

# Korea at the green growth crossroads

Themes that will sustain beyond 2012

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## Disclaimer & Disclosures

This report must be read with the disclosures and the analyst certifications in the Disclosure appendix, and with the Disclaimer, which forms part of it

- ▶ **Korea has committed itself to green growth, breaking from a high-energy, high-carbon trajectory**
- ▶ **Approval of the proposed emission trading scheme has been delayed, and we expect a final vote ahead of April's parliamentary elections**
- ▶ **We estimate Korea has moved from No 15 in terms of climate-smart exports in 2005 to No 7 in 2010, and expect it to displace Japan as No 4 in 2015**

Korea's economic success has been accompanied by rising energy consumption and an acute dependence on energy imports. Its greenhouse gas (GHG) emissions have doubled in the two decades to 2010. In 2008, President Lee Myung-bak made a strategic decision to change course, cemented in the country's comprehensive Green Growth Plan (GGP).

The growth dimension of Korea's plans focuses on the export potential of its core industrial base (e.g. batteries, LEDs, nuclear and solar). Our analysis shows that carbon constraints in Korea's key target markets are growing; backed by government support for R&D and domestic market testing, we forecast Korea's exports of climate-smart goods and technologies (CSGTs) will grow to 4.6% of total exports in 2015.

Turning to its green goals, Korea has committed to reducing GHG emissions by 30% below 2020 business as usual (BAU) projections and boosting the share of low-carbon energy – nuclear and renewables. It is moving cautiously to introduce carbon management in key sectors, and a domestic emission trading scheme (ETS) is awaiting approval.

This year's parliamentary and presidential elections pose questions about the durability of the green growth strategy under a new leadership. This report sets out the structural foundations for Korea's GGP, and details the key investment risks and opportunities. We believe essential features of green growth policy will endure as Korea seeks to carve out a distinctive economic strategy for the decade ahead.

# Contents

<b>Summary</b>	<b>3</b>	<b>Outlook</b>	<b>21</b>
		Political uncertainty	21
<b>Changing course – from high to low carbon</b>	<b>5</b>	Industrial continuity	21
Industrial success	5	International reputation	21
The carbon cost of growth	9	Straight ahead	21
The Green Growth Plan	10	<b>Disclosure appendix</b>	<b>22</b>
Scoring climate risk: Korea	11	<b>Disclaimer</b>	<b>24</b>
<b>Exporting green growth</b>	<b>13</b>		
Exporting its climate economy	13		
Green growth engines	16		
<b>Decarbonising growth</b>	<b>17</b>		
Carbon: First cap then trade?	17		
Cutting energy intensity	18		
Low carbon energy – renewables and nuclear	20		

# Summary

- ▶ Korea has decided to change course from high-energy, import dependence to low-carbon green growth
- ▶ Korea's green exports are growing to overtake Japan's in 2015
- ▶ The green strategy will survive beyond 2012 through innovation

## Energy-intensive economy relies on imports but at a cost

Korea entered the ranks of the industrialised world and joined the Organisation for Economic Cooperation and Development (OECD) on the back of tremendous industrial success. However, this was based on a high-energy and high-carbon model: its per-capita energy use continues to rise and is above its regional peers, China and Japan. Carbon emissions have doubled since 1990 on the back of industrial growth. Korea's carbon intensity is now the second highest of the G20 developed economies.

exports of ships, semiconductors, mobile phones, LCDs and computers together. Oil now accounts for one-quarter of the country's imports by value, and the reality of high crude prices poses a strategic risk for the economy. Energy prices are relatively low in Korea and we believe this explains the limited incentive for industry and consumers to drive efficiency.

## From high carbon to green growth

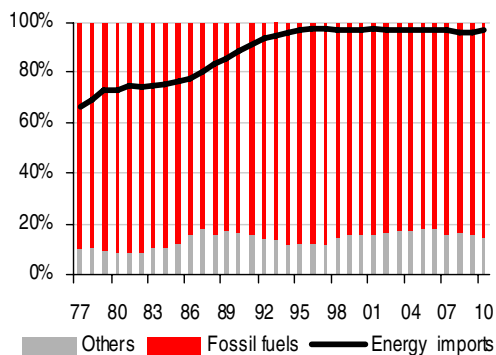
Korea's high-tech industrial base, import dependency and the rising international importance of climate change explain the launch of President Lee's GGP in 2008.

The strategy aims to cut reliance on fossil fuels, break the upward GHG trend and improve energy efficiency. The top 470 emitting companies will be governed by the target management system (TMS) for GHGs from 2012, and a possible ETS from 2015. We believe these regulations represent the first steps in a long-term strategy. However, business concerns about competitive impacts are contributing to policy caution.

## Exporting Korea's green expertise

Exports were equivalent to over half of GDP in 2010 and the high-tech products that Korea produces were an integral part of this. Korea currently ranks No 7 in the world for CSGT

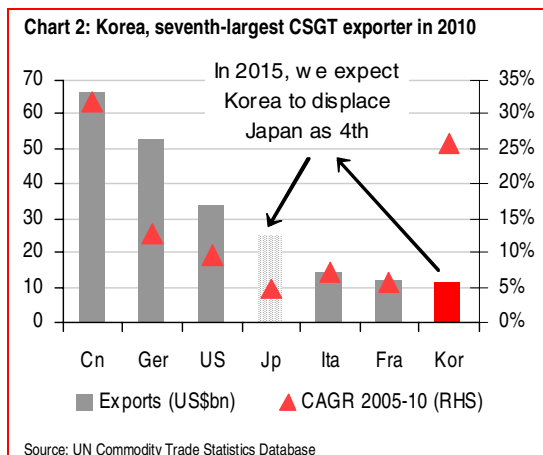
Chart 1: Korea, composition and imports of primary energy



Source: Korea Energy Economics Institute

This model has also been achieved through a heavy reliance on fossil fuels and energy imports. In 2011, energy imports cost more than the total

exports, up from No 15 in 2005 and we expect Korea to displace Japan as the fourth largest in 2015.



Globally, we expect more countries to be carbon constrained by 2015. We forecast that well over half of Korea's CSGT exports in 2015 will be to carbon-constrained countries. As a share of Korea's total exports, we expect CSGT to almost double to 4.6% by 2015.

### Green growth engines

Korea's existing strength in batteries, LEDs and nuclear provide the foundation for the GGP. The government has defined 17 new growth industries at the sector level and 27 core technologies as the engines to drive the GGP. These will receive increased R&D investment, up to one-quarter of the government R&D budget.

### Targeting energy efficiency

The GGP aims to cut Korea's energy intensity by 26.5% below 1990 levels by 2020. We believe Korea is on track to achieve its interim 2013 energy intensity target.

The current plans to improve building efficiency are encouraging but, in our view, not as strong as they need to be to wean the nation off its imported-energy habit.

To date, the government's plans to decarbonise the energy mix only include modest goals – to make renewables account for 6.9% of electricity generation by 2020, to be delivered by the new renewable portfolio standard (RPS). Nuclear will remain an important part of the generation mix despite the Fukushima accident in March 2011, and is expected to supply more than half of Korea's electricity between 2020 and 2030. The general public, however, is less excited about nuclear since Fukushima, and this poses a risk to the future generation mix.

### Green will continue beyond 2012

Green growth has strong roots in Korea's economic structure but politically, it is associated with President Lee Myung-bak who steps down this year. National elections in April followed by the presidential vote in December are contributing to uncertainty in climate policy – exemplified by repeated delays in approving the emissions trading legislation in the National Assembly.

In our view, Korea's green growth trajectory began before President Lee's administration – and it will continue beyond it. Key pieces of legislation have been put in place and substantial government resources have been allocated to boost innovation – equivalent to 2% of GDP. We expect the new assembly and president to refine the green growth strategy, while retaining the core elements. Internationally, green growth is closely associated with Korea – and the country is vying to host the new UN Green Climate Fund. For these reasons, we believe Korea will drive straight ahead at the crossroads.

Please also refer to our accompanying report published today for further details: *Investing in Korea's green growth: We identify stocks best positioned for the low carbon environment.*

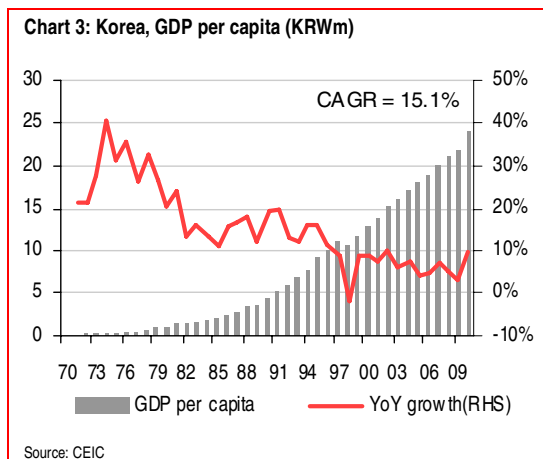
*We gratefully acknowledge the assistance of Beate Sonerud in the preparation of this report.*

# Changing course – from high to low carbon

- ▶ Industrial success built on high energy use and acute dependence on imports of energy
- ▶ Korea's Green Growth Plan combines both economic and environmental objectives
- ▶ The strategy rests on boosting innovative products and cutting carbon emissions as well as temporary civil engineering projects

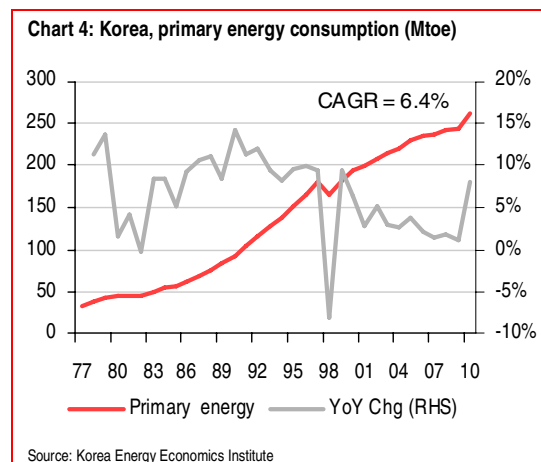
## Industrial success

Korea has broken away from the pack of developing countries; it stopped receiving aid from the OECD in 1995 and became a donor country in 2009. Over the past 40 years, the growth of its economy and industrial success has been remarkable (Chart 3). Annual growth in GDP since 1970 has averaged 15%, although the rate of increase has slowed to less than 10% since the turn of the century.



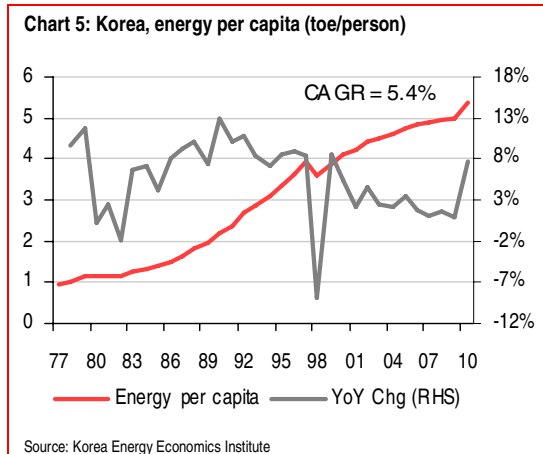
## Built on high energy and high carbon

Like most developed countries, Korea's success was built upon high energy use and, hence, high carbon intensity. Its consumption of primary energy has risen over five-fold in the last 30 years (Chart 4).

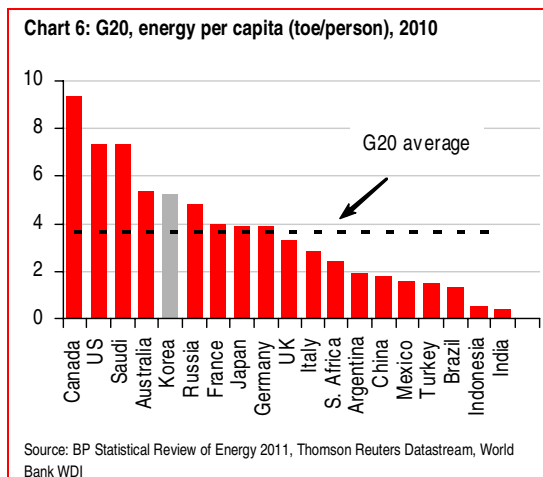


### Everyone is using more energy

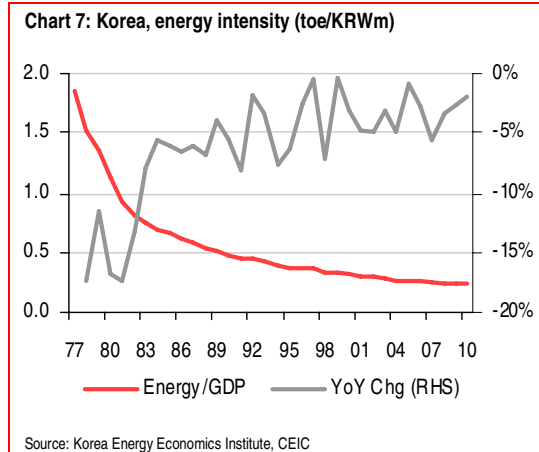
The rise in energy use has far outpaced the growth in population; hence, the country's per-capita use of energy has increased steadily since the 1970s (Chart 5).



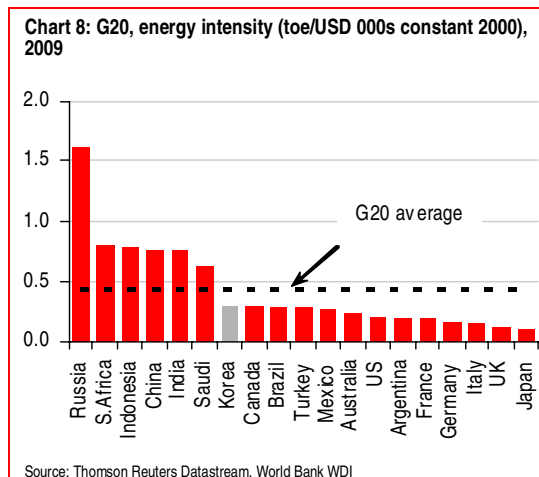
Korea's energy per capita is towards the high end of many large and developed economies (Chart 6) and is above its main regional peers, China and Japan.



The energy intensity of the economy (energy use/GDP) has fallen in nominal won terms, although the rate of decrease is slowing (Chart 7). We believe structural changes to the economy will need to take place if Korea is to further reduce its energy intensity, for example via a marked increase in energy efficiency.



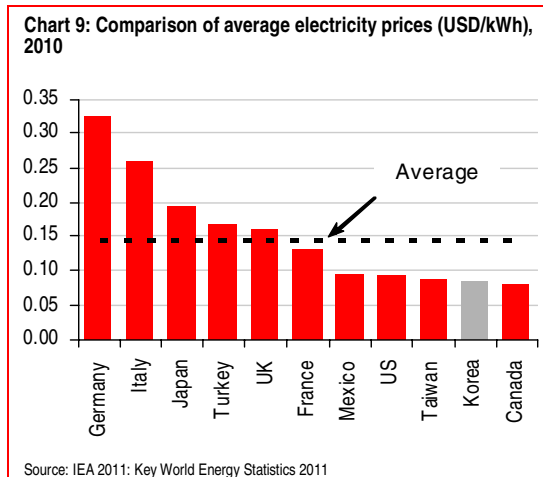
When compared to countries in the G20 (Chart 8), Korea is at an inflection point between developed and developing economies. It has the highest energy intensity among the developed economies, such as the US, Germany, the UK, and Japan. In our view, there is still considerable scope for improvement, given that its intensity is three times higher than that of neighbouring Japan.



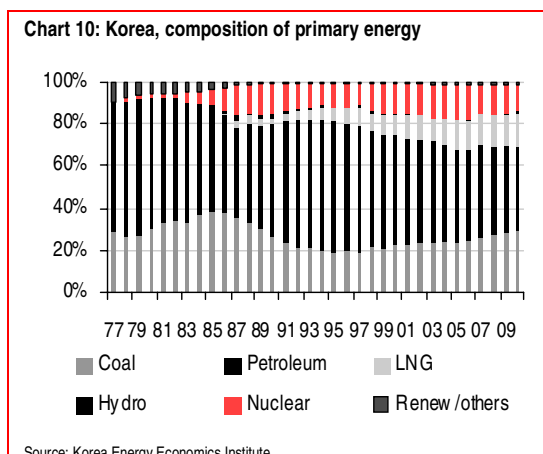
### The cost of energy is low

We believe that low energy costs in Korea partly explain the country's energy performance. Energy costs remain controlled to underpin industrial competitiveness. For example, not considering the cost of generation, Korea's average electricity price is among the lowest of many developed economies (Chart 9); it is half the cost of electricity in the UK and one-quarter of that in

Germany. As a result, Korea's electricity demand continues to rise as industrial production grows.



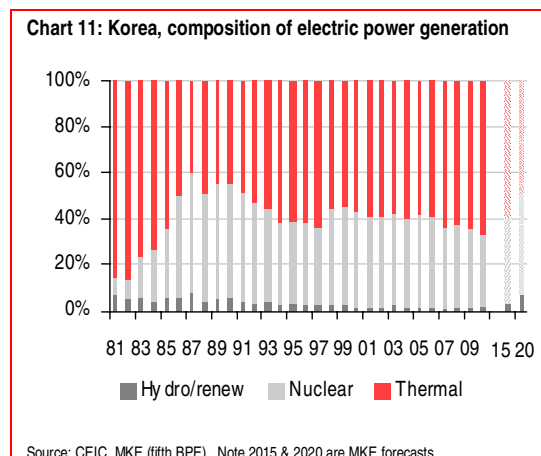
Primary energy in Korea is still highly reliant on fossil fuels (Chart 10), mainly petroleum but also coal and LNG, which continues to supply over 80% of primary energy. Nuclear has been a growing energy source since 1978 when Korea started its first commercial reactor. In the years since, a further 20 reactors have been built and the nine constructed from 1993 were designed by the national power company, KEPCO.



### Electric power management

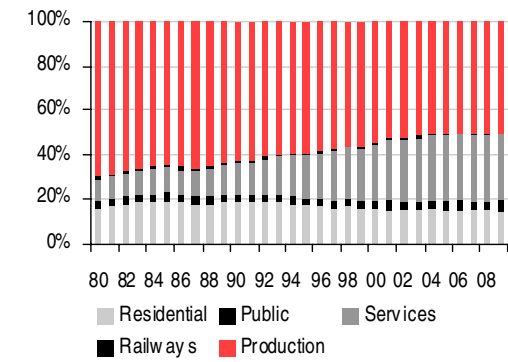
Power generation and consumption have grown at an average annual rate of 9% for the past 30 years. The country's power supply is designed to cope with peak demand in winter and summer. The government had expressed concerns over supply in the last decade because demand was rising quickly, whereas peak load reserves were falling to below 10%. In September 2011, these concerns played out as a blackout hit over 2m households and many businesses; the event was unprecedented in peace-time Korea.

The generation of electricity comes mainly from thermal (two-thirds of the total) and nuclear (one-third) (Chart 11).



The Ministry of Knowledge Economy (MKE) and the Korea Power Exchange issued the nation's fifth Basic Plan for Electricity (fifth BPE) in December 2010. This forecasts the share of thermal in electric power generation to fall below half by 2020, making way for an increase in the share of nuclear to 44% (31.4% in 2010) and renewables to 6.9% (1.3% in 2010) in the generation mix. The government remains committed to nuclear energy, despite the Fukushima incident. The MKE expects nuclear to supply 59% of domestic electricity by 2030 as KEPCO E&C plans to build 10 more reactors by 2023.

Chart 12: Korea, composition of electric power consumption



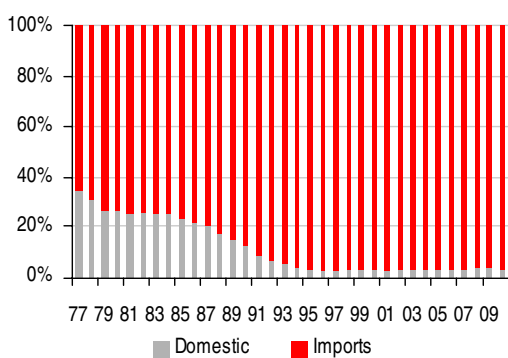
Source: KEPCO

The MKE forecasts power consumption will grow 40% from 2012 to 2020, with residential demand expected to grow 33.7%, slower than the expected 42.1% growth in commercial and industrial demand. These growth rates could, however, be reduced by a more sustained focus on energy efficiency.

### Importing primary energy

Domestic supplies were able to meet one-third of energy demand in 1977 but this share has fallen to negligible levels (Chart 13). Excluding nuclear, dependence on energy imports is extremely high, averaging 96% for the past two decades.

Chart 13: Korea, overseas dependence on energy ex-nuclear

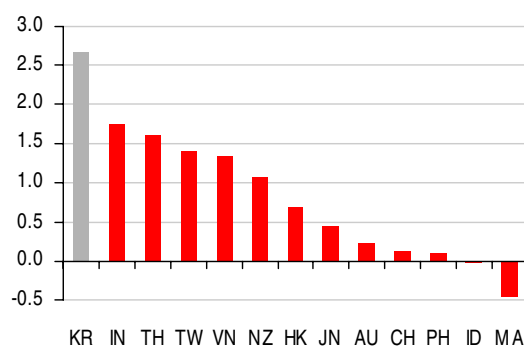


Source: Korea Energy Economics Institute

This dependence ratio falls slightly when nuclear is included in the energy mix, but imports still account for well over 80% of energy needs. In 2011, Korea's imports of energy amounted to USD174bn, up a staggering 42% from 2010. Interestingly, the 2011 cost was more than the value of all Korea's exports of ships, semiconductors, mobile phones, LCD displays, and computers.

Oil accounts for one-quarter of Korea's total imports and that figure is set to rise in tandem with crude prices. In 2008, the spike in oil price meant that Korea had to spend an additional amount equal to 2.7% of GDP to meet its oil needs (Chart 14). This is the highest of many Asian economies and could cost even more as oil continues to rise in 2012. HSBC economist Frederic Neumann highlighted this in [Asia and Oil](#), 17 February 2012. The Korea Development Institute estimates that a 10% increase in oil prices would cut Korea's GDP by 0.2%, investment by 1% and consumption by 0.1-0.2%.

Chart 14: Incremental cost of net oil imports as % of GDP due to oil price increase, 2008

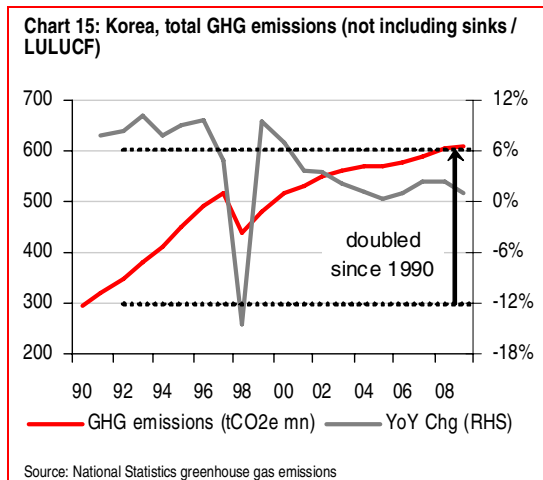


Source: BP, IMF, HSBC, NB: 2011 and 2012 uses HSBC consumption estimate

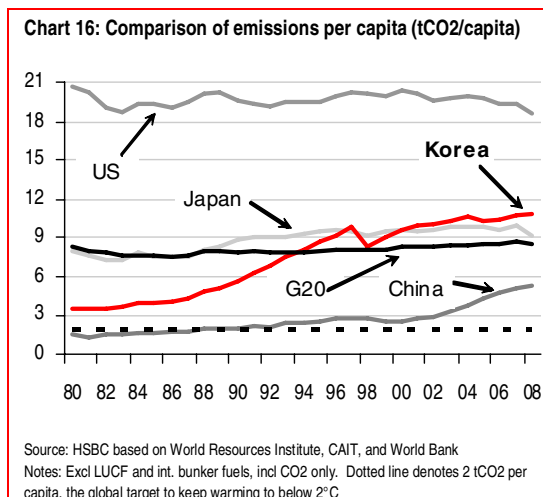


## The carbon cost of growth

The rapid expansion of Korea's economy and energy use has also brought with it substantial growth in GHG emissions (Chart 15). Korea's emissions have more than doubled since 1990 and now rank No 9 in the world.

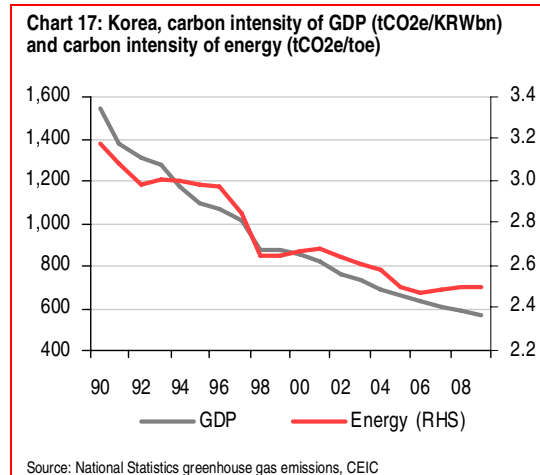


Per-capita emissions continue to rise (Chart 16) and are well over the average for the G20, ranking ahead of the UK and Japan. Crucially, Japan and even the US have seen their per-capita emissions begin to decline, while Korea's remained on a rising trend through to 2008. The nation's projected BAU 2020 emissions per capita are up 26% on 2009 levels. A key target of the GGP is to reduce this by 11.7% from 2009 levels, in line with its overall 30% reduction in total GHGs from the 2020 BAU.

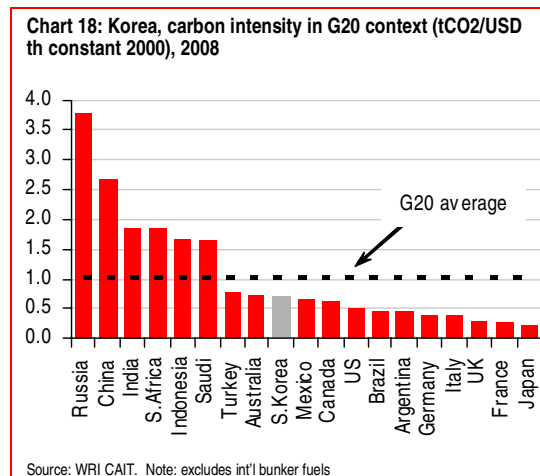


## Intensely carbonated

The carbon intensity of Korea's economy (GHG emission/GDP) has more than halved in the last two decades on a nominal won basis (Chart 17).



When compared to the G20, Korea is below average although this figure is heavily skewed by the emerging economies of China and Russia (Chart 18). Australia is the only G20 developed country with a higher carbon intensity than Korea. Major economies such as the US, Germany and the UK are all more carbon efficient; Japan is three times more efficient than Korea.



The carbon intensity of energy (GHG emissions / energy use) in Korea has been falling and is very similar to the G20 average of 2.5 tCO2/toe.

## The Green Growth Plan

High energy usage, compounded by the rising cost of energy, the extreme reliance on imports, the doubling of carbon emissions since 1990 and Korea's emergence as a developed country called for a change in the structure of Korea's economic growth – from *economic* to *sustainable* development.

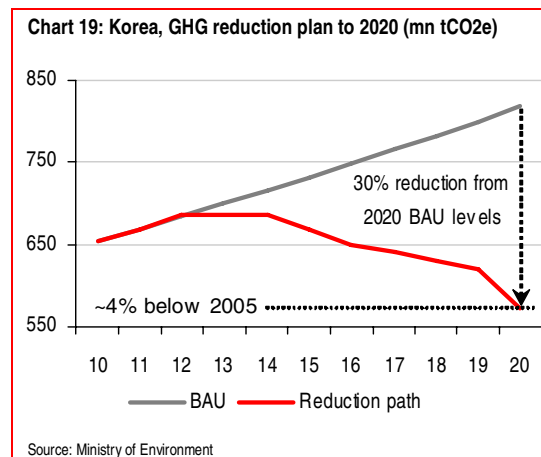
During the build-up to Copenhagen and as the clean tech sector was booming, the newly elected President Lee Myung-bak made green growth a cornerstone of his administration. He introduced the GGP in 2008 and the Green New Deal in 2009; he also enacted a suite of policies to turn Korea into the seventh largest green economy in the world by 2020.

In late 2009, parliament passed the Framework Act on Low Carbon, Green Growth. Unlike climate strategies in other parts of the world – notably in Europe – Korea's GGP contains economic and environmental objectives. Green growth is viewed as a way for the country to sustain and enhance its levels of prosperity and competitiveness. The three main components of green growth are climate change mitigation (low carbon), new growth engines (industry), and quality of life (reputation and four rivers project). (Table 1).

### Reducing emissions

Just ahead of COP15 in Copenhagen in 2009, President Lee outlined a non-binding political target

to reduce emissions by 30% from 2020 BAU levels (Chart 19). This translates into a c.4% reduction on 2005 emissions, quite a break with historical trends.



The chart also shows that in order to reach its 2020 target, emissions in Korea need to peak by 2014. We think it is still too early to judge whether Korea is on track.

### Regulating green growth

The following policies have been introduced or are planned in order to meet the emissions reduction target:

- ▶ Target Management System on GHG emissions (TMS)
- ▶ Emissions Trading Scheme (ETS)
- ▶ Energy Efficiency
- ▶ Green Energy (nuclear and renewables)

**Table 1: Korea's National Strategy for Green Growth: Objectives and Policy Direction**

Mitigation of climate change and energy independence	Creation of new engines for economic growth	Improvement in quality of life and enhancement of international standing
Effective mitigation of GHG emissions	Development of green technologies	Greening land & water, creation of green transport infrastructure
Reduction of fossil fuel use, enhancement of energy independence	Greening of existing industries, promotion of green industry	Bringing the green revolution into daily life
Strengthened capacity to adapt to climate change	Advancement of industrial structure	Becoming and international green growth role model
	Development of structural foundation for green economy	

Source: Presidential Committee on Green Growth

We believe these policies are necessary to take the carbon out of energy and then take more energy out of the economy. We discuss these in more detail in the *Decarbonising* section on page 17.

## Investing in green growth

The current administration originally planned to invest 2% of Korea's annual GDP or KRW107trn (about USD97bn) from 2009-13 in the GGP (Table 2). The 2009-13 timeframe spans one year beyond President Lee's tenure in office.

Table 2: Proposed GG investment (2% of annual GDP)

(KRWtrn)	2009	2010	2011	2012	2013
Climate Change and Energy Independency	8.5	15.5	16	9.8	7.7
New Growth Engines	4.8	5.2	5.8	6.4	6.8
Improvement in Life and National Reputation	5.2	4.8	5.2	5.7	6.3

Source: Presidential Committee on Green Growth (2009)

The GGP also includes programmes for boosting lending to priority sectors from the Korea Development Bank and Industrial Bank of Korea, as well as other institutions. The Korea Institute of Finance estimates that as of 2009, domestic bank loans for green business were KRW5.1trn (USD4.6bn) or 0.53% of total loans.

## Four Rivers infrastructure project

A core part of the government's Green New Deal stimulus programme was the Four Rivers civil engineering programme designed to regulate water flow. This, however, attracted controversy from environmental groups such as International Rivers Network and Friends of the Earth, concerned about the impacts on biodiversity and water quality. Floods in July 2011 raised concerns that the project was not actually helping water management. The project was declared complete in 2011 but there are estimates that it may incur annual maintenance costs of up to KRW1trn (USD896m) according to some Korean academics.

## Building a green growth reputation

Green growth is also being deployed as a way of strengthening the nation's international reputation. Domestically, the government's plans are overseen by the Presidential Committee on Green Growth (PCGG). Internationally, the Global Green Growth Institute (3GI) was established in June 2010 to export Korea's expertise to developing countries. In our view, this is an extension of Korea's strength in exports which we discuss in the next chapter.

## Scoring climate risk: Korea

According to HSBC's scoring framework, Korea is the fifth least climate vulnerable country in the G20. In our climate vulnerability scoring analysis, we analyse the exposure and sensitivity of the country to the physical factors associated with climate change, then assess the potential and capacity of each country to adapt to change from an economic and social perspective. The analysis provides a framework for the relative importance of climate change for a country, enabling further analysis into the economic impacts and financing requirements of change. For more details, please see [Scoring Climate Change Risk](#), 9 August 2011.

Korea scores well in terms of economic adaptive capacity (indicated by GDP per capita and debt-to-GDP ratio) and socio economic factors that can facilitate a transition to a low carbon economy (such as rule of law and level of education).

We find Korea to be relatively exposed to climate change. Korea is the fifth most vulnerable in terms of water availability per capita, and ranks bottom in terms of number of extreme events (adjusted for area) from 2001-10. The majority of these events have been floods. However, the physical and economic impacts (costs relative to GDP, mortality, and number of people affected) of the extreme events are relatively lower.

The floods in July last year were a wake-up call to many Koreans of the potential for a changing climate. The nation's GGP has been well publicised and awareness amongst the people is high, although participation less so.

Chart 20: Korea, number and cost of extreme events

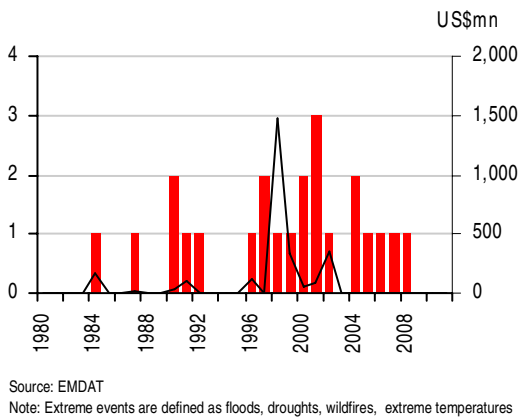
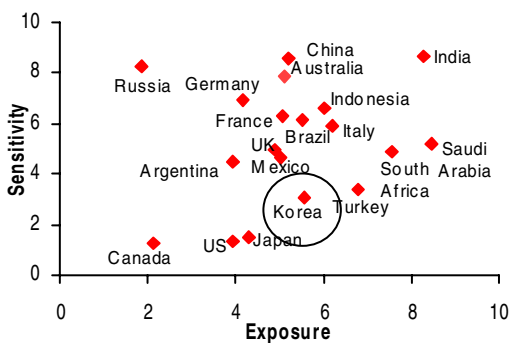
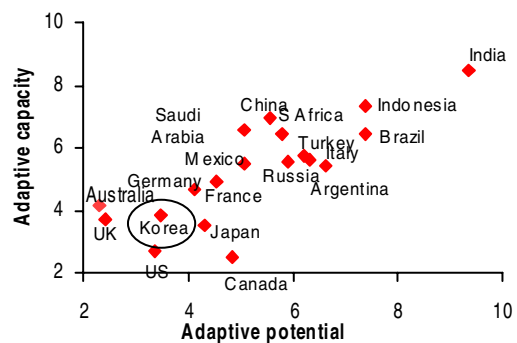


Chart 21: Korea has relatively low sensitivity to climate change impacts...



Source: HSBC

Chart 22 ... and relatively high adaptive capacity and potential



Source: HSBC

# Exporting green growth

- ▶ Growth flows from rising exports of climate smart goods and technologies (CSGTs)
- ▶ We forecast that Korea will displace Japan as fourth largest exporter of CSGTs in 2015
- ▶ We expect CSGTs to rise to 4.6% of total exports in 2015, with half of these to carbon constrained countries

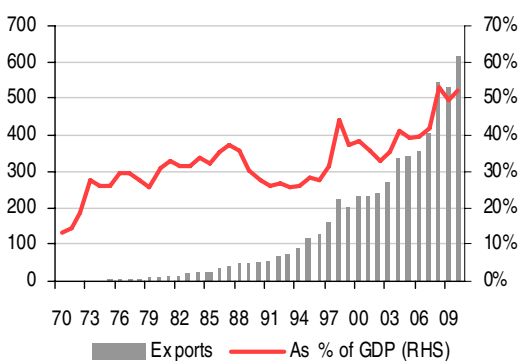
## Exporting its climate economy

Korea is a strong trading nation; in 2011, Korea's external trade (value of exports plus imports) reached USD1trn, equivalent to 83% of GDP.

This trade value is third in the region after China and Japan. Ronald Man, HSBC's Korean economist, expects Korean trade to rise a further 35% by 2015; see [Beyond a trillion](#), 27 February 2012.

Exports of goods and services have risen by an average 20% annually since 1970 when exports only accounted for 13% of GDP (Chart 23); that ratio is now over half (52% in 2010).

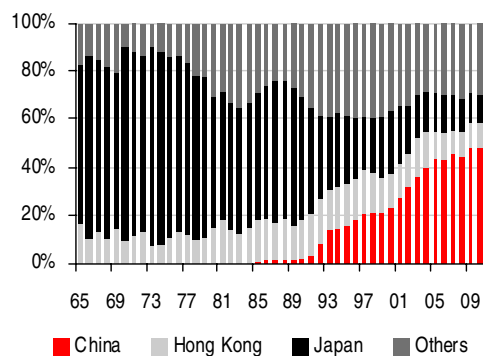
Chart 23: Korea, exports of goods & services (KRWtrn)



Source: CEIC

The rise in Asia's economies has no doubt complemented Korean exports over the past 40 years and Asia now accounts for over half (56% in 2011) of all Korean exports.

Chart 24: Korea, exports to Asia by country



Source: CEIC

Japan used to be the top recipient of Korean exports but this has fallen from 75% in the 1970s to a mere 13% in 2011. China has taken the top recipient spot from a standing start (0%) in 1985 to just under half in 2011 (Chart 24).

## Dominating the smart economy

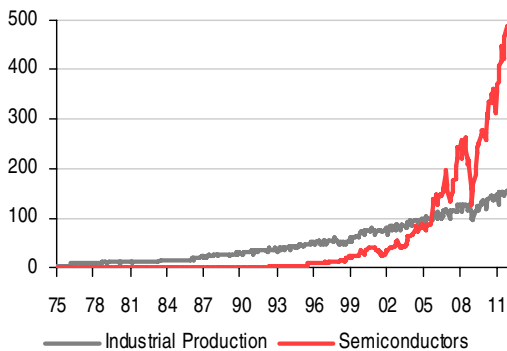
Korea has become a leader in technology exports. Samsung televisions now account for one in five sets sold throughout the world, with LG

televisions one in 10, displacing Japanese television makers who have traditionally held the largest market shares.

Korea's green growth plans flow from its core industrial strengths. It already commands the second largest market share in lithium batteries, produces the second most LED devices after Taiwan and will soon have the highest nuclear reactor density in the world. Its shipbuilding strengths also provide a basis for growth potential in offshore wind technology.

We believe smart technologies lie at the heart of a successful climate economy – an area of opportunity for Korea. We look at the growth in smart technology over traditional production in Chart 25. Production in semiconductors (as a proxy for smart tech) has far outgrown industrial production over the last decade.

**Chart 25: Korea, industrial production & semiconductor production indices**



Source: CEIC. Note: 2005 = 100

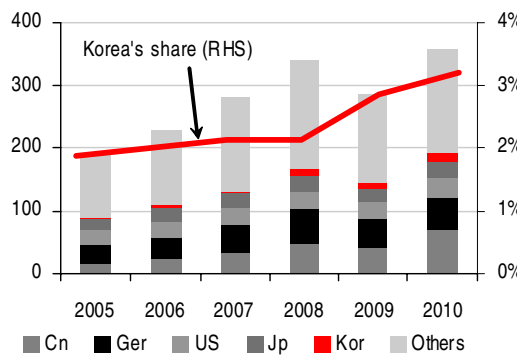
### Rising up the green export league

One of the key success factors of the GGP is its potential to boost exports. The government has set a target of achieving KRW13trn (USD11.6bn), or 1% of the world market in environmental exports by 2016. However, the definition of “environmental industry” is unclear.

To assess Korea's green export performance and potential, we have deployed the CSGT framework

developed by UNESCAP. These are defined as “products, components and technologies that tend to have a relatively less adverse impact on climate change”<sup>1</sup>. We estimate that the total global value of CSGT exports increased from USD192bn in 2005 to USD354bn in 2010 (Chart 26).

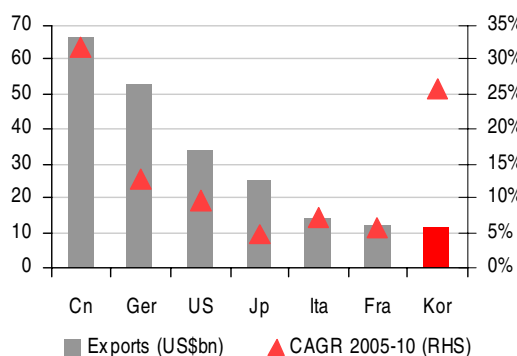
**Chart 26: Value of world exports in CSGT (USDbn)**



Source: UN Commodity Trade Statistics Database

China was the fourth largest exporter of CSGT in 2005 but rose to the top spot in 2010, knocking Germany into second place. Korea jumped from No 15 in 2005 to No 7 in 2010 and already accounts for over 3% of global CSGT exports. Korea's annualised CSGT growth in recent years is second only to China (Chart 27). At current growth rates, we expect Korea to become the fourth largest CSGT exporter in 2015, displacing Japan.

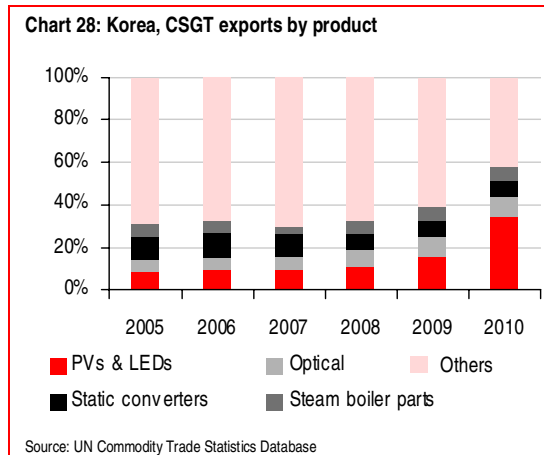
**Chart 27: Korea, seventh largest CSGT exporter in 2010, but second by CAGR**



Source: UN Commodity Trade Statistics Database

<sup>1</sup> Link to UNESCAP report  
[http://www.unescap.org/tid/publication/aptir2596\\_chap5.pdf](http://www.unescap.org/tid/publication/aptir2596_chap5.pdf)

From a product perspective, photovoltaic cells (PVs) and LEDs are Korea's largest CSGT exports by value, rising from 10% to over one-third in recent years (Chart 28).

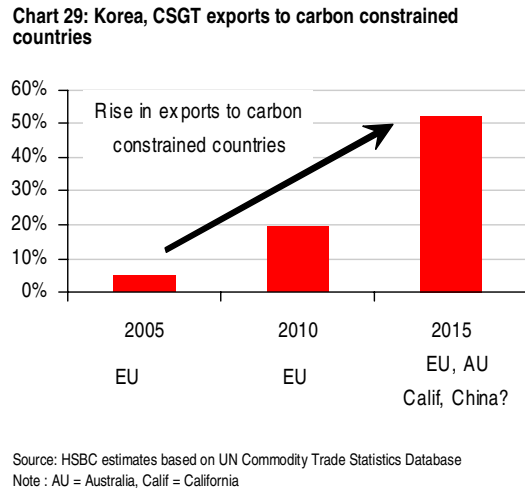


### Half of CSGT exports to carbon constrained countries in 2015

We believe that future CSGT export growth will be underpinned by the steady adoption of carbon constraints in key markets (Chart 29). In 2005, the EU was the only major market with meaningful climate targets. Back then, its share of Korea's CSGT exports was only 5.5%; by 2010, this share had grown to almost 20%.

Looking forward to 2015, Australia's cap and trade system will be up and running, as will California's. We also expect China to have a similar carbon system in key provinces. Consequently, over half of Korea's CSGT exports could be to carbon constrained countries.

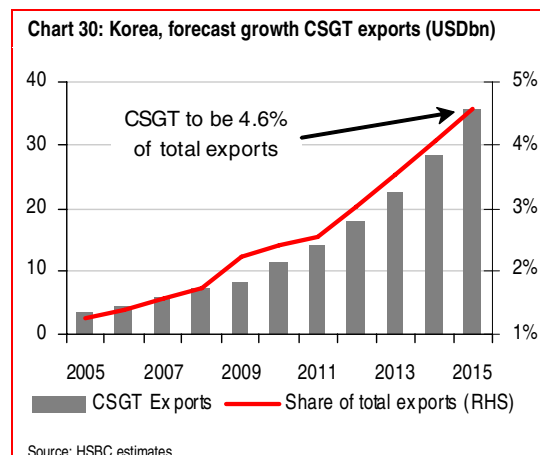
Furthermore, in 2010 CSGT exports as a portion of total exports to those four carbon constrained regions was only 3.2%; we forecast this will grow to 8.9% in 2015.



In our view, efforts made in carbon reduction and efficiency now will pay dividends in a future world where lower carbon footprint products are expected to be in higher demand.

### CSGT grows to 4.6% of total exports

As the GGP unfolds in Korea, we believe that the CSGT value will grow faster than the general economy, driven by continued R&D in the industry and further innovation by leading companies. As a result, we expect the share of CSGT exports to almost double from 2.4% of total exports in 2010 to 4.6% in 2015 (Chart 30).





## Green growth engines

Developing profitable green technologies is a key element of the GGP, and the government has defined 17 new growth industries (at the sector level) and 27 core technologies (Tables 3-4).

Taking a step back, we see the smart economy as a common theme for these, playing to existing strengths of the Korean economy – automotive, electronics, heavy engineering and shipping – as well as emerging strengths, such as software and medical services.

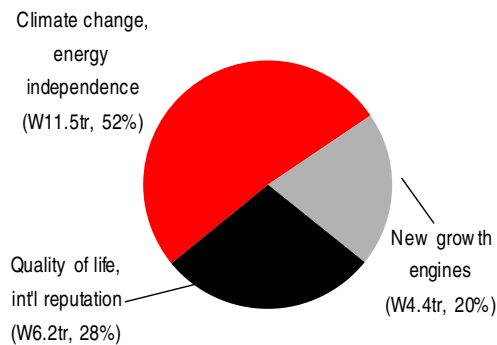
**Table 3: 17 new growth industries (at the sector level)**

1	IT Fusion System
2	LED Appliances
3	Renewable Energy
4	Low Carbon Resource Industry (CO2 Capture)
5	Green Transportation
6	Low Carbon Resource Industry(Nuclear Energy)
7	Cultural Contents & Software
8	Global Education Service
9	Cutting Edge Green City
10	Advanced Water Treatment
11	High Value-added Food Industry
12	High Value-added Medical Service
13	Broadcast, Communications Fusion Industry
14	Robot Applications
15	New Materials, Nano Fusion
16	Green Finance
17	MICE Fusion Tourism

Source: Presidential Committee on Green Growth

The government is keen to nurture these industries with research and development (R&D). In 2009, KRW2trn (USD1.8bn) was invested in green R&D, and this increased to KRW2.3trn (USD2.1bn) in 2010. The 27 core technologies are the major recipients of this investment, receiving an estimated one-quarter of the total government R&D budget. The 2012 budget earmarks KRW21.9trn (USD19.6bn) to the GGP (Chart 31), up from the KRW20.6trn (USD18.4bn) originally envisaged in 2009.

**Chart 31: Green growth in the 2012 budget, total KRW21.9trn**



Source: Presidential Committee on Green Growth

The PCGG expects the market value of the 27 core technologies (Table 4) to be USD5.7trn globally in 2020, up from USD1.5trn currently. The exact composition of the 27 might change slightly after 2012 since the technologies are currently under review. For example, wind is currently not a core technology.

**Table 4: 27 core green technologies**

1	Power IT and Technology for Enhancing Efficiency of Appliances
2	LED lighting, Green IT Technology
3	High Efficiency, Cost Saving Technologies of Silicon-based Solar Cell
4	Non Silicon Solar Cell Production and its Crucial Original Technologies
5	Bioenergy Production Related Technologies: Component-wise and System-wise
6	High Efficiency Hydrogen Creation and Storage Technology
7	Next Generation, High Efficiency Fuel Cell Technology
8	High Efficiency Secondary Battery Technology
9	CCS (carbon capture & sequestration)Technologies
10	Non CO2 Processing
11	High Efficiency, Low Pollution Vehicle Technologies
12	Technologies for Advanced Light Water Reactor Construction and Design
13	Technologies for Eco-friendly Non Proliferating Fast Reactor
14	Technologies for Design and Construction of Nuclear Fusion
15	Virtual Reality Technology
16	Ecosystem and Green Rehabilitation
17	Technology for Water Quality Management and Assessment
18	Technology for Alternative Water Resources
19	Monitoring of Harmful Substances / Environmental Cleansing
20	Technology for Eco-friendly, Low Energy Buildings
21	Technology for CTG (coal to gas)
22	Climate Change Prediction and Modelling
23	Climate Change Effects Assessment and Adaptation
24	Waste Reduction, Reuse
25	Green Process
26	Eco-friendly Plants
27	Intelligent, Transport System

Source: Presidential Committee on Green Growth

Note: These 27 do not all fall under the UNESCAP definition of CSGT.



# Decarbonising growth

- ▶ Carbon is being reduced through the TMS and possibly an ETS
- ▶ Energy efficiency is prioritised but extra incentives are required
- ▶ Clean energy targets in place but low compared to the EU, China

## Carbon: First cap then trade?

Korea's GHG reduction target marks a decisive break with the past. The government is putting in place a comprehensive carbon management and reduction plan, ever sensitive to industrial concerns about competitiveness.

In order to achieve the 2020 reduction target, Korea has established a two phase plan – first the TMS and then the ETS. These rest on a national GHG inventory set up to collate, verify and monitor emissions data. At a corporate level, many Korean companies have been collecting and publishing GHG data for a number of years.

Large emitters begin by falling under the TMS, but will “graduate” to the ETS if and when such a trading scheme is established (Table 5).

**Table 5: Controlled entities first fall under TMS, then graduate to ETS**

Emissions threshold for controlled entities (tCO <sub>2</sub> )	2011	2012	2013	2014	2015
125,000	TMS	TMS	TMS	TMS	ETS
87,500	-	TMS	TMS	TMS	TMS/ETS
50,000	-	-	-	TMS	TMS

Source: HSBC based on GHG Inventory & Research Center  
Note: assumes the ETS comes into effect from 2015

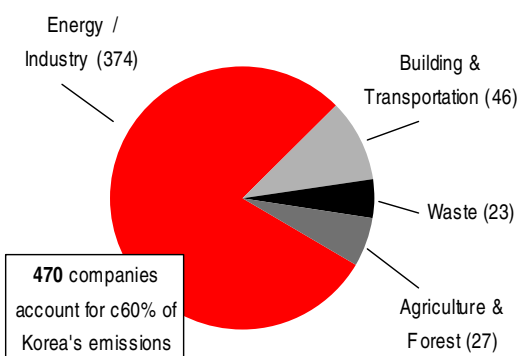
Many businesses in Korea oppose these mandatory schemes because they believe constraining carbon will affect their competitiveness on the global stage and could

impact national GDP. Research by the Korean government suggests that meeting the 2020 reduction target would directly cost only around 0.5% of Korea's GDP. However this estimate excludes any benefits such as energy savings and a stimulus to innovation.

## Capping carbon with the TMS

In 2011, approximately 470 companies which emit more than 125,000 tonnes of carbon became controlled entities which fall under the TMS (Chart 32). These 470 entities collectively account for around 60% of Korea's total emissions; this number will be increased to 490 in 2012.

**Chart 32: Number of companies under TMS in 2011**



Source: GHG Inventory & Research Center

### Annual target reductions

Under the TMS, controlled entities negotiate their annual targets with the relevant ministries (Table 6).

**Table 6: Emissions reduction target negotiation is not centralised**

Sector	Negotiating ministry
Energy / Industry	Ministry of Knowledge Economy
Building / Transportation	Ministry of Land, Transport and Maritime Affairs
Waste	Ministry of Environment
Agriculture / Forest	Ministry for Food, Agriculture, Forestry and Fisheries

Source: GHG Inventory & Research Center

In July 2011, the MKE released the emissions reduction targets for the country's top emitters (Table 7). In our view, these targets are likely to be relatively straightforward to achieve and represent an initial "learning by doing" phase. Actual performance is difficult to predict, as penalties for non-compliance are a nominal fine of KRW10m (USD9,000).

**Table 7: Emissions reduction targets by company in 2012**

Company	Reduction (tCO <sub>2</sub> )
POSCO	963,000
Samsung Electronics	429,000
LG Display	327,000
Hyundai Steel	192,000
Samsung Mobile Display	129,000
Ssangyong Cement Industrial	126,000
LG Chem	104,000
S-Oil	96,000
SK Energy	85,000
Tongyang Cement & Energy	80,000

Source: MKE

### Trading carbon with the ETS

Article 46 of the Framework Act on Low Carbon, Green Growth allows for the establishment of a cap and trade system for emissions (i.e. an emissions trading scheme or ETS).

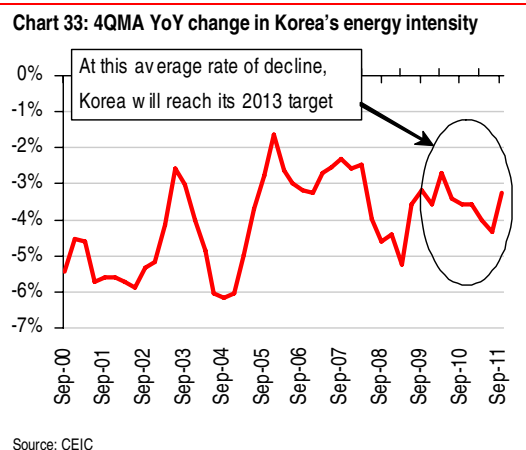
An emissions trading bill was tabled in 2009 by President Lee, but has been fiercely opposed by business groups such as the Federation of Korean Industries. Originally, the ETS was scheduled to come into effect from 2013 with an envisaged USD400m market size, growing to USD1.6bn by 2020. However, industrial opposition has delayed

the scheme by two years to 2015. Furthermore, the allocation of free allowances has been increased to 95%, up from the original 90%.

Following lengthy negotiations with business groups, a draft of the bill was passed by a special bipartisan committee on climate change on 8 February. However, the final vote in the National Assembly has been twice postponed, not primarily because of the ETS proposals themselves, but due to rising political tensions ahead of the April elections. At the time of writing, the vote is scheduled before the elections in April. If it does not take place, the whole legislative process will have to take place again in the new Assembly, pushing back the process even further.

### Cutting energy intensity

The GGP emphasises the importance of energy efficiency and set a target of reducing energy intensity by 8.5% by 2013 and 26.5% by 2020, from 2009 levels. Our calculations suggest that Korea is more or less on track to achieve the 2013 target, having reduced energy intensity by an average of 3.6% on a quarterly moving average y-o-y basis since 2009 (Chart 33).



### Product and fuel efficiency

The Energy Use Rationalization Act underpins a rating system for 24 products such as lights, refrigerators and vehicles. Production and sale of products below a certain rating are prohibited.

The government has also passed laws tightening the standard for fuel efficiency and GHG emissions for vehicles. The transportation sector in general has been set a GHG reduction target of 33% to 37% from BAU by 2020.

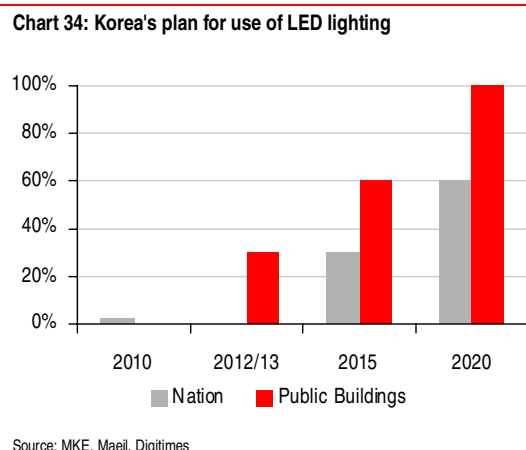
### Building efficiency

In 2010, the law on building standards was enhanced to incentivise construction companies to build more efficient buildings by granting them a higher floor area ratio. However, these laws currently only apply to public buildings although compulsory building efficiency ratings may come into force this year.

A plan that would force all new public buildings to be zero energy and emit zero carbon emissions from 2025 is currently under discussion. We think this is a good start although ideally it should include private buildings as well. The EU, for example, approved its energy performance of buildings directive recast in 2010, which requires nearly zero energy standards for public buildings by 2018 and for all new buildings from 2020.

In Korea, there is also no legislation on the retrofitting of existing buildings which we believe would be a significant contributor to improving efficiency. By contrast, the EU has set minimum energy performance requirements for all existing buildings undergoing major renovation. Buildings and structures in Korea have been set a GHG reduction target of 31% from BAU by 2020.

Public buildings also have a target to replace 30% of lighting with LED over the next two years providing a demand boost for domestic producers; private buildings have three more years to achieve the goal (Chart 34). Tax breaks of 30% are on offer to incentivise the switch.



### Using energy intelligently – smart grid

In May 2011, the government passed the Act on the Creation and Facilitation of Use of Smart Grids. The southern island of Jeju has been a testbed for smart grid since 2010. The plan is to integrate 6,000 households, transportation, consumer, renewables and electric services.

Many Korean companies such as KEPCO, LG Group, SK Telecom, Samsung Group and various automakers are involved in the Jeju project.

**Table 8: Korea, smart grid roadmap**

Phase 1	Phase 2	Phase 3
2010-2012 Jeju testbed	2012-2020 Expansion to metropolitan areas	2021-2030 Completion of a nationwide smart grid

Source: Korea Smart Grid Institute

The government aims to stimulate KRW239.5bn (USD215m) of investments into the project, with more than 70% from the private sector. If the test is successful, Korea plans to invest a total of KRW27.5trn (USD24.6bn) into turning the entire nation into smart grid by 2030. The first milestone is for half of households to have smart meters installed by 2016. The MKE estimates that cost savings from smart grids by 2016 would be equivalent to one nuclear reactor.

## Low carbon energy – renewables and nuclear

Taking the carbon out of energy not only involves reducing overall use of energy but also changing the composition of this energy.

### Adding low carbon to the energy mix

The fifth Basic Plan for Electricity (2010) increased the forecast contribution of renewables, which is expected to double by 2015 and almost double again by 2020 (Table 9). However this expansion starts from a small base.

Table 9: Korea, electricity generating mix plan

	2010	2015	2020
Thermal	67.3%	59.1%	49.0%
Nuclear	31.4%	37.2%	44.0%
Renewables	1.3%	3.7%	6.9%

Source: Fifth BPE

The renewable target is low compared to other countries, especially those with larger hydro capacity. For example, in China, renewables already supply around one-fifth of electricity and it targets non-fossil fuels to be used in 11.4% of all primary energy consumption (not just electricity) by 2015, and for this to rise to 15% by 2020. The EU is even more aggressive in targeting 33% of electricity to come from renewables and 20% of energy by 2020.

### Renewable energy boosted by RPS

A wide range of renewable technologies is expected to be employed through to 2020 (Table 10). Wind and fuel cell technologies would see the most growth according to the plan. Korea's strong shipbuilding industry has already been carrying out extensive research into offshore wind technology and is in a position to build out capacity using existing shipyard forges. Generation from solar, bio-diesel, waste and gas are expected to increase six-fold by 2020.

Table 10: Korea, expected generation from renewables (GWh)

	2010	2015	2020	Growth '15 vs '10	Growth '20 vs '10
Hydro	3,250	3,513	3,618	8.1%	11.3%
Wind	776	5,609	11,541	622.8%	1,387.2%
Tidal	0	573	5,721	NM	NM
Solar	686	2,553	4,252	272.2%	519.8%
Bio-energy	507	2,499	3,086	392.9%	508.7%
Waste	55	152	337	176.4%	512.7%
Gas	450	2,665	2,665	492.2%	492.2%
Fuel cell	224	1,392	3,065	521.4%	1,268.3%
Geothermal	0	2	57	NM	NM
IGCC/CCT	0	1,051	6,307	NM	NM
Total	5,948	20,009	40,649	236.4%	583.4%

Source: Fifth BPE

Korea's feed-in-tariff was replaced by a renewable portfolio standard (RPS) in March 2012. Power companies with more than 500MW in generating capacity are required to have a certain portion of their energy portfolios in new and renewable energy; starting with 2% this year, the plan is to reach 10% by 2022.

According to Ernst & Young, 97.7% of the power generating capacity will be covered by the RPS scheme, with renewable energy certificates (RECs) to be issued for power supplied by these new and renewable means.

### Nuclear technology to grow and be exported

The government remains committed to nuclear energy despite the Fukushima incident: 10 more reactors are scheduled to be built by 2023 and the MKE is expecting nuclear to supply 59% of electricity by 2030. There is a risk to these plans however, as public enthusiasm for nuclear has dampened since the Japan earthquake.

Exporting nuclear know-how is also a national strategy. In late 2009, a Korean consortium (including KEPSCO, Hyundai E&C, Samsung C&T and Doosan Heavy) won a USD40bn contract to build and operate four nuclear reactors in the UAE.

# Outlook

- ▶ A change in the political landscape – national and presidential elections in 2012 – creates uncertainty for green growth
- ▶ We expect continuity beyond 2012 as foundations have already been laid through R&D and investment
- ▶ We believe Korea will continue to make green growth a core theme of its international strategy

## Political uncertainty

Legislative elections for the national assembly (parliament) will take place on 11 April, followed by presidential elections on 19 December. The outcome of these is far from clear. The stalled emissions trading bill is a testimony to the political uncertainty which faces the GGP.

## Industrial continuity

We expect continuity in terms of the industrial focus of the GGP – R&D, investment and innovation. The strong growth in CSGT exports from 2008 was based on investment and R&D in the years before President Lee. We believe that chaebols, such as Samsung, LG and Hyundai, will continue to search for new growth avenues whatever the label, be it green growth, environment, sustainability or just plain high tech. Korea's strength in LEDs, batteries, offshore, solar and nuclear will continue to be in demand as the global economy seeks to move towards lower carbon, more efficient growth.

## International reputation

In our view, both government and industry, desire to maintain Korea's international reputation as a strong exporter of high quality and high tech goods – in tune with green growth. The Global Green Growth Institute has been set up to showcase its own model to the rest of the world. Korea has also contributed to the start-up cost of the UN Green Climate Fund. It is seeking to raise its international profile by bidding to become the permanent host of the Fund.

## Straight ahead

The GGP accentuates the positives of Korea's existing industrial structure around the smart economy. To date, the government has focused on frameworks and allocating considerable resources to R&D and test markets. Targets for carbon, renewables, efficiency, and smart grids have started off modestly, but could be amplified as experience grows. Historically, Korea has followed the West in its economic development path. But with low-carbon, there is no model to follow – and so Korea must pursue its own green growth track. In our view, Korea will choose the right direction at the crossroads: straight ahead.

# Disclosure appendix

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[324195]



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