growth
prospects*



India – at an inflexion point ...



> Doubling of capacity in next 5 years

Immense potential to catch up with global trends: packaging, light-weighting, green construction ...

10%+ annual growth in consumption in the years ahead

All stakeholders must ensure that we do not fritter away this enormous India advantage & derail the aluminium growth story

Thank you