

CHINA ZIRCON DEMAND

Overview

This briefing paper considers the application of historical trends to potential zircon intensity of use in China over the periods to 2016 and 2020. It also considers the implications of a number of key Chinese Government policy settings and likely economic trends - most notably targets to increase GDP per capita and achieve a defined level of urbanisation as embedded in the 12th Five Year Plan - on potential demand for zircon in China. China is the largest global consumer of zircon, at approximately 40 per cent of global consumption of 1.4 million tonne in 2010.

Two conclusions from this analysis are that:

- by 2016, China's zircon consumption **could double** from the current level; and
- by 2020, China's zircon consumption **could be greater than total global zircon consumption** in 2010.

These potential trends, despite expected periodic and short term demand variations and despite impacts of some substitution and thrifting of zircon in certain applications, provide a compelling perspective for medium to longer term zircon demand in China. When overlaid by accelerating demand in other developing countries and the paucity of identified material new zircon supply, the demand profiles support Iluka's positive view of supply/demand fundamentals for the medium term, both in China and other developing economies. Much of the analysis below relates to the use of zircon in ceramic applications, such as floor and wall tiles. Ceramics manufacture constitutes approximately 55 per cent of total zircon demand.

The analysis in this paper, based as it largely is on the extrapolation of trends to potential zircon usage in China, is a supplement to fundamental analysis and market assessments that Iluka makes to determine potential demand patterns for zircon. The results are *one* basis for Iluka's medium term perspective on demand trends for zircon in China and other developing economies.

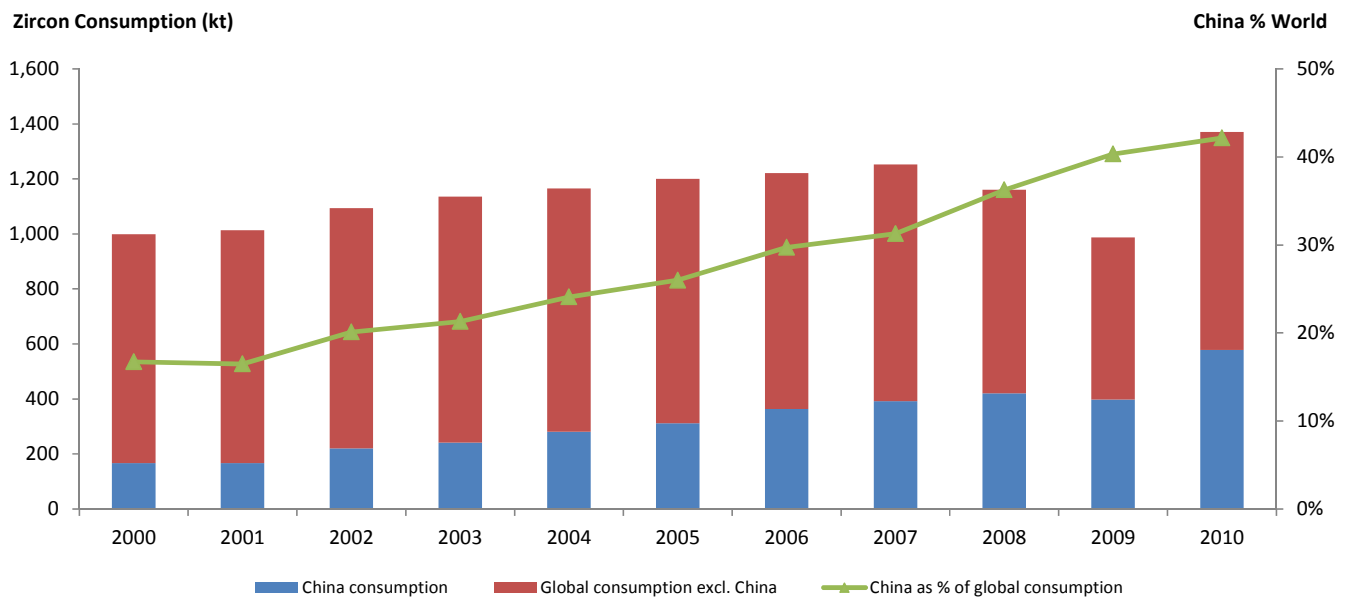
China's economic growth and urbanisation expected to underpin medium to longer term zircon demand

Economic development in China over the past 30 years has led to increases in economic output and major shifts in demographic profiles, which have been associated with increases in GDP and urbanisation. In turn, Chinese zircon consumption has been highly correlated to both GDP per capita and urbanisation, with a correlation coefficient between Chinese zircon consumption and:

- GDP per capita from 1980 to 2010 of 0.95; and
- the urbanisation rate over the same period of 0.94.

Figure 1 shows global zircon consumption by region over the past 10 years. Average Chinese consumption grew at a compound annual growth rate (CAGR) of 13 per cent, while global consumption grew at 3 per cent. In 2010, China consumed approximately 40 per cent of world zircon, compared with 17 per cent in 2000. Based on current trends, China is on track to exceed the 13 per cent growth figure in 2011. This is based on transaction volume only, which does not take into consideration demand that cannot be met due to supply constraints.

Figure 1 Global Zircon Consumption



Source: TZMI (2011)

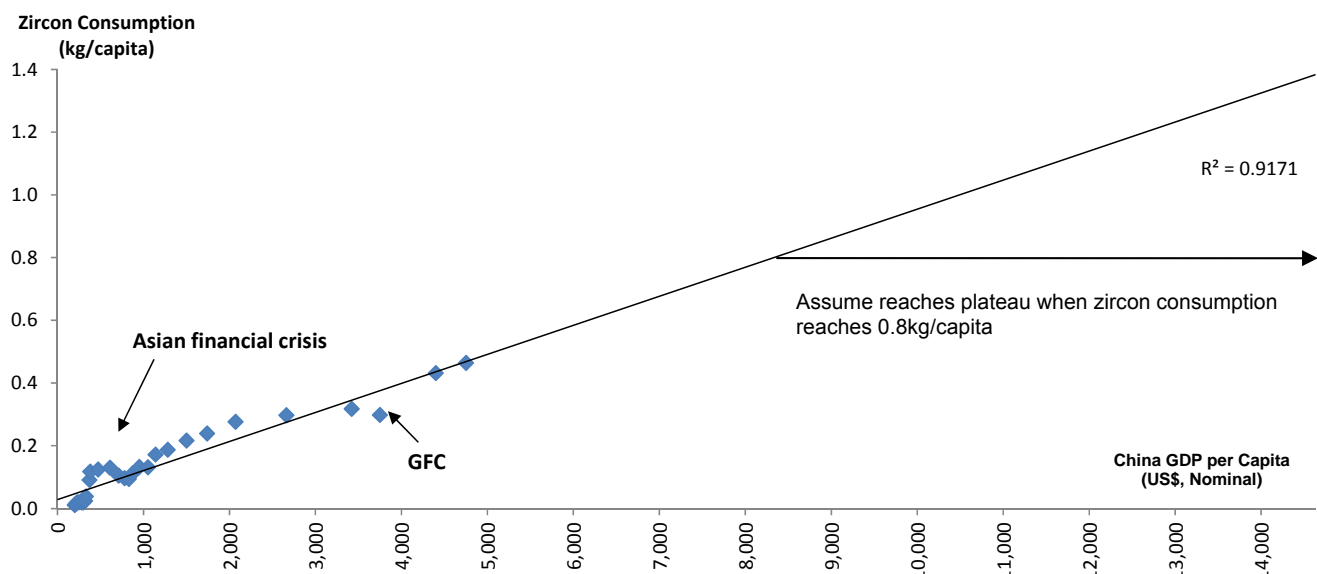
According to Iluka’s analysis, over 90 per cent of China’s zircon consumption was met from imports in 2010. China has limited and mature sources of indigenous zircon supply. With continued economic growth, urbanisation and a central China Government policy of limiting zircon mining on China’s main domestic source, Hainan Island, the level of zircon sourced internally is likely to reduce.

Zircon Intensity of Use

Figure 2 shows China’s intensity of use of zircon in the past 30 years. A linear trend is used to characterise the consumption profile against GDP per capita.

China’s zircon consumption pattern over the past 30 years suggests zircon consumption per capita grew 20 per cent faster than GDP per capita growth, with a 1.2:1 ratio between zircon consumption and economic growth.

Figure 2 Zircon Intensity of Use in China



Source: World Bank and TZMI (2011)

Note: China’s GDP per capita growth between 1980 to 2010 was at a 11% CAGR; China’s zircon consumption per capita from between 1980 to 2010 was at a 13% CAGR

Note: at 5% level of significance, there is sufficient evidence to prove that a positive linear relationship exists between zircon consumption and GDP per capita (P-Value ≈ 0). A summary of the statistical test results are shown in the table below.

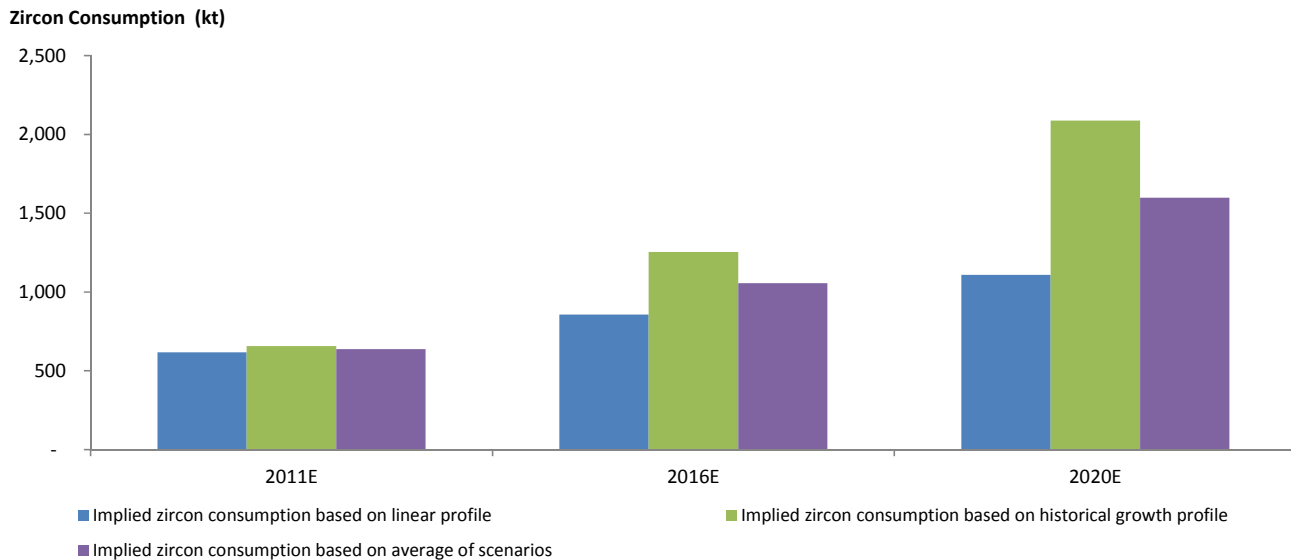
	Coefficients	Standard Error	P-value
Intercept	0.0245	0.0092	0.0122
GDP per capita	0.0001	0.0000	0.0000

Implications of China's GDP per capita targets for zircon demand

One of the prime policy goals of China's 12th Five Year Plan is to achieve a GDP per capita target of US\$10,000 by 2020. This implies a GDP per capita CAGR of 8.6 per cent from 2010. Two different profiles have been applied to analyse possible Chinese zircon consumption under this GDP per capita increase scenario, as follows:

- utilisation of a straight line growth scenario until reaches a plateau when consumption per capita is 0.8kg/capita; or
- assessing growth based on a consumption CAGR at the same rate as the average CAGR from 1980 to 2010.

Figure 3 China Zircon Consumption Trend



Source: China's 12th Five Year Plan (2011) and Global Insight (2011)

Note: Implied zircon consumption based on linear profile growth from 2010 to 2020 is at 6% CAGR; Implied zircon consumption based on average of scenarios growth from 2010 to 2020 is at 11% CAGR

Based on the above analysis, China's zircon consumption:

- by 2016, could range from ~900 thousand tonnes (kt) to ~1,250kt, with a forecast average of ~1,100kt; and
- by 2020, could range from ~1,100kt to ~2,000kt, with a forecast average of 1,600kt.

Zircon consumption based on zircon intensity of use, therefore, implies **potentially fundamental changes** in the level of zircon demand in China, in that:

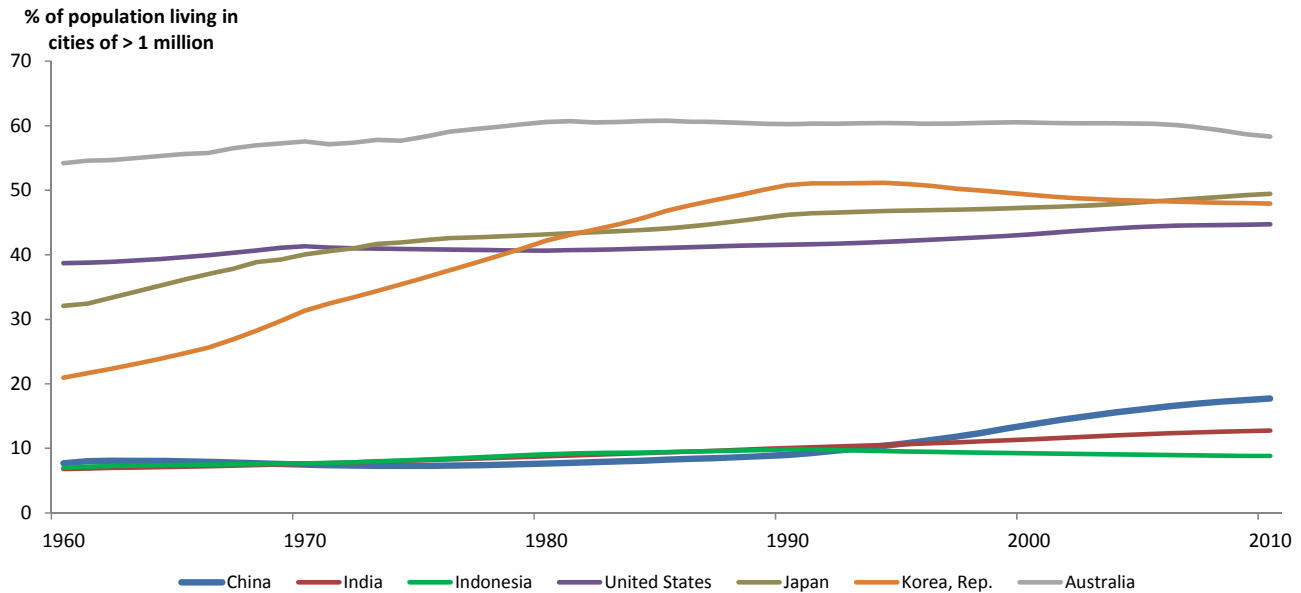
- China's zircon consumption, by 2016, could double from the current level (2011 estimate of ~620kt); and
- China's zircon consumption, by 2020, could be 200kt more than global zircon consumption in 2010 (~1.4 million tonnes).

Please note that the above analysis is based on the extrapolation of trends only, economic cycles will move demand above and below the trend line from time to time.

Zircon Consumption and Urbanisation

Figure 4 (overleaf) compares urban agglomeration rates in several emerging and developed countries. The urban agglomeration rate is the percentage of population in urban concentrations of more than 1 million compared with total population. China has an urban agglomeration rate of 17 per cent - in comparison Australia's urban agglomeration rate is almost 3.5 times this figure.

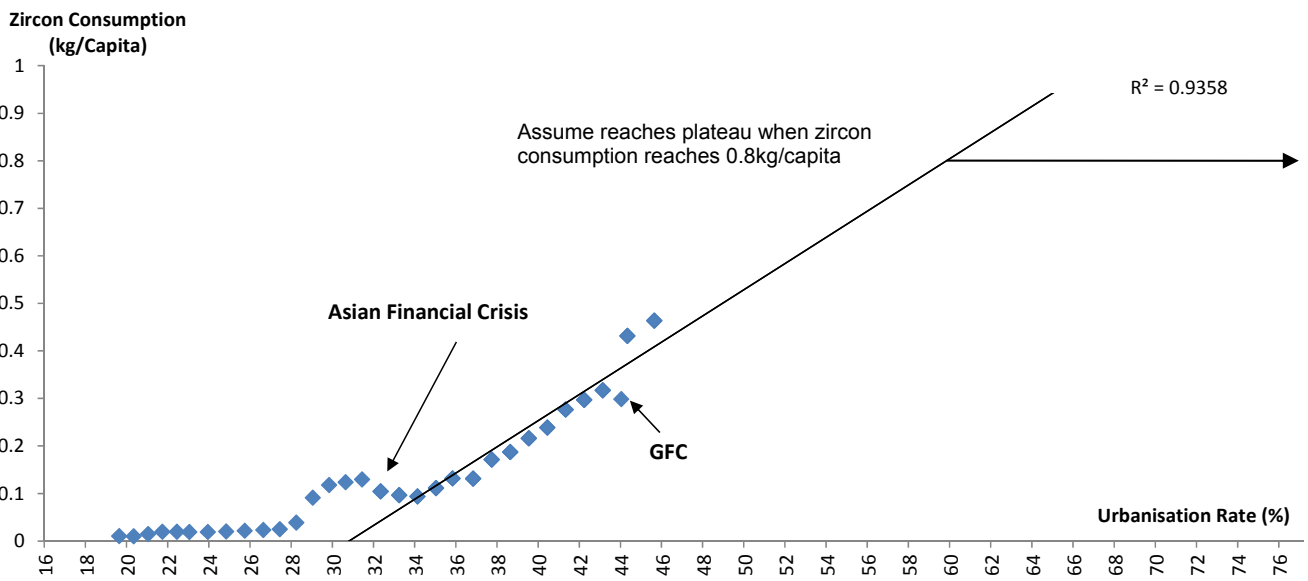
Figure 4 Urban Agglomeration Rate Comparisons



Source: World Bank (2011)

Figure 5 displays China's zircon consumption compared with the urbanisation rate over the past 30 years. Unlike the urban agglomeration rate which measures the population inhabitants at specific urban density levels (people who reside in a city that contain more than 1 million people), the urbanisation rate disregards the urban density level. It is a measurement of total urban population as a percentage of total population. The correlation coefficient between China's zircon consumption and urbanisation over the period 2000 to 2010 was 0.99, up almost 41 per cent from that in period 1990 to 2000. Therefore, a linear trend line is used to reflect the trend from 2000 to 2010.

Figure 5 China's Zircon Consumption Relative to Urbanisation Rate



Source: World Bank (2011) and TZMI (2011)

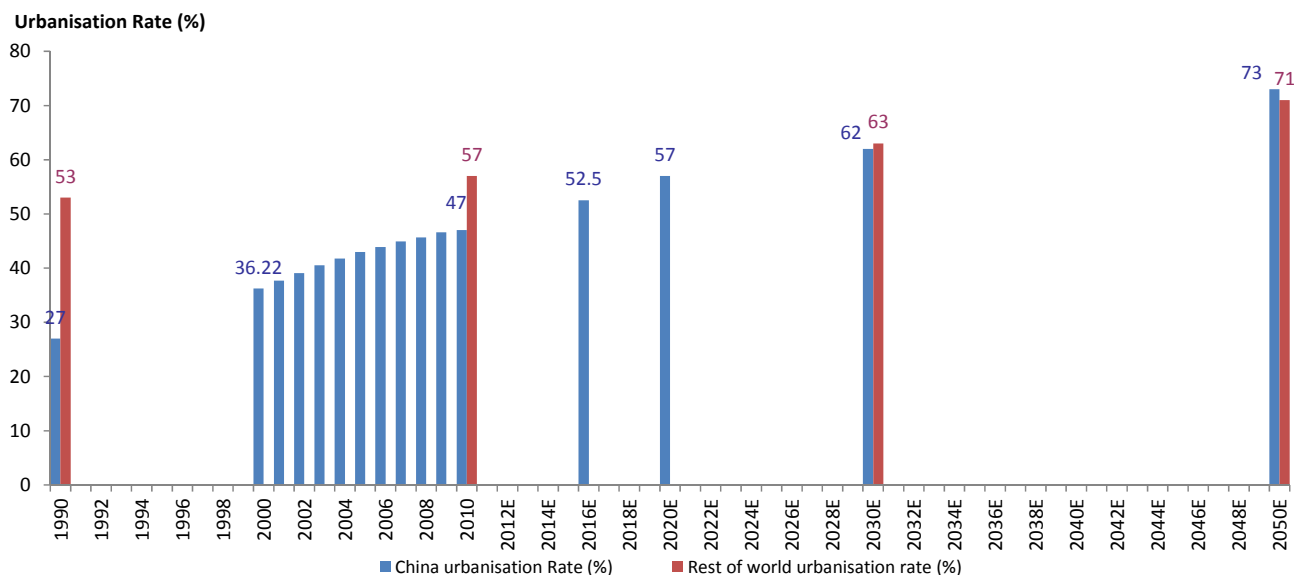
Note: at 5% level of significance, there is sufficient evidence to prove that a positive linear relationship exists between zircon consumption and the urbanisation rate (P-Value ≈ 0). A summary of the statistical test results is shown in the table below.

	Coefficients	Standard Error	P-value
Intercept	-0.3040	0.0327	0.0000
Urbanisation	0.0135	0.0010	0.0000

China's 12th Five Year Plan sets an urbanisation target of 51.5 per cent by 2015, relative to the current urbanisation level of 47 per cent. The urbanisation level target implies a CAGR of 2 per cent from 2010. As indicated in Figure 6, China's urbanisation growth, on this basis, would continue to outpace that of the rest of the world. It is estimated by the United Nations and McKinsey that China will need at least 20 years to "catch up" with the average urbanisation rate of the rest of world. Estimates of floor space expansion are influenced by a multitude of factors: continued private investment in housing construction; the

Government's social housing programme; refurbishment of existing housing and office stock and increases in floor space (and hence zircon consumption) associated with infrastructure (airport terminals, railway terminals), as well as commercial (office and hotel) construction activities. McKinsey in *Preparing China's Urban Billion* estimated that 40 billion square metres of floor space could be built by 2025, which would constitute the equivalent of up to fifty thousand new skyscrapers.

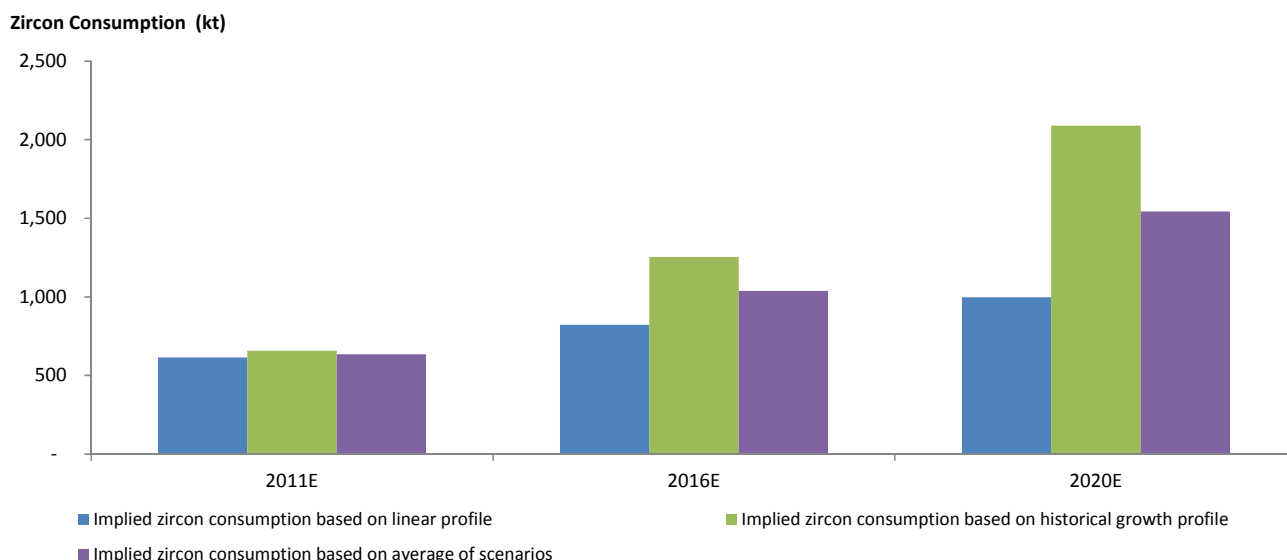
Figure 6 China and Global Urbanisation Rate



Source: BHP (2011), China's 12th Five Year Plan (2011) and China Bureau of Statistics (2011)
 Note: 2016 and 2020 urbanisation rate estimate is based on the implied urbanisation growth GAGR from 2010 to 2015 as per China's 12th Five Year Plan

Applying the same growth scenarios as above, the likely Chinese zircon consumption is shown in Figure 7.

Figure 7 China Zircon Consumption Trend Analysis



Source: China's 12th 5 Year Plan (2011) and Global Insight (2011)
 Note: Implied zircon consumption based on linear profile growth from 2010 to 2020 is at 5% CAGR; implied zircon consumption based on average of scenarios growth from 2010 to 2020 is at 10% CAGR.

The average zircon consumption is the equal weighted average consumption based on the scenarios above. Based on the trend analysis, China's zircon consumption:

- by 2016, could range from ~820kt to ~1,150kt, with average zircon consumption of ~1,050kt; and
- by 2020, could range from ~1,000kt to ~2,100kt, with average zircon consumption of ~1,550kt.

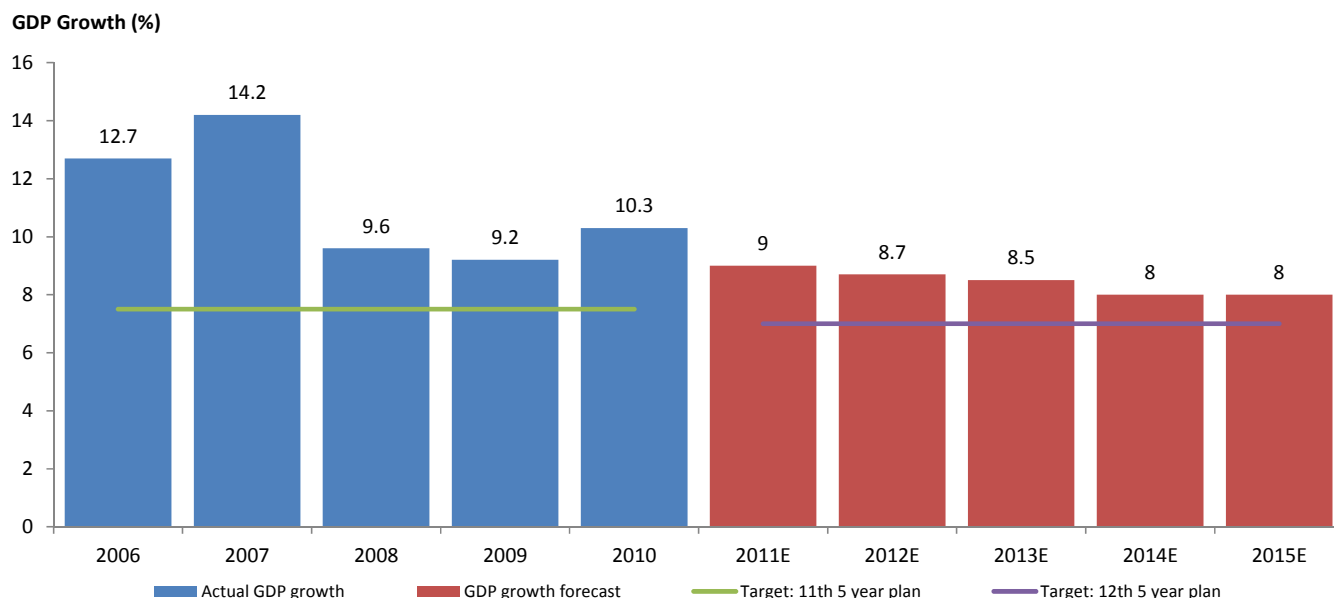
The above trends imply the potential that China's **zircon consumption could double from the current level**, and that by 2020, China's zircon consumption could be 200 thousand tonnes more than global zircon consumption in 2010. Once again, the above analysis is based on the extrapolation of trends only; economic cycles will move demand above and below the trend line from time to time.

Combining both of the growth trends above, suggests China's zircon consumption could grow at a CAGR of between 6 to 14 per cent with an average of 9 per cent.

Given that the Chinese Government's GDP per capita goal to 2020 implies 8.6 per cent GAGR growth, if the 1.2:1 relationship of the past 30 years is applied, a zircon consumption growth rate of 10 per cent CAGR would be likely. Clearly, actual demand will be influenced (negatively and positively) by a range of factors, including potential higher levels of thrifting and substitution; changes in the nature of tile manufacturing processes as well as other factors, such as potential new applications for zircon usage. Despite this, the demand profile is expected to exceed what is expected to be a stable to declining global zircon supply over at least the next five years – thus maintaining a tight to deficit supply/demand situation.

The above trend analysis is based on China's 12th Five Year Plan. History suggests that China's actual growth has consistently outperformed Government Plan forecasts, as indicated in the chart below.

Figure 8 China's Actual and Forecast Growth Rates

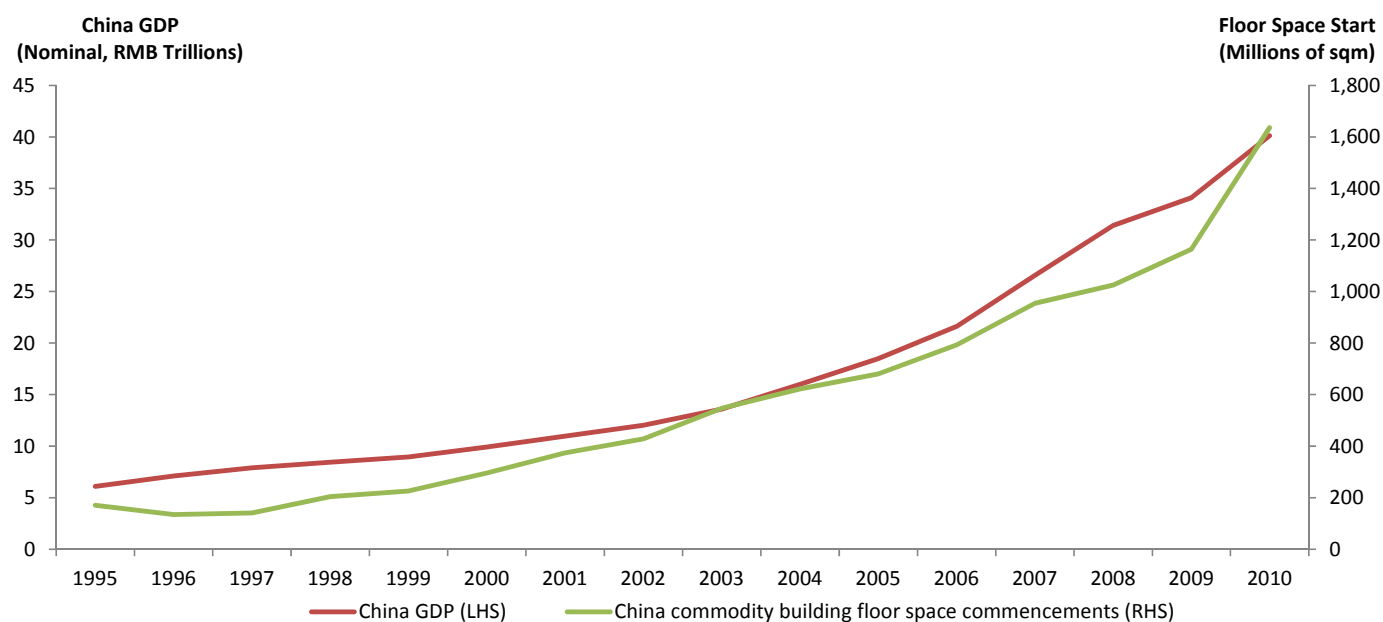


Source: KPMG (2011)

China's Property Market

Historically, China's floor space commencements, and macroeconomic and urbanisation rates are closely linked. The correlation coefficient has been 0.99 and 0.97, respectively.

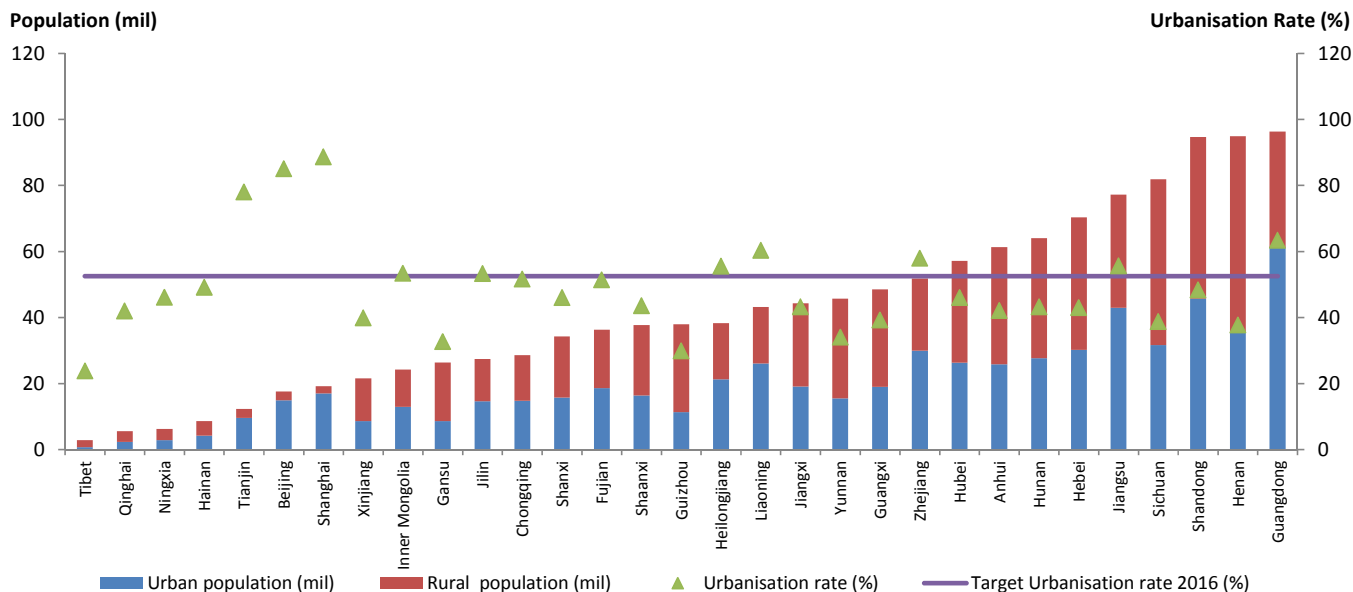
Figure 9 China Property Commencements and Business Cycle Comparison



Source: China Bureau of Statistic (2011)

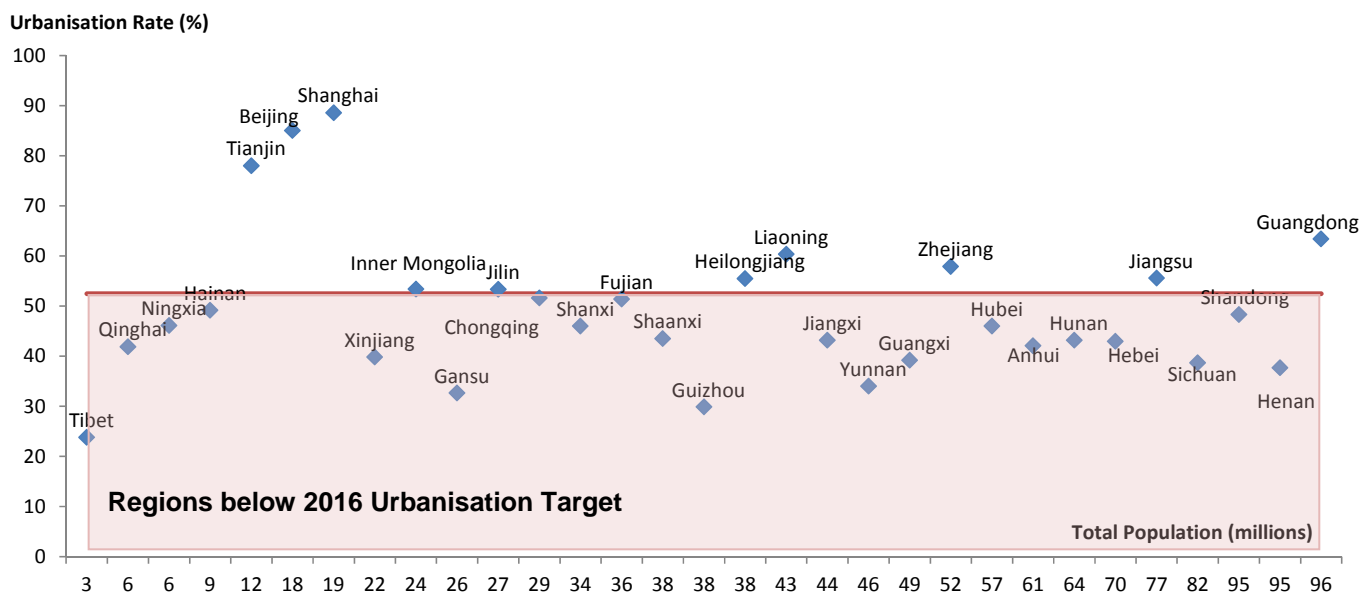
Figures 10 and 11 display the urban and rural populations, and hence urbanisation rates relative to the Government's five year target, across all main regions of China. While coastal cities have a high urbanisation ratio, the overall urbanisation rate across China is still low. Figure 12 shows the number of equivalent metropolitan areas that China would need to build to reach its desired urbanisation levels. This is calculated based on the number of people in 2010 still to move in order to reach a certain urbanisation target, divided by the population at key metropolitan areas in the same year.

Figure 10 China Urbanisation Rate by Regions



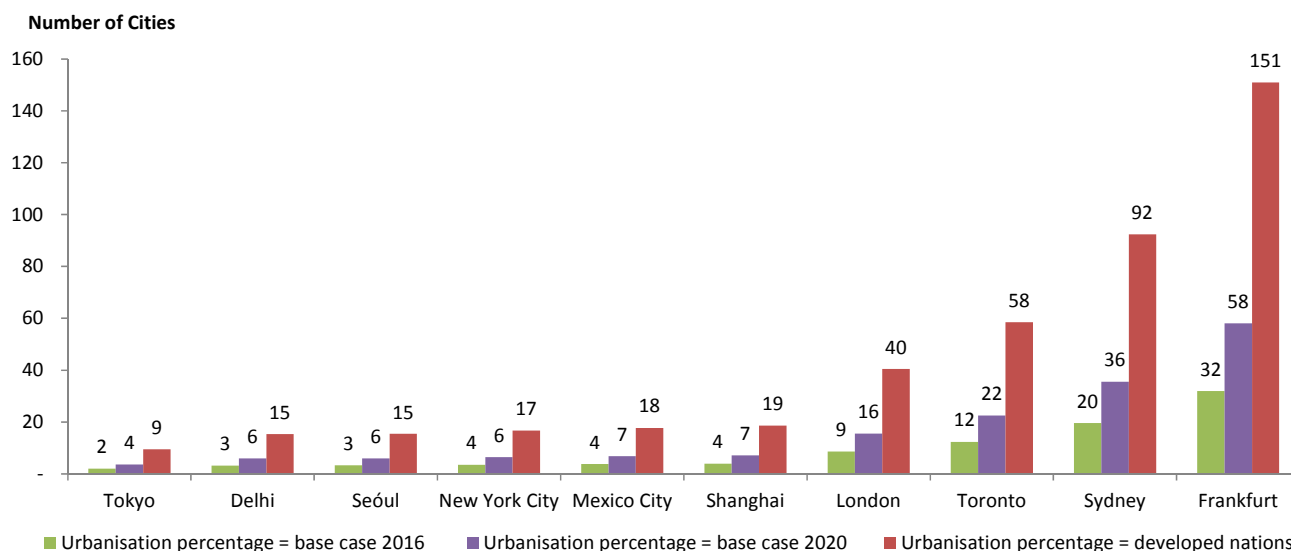
Source: China Bureau of Statistic (2011)

Figure 11 China's Regional Urbanisation Focus



Source: China Bureau of Statistic (2011)

Figure 12 Implication of China's Urbanisation



Source: UN (2011) and CIA (2011)

As indicated in the above chart, a potentially conservative scenario, China will need to build the equivalent of 20 cities the population of Sydney by 2016, or 32 cities the size of Frankfurt, assuming no increase in population. For China to be amongst the league of developed nations, China will need to build 17 New York city-equivalents or 40 cities the size of London. Based on McKinsey estimates, there will be 221 cities in China having a population of 1 million and above (Europe has 35 currently) by 2025.

In response to housing needs required for the Government's urbanisation targets, Premier Wen Jiabao announced in 2011 a major public housing programme to increase housing supply and improve affordability. Under the programme, 36 million social houses are planned to be built over the next 5 years. Since the announcement, there has been a rapid increase in construction commencements – from 34 per cent in late May to 86.8 per cent of this year's targetted 10 million units by the end of August. The social housing programme is a key feature of China's urbanisation targets, its macro economic settings and of the social harmony objective for the country. Refer to Iluka Briefing Paper, Social Housing in China (September 2010) for additional information.

Example of Completed Social Housing Complex in Shanghai



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