A Comparative Study on Economic Policies for Construction and Demolition Waste Minimisation

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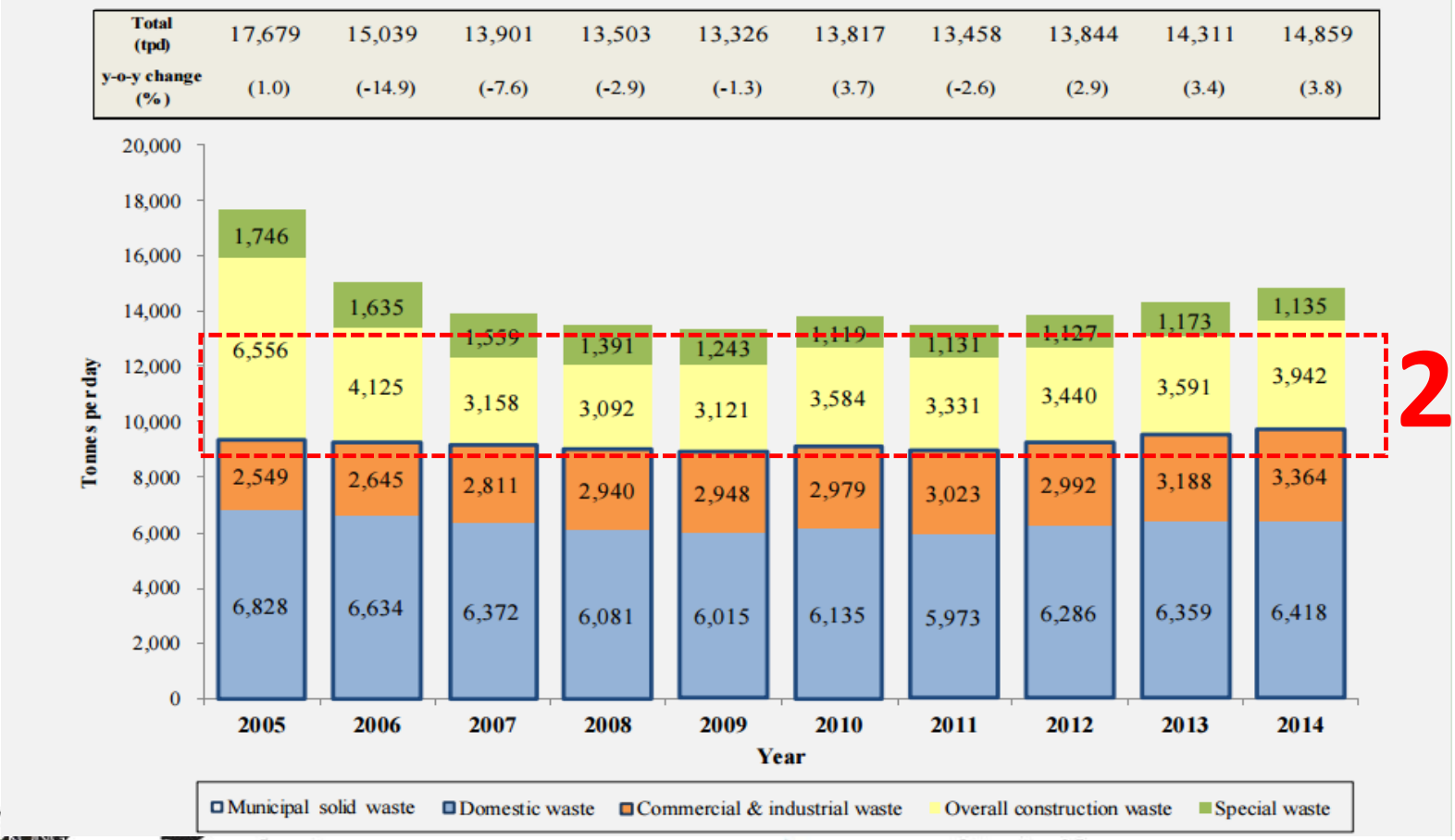
Contents

- Research Background
- Research Objectives
- Introduction to Economic Policies for C&D Waste
- Comparison of Economics Policies
- Analysis of C&D Waste Statistics
- Discussion and Conclusions
- C&D Waste Management Using BIM

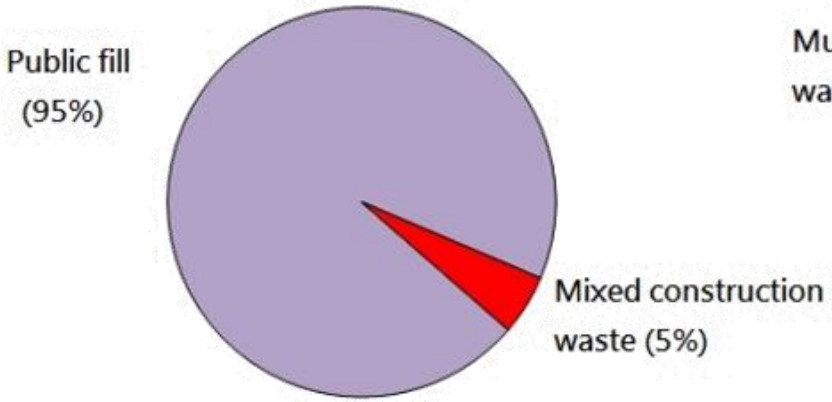
Current C&D Waste

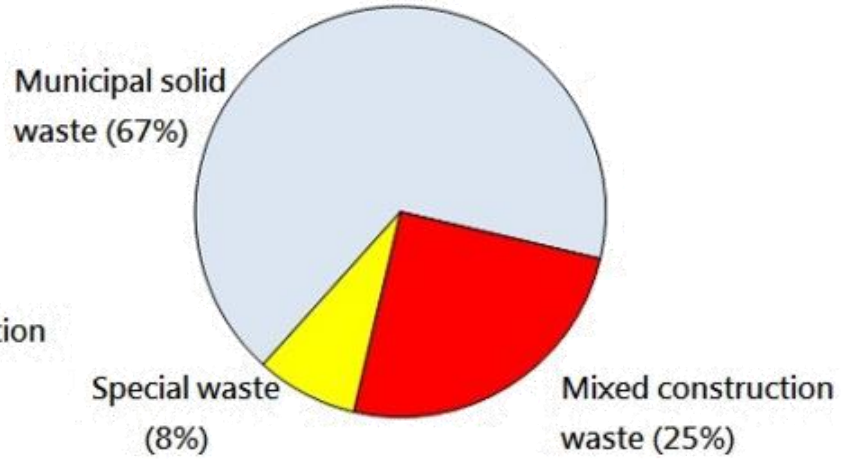
- Construction waste is a major source of urban wastes in HK, with daily generation of 57,547 tonnes in 2014 (3,942 tonnes to landfill per day).



Current C&D Waste

- Construction waste is a major source of urban wastes in HK, with daily generation of 65,971 tonnes in 2013 (3,591 tonnes to landfill per day).





(HKEPD, 2014)

Research Background

- Appropriate economic policies can motivate the construction industry to minimise C&D waste (Li, 2013).
- There are differences in economic policies adopted by various countries and cities.

→ Lack of comparative studies on economic policies

Research Objectives

- To compare the economic policies implemented for C&D waste minimization
  - Three regions: Asia Pacific, North American, and European regions (largest construction markets (IHS, 2013))
    - Hong Kong, South Korea, the US, the UK, Ireland, and the Netherlands
    - Economic policies and statistical data are officially provided
  - Establishment and modification years of economic policies, waste disposal facilities, classification of waste types, and charges for each waste type.
- To understand the impacts of the economic policies on C&D waste minimization
  - Solid waste generated per capita
  - C&D waste generated per capita
  - C&D waste generation rates

Introduction to Economic Policies for C&D Waste

- Deposit-refunded scheme
- Fines scheme
- Charging scheme (or landfill levy)
- Tax on raw materials

Introduction to Economic Policies for C&D Waste

- Deposit-refunded scheme
  - The deposit is refunded when the specific requirements are fulfilled. The scheme reduces the incentive to illegal dumping and stimulates reuse and recycling of waste streams.

Introduction to Economic Policies for C&D Waste

- Deposit-refunded scheme
- Fines scheme
  - Fines are charged for non-compliance such as illegal dumping and low recycling rates.

Introduction to Economic Policies for C&D Waste

- Deposit-refunded scheme
- Fines scheme
- Charging scheme (or landfill levy)
  - The charging scheme charges construction waste generation in order to reduce the amount of C&D waste disposed of at landfills.

Introduction to Economic Policies for C&D Waste

- Deposit-refunded scheme
- Fines scheme
- Charging scheme (or landfill levy)
- Tax on raw materials
  - Tax on raw materials is a financial measure by shifting the price differential against raw materials and in favour of secondary materials, in order to reduce resource extraction, to increase recycling rates, and to make full use of secondary materials.

Comparison of Economics Policies

Region (reference)	Economic policies (year)			
	Deposit-refunded scheme	Tax on raw materials	Fines scheme	Charging scheme
Hong Kong (HKEPD, 2012)	-	2001	-	2006
South Korea (KECO, 2016)	-	-	-	1993[a)] (2008[a)b)])
US (ESD, 2012)	2001 2007 (San Diego)	1998	2006	1989
UK (EIONET, 2009)	-	2002	-	1996
Ireland (EIONET, 2009)	-	-	-	2002 (2008[b)])
Netherlands (Oosterhuis et al., 2009, EIONET, 2009)	-	1997	-	1996

[a)] denotes the establishment or modification year for solid waste

[b)] denotes the modification year

Comparison of C&D Waste Charging Schemes

Country (Reference)	C&D waste type	Facility type	Charing fee (USD/tonne)	Ratio (%)
Hong Kong (HKEPD, 2012)	Less than 50% inert waste	Landfill	16.4	15.2
	Inert waste	[illegible]	[illegible]	[illegible]
	More than 50% inert was	[illegible]	[illegible]	[illegible]
South Korea (Lee and Dong, 2016)	Mixed waste	[illegible]	[illegible]	[illegible]
	Recyclable waste	Sorting facilities	67.3*	62.4
	Combustible	Incineration	134.5*	124.9
US (ESD, 2012)	Mixed waste	Landfill	74.0	68.7
	Recyclable concrete	-	10.0	9.3
UK (UKGov, 2006)	Mixed waste	Landfill	107.7	100.0
	Sorted waste (rock or soil)	[illegible] fill	3.2	3.0
Ireland (Li, 2013)	-	[illegible]	[illegible]	24.1
Netherlands (Van Dijk et al., 2001)	Non-combustible	[illegible]	[illegible]	12.9
	Combustible	-	70.8	65.7

Most expensive (incineration)

Most expensive (landfill)

* is the average value of charging fee

Analysis of C&D Waste Statistics

- Solid waste generated per capita
- C&D waste generated per capita
- C&D waste generation rates

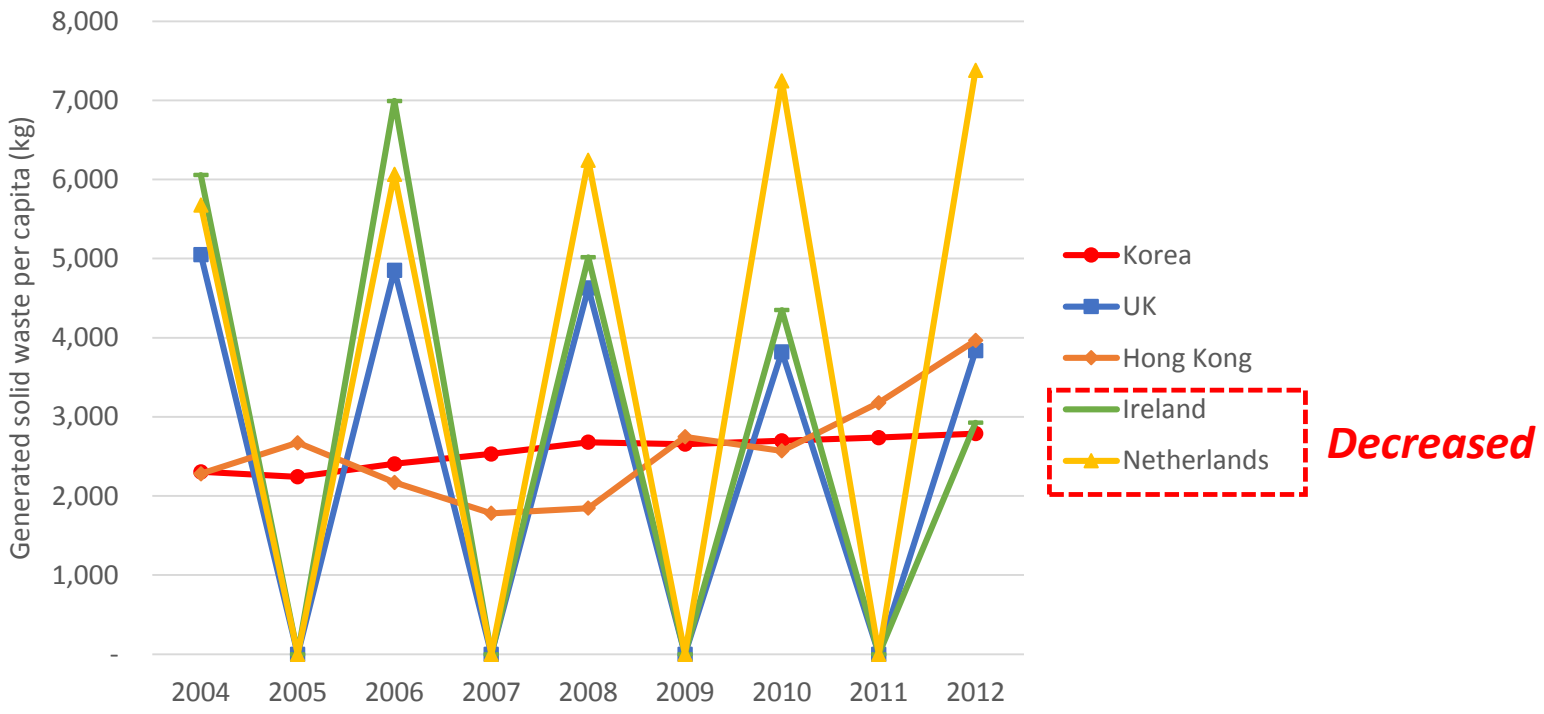
Analysis of C&D Waste Statistics

- Data collection

	Solid and C&D waste	Population
Hong Kong	HKEPD (2015)	HKCSD, 2016
South Korea	ME and KECO (2014)	OECD STAN
UK	Eurostat (2016)	OECD STAN
Ireland	Eurostat (2016)	OECD STAN
Netherlands	Eurostat (2016)	OECD STAN
US	Data were not collected.	

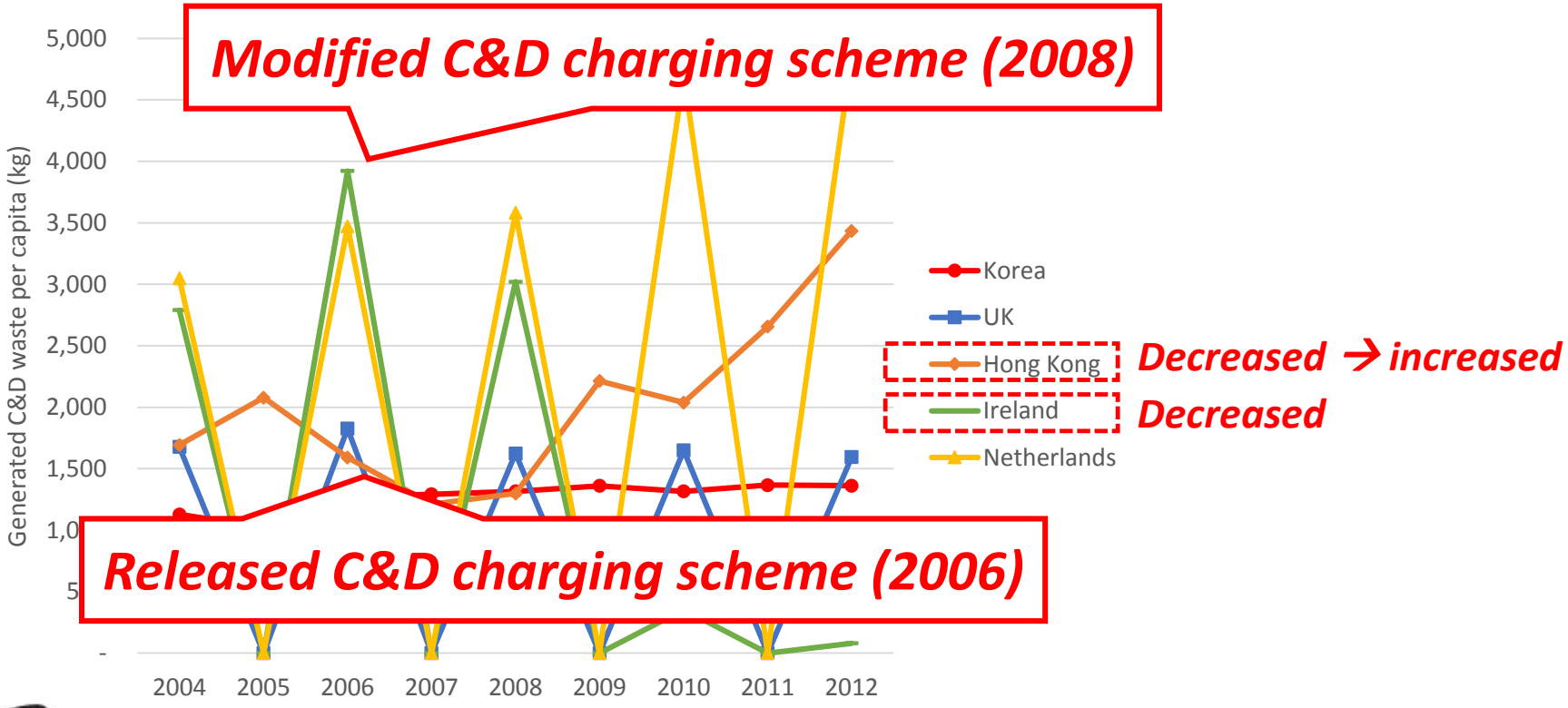
Analysis of C&D Waste Statistics

- Solid waste generated per capita



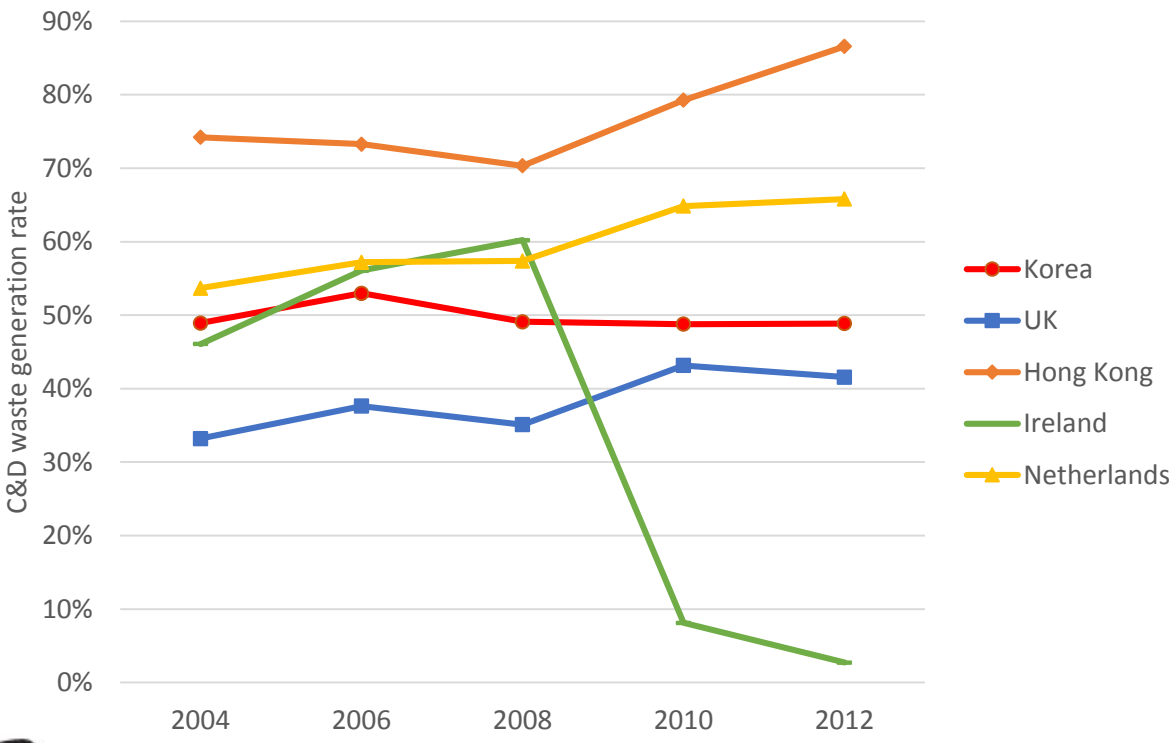
Analysis of C&D Waste Statistics

- C&D waste generated per capita



Analysis of C&D Waste Statistics

- C&D waste generation rates



Discussion

- Appropriate adjustment of disposal cost of C&D waste can motivate practitioners to efficiently minimise and manage C&D waste.
- In Hong Kong, the charges for C&D waste disposal has been recently increased (April 2017)
  - Public fill charge: USD 9.2 (HKD 71)
  - Sorting charge: USD 22.6 (HKD 175)
  - Landfill charge: USD 25.8 (HKD 200)
- Quantified goals, such as setting limits on the amount of total C&D waste being sent to landfills, setting recycling rates for C&D waste, etc., are additionally required.

Conclusions

- To quantitatively and qualitatively compare the economic policies for C&D waste minimisation in Hong Kong, South Korea, the US, the UK, Ireland, and the Netherlands
  - Deposit-refunded scheme, fines scheme, charging scheme (or landfill levy), and tax on raw materials.
- To compare results of C&D waste statistics in countries
  - C&D waste charging schemes have positive impacts on C&D waste minimisation.

Limitations

- Relationships between the economic policies and the amount of C&D waste were not analysed quantitatively
- Other factors can affect the C&D waste statistics as well

Further Thoughts

- Soft side: **policies**, incentives
- Hard side: technologies

Thank you

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