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Appendix A

Table A1. Summary of EU directives, national and local waste management strategies and progresses made following their introduction.

Level of Enforcement	Publication Year	Directives & Strategies	Targets	Progress
EU	1999	EU Landfill Directive	Reduction in the amount of landfilled BMW to: 75% of that in 1995 within five years; 50% of that in 1995 within eight years; 35% of that in 1995 within fifteen years (European Commission, 1999).	(1) Reduction: Per capita MSW generation declined from 521kg in 2000 to 487 kg in 2017 (Eurostat, 2019); (2) Recycling: improved from 28% of MSW in 2004 to 37% of MSW in 2012 (EEA, 2016), improved from 52 kg per capita in 1995 to 144 kg per capita in 2017 (Eurostat, 2019);
	2004, 2005	Amended Packaging and Packaging Waste Directive 2004/12/EC and 2005/20/EC (EC, 2004, EC, 2005)	(1) Prevention: implementing preventive measures. (2) Recycling: the materials contained in packaging waste by 31 December 2008: 60% by weight for glass; 60% by weight for paper and board; 50% by weight for metals; 22.5% by weight for plastics; 15% by weight for wood. (3) Recover: no less than 60% by weight of packaging waste by 31 December 2008.	(3) Incineration: improved from 67 kg per capita in 1995 to 133 kg per capita in 2017 (Eurostat, 2019); (4) Composting: improved from 30 kg per capita in 1995 to 81 kg per capita in 2017 (Eurostat, 2019); (5) Landfilled waste reduction: from 205 billion tonnes in 2004 to 157 billion tonnes in 2010 (EEA, 2016); from 302 kg per capita in 1995 to 133 kg per capita in 2017 (Eurostat, 2019).
	2008	EU Waste Framework Directive (European Commission, 2008)	(1) Reusing and recycling: 50% of HW by 2020. (2) Reusing, recycling and material recovery: 70% of waste by 2020.	
	2015	Amended Packaging and Packaging Waste Directive 2015/720 (EC, 2015)	(1) Reduction: the number of lightweight carrier bags per person to Less than 90 by 31 December 2019 and less than 40 by 31 December 2025; (2) And/or no free lightweight carrier bags are provided at the point of sale of goods or products.	
National	2000	Waste Strategy for England 2000 (Burnley, 2001).	(1) Recycling: 25% of HW by 2005; 30% of HW by 2010; 33% of HW by 2015; (2) Recovery:	(1) Reduction of HW: 450kg/person in 2000 to 370 450kg/person in 2005;

			40% of MSW by 2005; 45% of MSW by 2010; 67% of MSW by 2015.	(2) Recycling and composting of waste: increased from around 8% in 1996/97 to 27% in 2005/06; (3) Landfilled reduction : by 9% between 2000/01 and 2004/05 (DEFRA, 2007).
	2007	Waste Strategy for England 2007 (DEFRA, 2007)	(1) Reduction : 29% of not reused, recycled or composted HW by 2010; 45% of not reused, recycled or composted HW by 2020; (2) Recycling and composting : 40% of HW by 2005; 45% of HW by 2015; 50% of HW by 2020; (3) Recovery : 53% of MSW by 2010; 67% of MSW by 2015; 75% of MSW by 2020.	(1) Reduction of HW: by 2% per year between 2007-2013; (2) Recycling and composting of HW: increased from 36% in 2007/08 to 43% in 2012; (3) Landfilled reduction : by 60% in 2000 - 2012; (4) Refuse derived fuel was introduced in 2009 and increased to 887,465 tonnes in 2012 (DEFRA, 2013).
	2013	Waste management plan for England 2013 (DEFRA, 2013)	Reusing and recycling at least 50% of HW by 2020.	(1) Recycling and composting of HW: increased to 44.9% in 2016; (2) Landfilled reduction : by 51% in 2012-2016 (DEFRA, 2017).
Local	2002	Nottinghamshire and Nottingham Waste Local Plan (Nottinghamshire County Council Environment, 2002)	Targets set in Waste Strategy for England and Wales 2000.	Details illustrated in section 4.
	2010	A "Waste-Less" Nottingham Waste Strategy 2010-2030 (Nottingham City Council, 2010)	(1) Reduction : 400 kg/person of HW by 2020; 390 kg/person of HW by 2025; 222 kg/person of HW by 2020; <200 kg/person of residual HW by 2030; (2) Recycling : 50% of HW by 2020; 55% of HW by 2025; (3) Zero waste to landfill by 2030.	
	2013	Nottinghamshire and Nottingham Waste Core Strategy (Nottingham City Council, 2013)	(1) Recycling and composting 70% of all waste by 2025; (2) Disposal rate reduce to no more than 10% by 2025.	

Table A2. Data and data sources in this study

Data	2001/02	2006/07	2016/17
Composition of household waste	N/A	DEFRA (2008)	NCC (2013)
Composition of incinerated waste	N/A	Waste Research Limited (2008)	Waste Research Limited (2014)
Amount of Waste generation/collected	NCC (2005)	WasteDataFlow Database	WasteDataFlow Database
Waste treatment	NCC (2005)	WasteDataFlow Database	WasteDataFlow Database
Waste streams	N/A	WasteDataFlow Database	WasteDataFlow Database
Policies and actions	Government documents from official websites of Nottingham City Council		
Economy and social demography	Nottingham Insight and WasteDataFlow Database		

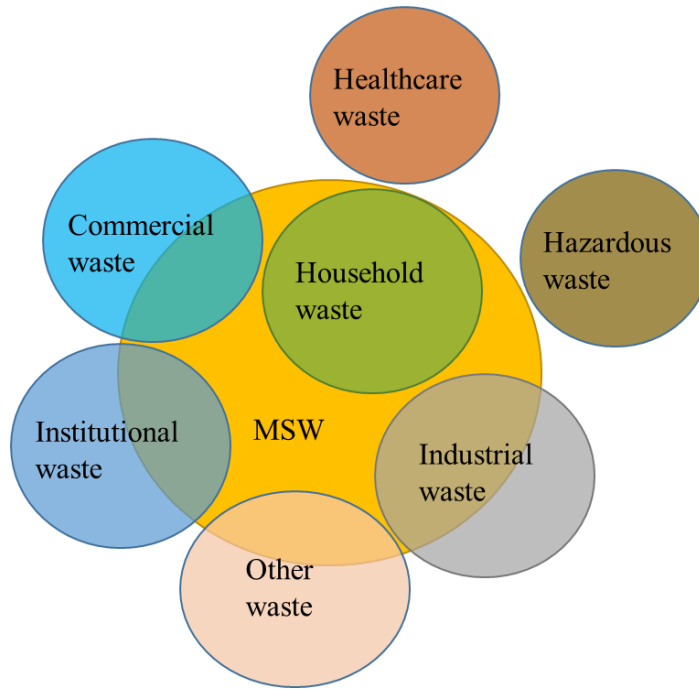
DEFRA: Department for Environment, Food & Rural Affairs. NCC: Nottingham City Council.

Table A3. Percentage of recyclable materials in residual waste which could be separated at source (Nottingham City Council, 2013b).

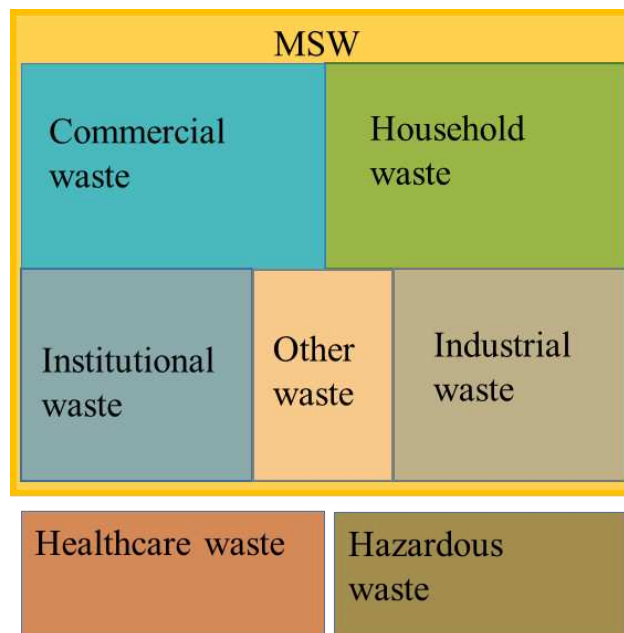
Recyclable materials	Percentage (%)
Paper	3.5
Card & cardboard	2.6
Plastics	3.2
Glass	2.9
Metal	2.0
Textile	1.9
Garden waste	0.9
Total	16.9

Table A4. Recycling and rejection rate in two types of MRF during 2006/07 – 2016/17

	Residual MRF					MRF			
	Input (Tonne)	Recycling (%)	RDF (%)	Landfill (%)	Compost (%)	Input (Tonne)	Recycling (%)	RDF (%)	Landfill (%)
2006/07	18312	20.8	0	79.2	0	5350	99.6	0	0.4
2007/08	20099	18.9	0	80.5	0	10748	96.1	0	3.9
2008/09	16007	19.0	0	72.9	0.5	13060	92.9	0	7.1
2009/10	15076	25.1	1.6	67.0	8.2	13610	91.2	0	8.9
2010/11	14597	19.6	4.4	70.7	7.3	18206	89.3	0	10.7
2011/12	13565	18.7	6.3	74.9	6.0	17982	88.7	11.3	0
2012/13	11335	18.3	14.5	59.4	7.8	16297	79.2	9.5	11.4
2013/14	11557	22.6	19.9	52.8	4.7	19049	82.5	8.8	8.8
2014/15	10974	17.9	31.0	46.1	5.1	17780	84.1	7.9	7.9
2015/16	9322	18.6	24.2	49.7	4.3	17150	83.0	16.2	0
2016/17	10564	16.9	19.5	57.8	2.9	16036	81.8	18.2	0



(a)



(b)

Fig. A1. Framework of the definitions of MSW: (a) The broadly adopted definition of MSW. (b)

The definition of MSW was adopted by England and currently adopted by Nottingham

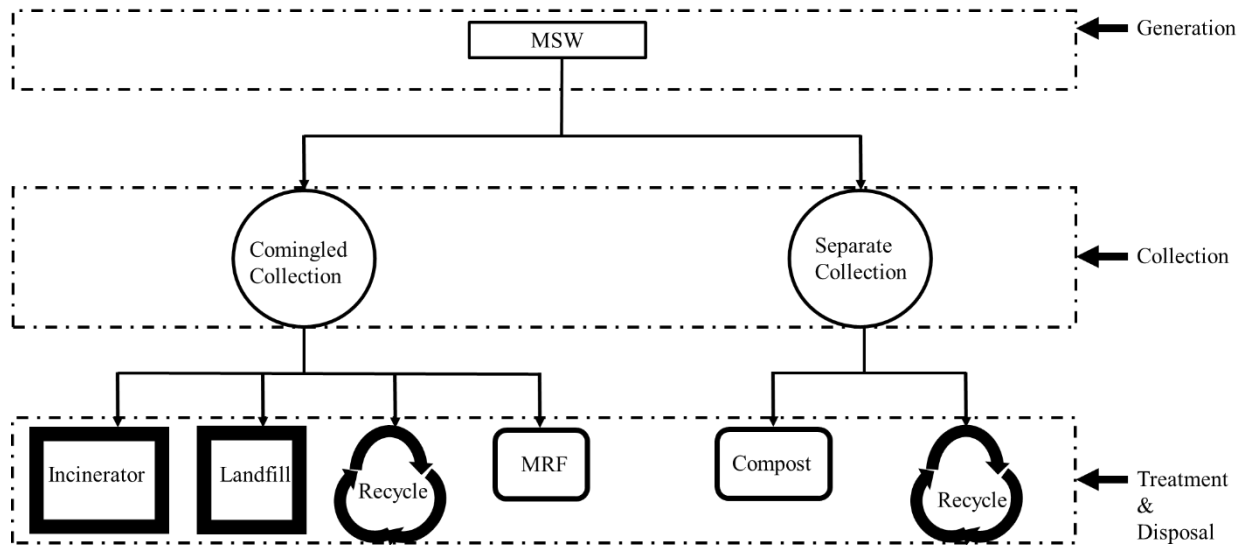


Fig. A2. System boundaries for MSWM in Nottingham. MRF represents material recovery facility.

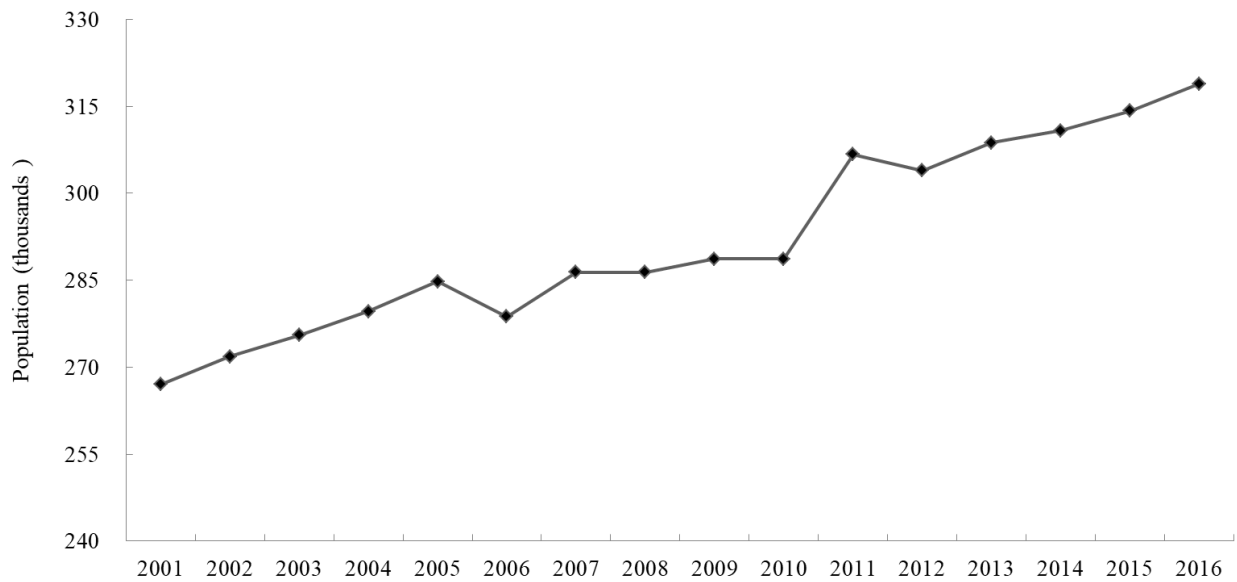


Fig. A3. Population change in Nottingham from 2001 to 2016.

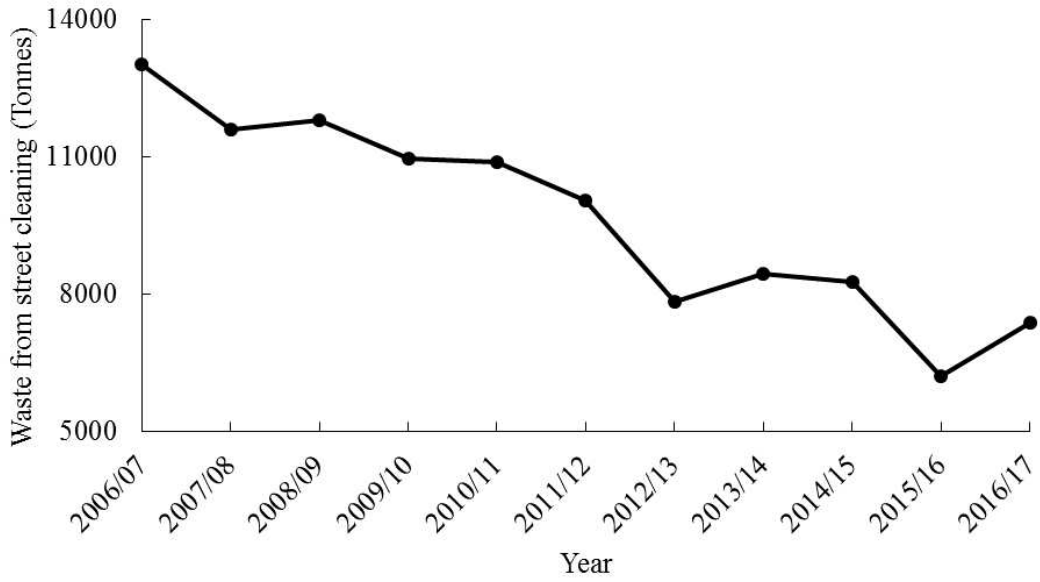


Fig. A4. Amount of waste from street cleaning.

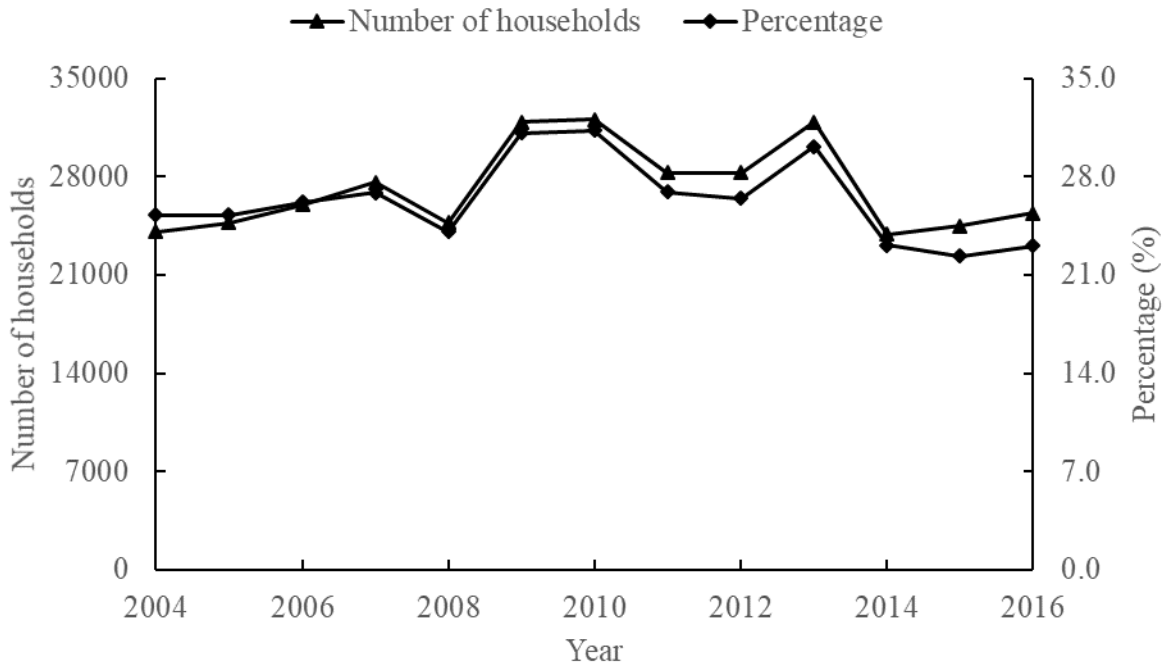


Fig. A5. The change of workless households from 2004 to 2016 (NCC, 2017).



Fig. A6. Bins used for separating and storing waste in KCS (Nottingham City Council, 2018).

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