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ILUKA

Zircon Industry Association Conference 2018

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All figures are expressed in Australian dollars unless stated otherwise.

Key Messages



1. Tight market in 2018 reflecting sustained demand and reduced production
2. Iluka's approach directed toward sustainability for the zircon industry
3. ZIA has important role to play representing the industry, informing debate & settings standards



Jacynth-Ambrosia, South Australia

Today's Zircon Market



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Geraldton port, Western Australia

Solid Demand Fundamentals

- Solid demand broadly based, both regionally and by application
- European ceramics industry benefitting from growth in domestic and export markets
- Industrial activity in US and Japan delivering growth in refractory and foundry applications
- Overall zircon consumption in Asia-Pacific region expected to be stable
 - 2018 Chinese consumption impacted by environmental closures limiting production
 - Indian and SE Asian tile makers penetrating traditional Chinese export markets



2018 Supply and Consumption Balanced

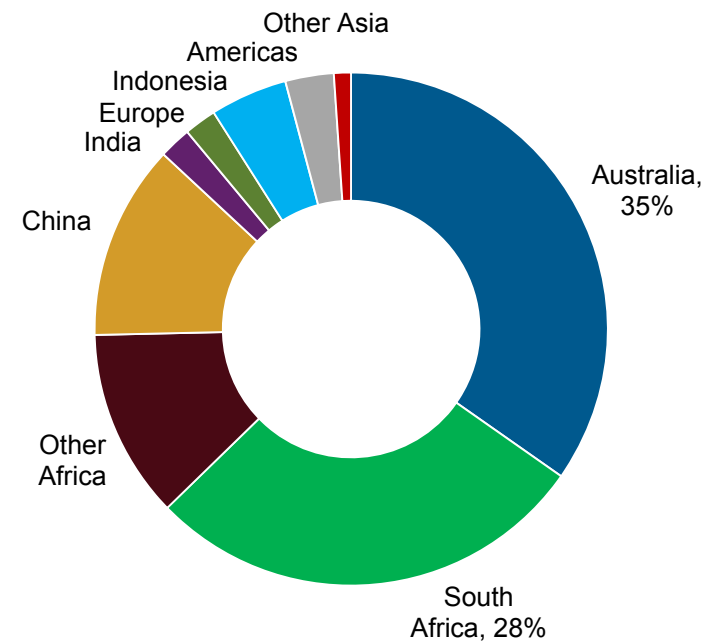


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Global Zircon Supply and Consumption

- Significant supplier inventory depleted in recent years
 - 2016 to 2018 supply = production + inventory draw
- Existing producers' mines mature and entering decline in coming years
- 2019 market expected to remain tight
 - Global demand greater than mine production rates

2018 Global Zircon Production

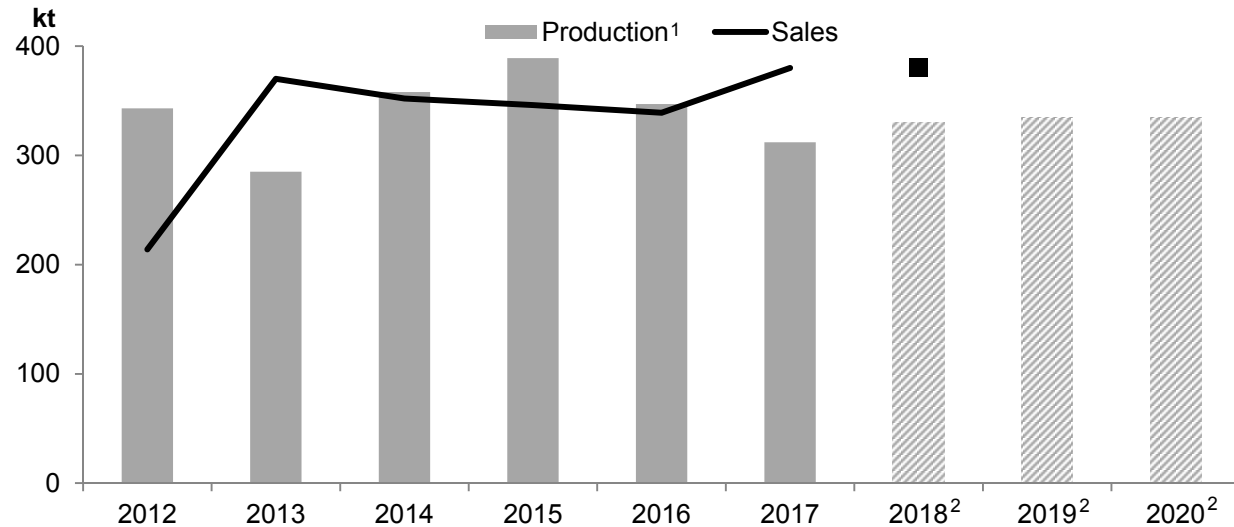


Iluka's Production Response

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Iluka's Zircon Production and Sales



Iluka's response to tight market conditions:

- Guided 2018-2020 zircon production of ~335ktpa
 - Cataby project tonnes available in 2019
 - early Ambrosia mine move (smoothing production)
- Potential for additional Zircon in Concentrate production

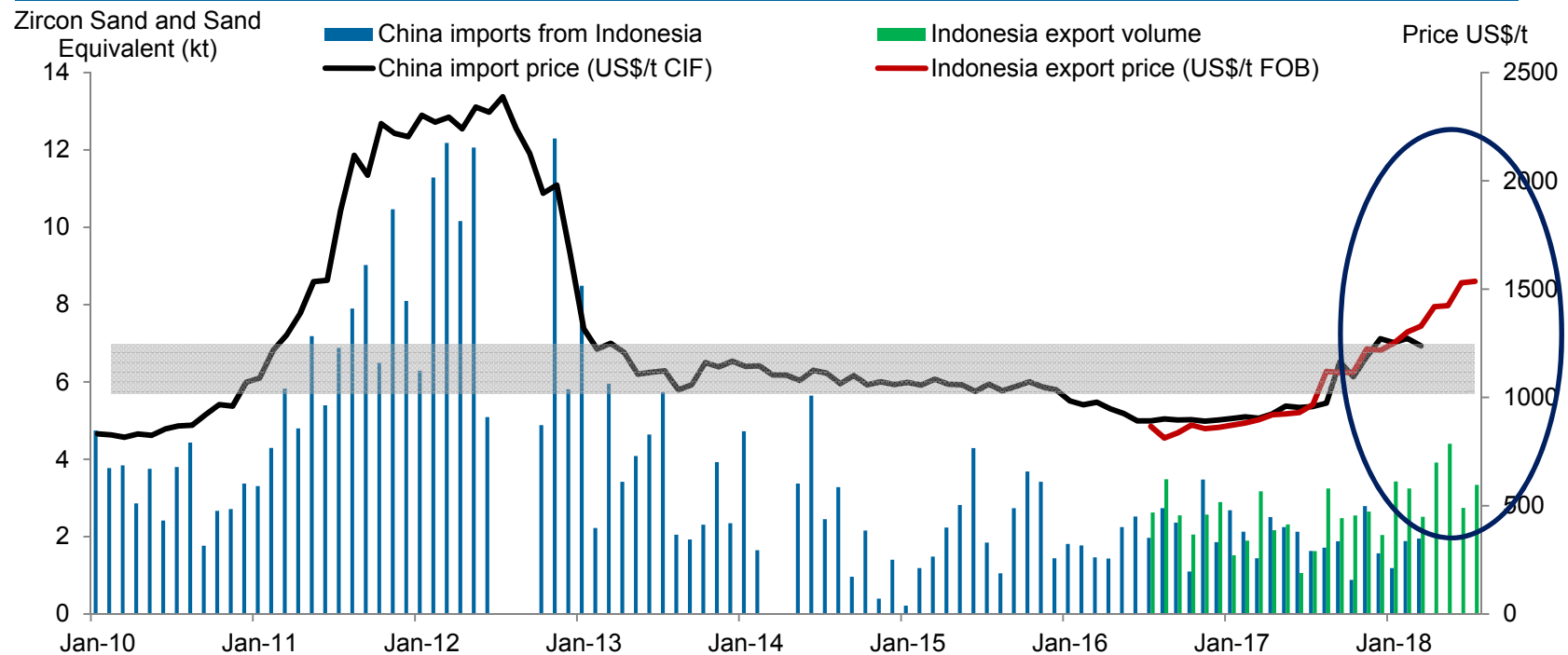
1. Production denotes finished zircon product. Over the period 2012-16 Iluka built a significant stockpile of heavy mineral concentrate at its zircon dominant mine – Jacinth Ambrosia

2. 2018-2020 production guidance of 335ktpa and 2018 sales assumes 2018 H1 and H2 sales evenly weighted, as guided

Industry Response

- Aside from Iluka, current industry response limited to Kalimantan

Chinese imports from Indonesia / Indonesian exports



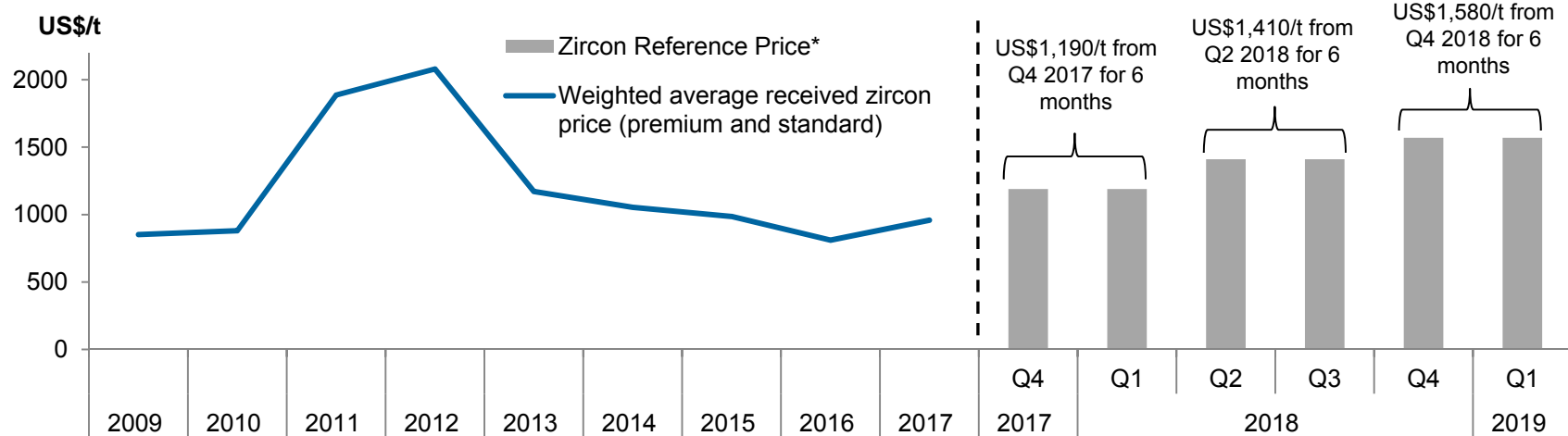
Source: Iluka, TZMI, Export Genius

- Inducement price for Kalimantan exports generally regarded to be ~US\$1,400/t
- Indonesian exports currently ~50ktpa rate

Approach to Pricing

- Supply / demand fundamentals have driven recent price trajectory
- Iluka approaching pricing decisions mindful of history and of potential impacts of decision
- Pricing cadence slowed
- Focus on monitoring:
 - zircon customer and ‘end user’ behaviour
 - price of major zircon substitutes
 - Indonesian ‘swing’ production

Zircon Price History



Source: Iluka

* Zircon Reference Price is based on 2 tonne bag of Zircon Premium, DAT, ex-China warehouse

Iluka's Approach to Zircon - Sustainability



Production / Marketing / Sales Approach

- Maintain security of supply to customers
 - draw inventory and release to market
 - guided production 2018-2020
 - invest in new production
 - potentially mobilise more concentrates
- Endeavour to satisfy genuine customer demand only
 - do not support speculation

Pricing Approach

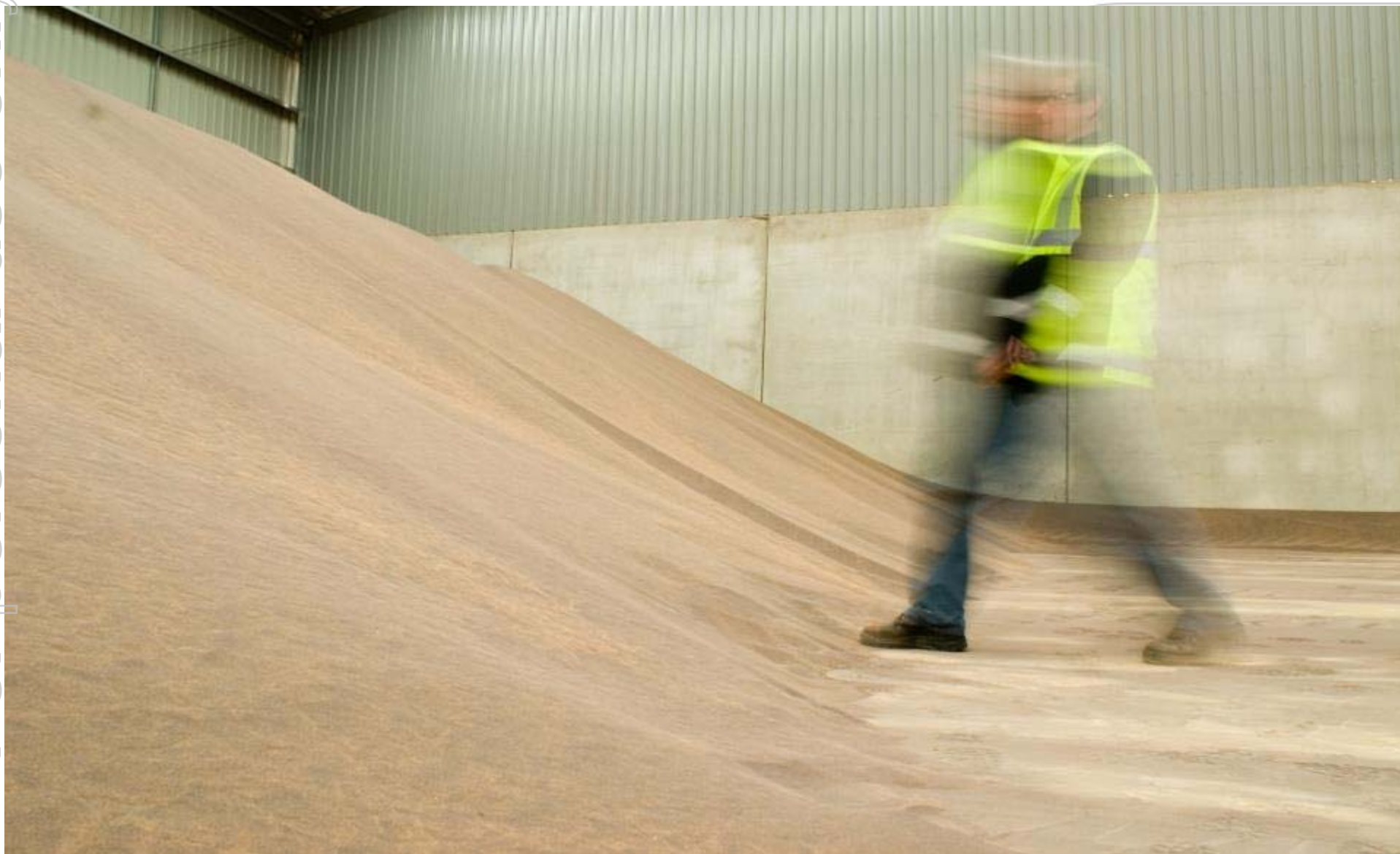
- Consider quantum of price increases in market context
- Monitor customers and end-users
- Prudent pricing cadence to permit monitoring of impacts and price absorption through value chain
- Demonstrated ability to adapt to market



Modernisation, Substitution and Thrifting



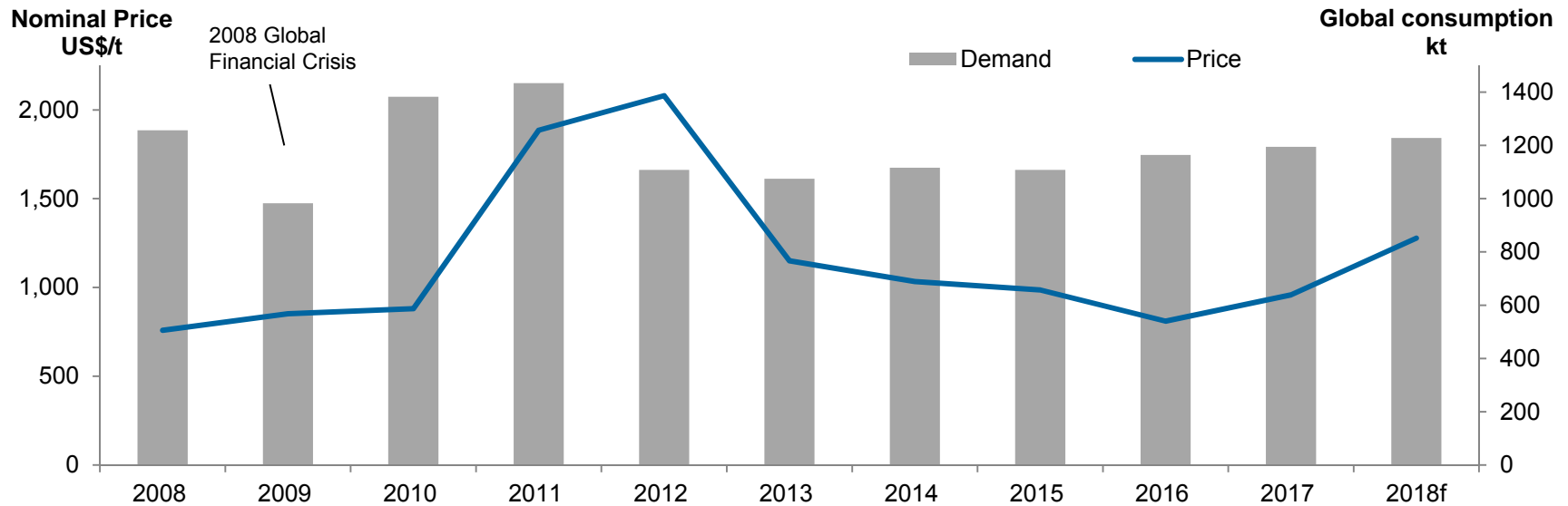
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Zircon Price and Consumption: 2008-2018



Zircon Price and Consumption History



Source: Iluka, TZMI

2009:

- One off ~250kt temporary reduction in zircon consumption

2010-2011:

- Strong recovery helped by Chinese economic stimulus package
- Price escalation and limited short term supply response

2012:

- Rapidly increasing prices hastened changes to downstream production techniques
- Permanent market destruction of ~250kt due to modernisation, thrifting and substitution

2013-2014

- New production induced by price spike leads to over-supply and further price weakness

Lessons Learned



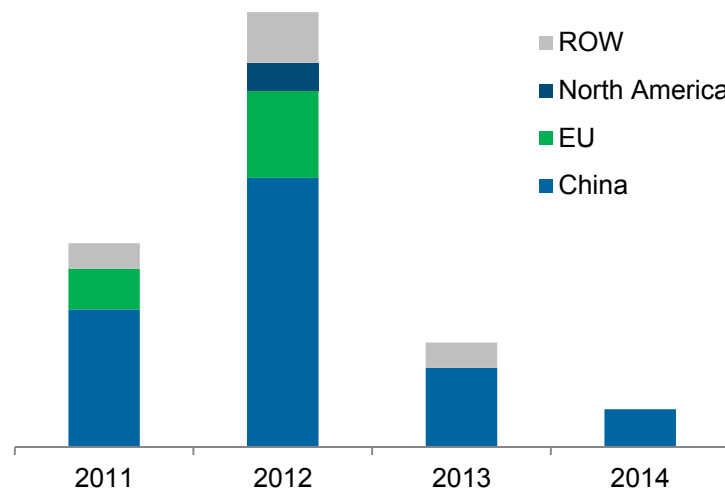
Industry myths 'debunked' after 2012 ...

Myth	2012 experience
<i>No substitute for zircon - demand inelastic to price</i>	Alumina, feldspar and other materials were used to reduce zircon loading. Double charging and other new manufacturing techniques reduced the loading of zircon in tiles.
<i>Quantity of zircon per tile meant that cost is immaterial to end consumer and large cost increases can be easily absorbed</i>	Zircon is a meaningful percentage of downstream purchasing manager's portfolio. Cadence and magnitude of price increases were too fast and too large.

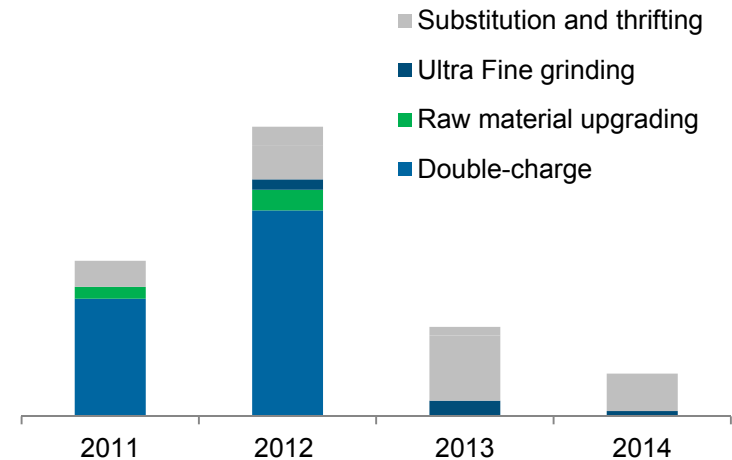
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Where Zircon Demand Was Lost

Modernisation, Thrifting and Substitution -
by Region (kt)



Modernisation, Thrifting and Substitution -
in Chinese Porcelain Tiles (kt)



Source: Iluka, TZMI, Roskill, Asian Ceramics

- Total demand destruction ~250kt
- Largest impact in areas with lowest technical/adoption hurdles (ceramics and foundry)
- European producers had already started modernisation process well before 2011
- Impact now fully reflected, zircon growing from new, but lower base

Zircon Substitution

Although substitutes exist, zircon is the better product

Zircon attributes

- Opacity – whiteness
- Hardness
- Low thermal expansion
- High melting point
- Low thermal conductivity
- Chemically inert
- Low neutron absorption



- Alumina
- Feldspar
- Kaolin
- Chromite
- Synthetic Mullite

Adoption of substitutes has value-in-use and technical limitations

Substitution Landscape



Market	Application	% of zircon market (est)	Major Substitute	Adoption Hurdle	Mitigation
Ceramics	Body	16	Calcined alumina; white clays; white feldspar; kaolinite	Medium	Alumina content in tile formulation Final product attributes (e.g. porosity, dimensions) Declining availability and quality of ceramic clay and feldspar deposits
	Engobes & glazes	27	Calcined alumina	Medium/High	Alumina content in tile formulation Final product quality (e.g. water mark, melting point, chemistry, gloss) Increasing demand for higher-quality and HD digital glazed tiles
	Ceramic frits	9	Titanium frits	High	Zircon's effects unmatched Titanium frits limited volume
Chemicals	Pigments (zirconia)	20	Nil	High	ZrO ₂ 's effectiveness to provide crystal encapsulation for specific colours
	Medical Applications		Nil	High	Highly specific functions
	Advanced materials		Nil	High	Highly specific functions (e.g. fuel rods, oxygen sensors, high-temperature turbine coatings)
Refractory	Glass refractory	16	Nil	High	Highly specific function High-impact failures if cheaper substitutes fail
	Steel refractory		High-purity alumina; spinel	Medium/High	High-impact failures if cheaper substitutes fail
Foundry	Sand-casting	2	Synthetic mullite; chromite	Low	Limitation in performance of substitutes (e.g. desired high-level surface finish and chilling effects)
	Coatings	10	Alumina; synthetic mullite	High	Limitations in performance of substitutes (e.g. resistance to molten metal)
	Precision Casting		Fused silica; WFA; synthetic mullite	High	Limitations in performance of substitutes (e.g. surface finish quality, coating slurry instability)

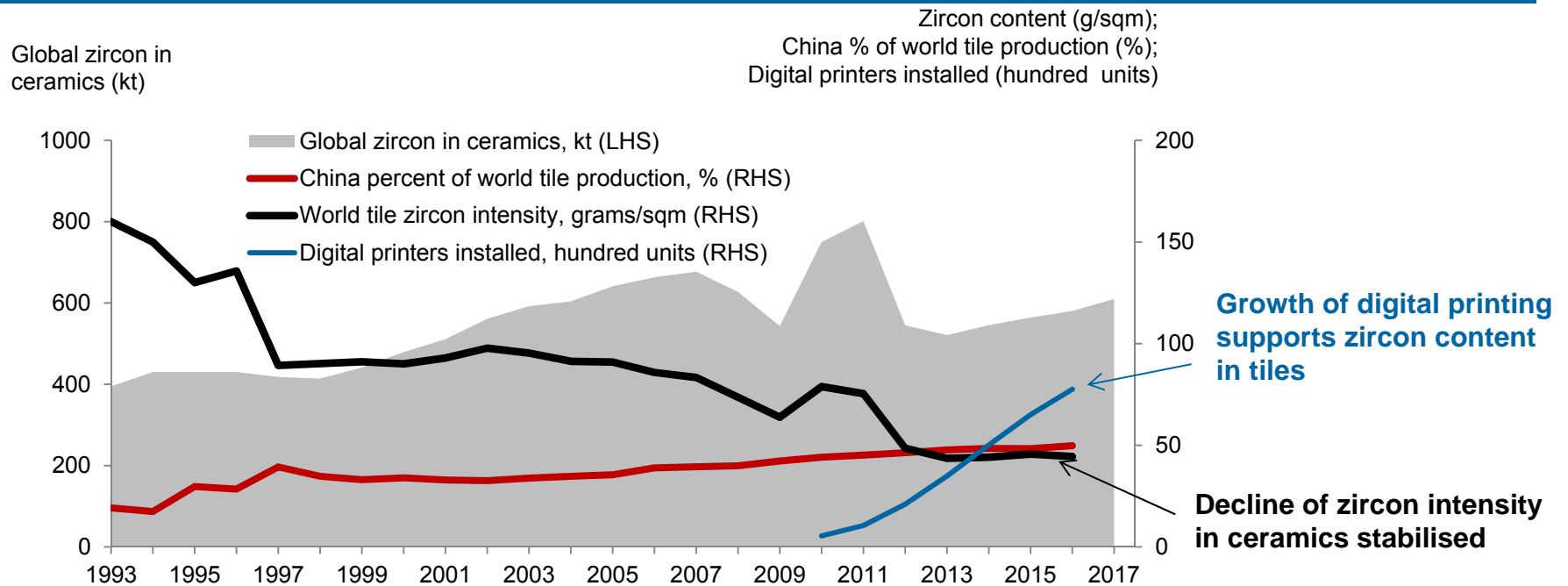
Adoption Hurdle Low = Likely requires only in-house competencies to trial and implement the change. Change could likely be achieved in less than a year. Low economic risk.
 Medium = Focussed effort needed, external specialist knowledge may be required. Change may require between one to three years.
 High = Technical limitations, Deep and specialised technical knowledge to study, trial or implement the changes. May require more than three years of efforts. High potential economic risk from any trials.

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Ceramics Zircon Intensity



Reduced loading of zircon appears to have approached technical limits
Rise of digital printing is supporting zircon intensity in tiles



Source: Ceramic World Review, TZMI

- Modernisation, thrifting and substitution in ceramics reached technical limits
- Digital printing could bring higher quality tiles (higher zircon content) to traditionally low quality markets (India/Brazil) and has allowed emerging producers to compete easier
- Trend to higher quality tiles positive for zircon (both volume and value-in-use)

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Role of the ZIA



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Role of Industry Associations



Development of industry standards



Product promotion and innovation



Forum for information exchange and debate



Promote Corporate and Social Responsibility



Influencing policy and regulation development and setting

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Rehabilitated land, Murray Basin

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