

Presentation by
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i-SUSTAIN



Comparative Study of Seattle's and Copenhagen's Solid Waste Management practices between the years of 2004 – 2006

2010 ; 2008 ; 2006 - 2004

Recycling Rates 2006

Seattle = 52%
Copenhagen=55%



Copenhagen

Seattle

Percent

Inhabitants

503,700

586,200

+17%

Households

291,167

282,000

-3%

Workplaces

325,978

490,700

+51%

**Municipal Solid
Waste**

880,335

835,095

(-5%)

Copenhagen Waste in US Tons

1 “Long Ton” = 2,240 lbs

1 US Ton = 2,000 lbs

880,335 “Long Tons”

985,975 “US tons”

Total Waste Tonnage by Waste Stream in 2006

	Copenhagen	Seattle
• Household	261,444	292,476
• Commercial	292,244	416,564
• Self-Haul	-	126,055
• C+D	432,218	-
• Total	<hr/> 985,975	<hr/> 835,095

Municipal Solid Waste (SMC): means solid waste excluding special wastes, unacceptable wastes, recyclable materials, compostable wastes, and construction, demolition, and land-clearing debris.

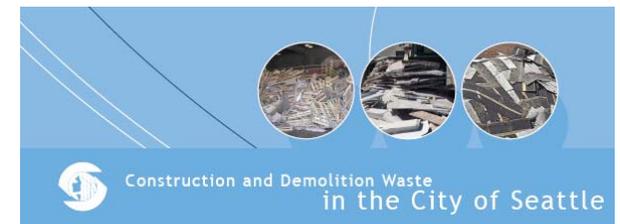
Jens Nejrup, From the Copenhagen Recycling Center 1 "Long Ton" = 2,240 lbs

How Much C&D is Recycled and Disposed in Seattle? Historically, Seattle has tracked the amount of disposed C&D but not how much C&D is generated and recycled. A recent survey estimates that around 373,000 tons of C&D was generated in Seattle in 2005 through the construction, remodeling and demolition of commercial and residential properties. Of that amount, 216,000 tons of C&D waste was sent to landfill disposal. Around 40% of the generated C&D from Seattle was either reused (example: salvaged lumber reused in new construction), recycled into new products (example: gypsum from new construction used to make new gypsum wallboard), or in some way diverted from landfill disposal (example: wood waste to paper/pulp mills or industrial boilers as a fuel).

**373,000 (100%)
Tons Generated**

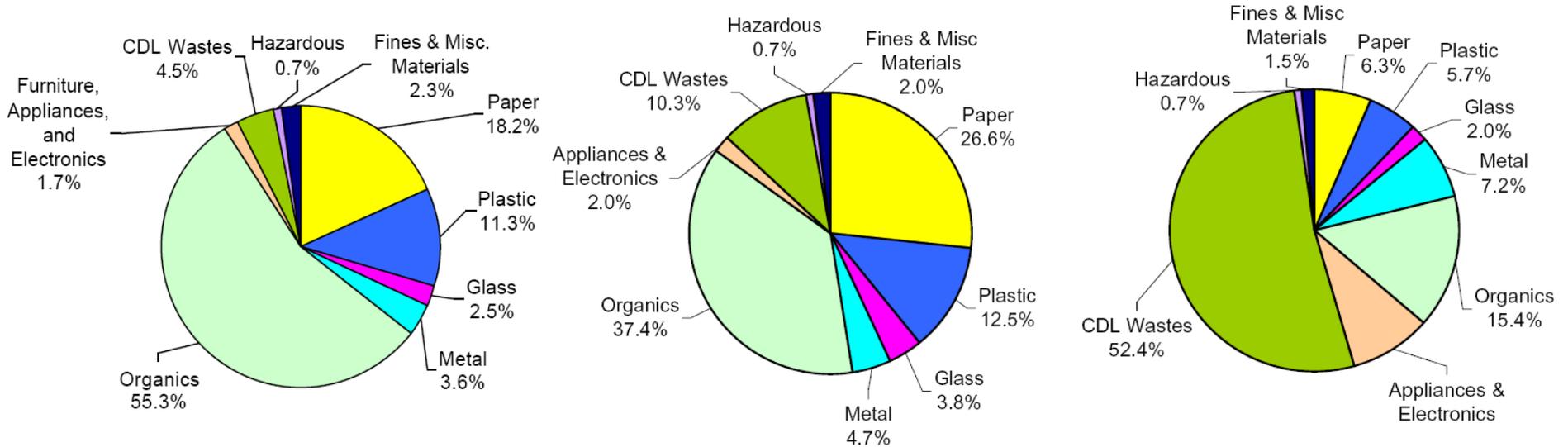
**216,000 (58%)
Landfill Disposal**

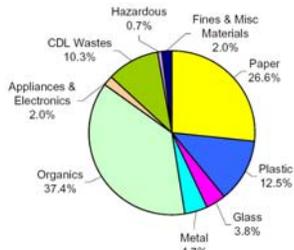
**157,000 (42%)
Reused/Recycled/Diverted (recovered?)**



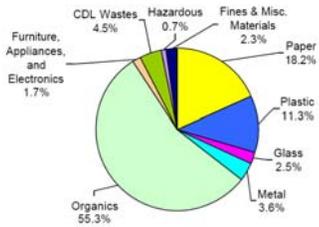
Construction and Demolition Waste in the City of Seattle 2005, study by Seattle Public Utilities

Residential - Commercial - Self-Haul

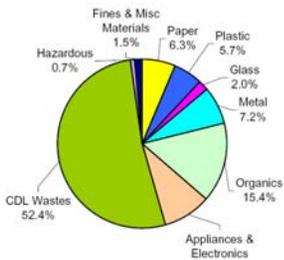




21,180 =
(10.3% x
205,637)

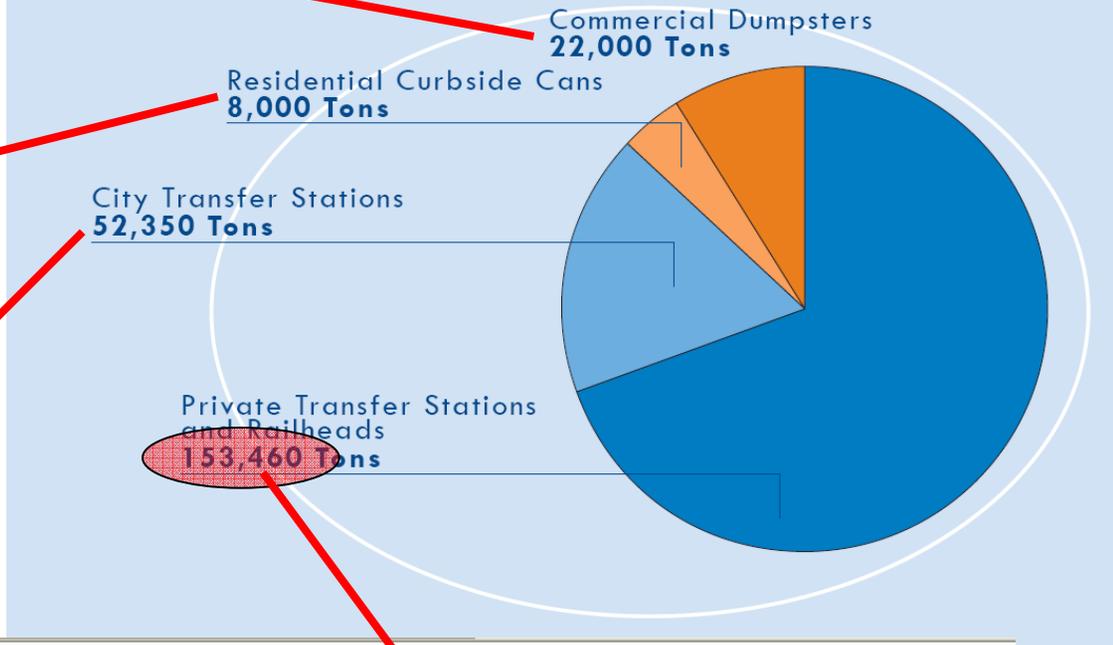


6,055 =
(4.5% x
134,557)



52,661 =
(52.4% x
100,499)

2005 Disposed Seattle C&D Tonnage by Receiving Area



Construction Demolition & Landclearing Report

	TOTAL CDL FOR CITY OF SEATTLE													
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
JAN	7,983	7,964	9,708	10,899	11,137	13,857	13,032	12,948	14,013	15,864	12,244	10,715	12,350	13,342
FEB	8,035	8,741	8,246	9,181	11,705	12,838	18,873	12,066	11,390	14,128	12,531	11,112	12,538	13,334
MAR	12,650	9,882	9,811	10,565	14,615	16,968	18,040	14,237	13,469	12,341	14,994	12,425	14,927	15,997
APR	7,972	9,596	9,839	12,252	12,885	17,489	16,738	12,512	10,786	11,441	11,944	12,731	15,129	13,586
MAY	7,029	9,058	11,144	12,038	15,490	14,408	15,337	13,224	13,714	13,751	11,055	13,803	17,844	17,068
JUN	7,812	9,757	10,680	11,961	16,335	16,985	18,546	14,324	15,340	14,116	12,498	14,159	16,852	13,582
JUL	8,450	10,661	13,543	14,074	16,305	19,385	18,150	14,884	14,525	16,892	15,748	13,136	15,660	13,953
AUG	8,032	12,750	14,297	14,202	16,671	18,888	21,140	19,201	14,074	20,400	14,444	13,955	18,650	15,382
SEP	8,486	11,592	11,181	16,414	15,724	15,697	17,683	14,344	15,556	20,190	14,523	14,572	16,136	13,080
OCT	9,634	11,710	11,450	14,951	15,973	16,351	16,673	13,967	16,438	15,183	13,706	12,548	15,151	16,334
NOV	8,155	9,733	10,510	11,209	12,832	11,764	14,809	10,457	12,359	11,523	14,173	12,400	12,479	16,908
DEC	8,381	8,020	8,716	12,310	12,273	12,624	12,618	8,455	11,045	11,458	19,600	11,905	12,957	12,539
TOTAL	102,618	119,463	129,126	150,056	171,945	187,256	201,638	160,621	162,738	178,296	167,462	153,461	180,672	175,104

Construction Demolition and Landclearing Report by Seattle Public Utilities

Total Waste Tonnage (Recycled, Treated + Disposed)

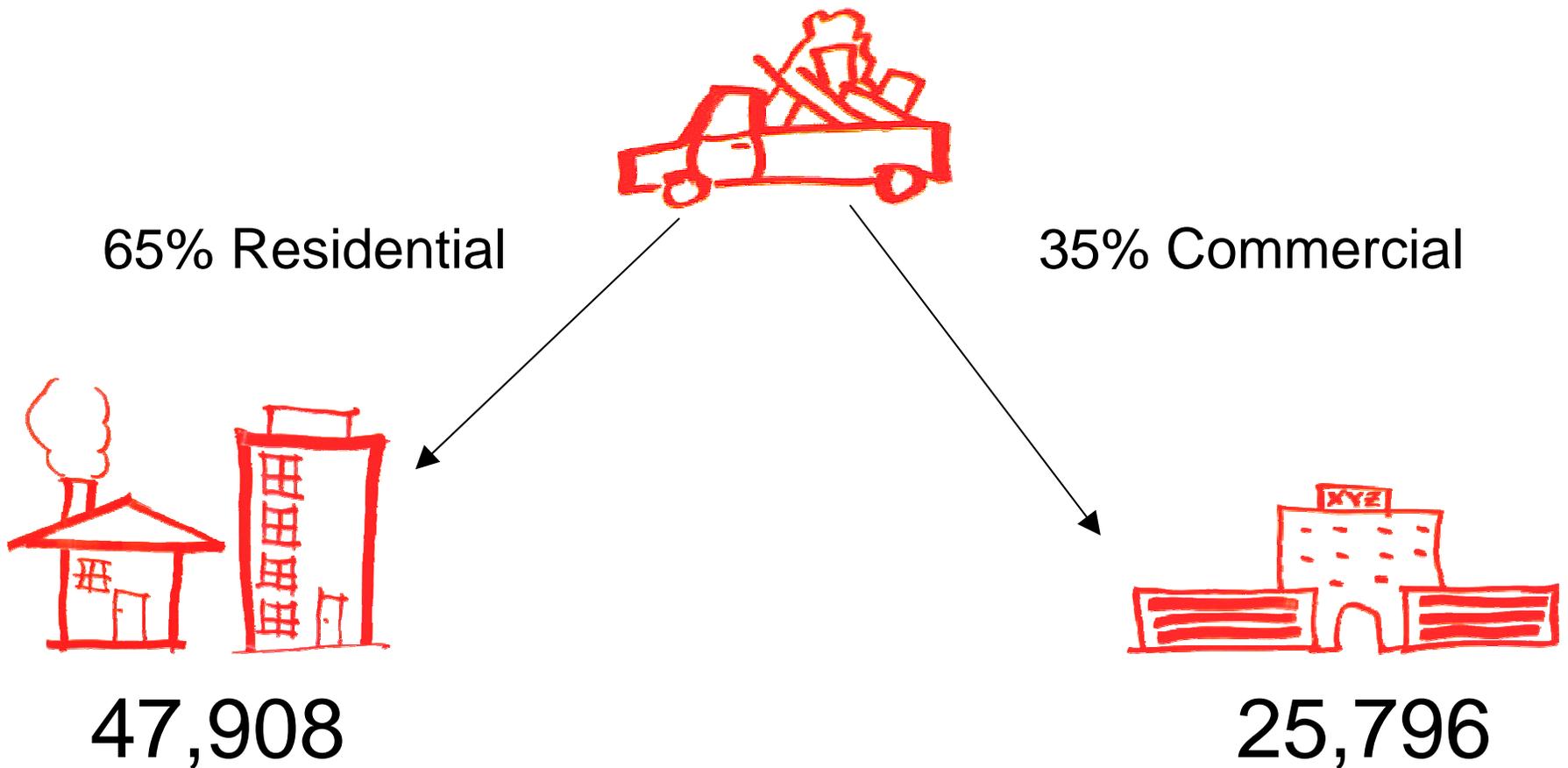
	Copenhagen	Seattle
• Household	261,444	292,476
• Commercial	292,244	416,564
• Self-Haul	-	126,055
• C+D	432,218	-
• Total	<hr/> 985,975	<hr/> 835,095

Total Waste Tonnage **without C+D**

	Copenhagen	Seattle
• Household	261,444	284,476
• Commercial	292,244	394,564
• Self-Haul	-	73,705
• C+D	-	-
• Total w/o C+D	<hr/> 553,688	<hr/> 752,744 (+36%)

Total Self-Hauled Waste Tonnage **without C+D**

73,705 Tons



Total Waste Tonnage **without C+D**

	Copenhagen	Seattle
• Household	261,444	284,476
• Commercial	292,244	394,564
• Self-Haul	-	73,705
• C+D	-	-
• Total w/o C+D	<hr/> 553,688	<hr/> 752,744

Total Waste Tonnage without C+D or Self-Haul

	Copenhagen	Seattle
• Household	261,444	332,384
• Commercial	292,244	420,360
• Self-Haul	-	-
• C+D	-	-
• Total	<hr/> 553,688	<hr/> 752,744

Apples to Apples w/o C+D

	Copenhagen	Seattle	Percentile
Household	261k	332k	+27%
Commercial	292k	420k	+43%
Per Inhabitant	0.519	0.567	+10%
Per Employee	0.897	0.857	-5%

Total C+D (+L) Waste

	Copenhagen	Seattle
CD (+L) Waste	432,218	373,000
<u>+Total w/o C+D</u>	<u>553,688</u>	<u>752,744</u>
Total w C+D	985,975	1,125,744 (+14%)

Official Recycling Rates

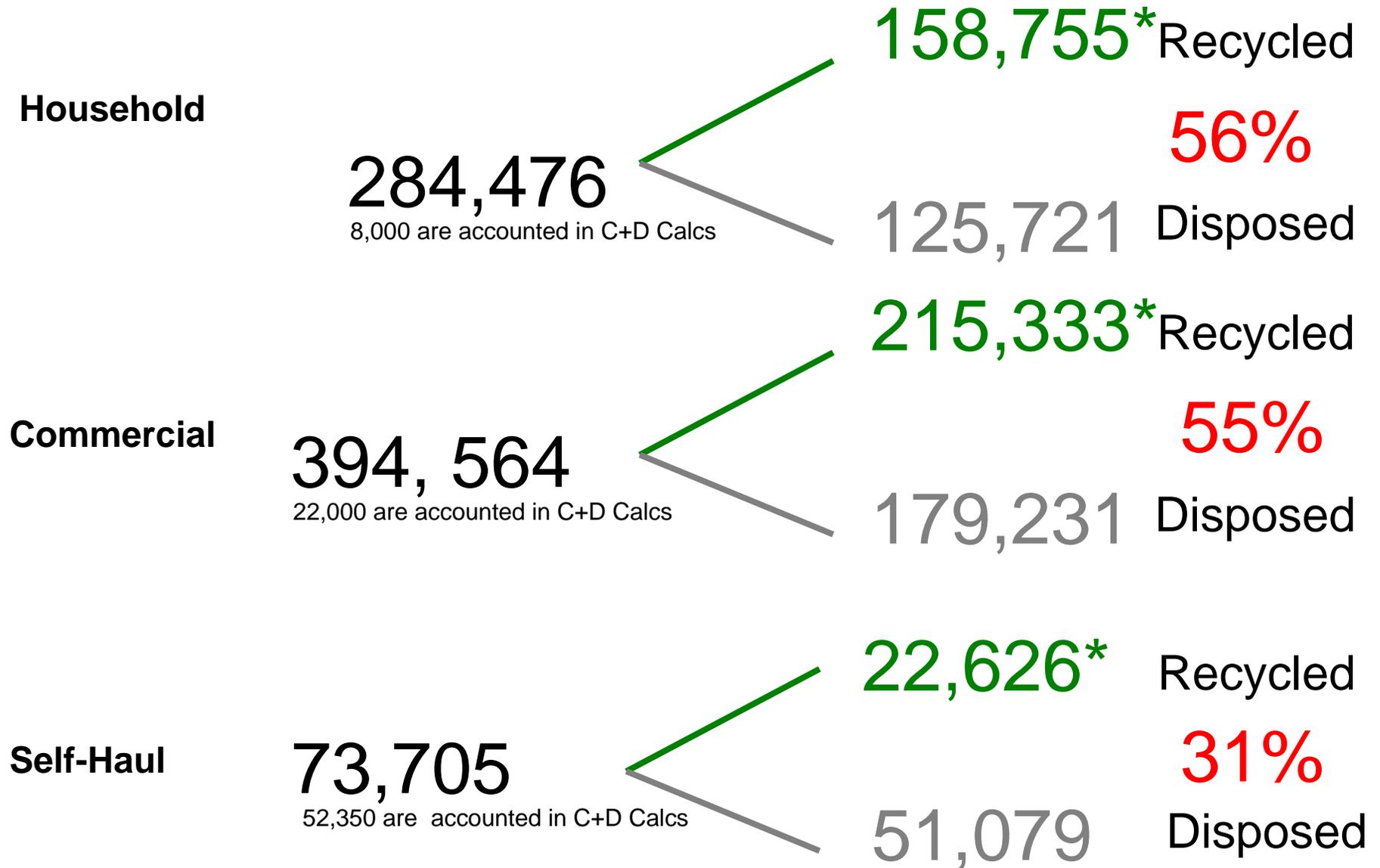
Copenhagen

55%

Seattle

52%

Seattle Recycling Rate according to Study=54%



* "City of Seattle Recycling by Year by Sector, 2006." Internal SPU Document, Jennifer Bagby.

Copenhagen's Official Recycling Rate=55%

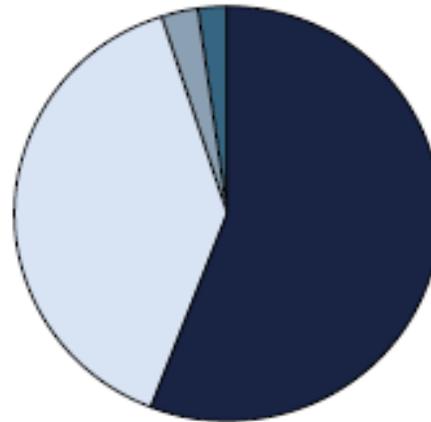
56% (2004) 54% (2006)

2004

2006

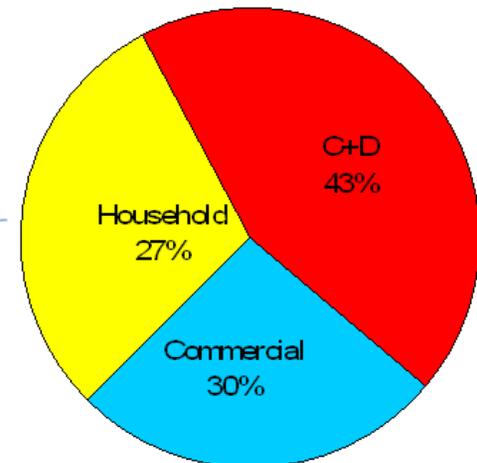
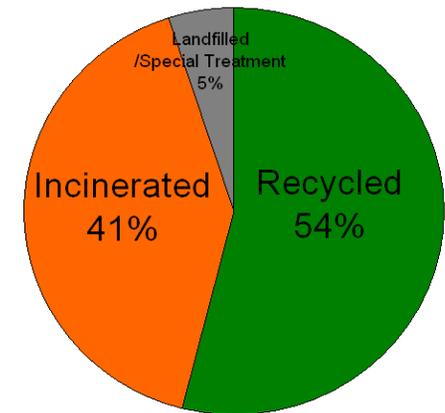
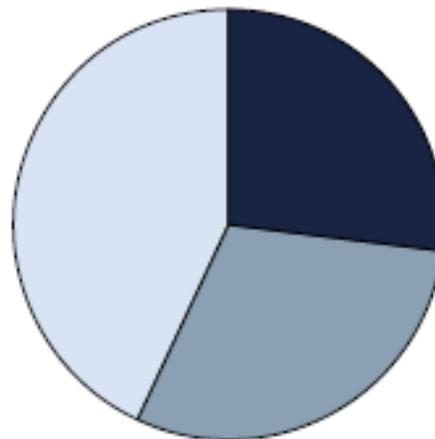
In 2004, total waste arisings were managed as follows:

- Recycling: 56 %
- Incineration: 39 %
- Landfill: 3 %
- Special treatment: 2 %



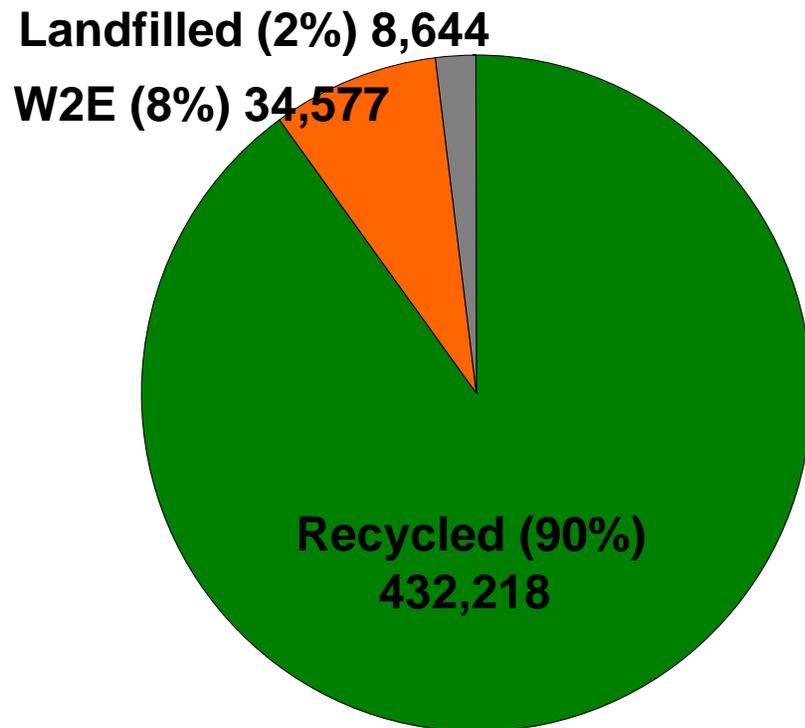
distributed as follows:

- Household waste: 27 %
- Industrial waste: 30 %
- Construction and demolition: 43 %

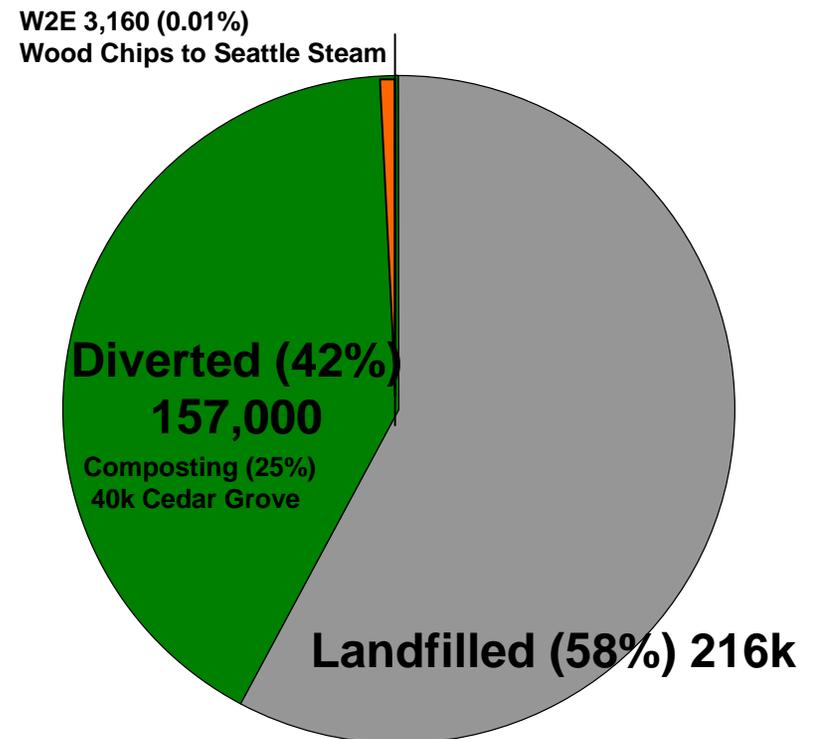


Total CD (+L) Waste and Treatment in 2006

Copenhagen 432,218 Tons (100%)

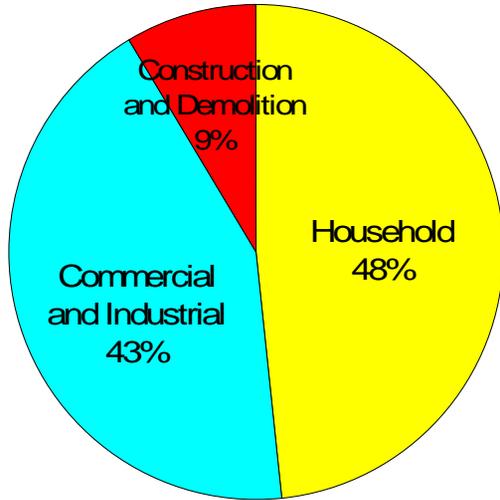


Seattle 373,000 Tons (100%)



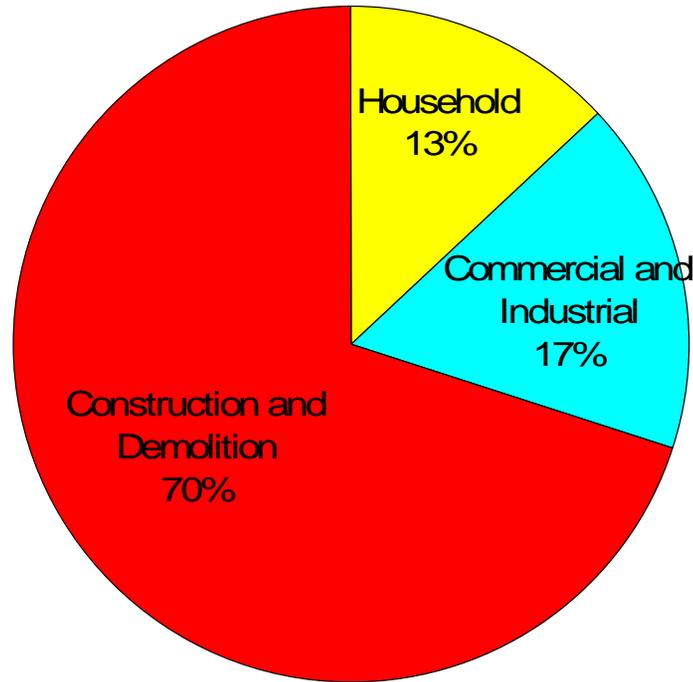
Incineration 40%

39% (2004) 41% (2006)

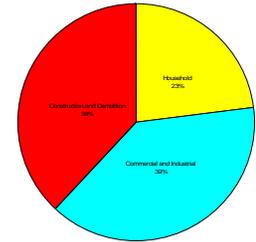


Recycle 55%

56% (2004) 54% (2006)



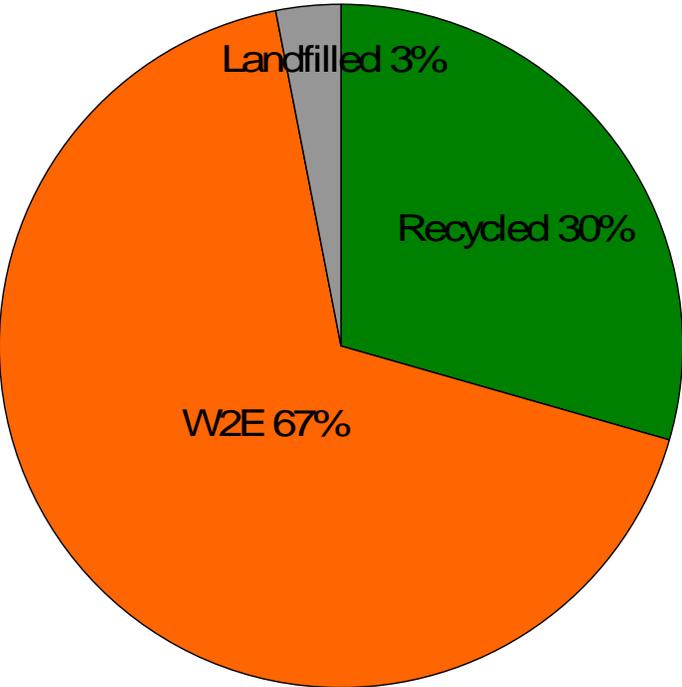
Landfill 3%



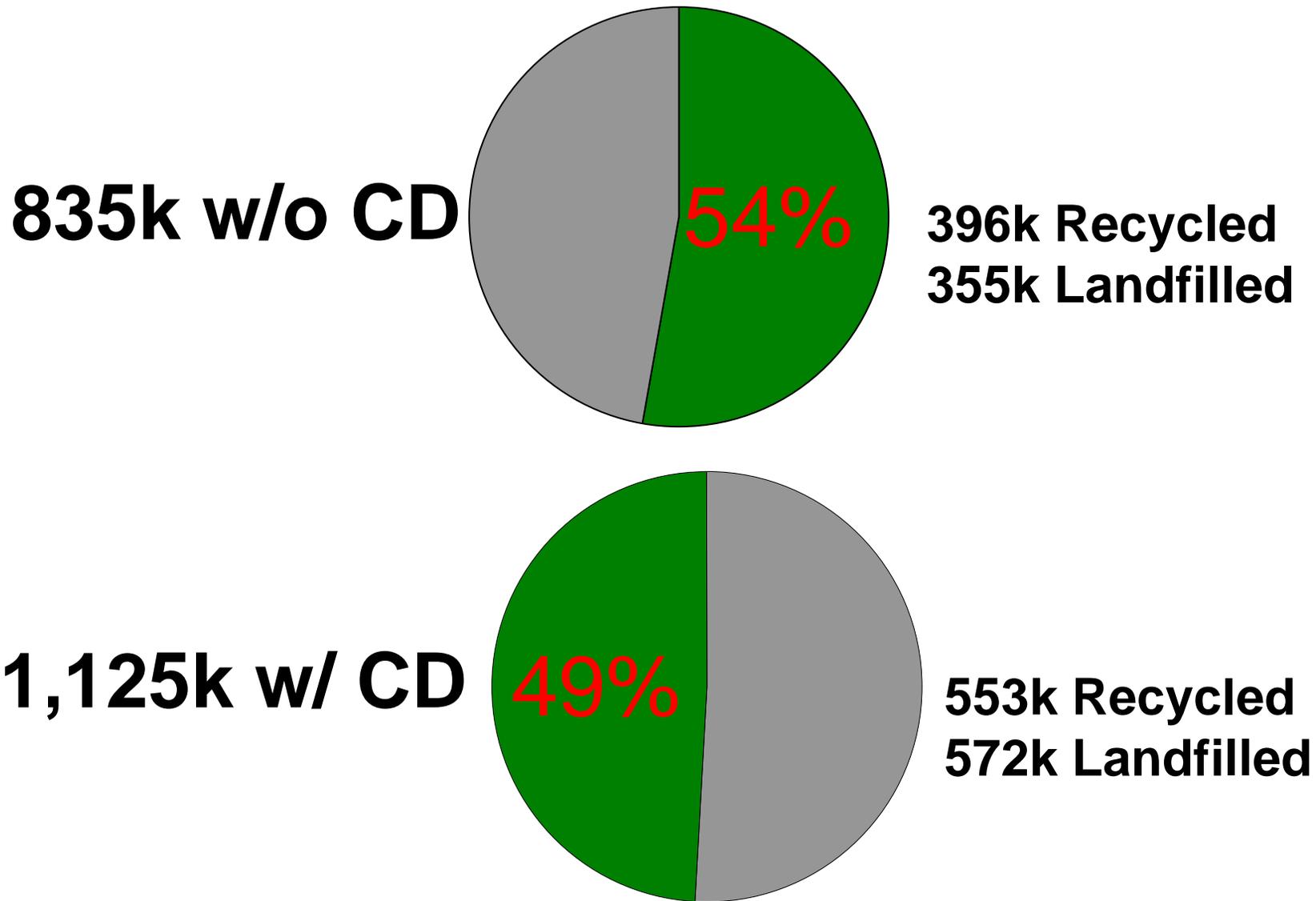
Special Treatment 2%

Copenhagen's Recycling Rate according to Study = 30%

Recycling Rate w/o C+D



Seattle Recycling Rate with and without C+D



Landfill / footprint

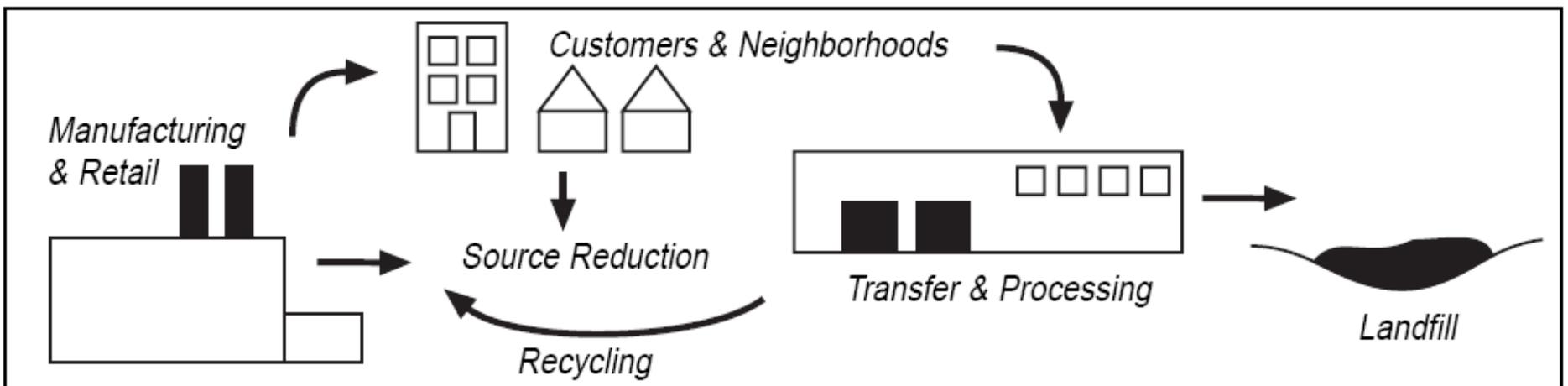
29K 572K Landfilled

5% / 200 times

Landfill / linear process

Solid Waste Continuum

Residents and businesses consume products and resources. Solid wastes from these products are reused, recycled into new products, or disposed of in a landfill. SPU programs intervene within this continuum to reduce the production of new wastes, increase reuse and recycling of wastes, and manage the safe disposal of remaining wastes.



**“You cannot run a linear system
on a finite planet indefinitely.”**

Story of Stuff

Landfill / imperfect – risk for future generations





“Peeing @ your neighbors yard is inmoral, even if you pay for it.”

Svend Aukend

Energy / Climate Change Considerations



Mile-long train of piggy-backed containers,
6 days a week, 300 miles away

Residential Collection - *Territories*

Waste Management



Rabanco (Allied Waste)



Commercial Collection – Territories: “Primary Service Areas”

- Optional

Rabanco (Allied Waste)



Waste Management



Residential Garbage Collection - *Tons to NRDS*

29,663 / 133,774 Tons = 22.1%

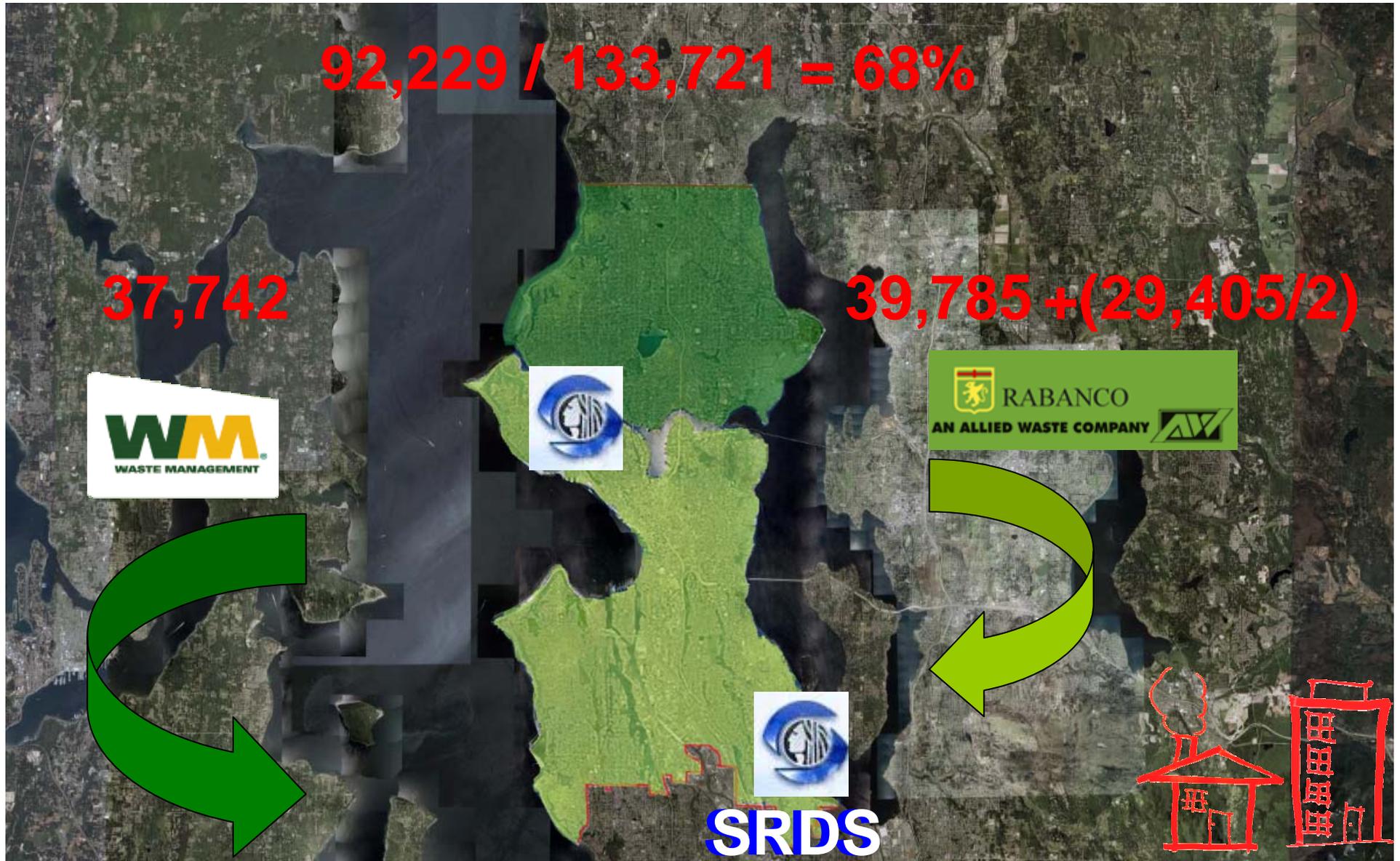
11,977

NRDS

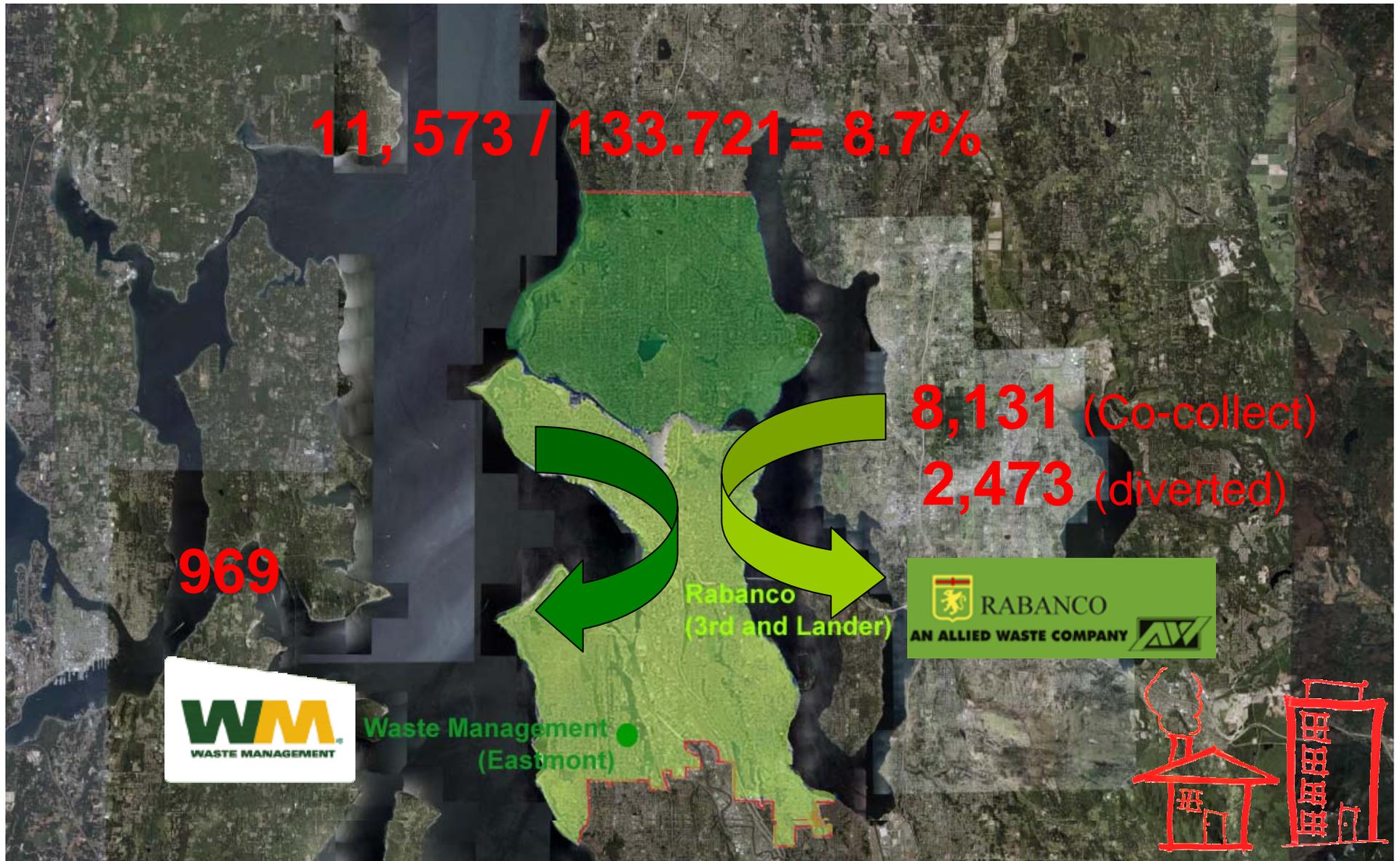
2,984 + (29,405/2)



Residential Garbage Collection - *Tons to SRDS*



Residential Garbage Collection - Tons to Private Facilities



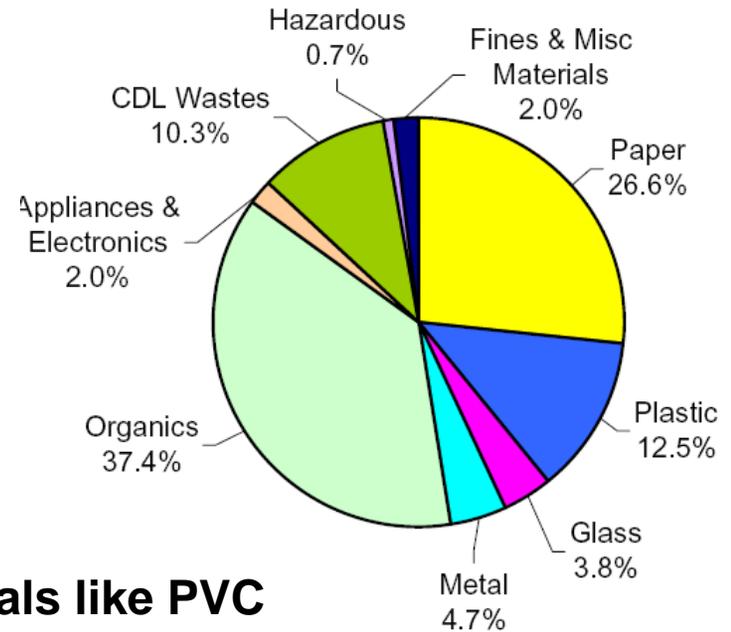
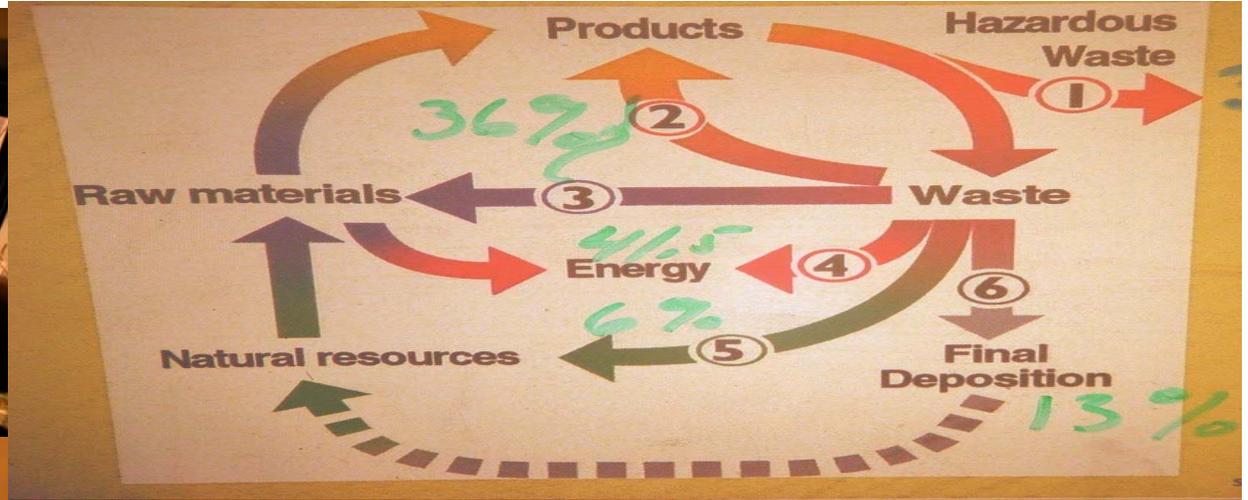
5:1 in BTUs

7:1 in CO2

Energy Surplus of 110 times

Trip	Miles	Tons	Mode of transportation	Btu per ton mile	Actual BTUs	lbs of CO2 per million Btu's per ton of fuel	Actual CO2 lbs
Step 1							
Residential-NRDS		2,50					
Residential-SRDS		2,50					
Residential-Rabanco		2,50					
Residential-WM		10,00					
<i>Residential subtotal</i>		133,461					
C+D Adjustment		8,000					
TOTAL RESIDENTIAL	2,55	125,461	Heavy Truck	3357	1,075,866,020,42	161,386	173,629,71
Commercial-NRDS		2,50					
Commercial-SRDS		2,50					
Commercial-Rabanco		8,00					
Commercial-WM		2,50					
<i>Commercial Subtotal</i>		200,205					
C+D Adjustment		22,000					
TOTAL COMMERCIAL	4,59	178,205	Heavy Truck	3357	2,747,885,138,56	161,386	443,470,19
Self-Haul - NRDS		2,50					
Self-Haul - SRDS		2,50					
<i>Self-Haul Subtotal</i>		103,423					
C+D Adjustment		52,350					
TOTAL SELF-HAUL	2,50	51,073	SUV Truck	4329	552,737,542,50	156,425	86,461,97
Step 2							
Rabanco - ARGO		2,00					
WM - ARGO		2,50					
NRDS - ARGO		8,20					
SRDS - ARGO		2,10					
<i>Garbage Subtotal</i>		437,089					
C+D Adjustment		82,350					
TOTAL GARBAGE FOR DISPOSAL	3,94	354,739	18 Wheel Heavy Truck	3357	4,690,379,127,84	161,386	756,961,53
Step 3							
ARGO - ORE	290,00	354,739	Rail Class 1	344	35,388,762,640,00	161,386	5,711,250,85
TOTAL CO2 EMISSIONS SEATTLE WASTE COLLECTION/TRANSPORT SYSTEM							7,171,774,25
Step 1							
Residential-Commercial to Amagerforbrænding		2,00					
Residential-Commercial to Vestforbrænding		7,00					
<i>Residential subtotal</i>		553,000					
					3,900,000,000,000,00		
TOTAL RESIDENTIAL/COMMERCIAL W2E PLANTS	3,67	553,000	Heavy Truck	3357	6,806,877,000,00	161,386	1,098,534,65
					3,893,193,123,000,00		
TOTAL CO2 EMISSIONS COPENHAGEN WASTE COLLECTION/TRANSPORT SYSTEM							1,098,534,65

3:1 oil:garbage vs 400 years



Ban Materials like PVC

Density: 35 mi² vs 91m²



R-98 non-profit concessionary company owed by the municipalities of Fredericksberg and Copenhagen, operating since 1898.

7 miles from the city hall





Crushing of concrete



Sorting of garden and park waste



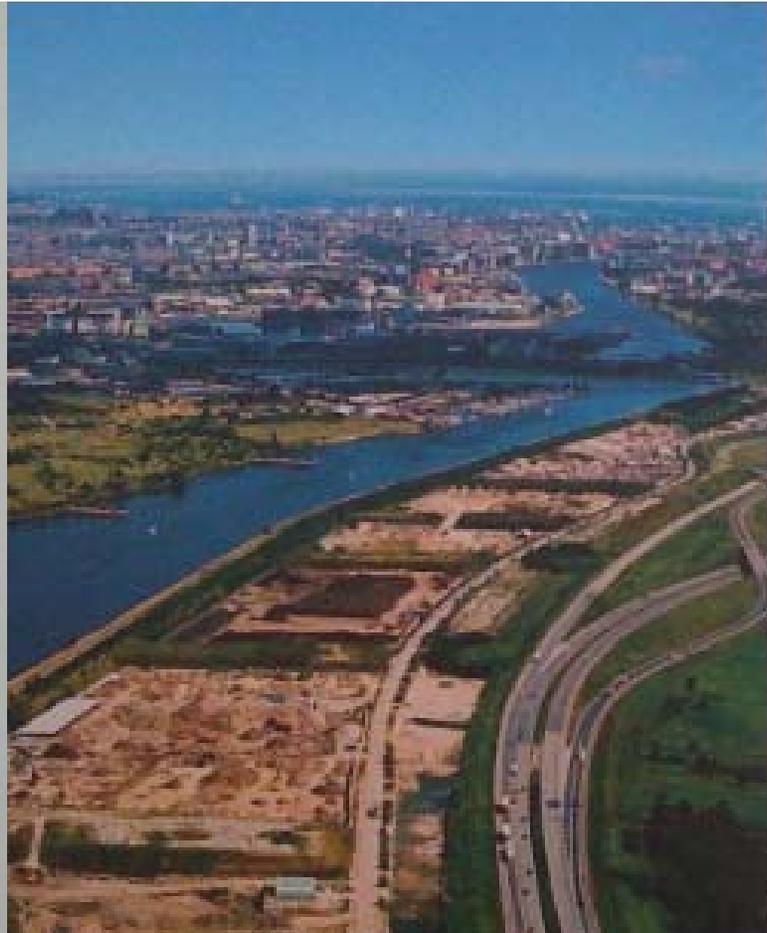
Sorting of timber



Sorting of plastic, foam and



Big wheels



Copenhagen Recycling Center

TREATMENT OF WASTE IN COPENHAGEN'S BACKYARD

RMC opened its plant in Copenhagen's backyard in 1994. The location, only 100 kilometers from downtown Copenhagen, ensures minimal traffic both when waste is brought to RMC and when recyclables are loaded back for use in the Danish building and construction sector.

This is of benefit to the environment, since both its land and storage and heavy traffic is reduced considerably on the heavily trafficked roads. But the location has another advantage as the site is flat, it is built behind a natural area – close to the City.

Initially, there are also disadvantages in placing a waste management facility so close to the City: odors, traffic, dust and noise. In order to maintain a low threshold, RMC is constantly in dialogue with neighbours and politicians in order of solving problems quickly and efficiently.

Other measures are engaged by creating low-impact structures that are forested after, and by checking wind direction before sorting. Transport routes, although not that significant, are included in the considerations during the preparation of final plans. The construction of a new access road for example, reduced traffic disturbance to around one thousand cars. Other measures are achieved by creating and marking dimensions and open spaces, and almost all noise is recuperated to large noise dampeners at the exit.



TURNING A WASTE MANAGEMENT FACILITY INTO A NATURAL PARK



ENVIRONMENTAL PROTECTION AGENCY
CITY OF COPENHAGEN
COPENHAGEN RECYCLING CENTRE

70,000 homes

• Incineration: Vestforbrænding

1/3 of Copenhagen's Waste

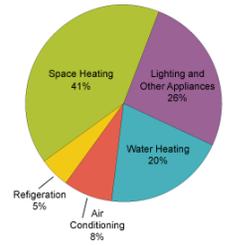
- Capacity: 500,000 t/year
- Energy Production: 4,200,000 GJ/year (heat 90%, elec. 10%)
- Partners: Copenhagen and 20 other municipalities

Incineration: Amagerforbrænding

• 2/3 Copenhagen's Waste

- Capacity: 400,000 t/year
- Energy Production: 2,844,000 GJ/year (heat 75%, elec. 25%)
- Partners: Copenhagen and 4 other municipalities

How Energy Is Used in Homes (2005)



Source: U.S. Energy Information Administration, Residential Energy Consumption Survey 2005



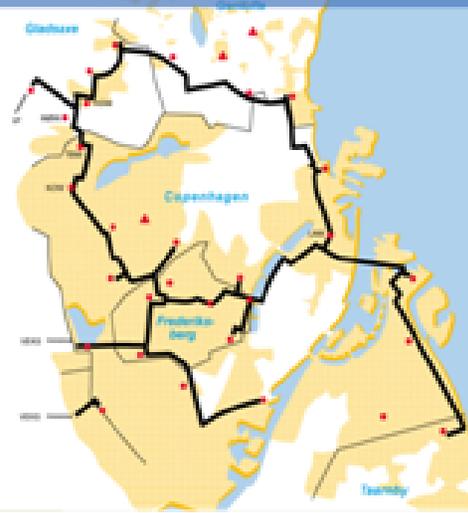
INFRASTRUCTURE

District Heating

A District Energy System takes thermal energy (heating or cooling) from one or more sources and distributes it to multiple customers through a piping distribution network.

CTR- the company that owns the Main District Heating Network in Greater Copenhagen- serves 5 municipalities with 34 miles of double pipes. The company employs 60 people annually, and has an annual turnover of 1.5 billion DKK.

The investment expenditure for the entire transmission net currently totals 3 billion DKK (US \$500 million) -double the annual turnover. It has the ability to heat 275,000 households (90-95% of those living in the area).



CHP Plants (70% of CTR's heat supply)

In a traditional thermal power plant 40% to 60% of the energy contained in the fuel is dispersed into the atmosphere or cooling water as "waste" heat. In CPH Plants, this "waste" heat is captured and used for different purposes: district heating, industrial processes and other production processes. As a result the overall plant efficiency can be increased to 90% or more.



W2E Facilities (25% of CTR's heat supply)

For every THREE tons of waste, a "State of the Art" Incinerator can extract the equivalent ENERGY of ONE ton of oil.

On an Average Danish incinerator, 4 tonnes of waste substitutes 1 tonne of oil or 1.6 tonnes of coal.

LFBS





Inspiration

[Top 10 sights](#)[Top 10 alternative](#)[Top 10 on a warm day](#)[Top 10 on a cold day](#)[Top 10 for kids](#)

Green Copenhagen

CO2 neutral in 2025

[10 eco things you can do](#)[Green hotels](#)[Green transportation](#)[Green restaurants](#)[Green shopping](#)[Farms and ecovillages](#)[Green experiences](#)[Green Copenhagen on film](#)[Romantic Copenhagen](#)[Tourist](#) > [What to see and do](#) > [Inspiration](#) > [Green Copenhagen](#) > [CO2 neutral in 2025](#)

Copenhagen CO2 neutral in 2025

Copenhagen is to be the world's first CO2 neutral capital in 2025. That is according to the climate strategy of the Municipality of Copenhagen. Great efforts lie ahead for both city and citizens, but Copenhagen is well on its way.

Ecology, environment and sustainability are of concern to both consumers, retailers and politicians in Copenhagen. As the host city for the UN Climate Change Conference in 2009 Copenhagen is a forerunner in the fight against greenhouse gases and global warming.

The municipality has a plan to reduce Copenhagen's total CO2 emissions by 20 percent from 2005 - 2015 and make it the world's first CO2 neutral capital by 2025. The city is already well underway.

