

*The 21<sup>st</sup>*

*ASIA CONSTRUCT CONFERENCE*

23-25th November

# Country Report

## : Economy and Construction in Korea

Prepared by **KRIHS**

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## **1. Executive Summary**

The Korean economy has successfully passed through the global financial crisis, even though it is currently slowing down due to sluggish exports and imports. GDP growth rate presents the trend of Korean economy's phase stabilized into the range of 2-3%. Along with slow growth of global economy, Korean economy also shows slow growth due to sluggish domestic demand and trade. Vigorous construction business is leading the entire economy slackened by dormant manufacturing production and weak service sector. In the meanwhile, the restructuring of distressed firms looks inevitable. Korea's macro economy strongly needs active policies supporting restructure of some industries including shipping and shipbuilding.

In the construction sector, the value of contracts in 2015 definitely has increased 47% owing to the rocketing of private projects mainly in residential building. Trend of construction contracts was downside during 2007-2013, but it changed to upside for the recent two years due to the development of new administrative city, SeJong, and New-Town projects in many metropolitan cities. This growth of contracts is projected to be continuous, even though its rate be lesser.

Current conditions of Korean construction sector can be summarized as follows:

- 1) The number of construction firms sustains (around 56k) despite of global and local low growth.
- 2) The number of construction workers also remains around 1.8 million, while foreign labor forces increased almost twice, from 6k in 2007 to 12k in 2015.
- 3) The labor productivity, estimated by value-added per employee, decreased while other industries increased, and the total factor productivity is not good either presenting non-positive values. The low productivity comes from the labor intensive characteristics of construction industry.
- 4) Some materials experienced price surges but the others did not for long-term perspective. But recent years most materials do not show changes in their price.
- 5) Korea exported construction services of USD 72 billion in 2010, but the global situations shrunk Korean construction exports to 46 billion in 2015. The list of major country to which Korea export its construction services was also been changed; Turkmenistan, never been on the list from 2007, was the top of 2015.

## **2. Macro Economic Review and Outlook**

### **2.1. Overview of Korean Economy and Main Economic Indicator**

The Korean economy shows slow growth during a moderation in domestic demand and continued downtrend in exports. Economic growth recorded 2.6% in 2015, down from the previous year, implying an overall economic slowdown. By economic activity, vigorous construction has counteracted the slackening although manufacturing production remains dormant and service production weakens.

Overall betterment in domestic demand has softened, mainly in private consumption and facilities investment. However, additional declines will be less feasible. Rise in private consumption weakened, hindered by the increasing life expectancy and diminishing effects from consumption stimulus policies of the last year. Facilities investment turned to a decrease on decreased overseas demand and stagnant industrial

production. Meanwhile, government consumption has increased largely as a result of the impact of early budget spending. Construction investment is predicted to continue the encouraging momentum, bolstering up domestic demand.

Exports remained dull by cause of weak global investment and depleted external competitiveness while imports presented slowing growth due to temperance in domestic demand. CPI inflation stays at around 1% while growth in apartment prices has abated to around 0%, boosting concerns over a slump in real estate. Both retreated employment growth and rose unemployment rate implies a slight shrinkage in employment conditions. Global economic growth, meanwhile, has slowed due to downside risks looked to be persistent. Thus, it will be difficult to exclude the possibility of additional burden on the Korean economy's recovery pace.

On the other hand, the restructuring of distressed companies is regarded as inevitable. The number of marginal firms is rocketing and sales are falling in the aftermath to the financial meltdown, hinting at growing corporate insolvency and the resultant vulnerability to external shocks. In order to stabilize the Korea's macro economy, economic policies are required to be active in restructuring distressed businesses and to take strong action against the short-term negative impacts.

Table 2.1. Main Economic Indicators

	2010	2011	2012	2013	2014	2015
GDP and Components						
GDP at real price (KRW trillion, base year 2010)	1,266.6	1,287.3	1,322.5	1,371.7	1,417.8	1,510.6
GDP at current market price (KRW trillion)	1,266.6	1,340.5	1,391.6	1,439.6	1,490.8	1,565.8
GDP growth (%)	6.5	3.7	2.3	2.9	3.3	2.6
GDP growth (%) for agri. and fishing sector	-4.3	-2.0	-0.9	3.1	3.6	-1.5
GDP growth (%) for manufacturing sector	13.7	6.5	2.4	3.6	3.5	1.3
GDP growth (%) for services sector	4.4	3.1	2.8	2.9	3.3	2.8
GDP growth (%) for construction sector	-3.7	-5.5	-1.8	3.0	0.8	3.0
Demographic Indicators						
Population (1000 people)	49,410	49,779	50,004	50,220	50,424	50,617
Population growth rate (%)	0.46	0.75	0.45	0.43	0.41	0.38
Labor force (1000 people)	23,829	24,244	24,681	25,066	25,599	25,936
Labor force growth rate (%)	1.37	1.74	1.80	1.56	2.13	1.32
Unemployment rate	3.7	3.4	3.2	3.1	3.5	3.6
Inflation rate (%)	3.0	4.0	2.2	1.3	1.3	0.7
Financial Indicators						
Interbank interest rate (%)	2.03	3.00	2.88	2.50	2.13	1.50
Short term interest rate (%)	2.67	3.44	3.30	2.72	2.49	1.77
Long term interest rate (%)	3.72	3.62	3.13	2.79	2.59	1.80

Note: short-term interest yields on 91-days CD; long-term on 3-years Treasury Bonds.

Source: Statistics Korea, The Bank of Korea (BOK), Construction Association of Korea (CAK).

## 2.2. Trade

### 2.2.1. Value of import and export

The balance of trade was recorded a surplus of \$41.1 billion in 2010, due to the sharp increase of export exceeding the increase of import. However, that value in 2012 declined to \$28.3 billion, even though the trade volume of export and import increased. In 2015, it made a surplus of \$90.3 billion, that is, 1.9 times bigger than that of last year.

The export in 2015 is estimated to have declined of -8.0%, which was caused by the global economy's slowdown, mainly in emerging market and developing economies. Semiconductor and mobile device were lively while petrochemical, oil products, steel, automobile, and shipping were sluggish.

Likewise, the import is estimated to have shrunk about 16.9%, which was caused by the dropped price of raw materials. Exports and imports have decreased significantly due to continued low oil prices. Consequentially, the balance of trade continues to run a huge surplus despite sagging exports.

Table 2.2. Export and Import

(unit: USD billion)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Export (increase rate)	371.5 (14.1)	422.0 (13.6)	363.5 (-13.9)	466.3 (28.3)	555.2 (19.0)	547.8 (-1.3)	559.6 (2.1)	572.6 (2.3)	526.7 (-8.0)
Import (increase rate)	356.8 (15.3)	435.3 (22.0)	323.1 (-25.8)	425.2 (31.6)	524.4 (23.3)	519.5 (-0.9)	515.5 (-0.8)	525.5 (1.9)	436.4 (-16.9)
Balance of trade	14.7	-13.3	40.4	41.1	30.8	28.3	44.1	47.1	90.3

Source: Korea International Trade Association (KITA).

### 2.2.2. Major trading countries

Five major export-trading countries of Korea in 2015 are China, U.S., Hong Kong, Vietnam and Japan. Exports to Vietnam increased; exports to U.S. stayed; and exports to EU, Japan, China, Central and South America, and Middle East decreased. Sluggish China's exports and rise in self-sufficiency of components and materials are braking Korea's exports to China.

Germany and Saudi Arabia replace Hong Kong and Vietnam in the five major countries of import.

Table 2.3. Top 5 Major Trading Countries of Import and Export (2015)

(unit: USD million)

Rank	Export		Import	
	Country	Value	Country	Value
1	China	137,124 (26.0%)	China	90,250 (20.7%)
2	United States	69,832 (13.3%)	Japan	45,854 (10.5%)
3	Hong Kong	30,418 (5.8%)	United States	44,024 (10.1%)
4	Vietnam	27,771 (5.3%)	Germany	20,957 (4.8%)
5	Japan	25,577 (4.9%)	Saudi Arabia	19,561 (4.5%)

Source: Korea International Trade Association (KITA).

### 3. Overview of the Construction Industry

#### 3.1. Construction Contracts

Until 2007, the construction business has risen helped by brisk housing business, regardless of government’s strong restriction on the real estate market. With increasing residential building construction in the nation-wide and spreading global financial crisis by sub-prime mortgage, it has resulted in a huge oversupply in housing market and unsold apartments all over the country.

In 2009, the rate of civil construction contracts increased by 31.2%, but that of total construction contracts conversely decreased by 1.1% with offsetting by a large fall of private projects. In 2010, only non-residential construction contracts recorded positive growth of 18.6%. Fortunately, the residential construction contracts in 2011 increased rapidly into 22.4%, which brought about the positive growth in total construction. However, construction contracts including civil and privates have been deeply decreased by domestic recession since 2013.

The civil and residential construction contracts in 2015 were recorded the extremely positive growth of 39.0% and 64.7% respectively, meanwhile the non-residential construction contracts increased by 33.2%. By the results, the total construction contracts showed the positive growth of 47.0%, reaching a value of KRW 157.9 trillion (USD 140 billion).

The economic prospects for the second half of this year are different from the sectors. It is expected that it will be difficult to improve the residential construction contracts by the depressing of the housing market in Seoul metropolitan area. It is predicted to be the positive growth in the non-residential buildings and infrastructure, however, resulted by increasing the supply in public sector relocation into Multifunctional Administrative City (Sejong-si) and New-Town projects in many cities.

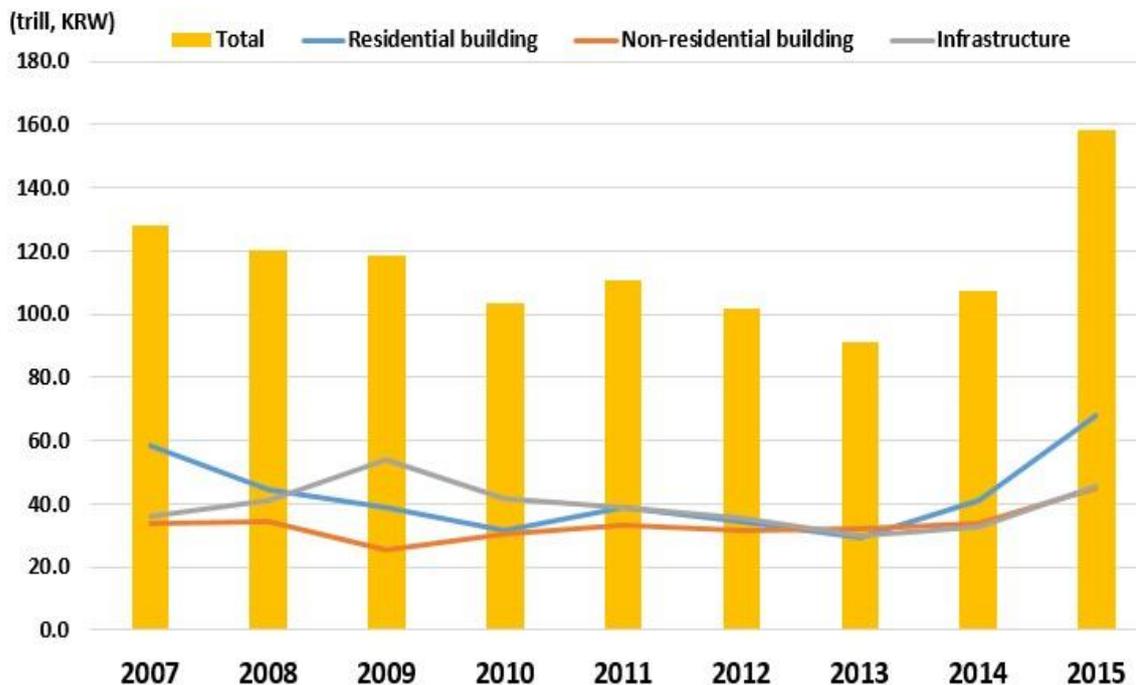


Figure 3.1: The Value of Construction Contracts (2007-2015)

Table 3.1. The growth rate of construction Contracts

(Unit: %)

Year	Residential	Non-residential	Civil(Infra)	Total
2007	9.1	30.8	27.5	19.2
2008	-23.2	1.8	14.0	-6.1
2009	-12.5	-25.4	31.2	-1.1
2010	-19.1	18.6	-23.5	-13.0
2011	22.4	9.8	-6.2	7.2
2012	-11.4	-5.0	-8.1	-8.3
2013	-14.6	-1.0	-16.2	-10.0
2014	40.3	7.8	9.4	17.7
2015	64.7	33.2	39.0	47.0

Source: Construction Association of Korea (CAK).

Table 3.2. Breakdown of Construction Contracts

(Unit: KRW billion, current price)

Type of Contract	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Public Project</b>									
Residential building	7,570	9,346	7,378	4,738	6,963	6,446	5,058	5,257	5,161
Non-residential building	7,587	9,149	8,327	7,749	7,779	8,730	11,048	10,938	8,909
Infrastructure	21,932	23,354	42,782	25,749	21,882	18,901	20,063	24,534	30,661
Sub-Total	37,089	41,849	58,487	38,236	36,624	34,077	36,170	40,730	44,732
<b>Private Project</b>									
Residential building	50,578	35,311	31,699	26,875	31,742	27,850	24,233	35,828	62,521
Non-residential building	25,984	25,021	17,161	22,486	25,406	22,797	21,061	22,711	35,900
Infrastructure	14,261	17,904	11,366	15,631	16,927	16,781	9,840	8,195	14,828
Sub-Total	90,823	78,236	60,227	64,993	74,076	67,428	55,136	66,736	113,250
<b>Total</b>									
Residential building	58,148	44,657	39,078	31,613	38,705	34,295	29,291	41,085	67,682
Non-residential building	33,571	34,170	25,488	30,235	33,185	31,528	32,109	33,629	44,809
Infrastructure	36,193	41,258	54,149	41,380	38,809	35,683	29,903	32,729	45,489
Total	127,912	120,085	118,714	103,229	110,701	101,506	91,306	107,466	157,982

Source: Construction Association of Korea (CAK).

### 3.2. Construction Companies

#### 3.2.1. The number of contractors by type

The number of construction businesses has shown up-and-down around 55K from 2007 to 2015. Although the number of general contractors gradually decreases during those years, the numbers of specialized and equipment contractors increase a little. It is noted that the global financial crisis and slow growth could not shrink Korean construction industry, at least in the numbers of contractors.

The most of the construction contractors in 2015 are composed with the specialized contractors, 67.4% of total construction companies, and the shares of general and equipment contractors are 20.0% and 12.6% respectively.

Table 3.3. The number of Construction Companies

(Unit: each).

Year Number	2007	2008	2009	2010	2011	2012	2013	2014	2015
General contractors	12,842	12,590	12,321	11,956	11,545	11,304	10,921	10,972	11,220
Specialized contractors	36,422	37,106	37,914	38,426	38,100	37,605	37,057	37,117	37,872
Equipment contractors	5,478	5,768	5,994	6,151	6,330	6,463	6,599	6,788	7,062
Total	54,742	55,464	56,229	56,533	55,975	55,372	54,577	54,877	56,154

Source: Construction Association of Korea (CAK).

### 3.3. Construction Employees and Labors

#### 3.3.1. The number of construction workers by job type

The number of workers also shows an up-and-down pattern in the construction industry. For the year of 2007, more than 1.8 million employees worked in the construction field, which was 7.9% of total employment of Korean economy. However, the number of workers in 2008 slightly declined with construction business depression. And it sharply fell by 1.7 million workers in 2009, when Korean economy was in the deepest recession affected by global financial crisis. In 2010, the number of employees in construction increased a few owing to the growth in the economically active population. During years between 2010 and 2013, the number of construction employee remains at 1.7 M persons. The number has increased somewhat recording near 1.8 M in year 2014 and 2015.

It is hard to analyze the latest trend by job type, because the relevant data was not available in some years, as showing in the Table 4.3.1b. The numbers are somewhat change in detail, while the total number does not seem to have variation.

Table 3.4. The total number of workers in Construction

(Unit: thousand persons)

Year Number	2007	2008	2009	2010	2011	2012	2013	2014	2015
# of employee in construction	1,849	1,812	1,720	1,753	1,751	1,773	1,754	1,796	1,823

Source: Construction Association of Korea (CAK).

Table 3.5. The number of Construction Workers by Job Type

(Unit: thousand workers)

Type \ Year	2010	2011	2012	2013	2014
General construction	468	463	481	496	481
Heavy construction	166	176	194	177	179
Building construction	302	287	287	319	302
Special trade construction	1,157	1,111	1,027	1,051	1,050
Engineering and building	466	424	407	419	416
Building installation	177	182	161	171	170
Electrical & communication works	280	269	254	255	254
Building completion	234	235	204	206	210
Equipment construction	128	177	265	207	265
Total	1,753	1,751	1,773	1,754	1,796

Source: Korean Statistical Information Service (KOSIS).

### 3.3.2. The number of foreign construction workers

There are few statistics about the number of foreign workers in Korean construction market, because it is difficult to assemble acute figures for the number of foreign workers. The reason that can't exactly accumulate the number of foreign workers is that there are a lot of illegal foreigner more than 1 million.

We can count the part of total number of foreign construction workers with E-9-2 workers. The E-9 Non-professional Employment visa is made for workers coming to work in the manual labor field, and E-9-2 is for the construction work. The countries can apply for a E-9 visa is limited to a list of 15: Philippines, Mongolia, Sri Lanka, Vietnam, Thailand, Indonesia, Uzbekistan, Pakistan, Cambodia, China, Bangladesh, Nepal, Kazakhstan, Myanmar, and East Timor.

Construction workers from foreign country, which have E-9-2 visa, increased rapidly in 2007, then have remained around 1.1-1.2 million persons by 2015.

Table 3.6. The number of foreign workers in construction field

(Unit: persons)

Year \ Number	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Non-professional visa (E-9)	175,001	190,777	188,363	220,319	234,295	230,237	246,695	265,256	271,310
Foreign constructors (E-9-2)	6,054	9,009	8,929	11,332	12,048	11,462	11,088	11,448	11,834

Source: Lee & Choi (2016), *IOM MRTC Issue Brief* No. 2016-01

### 3.4. Productivity

#### 3.4.1. The value-added per employee

The indexes of value-added per employee are compared with the base year, 2010. The value-added per employee of construction dropped from 119.6 in 2009 to 87.1 in 2015. The other industries present continuous growth in value-added per employee during 2008-2015. The low labor productivity of construction sector might be caused by labor intensive property of this industry. Although its labor intensity, construction sector needs various approaches to make its efficiency in using labor forces.

Table 3.7. The Value-Added per Employee

(2010 is the base year, unit: %)

Industry	2008	2009	2010	2011	2012	2013	2014	2015
Total (Except Primaries)	95.2	95.2	<b>100.0</b>	100.6	99.5	102.1	102.7	103.2
Manufacturing	91.0	93.3	<b>100.0</b>	103.1	103.7	105.3	106.0	105.3
Service	96.6	95.6	<b>100.0</b>	100.3	99.1	101.7	102.5	103.8
Construction	110.2	119.6	<b>100.0</b>	88.8	85.8	91.3	88.5	87.1

Source: Korea Productivity Center.

#### 3.4.2. Physical measurement of productivity

Total Factor Productivity(TFP), in economics, is a variable which accounts for effects in total output growth relative to the growth in traditionally measured inputs of labor and capital. TFP can be taken as a measure of an economy's long-term technological progress if all inputs are accounted for.

Korean economy's TFP estimates are various by the industry: manufacturing leads, and service and construction sectors follows. For all times from 1970s, manufacturing industry is the most productive with 2.1-7.1% growth. Service sector presents up-and-down near 1% growth rate. Korean construction industry recorded estimates indicating reverse growth in this field. The low technical progress indicated by TFP numbers and the low labor productivity stated above are the main risks preventing Korea's construction from going forward.

Table 3.8. Trend of growth rate of Total Factor Productivity

(unit: %)

Industry	71-75	76-80	81-85	86-90	91-95	96-00	01-05	06-10	11-15
Manufacturing	2.6	2.5	3.1	3.5	6.0	7.1	6.0	4.3	2.1
Service	0.6	0.0	1.3	1.9	1.0	0.8	0.8	0.8	0.7
Construction	-3.7	-2.6	0.3	-0.7	-2.1	-1.2	0.0	-0.3	-1.2

Source: Hyundai Research Institute (2016.08) *Weekly Economic Review* 16-31.

### 3.5. Construction Cost

#### 3.5.1. Construction material prices

The official prices of major construction materials are influenced by government guideline but the actual transaction value likely changes according to the market conditions. The demand and supply for most construction materials can be more or less matched domestically. Some of the price for construction materials have not been much changed since 2007, while others have experienced price surges.

In 2008, the price of Steel bars sharply rose to KRW 889k per ton from the previous year's 527k. Because the raw material of steel bar mainly depended on import, the price was influenced by international market situation such as construction and shipbuilding. The price of steel bars came down to 741k in 2009. But it had been risen up to 1,070k in 2014 and the price has been stabilized so far.

Table 3.9. Average Construction Material Price

(unit: KRW)						
Year	Cement in bulk (per 40kg)	RMC* kg/cm <sup>3</sup> (per m <sup>3</sup> )	Steel bars (per ton)	25mm aggregates (per m <sup>3</sup> )	Concreting sand (per m <sup>3</sup> )	Common bricks (per 1k pieces)
2007	3,370	49,080	526,500	11,500	13,083	45,000
2008	3,370	51,248	888,500	12,417	12,000	45,000
2009	4,000	51,970	741,000	12,000	13,000	45,000
2010	3,800	54,670	811,000	12,000	13,000	50,000
2011	3,800	51,430	975,000	12,000	13,000	50,000
2012	3,890	56,970	995,000	13,500	13,000	55,000
2013	4,400	57,600	995,000	13,500	13,000	55,000
2014	4,500	66,100	1,070,000	14,000	13,000	55,000
2015	4,500	66,100	1,070,000	14,000	13,000	55,000

\* RMC: Ready Mix Concrete.

Source: KPC (Korea Price Information Corp).

#### 3.5.2. Construction industry salaries and wages

In construction like other industries, the salaries and wages have mildly increased since 2007. For instance, the wage for special daily workers was KRW 79k and gradually increased by 107k in 2014. In the recent year, 2015, the average wages per one day were KRW 112k (USD 98) for chief workers and special daily labors, KRW 90k (USD 78) for normal daily wage.

Table 3.10. Wages in the Construction Industry

(unit: KRW)

	2007	2008	2009	2010	2011	2012	2013	2014	2015.9
Chief worker	81,700	87,995	90,889	97,000	101,726	104,876	105,174	109,664	111,998
Special daily wage	79,027	83,141	84,862	91,396	96,325	95,232	100,936	106,569	111,771
Normal daily wage	59,715	65,076	68,437	71,456	74,808	81,088	93,975	86,686	89,566

Source: CAK (Construction Association of Korea).

### 3.6. Import and Export of Construction Services

#### 3.6.1. Annual export of construction services

Such a tremendous increase in export of construction works was experienced in 2010, because the United Arab Emirates(UAE) signed a nuclear power plant contract with Korean builders at the end of 2009, and it was brought into 2010's calculation. Meanwhile, the exports in 2011 showed a little decrease by the global depression sparked in Europe. The total value in export in construction was recorded USD 46 billion in 2015, and this was amount of 30% decline compared with 66 billion of the previous year.

Among construction sectors, the export of plant building occupied the largest portion, 78.4% of total exports, recording USD 52 billion in 2014. It is noted that the export of plant construction showed the largest drop in 2015 to 26 billion, which was almost 50% decrease.

Table 3.11. Annual Export of Construction Services

(unit: USD million)

Year	Total Export	Contract by Construction Type					
		Civil	Architecture	Plant	Electric	Telecom	Engineering
2007	39,788	5,232	8,177	25,268	690	41	381
2008	47,640	9,364	9,192	26,764	1,336	19	965
2009	49,147	5,746	6,273	35,692	756	20	660
2010	71,578	4,124	7,724	57,285	770	458	1,217
2011	59,144	5,857	7,846	43,269	954	61	1,157
2012	64,880	8,795	14,332	39,549	1,323	73	818
2013	65,211	18,128	5,446	39,649	761	238	988
2014	66,009	5,664	4,929	51,720	1,402	189	2,107
2015	46,144	8,503	7,110	26,490	855	184	3,000

Source: International Construction Association of Korea (ICAK).

### 3.6.2. Top 5 countries for construction export

Middle-east Asian countries are usually included in top five countries for construction export of Korea. In the recent year (2015) Turkmenistan were the-highest-value countries in construction exports and Venezuela recently entered into the list of 5 major construction-export nations. The construction services exported to middle-east Asian countries are mainly plant buildings and the services to south-east Asian countries are infrastructure constructions or architecture contracts.

In 2015 USD 4,970 million of construction services were traded to Turkmenistan, the most Korean-construction-importing country. It was also noteworthy that Vietnam in Middle Asia held the third rank in the Korean-construction-export list.

Table 3.12. Top Five Countries for Construction Export

(unit: USD million)

Year		Rank	1	2	3	4	5
2011	Country		Saudi Arabia	Brazil	Iraq	Vietnam	Singapore
	Value		16,588	4,606	3,666	3,459	3,289
2012	Country		Saudi Arabia	Iraq	Kazakhstan	Vietnam	Singapore
	Value		16,167	9,636	4,161	3,416	3,345
2013	Country		Saudi Arabia	Australia	Uzbekistan	Vietnam	Singapore
	Value		9,975	5,855	4,533	4,043	3,516
2014	Country		Iraq	Kuwait	Russia	Venezuela	Algeria
	Value		8,532	7,739	5,604	5,067	4,388
2015	Country		Turkmenistan	Kuwait	Vietnam	Saudi Arabia	Venezuela
	Value		4,970	4,960	4,497	3,592	2,901

Source: International Construction Association of Korea (ICAK).

# **Brownfield Concessions of Aged Infrastructure Facilities For a Sustainable Development in Korea**

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## **Executive Summary**

It is necessary to consistently rehabilitate or redevelop aged infrastructure facilities not only to sustain an economic development, but also to protect people's health and safety. In Korea, it has been reported that the percentage of aged infrastructure facilities which are more than thirty years since their construction is almost 10% of the total infrastructure facilities. Rehabilitation or redevelopment of these aged infrastructure facilities requires quite a large amount of funds, which the government alone can not afford. Thus, private sector's participation in brownfield, or possibly greenfield, infrastructure facility projects from financing to rehabilitate or redevelop, and to maintain and operate them is definitely needed in a certain manner. One of the best possible ways for private sector's participation in infrastructure rehabilitation or redevelopment is through the form of a concession agreement or some contractual arrangements between the public and private sectors. In this paper, two forms of concession agreement or some contractual arrangements are proposed to accomplish this purpose on the basis of the current practice of public-private partnership (PPP) around the world. The first one is a partial privatization in the form of a joint venture (J/V) formed by the public and private sectors on the basis of a contractual arrangement among them through a concession agreement. The second one is the full privatization of these aged infrastructure facilities, which need to be rehabilitated or redeveloped. It is hoped that these ways of rehabilitation or redevelopment of aged infrastructure facilities could be utilized not only to consistently sustain an economic development, but also to constantly protect people's health and safety in Korea.

# I. One of the Main Issues in the Current Korean Construction Industry

## 1. The current status and future prospect of aged infrastructure facilities

Since the mid-1970's, major infrastructure facilities in Korea has been largely delivered due to the rapid economic growth on the basis of the private sector's economic growth. In particular, during the period of 1970-1990, the infrastructure facilities such as roads, railroads, bridges, dams, industrial complexes, and water and sewage facilities, to name a few of them, have been excessively delivered. The current status of these infrastructure facilities, that is very critical for sustainable development of the Korean economy, is that they are too aged in the sense that some of them have been developed more than thirty years ago.

In particular, transportation infrastructure facilities have been rapidly supplied since the mid 1970's. Since the 1980's, most of major transportation infrastructure facilities such as bridges and tunnels have been rapidly delivered (See <Table 1>). Moreover, since the 1980's, the number of newly supplied transportation infrastructure facilities has rapidly increased, and, as a result, its current portion among the total number of transportation infrastructure facilities is more than fifty percent. This situation leads us to face with three serious problems: firstly, this disrupts the growth of national economy; secondly, this leads to poor living standard of the lives of the people; thirdly, this endangers the health and safety of the people.

<Table 1> Major aged infrastructure facilities and their safety grade

Grade	A	B	C	D	E	Unknown	Total
Bridges	31	314	207	8	0	0	550
Tunnels	8	65	54	0	0	1	128
Harbors	1	41	10	1	0	0	53
Dams	59	120	129	8	0	1	317
Buildings	53	341	130	3	0	5	532
River facilities	64	209	55	7	0	188	523
Water and sewage	47	107	17	0	0	1	172
Retaining walls	18	82	9	0	0	1	110
Excavated slopes	0	0	1	0	0	0	1
Total	281	1,279	612	27	0	197	2,396

Source: Kang, S. and Y. Lee (2013), *An Understanding of an Infrastructure Report Card of the Advanced Countries and its Implication in the Korean Infrastructure Policy*, Construction and Economy Research Institute of Korea (CERIK).

## 2. Problems that need to be solved

Due to the sharp increase of the number of aged infrastructure facilities, we need to solve two major problems for maintain a sustainable economy: (1) how to solve the problem of endangering the health and safety of the people by rehabilitating and/or redeveloping aged infrastructure facilities, and (2) how to solve the problem of establishing management authority to effectively and efficiently operate, maintain, and manage these aged infrastructure facilities.<sup>1</sup>

In the current paper, our discussion will be focused on the solution to the first problem only. In order to seek the solution for the second problem, please refer to Kang, S. and Y. Lee (2013), *An Understanding of an Infrastructure Report Card of the Advanced Countries and its Implication in the Korean Infrastructure Policy*, Construction and Economy Research Institute of Korea (CERIK).

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<sup>1</sup> In the previous section, it was stated that we have three serious problems. The first two problems will be automatically solved, as long as the last problem can be solved.

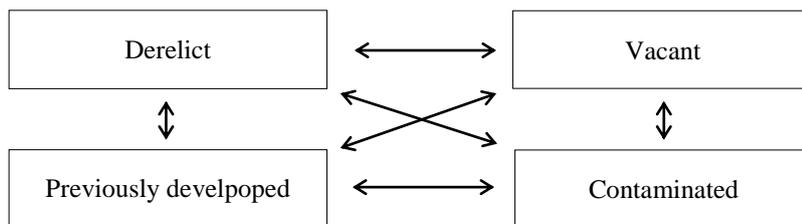
## II. Proposed Solutions for the Utilization of Private Funds for the Improvement of Aged Infrastructure Facilities

### 1. Definition of brownfield projects/concessions

Although a unified definition of brownfield projects for aged general facilities or brownfield concessions for aged infrastructure facilities is hardly found in the relevant literature, we can get a kind of picture for the term in <Figure 1> and <Figure 2>. In <Figure 1>, the terms associated with ‘brownfield’ are (1) derelict, (2) contaminated, (3) vacant, and (4) previously developed. Also, as seen in <Figure 2>, criteria within the definition of brownfield are, in the present (1) previously developed, (2) rural or urban, (3) not in current use, and (4) land and/or buildings, but in the future (1) vacant, (2) derelict, (3) partially occupied, (4) statutory contaminated land, (5) green belt, and (6) land contamination.

Especially, for the rehabilitation and/or redevelopment of aged infrastructure facilities, we use the term ‘brownfield concessions’.<sup>2</sup> The World Bank and the Public-Private Infrastructure Advisory Facility (PPIAF) simply refers to brownfield concessions as “concessions”, and define them as contractual arrangements whereby “a private entity takes over the management of a state-owned enterprise for a given period during which it also assumes significant investment risk”.<sup>3</sup>

**<Figure 1> Terms associated with brownfield**

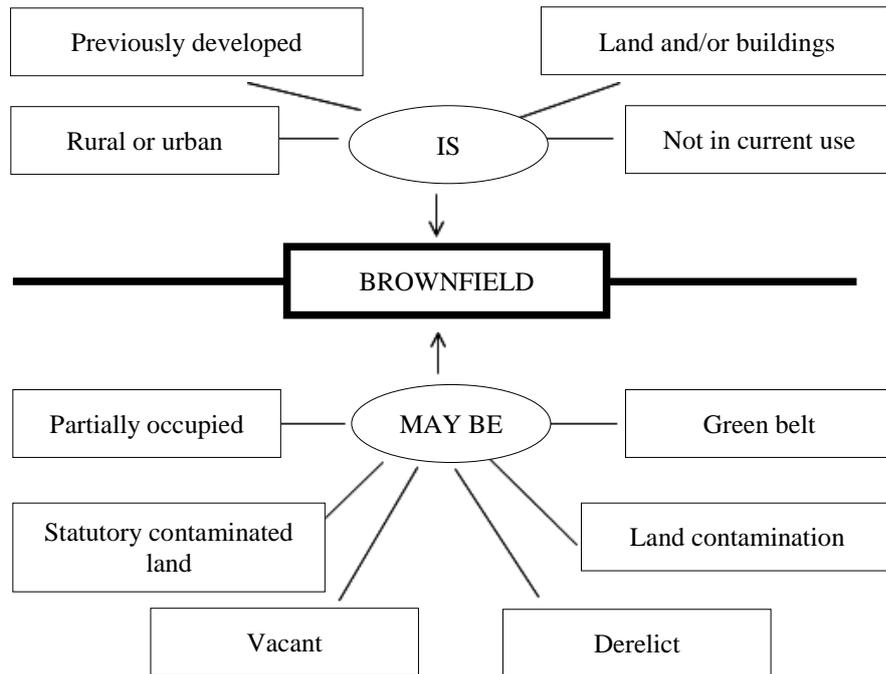


Source: Alker, S., Joy, V., Roberts, P. and N. Smith (2000), “The definition of brownfield”, *Journal of Environmental Planning and Management*, Vol. 43, No. 1, p. 56.

<sup>2</sup> Compared to brownfield concessions applied for rehabilitation or redevelopment of aged infrastructure facilities, a typical term that is applied to build and/or construct new infrastructure facilities is ‘greenfield concessions’.

<sup>3</sup> For more details, please refer to Leigland, J. (2008), *The rise and fall of brownfield concession: But some signs of recovery after a decade of decline*, The World Bank, Working Paper No. 6.

**<Figure 2> Criteria within the definition of brownfield**



Source: Alker, S., Joy, V., Roberts, P. and N. Smith (2000), “The definition of brownfield”, *Journal of Environmental Planning and Management*, Vol. 43, No. 1, p. 63.

From this definition, we need to pay attention to the fact that the private sector is responsible for capital investment which is necessary for rehabilitation and/or redevelopment of aged infrastructure facilities along with the responsibility of operation and maintenance of the facilities during the long-term concession period that is determined on the basis of concession agreements between the public and private sectors through negotiations. This implies that the private sector is responsible for not only return on investment from the cash flow based on capital investment, but also investment risks from the facilities. Also, the private sector rehabilitates and/or redevelops the aged facilities using their own funds, and, if necessary, develops additional facilities.<sup>4</sup> However, the ownership of the infrastructure assets will be transferred to the government after the end of the concession period.

<sup>4</sup> In this respect, the typical model for the first type brownfield concessions is ROT (rehabilitate-operate-transfer), and the one for the second type brownfield concessions is BROT (build-rehabilitate-operate-transfer).

## 2. Brownfield concessions through TOT in China water market<sup>5</sup>

As we can see in <Table 2>, there are the diversified business models of the Chinese water PPP (public-private partnership) market. Included in the TOT (transfer-operate-transfer) category are the ROT (renovate-operate-transfer) and BROT (build-rehabilitate-operate-transfer). The three forms are grouped together because the models involve the transfer of property and operation rights from the public to the private sector in a limited contract period and the renovation of the existing facilities in water services. Although a controversial issue, the property rights of China's water utilities are normally regarded as limited, allowing private enterprises to enjoy the rights of investment, operation, and management without requiring the ownership of assets. The divestiture projects include cases of partial and full asset acquisition, classified according to the percentage of equity transferred.

**<Table 2> Current status of diverse PPP projects in China's water market**

PPP business models	Ownership (equity transfer)	Operation	Investment	Risk	Period (years)
Management contract	Public	Private	Public	Public	3-5
Lease	Public	Private	Public	Shared	8-15
BOT/BOO/BOOT	Public/private <sup>1)</sup>	Private	Private	Private	20-30
TOT/ROT/BROT	Public	Private	Private	Private	20/30
Divestiture	Public/private	Shared	Private	Shared	25-50 <sup>2)</sup>

Note: <sup>1)</sup>Choice varies upon contract or local regulation; <sup>2)</sup>Also called time-bound divestiture as the contract is valid during the contract period.

Source: Jang, W., Lee, D. and J. Choi (2014), "Identifying the strengths, weaknesses, opportunities and threats to TOT and divestiture business models in China's water market", *International Journal of Project Management*, Vol. 32, No. 2, p. 300.

<Table 3> lists the distribution of PPP models for three different project categories: water treatment plants (WTP), wastewater treatment plants (WWTP), and water-and-wastewater combined treatment plants (WTP&WWTP). Water recycle projects are included in WTP and WWTP, and water supply distribution network projects are included in WTP. In the wastewater treatment sector, the BOT (build-operate-transfer) model was adopted for 240 projects (75.0%) followed by the TOT (22.19%), M&L (1.88%), and

<sup>5</sup> This section heavily depends upon the following two articles: Jang, W., Lee, D. and J. Choi (2014), "Identifying the strengths, weaknesses, opportunities and threats to TOT and divestiture business models in China's water market", *International Journal of Project Management*, Vol. 32, No. 2, pp. 298-314; Meng, X., Zhao, Q. and Q. Shen (2011), "Critical success factors for transfer-operate-transfer urban water supply projects in China", *Journal of Management in Engineering*, Vol. 24, No. 4, pp. 243-251.

divestiture (0.94%) models. The highest percentage of BOT and TOT models explains the commitment of central and local governments to enhancing the capacity and operation rate of WWTP, which reached only 58% and 65% in 2006 and 2008, respectively.

**<Table 3> Distribution of PPP schemes for different project categories:  
WTP, WWTP and WTP&WWTP(from 1994 to 2009)**

PPP model	WTP	WWTP	WTP&WWTP
BOT	60 (16.80%)	240 (75.00%)	7 (33.33%)
TOT	54 (33.13%)	71 (22.18%)	8 (38.10%)
Divestiture	46 (28.22%)	3 (0.94%)	5 (23.81%)
M&L	3 (1.84%)	6 (1.88%)	1 (4.76%)
Total	163 (100%)	320 (100%)	21 (100%)

Note: 1) M&L=Management and lease contract; 2) Data (percent) may not sum to total because of rounding.

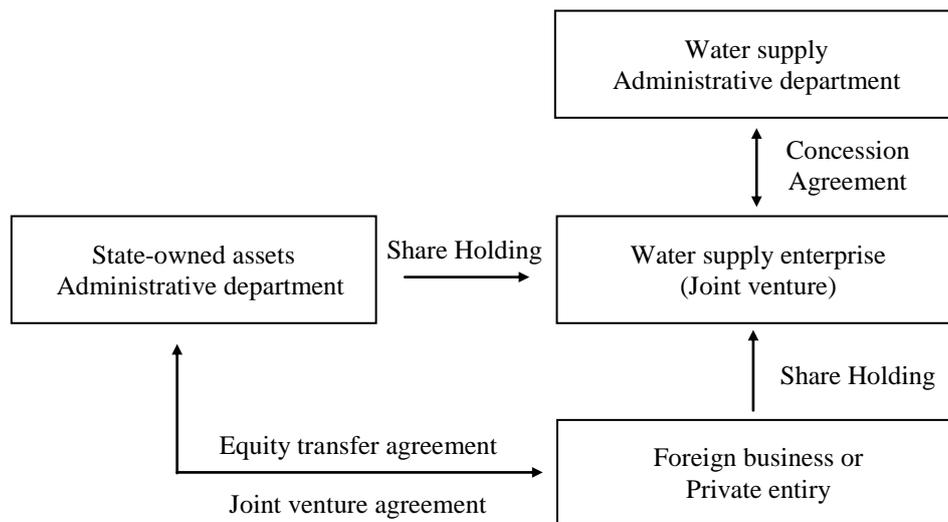
Source: Jang, W., Lee, D. and J. Choi (2014), "Identifying the strengths, weaknesses, opportunities and threats to TOT and divestiture business models in China's water market", *International Journal of Project Management*, Vol. 32, No. 2, p. 301.

In the water supply sector, TOT (33.13%) and divestiture (28.22%) are second and third, respectively, after BOT (36.80%). The relatively high portion of TOT and divestiture in comparison to the wastewater sector indicates the diversification of financing in water PPP projects. Most municipalities plan not only to rectify the problems caused by high levels of non-revenue water (NRW) and inefficient plant operation. The NRW rate reached 30% in 118 cities and exceeded 20% in 293 cities. In addition, the percentage of inoperative water supply facilities was 45% in 2006. Database analysis also reveals two interesting trends: (1) many PPP wastewater treatment projects have emerged since 2000, and the number of wastewater treatment projects has rapidly increased; and (2) consequent to the global financial crisis, WWTP projects with small capacities projects have dominated the market, and WTP&WWTP integrated projects have not been preferred due to the larger financing required from lenders.

An urban water supply project consists of two major parts: the water plant and the water pipe network. As a common concession arrangement in China, BOT has experienced several attempts in the urban water supply projects. In recent years, TOT as a variation of BOT has been introduced into the urban water supply projects that have been built and put into use. In these projects, TOT refers to a scheme by which a foreign business or private entity invests in a completed water supply project that was financed by the government and operated by a state-owned enterprise. The government transfers a part of equity, up to 49% of equity of the state-owned enterprises to the foreign businesses or

private equity, which in turn forms a joint venture with the state-owned enterprise.<sup>6</sup> The joint venture receives a concession from the government to operate the project for a specified period of time. During the concession period, the foreign business or private equity can recover its investment and make profits from charging its customers appropriate fees. After the concession period ends, the ownership of the project is transferred back to the government. <Figure 3> shows the detailed relationship between key stakeholders in TOT scheme.

**<Figure 3> Relationship between key stakeholders in TOT scheme**



Source: Meng, X., Zhao, Q. and Q. Shen (2011), “Critical success factors for transfer-operate-transfer urban water supply projects in China”, *Journal of Management in Engineering*, Vol. 24, No. 4, p. 244.

Recently, the concept of critical success factors (CSFs) is widely recognized as a key element that is necessary for an organization or project to achieve its goals. CSFs are required for ensuring the success of a business, and are those fundamental issues inherent in the project that must be maintained for teamwork to take place in an efficient and effective manner. Eight (8) identified CSFs for TOT projects and their priority are as follows: (1) project profitability, (2) asset quality, (3) fair risk allocation and sharing, (4)

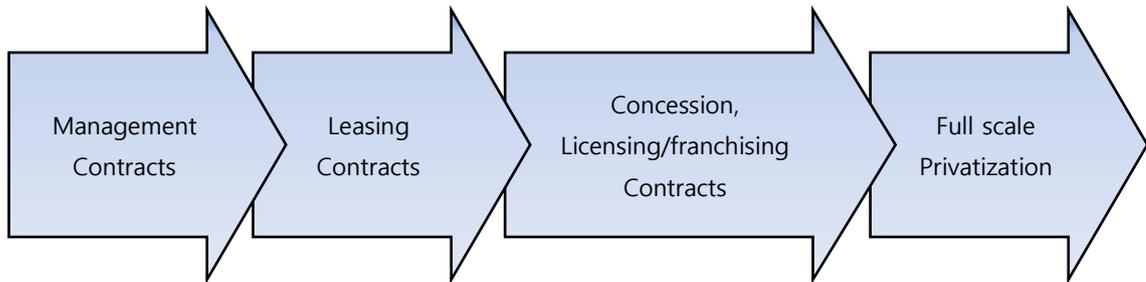
<sup>6</sup> In PPP projects, there are five significant conditions for successful joint venture partnership: (1) good communication, (2) openness, (3) effective planning, (4) ethos within the joint venture, and (5) direction. For more details on the subject, please refer to Trafford, S. and T. Proctor (2006), “Successful joint venture partnerships: Public-private partnerships”, *International Journal of Public Sector Management*, Vol. 19, No. 2, pp. 117-129.

competitive tendering, (5) internal coordination within government, (6) employment of professional advisors, (7) corporate governance, and (8) government supervision.

### 3. Utilization of Private Funds for Brownfield Concessions

As seen in <Figure 4>, we can consider various ways for the private sector to participate in the rehabilitation and/or redevelopment of aged infrastructure facilities, and the provision of infrastructure service. In this section, we suggest two ways: (1) Brownfield concessions by establishing a joint venture between the public and private sectors, and (2) brownfield concessions through full-scale privatization by transferring all equity of the public sector to the private sector.

<Figure 4> Spectrum of PPP models



#### 1) Forming a joint venture

This approach is based on the concept of TOT concessions in China. Basically, a private company forms a joint venture with the concerned public authority, and the joint venture rehabilitates and/or redevelops aged infrastructure facilities, or sometimes, newly builds some infrastructure facilities with funds from the private sector on the basis of a concession agreement between the joint venture and the government. This joint venture rehabilitates the aged infrastructure facilities, and operates and maintains them for a certain period of time as specified in the concession agreement.

#### 2) Full-scale privatization

This approach is one form of divestiture by transferring all equity of the public sector for the aged infrastructure facilities to the private sector using the private sector's funds. On the basis of transferred ownership for the facilities under consideration, the private company rehabilitates, operates and maintain the aged infrastructure facilities during their life-time.

### **III. Suggestions for Brownfield Concessions Policy Direction**

Basically, the rehabilitation of aged infrastructure facilities for health and safety of people is the public sector's job. However, the limitation of government budget leads to attract the private sector's funds for the job. With this kind of budget constraint in mind, three policy suggestions are made in this paper to activate the private sector's investment for the rehabilitation and/or re-development of aged infrastructure facilities for maintaining a sustainable development by providing a favorable environment for involving the private sector in the infrastructure sector, where it is economic infrastructure or social infrastructure.

First, the government needs to establish a kind of special laws and regulations for the activation of brownfield concessions in order to sustain economic growth and to maintain a certain level of health and safety for people. Simply because concession agreements for PPP projects are agreements among the public and private sectors, a favorable legal and regulatory framework needs to be established in order to attract private and/or foreign investors.

Second, the government needs to arrange some supporting measures to attract private and/or foreign investors for the rehabilitation and/or re-development of aged infrastructure facilities. One of the most thinkable ways is government subsidy or tax exemption in order to raise the internal rate of return (IRR) or return on investment (ROI) of the private and/or foreign investors.

Third, the government needs to create a favorable atmosphere for people to feel a sense of closeness for private participation in infrastructure facilities, whether they are aged or new. People think that the provision of infrastructure facilities is the sole duty of the government on the basis of taxes they pay. Thus, the government needs to promote the necessity and advantage of private and/or foreign investors for rehabilitation and/or re-development of aged infrastructure facilities in order to maintain sustainable development for the next generation.

## **IV. Conclusion**

In this paper, we pointed out the current problems of the Korean construction industry, which is the portion of the aged infrastructure facilities is rapidly increasing. This is a very crucial issue when we are concerned about the health and safety of people.

In order to get some helpful ideas for rehabilitation and/or re-development of aged infrastructure facilities, we very briefly review China's PPP water market. One of the interesting delivery methods is TOT concession agreements between the public sector and the private and/or foreign investors. On the basis of this type of brownfield concessions, we propose two ways of attracting the private and/or foreign investors for brownfield concession agreements of rehabilitating and/or re-developing the aged infrastructure facilities. One is through forming a joint venture among the public sector and the private and/or foreign investors, and the other is full-scaled privatization.

In order to activate the attraction of private and/or foreign investment into brownfield concessions, the government needs to do the following three jobs: firstly, the establishment of a special law and regulation to activate brownfield concessions; secondly, the arrangement of some supporting measures in terms of government subsidy and/or tax exemption; thirdly, the creation of a favorable atmosphere for people to feel a sense of closeness for private participation in brownfield concessions for infrastructure facilities.

*The 21<sup>st</sup>*  
*Asia Construct Conference*  
23-25th November 2016

# **Economy and Construction in Korea**

**Prepared by KRIHS**

**JinCheol Jo**

# Contents

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**1. Executive Summary**

**2. Macro Economic Review and Outlook**

**3. Overview of the Construction Industry**

# 1. Executive Summary

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## 1.1 Korean Economy

- **Korean economy's phase stabilized into the range of 2-3%**
  - Korean economy has passed through the global financial crisis but currently slowing down due to sluggish domestic demand and trade which interact slowly growing global economy
- **Construction is leading the entire economy**
  - Vigorous construction business is leading Korean economy slackend by dormant manufacturing production and weak service sector
- **Restructuring is inevitable**
  - Korea's macro economy strongly needs active policies supporting restructure of some industries: shipping and shipbuilding

# 1. Executive Summary

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## 1.2 Construction Sector

- **Trend of contracts changed to upside for the recent 2 years**
  - Value increased 47% in 2015 owing to the private projects mainly in residential building: development of new administrative city and ‘New Town’ projects in many metropolitans
- **Summary of Korean construction sector**
  - # of construction firms sustains 56k despite of low growth
  - # of construction workers remains 1.8m while foreigners increased twice during 2007-2015
  - Labor productivity decreased while other industries increased
  - Recent years, most materials do not show changes in their price
  - Global situations shrunk Korean construction exports, and the list of major trading country has been changed

## 2. Macro Economic Review and Outlook

### 2.1 Main Indicators

- **Korean economy slows down like global economy**
  - Global growth stabilizes into the mid-2 percent range, and Korea follows
- **Construction counteracts the slackening**
  - although manufacturing production starts to falter

	2010	2011	2012	2013	2014	2015
<b>GDP per capita (constant 2000 USD)</b>	22,151	22,796	23,214	23,784	24,479	25,023
<b>GDP growth (real, %)</b>	6.5	3.7	2.3	2.9	3.3	2.6
<b>World (real, %)</b>	4.4	3.1	2.5	2.4	2.6	2.5
<b>Construction (real, %)</b>	-3.7	-5.5	-1.8	3.0	0.8	3.0
<b>Manufacturing (real, %)</b>	13.7	6.5	2.4	3.6	3.5	1.3

## 2. Macro Economic Review and Outlook

### 2.2 Trade

- **Major trading countries (2015)**

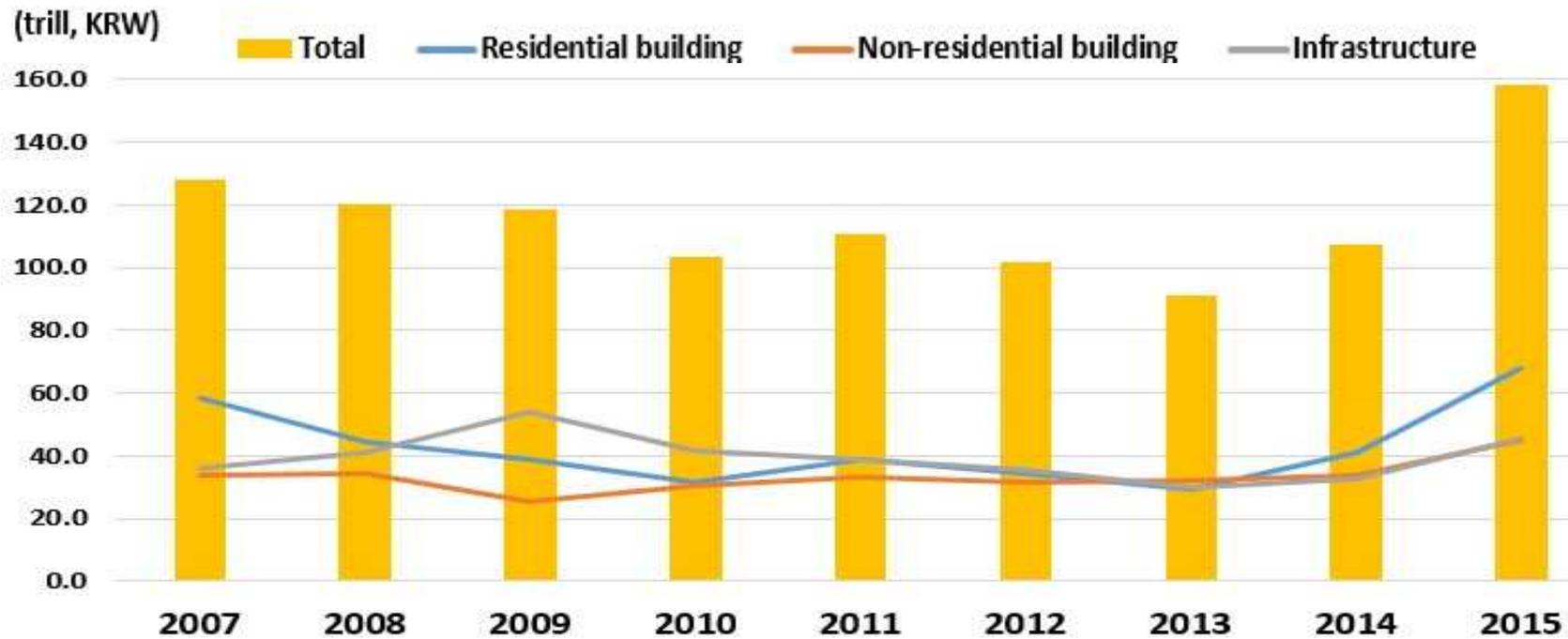
- Exports to Vietnam increased; to U.S. stayed; and to others decreased
- Germany and Saudi Arabia replace Hong Kong and Vietnam in the countries of import

Rank	Export		Import	
	Country	Value (USD million)	Country	Value (USD million)
1	China	137,124 (26.0%)	China	90,250 (20.7%)
2	United States	69,832 (13.3%)	Japan	45,854 (10.5%)
3	Hong Kong	30,418 (5.8%)	United States	44,024 (10.1%)
4	Vietnam	27,771 (5.3%)	Germany	20,957 (4.8%)
5	Japan	25,577 (4.9%)	Saudi Arabia	19,561 (4.5%)

### 3. Overview of the Construction Industry

#### 3.1. Construction Contracts

- **Contracts showed positive growth of 47% in 2015**
  - reaching USD 140 billion
  - Residential construction increased by 65%; civil by 39%; and non-residential by 33%



### 3. Overview of the Construction Industry

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#### 3.2. Construction Companies

- **The number of contractors has not changed**
  - up-and-down around 55k during 2007-2015
  - Global financial crisis and slow growth could not shrink Korean construction industry

	2007	2008	2009	2010	2011	2012	2013	2014	2015
General contractors	12,842	12,590	12,321	11,956	11,545	11,304	10,921	10,972	11,220
Specialized contractors	36,422	37,106	37,914	38,426	38,100	37,605	37,057	37,117	37,872
Equipment contractors	5,478	5,768	5,994	6,151	6,330	6,463	6,599	6,788	7,062
Total	54,742	55,464	56,229	56,533	55,975	55,372	54,577	54,877	56,154

### 3. Overview of the Construction Industry

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#### 3.3. Construction Employees and Labors

- **The number of construction workers has not changed**
  - The number shows up-and-down, with the range of 1.7-1.8 millions
- **The number of foreign construction workers has doubled**
  - E-9 Non-professional Employment visa is for workers coming to work in the manual labor field, and E-9-2 is made for the construction work

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total workers (k persons)	1,849	1,812	1,720	1,753	1,751	1,773	1,754	1,796	1,823
Foreign constructors (k persons)	6.1	9.0	8.9	11.3	12.0	11.5	11.1	11.4	11.8

### 3. Overview of the Construction Industry

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#### 3.4. Productivity

- **Labor productivity of construction is low**
  - Value-added per employee dropped sharply from 120 to 87
  - The other industries present continuous growth during 2008-2015

- **Construction needs approaches to improve its efficiency**

(2010 is the base year, unit: %)

Industry	2008	2009	2010	2011	2012	2013	2014	2015
Total	95.2	95.2	100.0	100.6	99.5	102.1	102.7	103.2
Manufacturing	91.0	93.3	100.0	103.1	103.7	105.3	106.0	105.3
Service	96.6	95.6	100.0	100.3	99.1	101.7	102.5	103.8
Construction	110.2	119.6	100.0	88.8	85.8	91.3	88.5	87.1

### 3. Overview of the Construction Industry

#### 3.5. Construction Cost

- Material prices unlikely change in recent years

(unit: KRW thousand)

Year	Cement in bulk (per 40kg)	RMC * kg/cm <sup>3</sup> (per m <sup>3</sup> )	Steel bars (per ton)	25mm aggregates (per m <sup>3</sup> )	Concreting sand (per m <sup>3</sup> )	Common bricks (per 1k pieces)
2013	4.4	57.6	995	14	13	55
2014	4.5	66.1	1,070	14	13	55
2015	4.5	66.1	1,070	14	13	55

\* RMC: ready mix concrete

- Wages slightly grows in recent years

(unit: KRW thousand)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Chief worker	82	88	91	97	102	105	105	110	112
Special daily	79	83	85	91	96	95	101	107	112
Normal daily	60	65	68	71	75	81	94	87	90

### 3. Overview of the Construction Industry

#### 3.6. Import and Export of Construction Services

- **Top 5 countries for construction export**

- Korea exported over USD 65 billion, but global situations shrunk exports to 46 billions
- Turkmenistan, never been on the list, was the top of 2015

(unit: USD million)

Year	Rank	1	2	3	4	5	Total Export
2011	Country	Saudi Arabia	Brazil	Iraq	Vietnam	Singapore	59,144
	Value	16,588	4,606	3,666	3,459	3,289	
2012	Country	Saudi Arabia	Iraq	Kazakhstan	Vietnam	Singapore	64,880
	Value	16,167	9,636	4,161	3,416	3,345	
2013	Country	Saudi Arabia	Australia	Uzbekistan	Vietnam	Singapore	65,211
	Value	9,975	5,855	4,533	4,043	3,516	
2014	Country	Iraq	Kuwait	Russia	Venezuela	Algeria	66,009
	Value	8,532	7,739	5,604	5,067	4,388	
2015	Country	Turkmenistan	Kuwait	Vietnam	Saudi Arabia	Venezuela	46,144
	Value	4,970	4,960	4,497	3,592	2,901	

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# Thank you



# **Brownfield Concession of Aged Infrastructure Facilities for Sustainable Development**

**24-25 November, 2016**

**Dr. Sejong Wang**

**Research Fellow**

**(Ph.D. in Economics)**

**Construction & Economy Research Institute of Korea  
(CERIK)**

### **I . One of the Main Issues in the Current Korean Construction Industry**

1. The Current Status and Future Prospect of Aged Infrastructure Facilities
2. Problems that Need to be Solved

### **II . Proposed Solutions for the Utilization of Private Funds for the Improvement of Aged Infrastructure Facilities**

1. Definition of Brownfield Projects/Concessions
2. Brownfield Concessions through TOT in China Water Market
3. Utilization of Private Funds for Brownfield Concessions

### **III . Suggestions for Brownfield Concessions Policy Direction**

### **IV . Concluding Remarks**

# The current status and future prospect of aged infrastructure facilities in Korea

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- **Since the mid-1970's, Korea has enjoyed a rapid economic growth, leading to a great increase in the supply of major infrastructure facilities.**
  
- **In particular, during the period of 1970-1990, the infrastructure facilities such as roads, railroads, bridges, harbors, dams, industrial complexes, tunnels, and water and sewage facilities have been excessively delivered**
  
- **This situation leads us to be faced with three serious problems:**
  - ① **this disrupts the growth of national economy;**
  - ② **this leads to poor living standard of the lives of the people;**
  - ③ **this endangers the health and safety of the people.**

## Major aged infrastructure facilities and their safety grade

<Table 1> Major aged infrastructure facilities and their safety grade

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Source: Kang, S. and Y. Lee (2013), *An Understanding of an Infrastructure Report Card of the Advanced Countries and its Implication in the Korean Infrastructure Policy*, Construction and Economy Research Institute of Korea (CERIK).

# The problems that need to be solved in the Korean construction industry

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- **Due to the rapid increase in the number of aged infrastructure facilities, we need to solve two major problems for maintaining a sustainable economic growth**
  - ① **how to solve the problem of endangering the health and safety of the people by rehabilitating and/or redeveloping aged infrastructure facilities;**
  - ② **how to solve the problem of establishing management authority to effectively and efficiently operate, maintain, and manage these aged infrastructure facilities.**
- **In this paper, we will focus on the solution of the first problem only.**
- **In particular, we will provide a set of solutions of rehabilitation and/or redeveloping aged infrastructure facilities by utilizing private funds in the form of brownfield concessions through public-private partnership (PPP).**

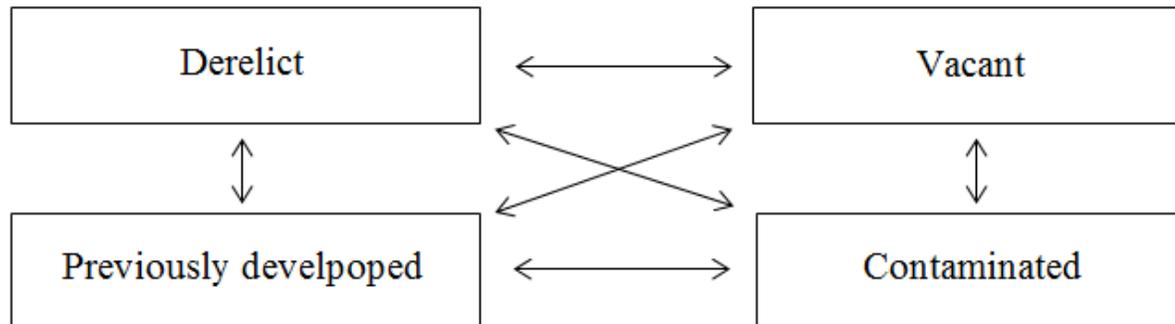
# Definition of brownfield concessions (I)

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## ● Terms associated with brownfield:

- ① derelict;
- ② contaminated;
- ③ vacant;
- ④ previously developed.

<Figure 1> Terms associated with brownfield



Source: Alker, S., Joy, V., Roberts, P. and N. Smith (2000), “The definition of brownfield”, *Journal of Environmental Planning and Management*, Vol. 43, No. 1, p. 56.

# Definition of brownfield concessions (II)

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## ● Criteria within the definition of brownfield

### - In the present,

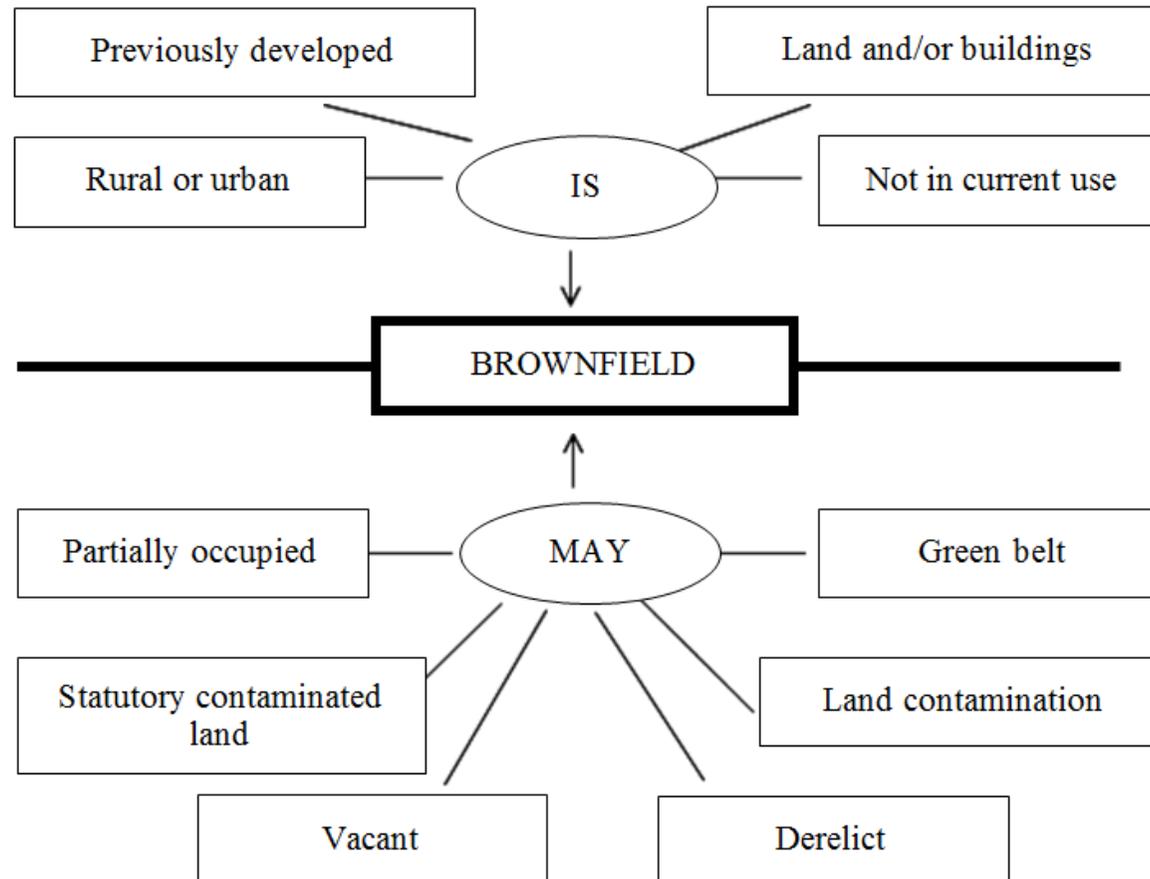
- ① previously developed;
- ② rural or urban;
- ③ not in current use;
- ④ land and/or buildings.

### - In the future,

- ① vacant;
- ② derelict;
- ③ partially occupied;
- ④ statutory contaminated land;
- ⑤ green belt;
- ⑥ land contamination

# Criteria within the definitions of brownfield

<Figure 2> Criteria within the definition of brownfield



Source: Alker, S., Joy, V., Roberts, P. and N. Smith (2000), "The definition of brownfield", *Journal of Environmental Planning and Management*, Vol. 43, No. 1, p. 63.

# Brownfield concessions through TOT in China water market

## ● Diverse forms of PPPs in China water market:

- Management contracts;
- Leasing contracts;
- BOT(build-operate-transfer)/BOO(build-own-operate)/BOOT(build-own-operate-transfer);
- TOT(transfer-operate-transfer)/ROT(rehabilitate-operate-transfer)/BROT(build-rehabilitate-operate-transfer);
- Divestiture or full-scale privatization.

<Table 2> Current status of diverse PPP projects in China's water market

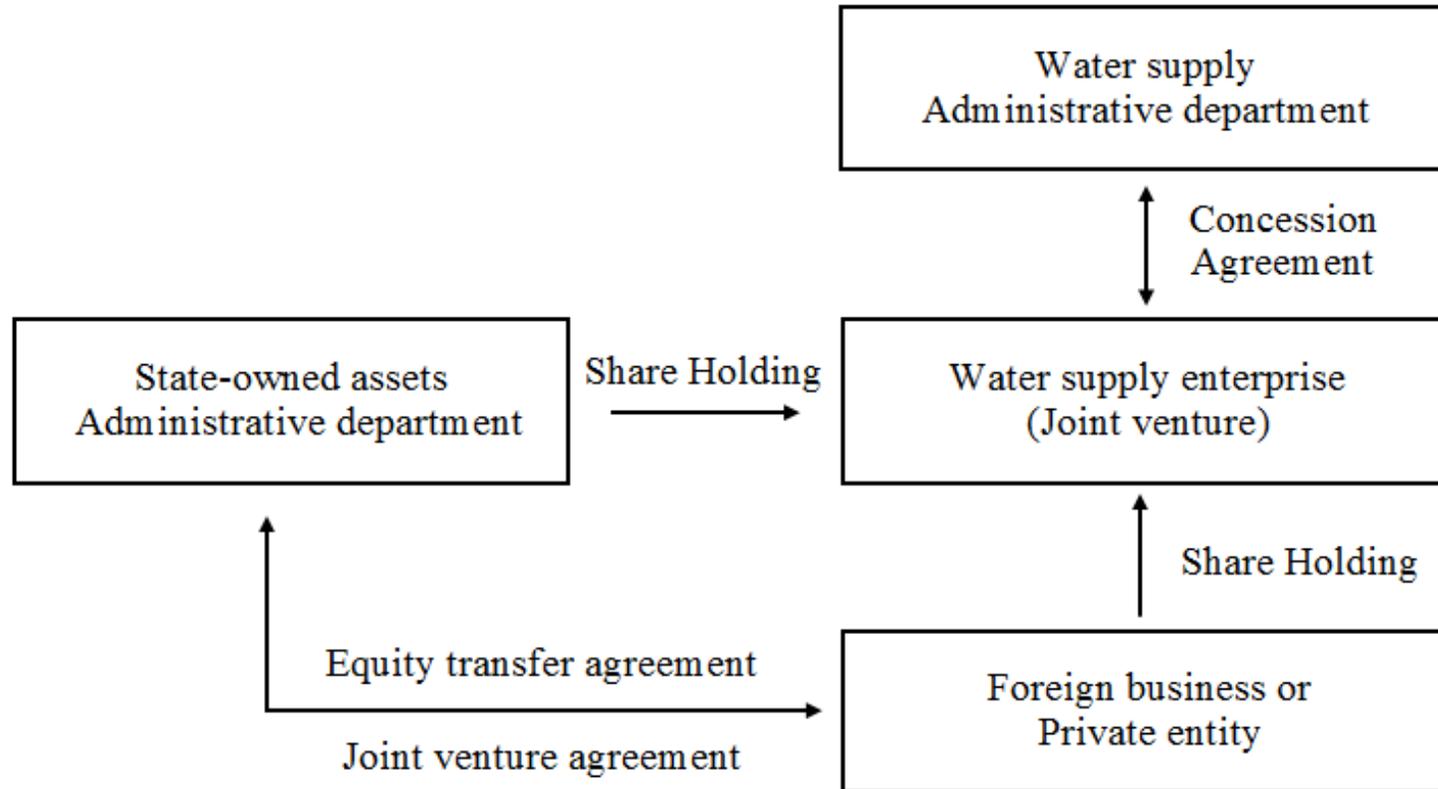
PPP business models	Ownership (equity transfer)	Operation	Investment	Risk	Period (years)
Management contract	Public	Private	Public	Public	3-5
Lease	Public	Private	Public	Shared	8-15
BOT/BOO/BOOT	Public/private <sup>1)</sup>	Private	Private	Private	20-30
TOT/ROT/BROT	Public	Private	Private	Private	20/30
Divestiture	Public/private	Shared	Private	Shared	25-50 <sup>2)</sup>

Note: <sup>1)</sup>Choice varies upon contract or local regulation; <sup>2)</sup>Also called time-bound divestiture as the contract is valid during the contract period.

Source: Jang, W., Lee, D. and J. Choi (2014), "Identifying the strengths, weaknesses, opportunities and threats to TOT and divestiture business models in China's water market", *International Journal of Project Management*, Vol. 32, No. 2, p. 300.

# Structure of TOT concessions in China water market

<Figure 3> Relationship between key stakeholders in TOT scheme



Source: Meng, X., Zhao, Q. and Q. Shen (2011), "Critical success factors for transfer-operate-transfer urban water supply projects in China", *Journal of Management in Engineering*, Vol. 24, No. 4, p. 244.

# Critical success factors (CSFs) of TOT concessions

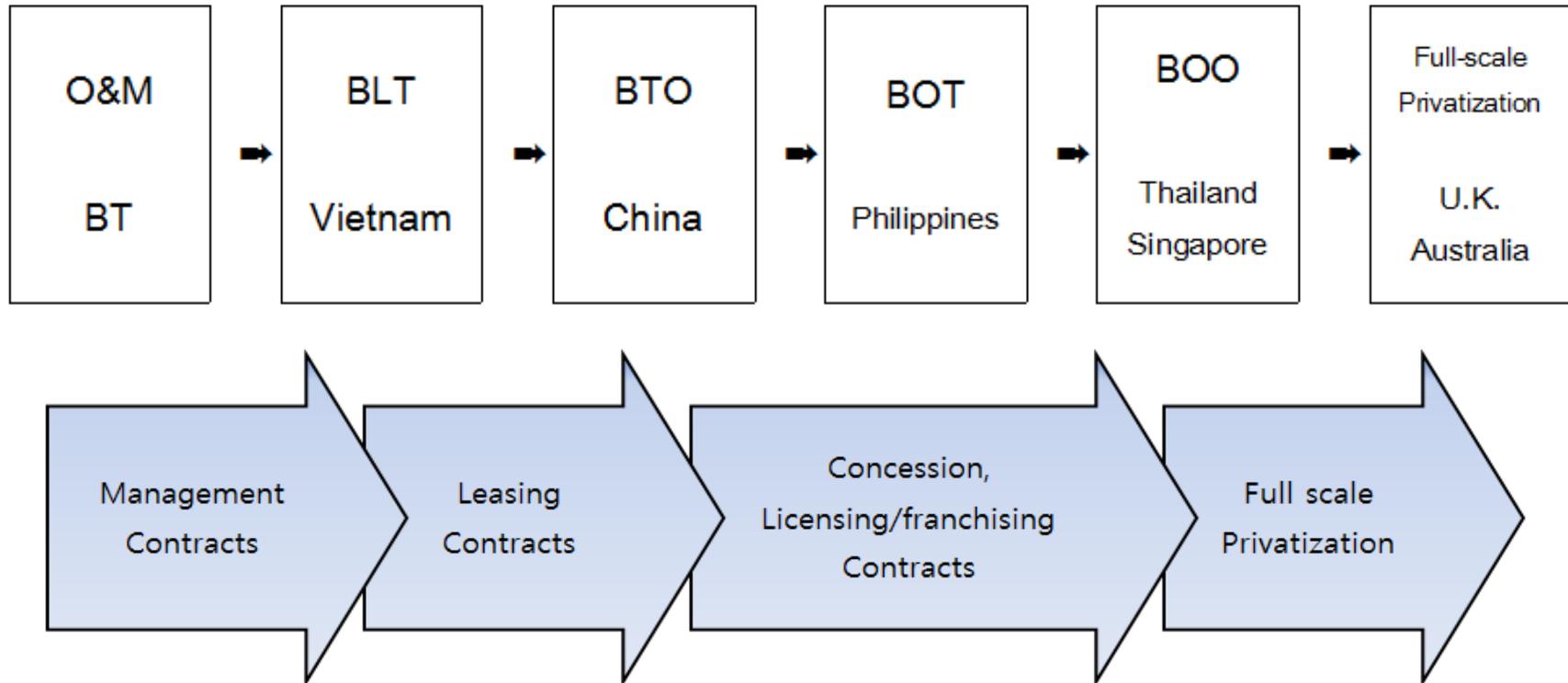
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## ● Eight (8) identified CSFs for TOT projects and their priority;

- ① project profitability;
- ② asset quality;
- ③ fair risk allocation and risk sharing;
- ④ competitive and transparent tendering;
- ⑤ internal coordination within government;
- ⑥ employment of professional advisers  
(design/engineering/legal/accounting/project management);
- ⑦ corporate governance;
- ⑧ government supervision.

# Spectrum of PPP models

<Figure 4> Spectrum of PPP models



Source: The World Bank Institute, <http://www.worldbank.org>.

# Utilization of private funds for brownfield concessions

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## ● Formation of a joint venture

- On the basis of the concept of TOT concessions in China, foreign and/or private company forms a joint venture with the concerned public authority.
- This joint venture rehabilitates and/or redevelops aged infrastructure facilities, or sometimes newly builds some infrastructure facilities to enhance the operational efficiency, with funds from the private sector based on a brownfield concession agreement between the joint venture and the government, and operates and maintains them for a certain period of time as specified in the concession agreement.

## ● Full-scale privatization

- Using one form of divestiture by transferring all equity of the public sector for the aged infrastructure facilities to the private sector with the private sector's funds.
- On the basis of transferred ownership for the aged infrastructure facilities, the private company rehabilitates, operates and maintains them during their life-time.

## **Suggestions for brownfield concession policy direction**

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- **In order to activate the private sector's investment for the rehabilitation and/or re-development of aged infrastructure facilities for maintaining a sustainable economic development, the government needs to provide a favorable environment for involving the private sector in the infrastructure sector, whether it is economic infrastructure or social infrastructure.**
- **The government needs to establish a kind of special laws and regulations for the activation of brownfield concessions, leading to a favorable legal and regulatory framework for brownfield concessions.**
- **The government needs to arrange some supporting measures to attract private and/or foreign investors. One of the most thinkable ways is tax exemption or government subsidy in order to raise the internal rate of return (IRR) or return on investment (ROI) of the private and/or foreign investors.**
- **The government needs to create a favorable atmosphere for people to feel a sense of closeness for private participation in infrastructure facilities, whether they are aged or new.**