Increasing CO_2 reductions related to source separation of Municipal Biowaste in The Netherlands

1. CO_2 reductions should not harm compost production

2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste

3. CO_2 tool to compare options for municipal biowaste, used in RFP's

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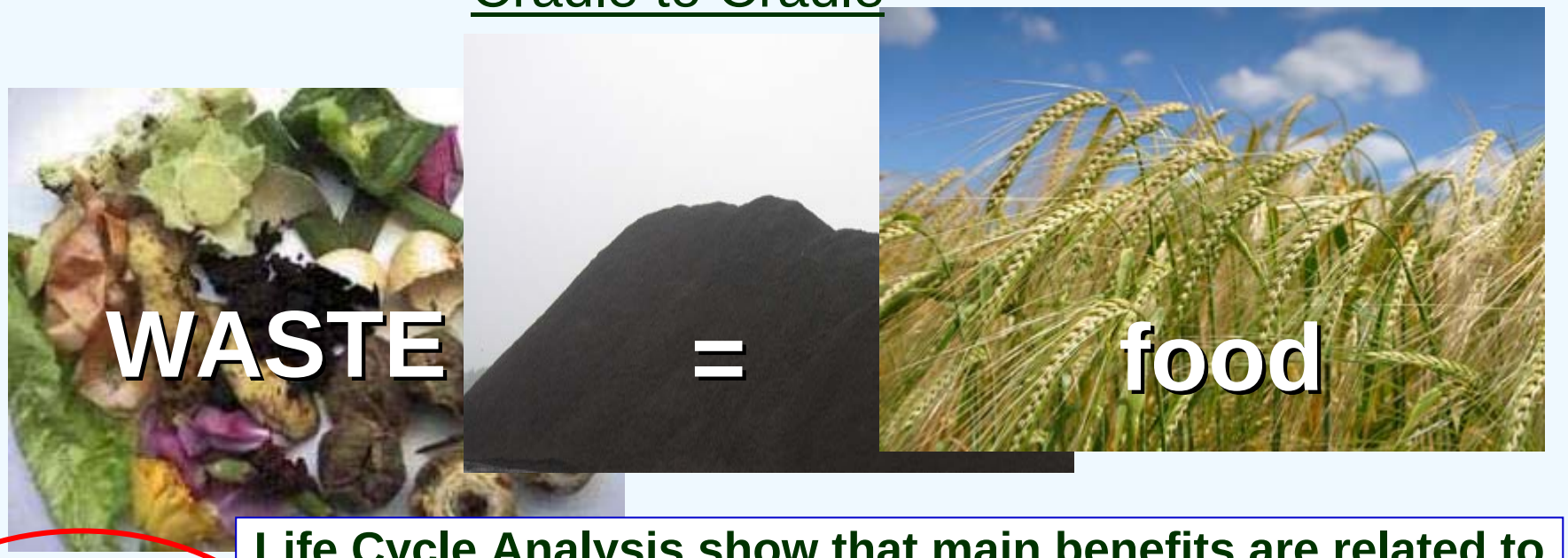
1. CO_2 reductions should not harm compost production

Cradle to Cradle



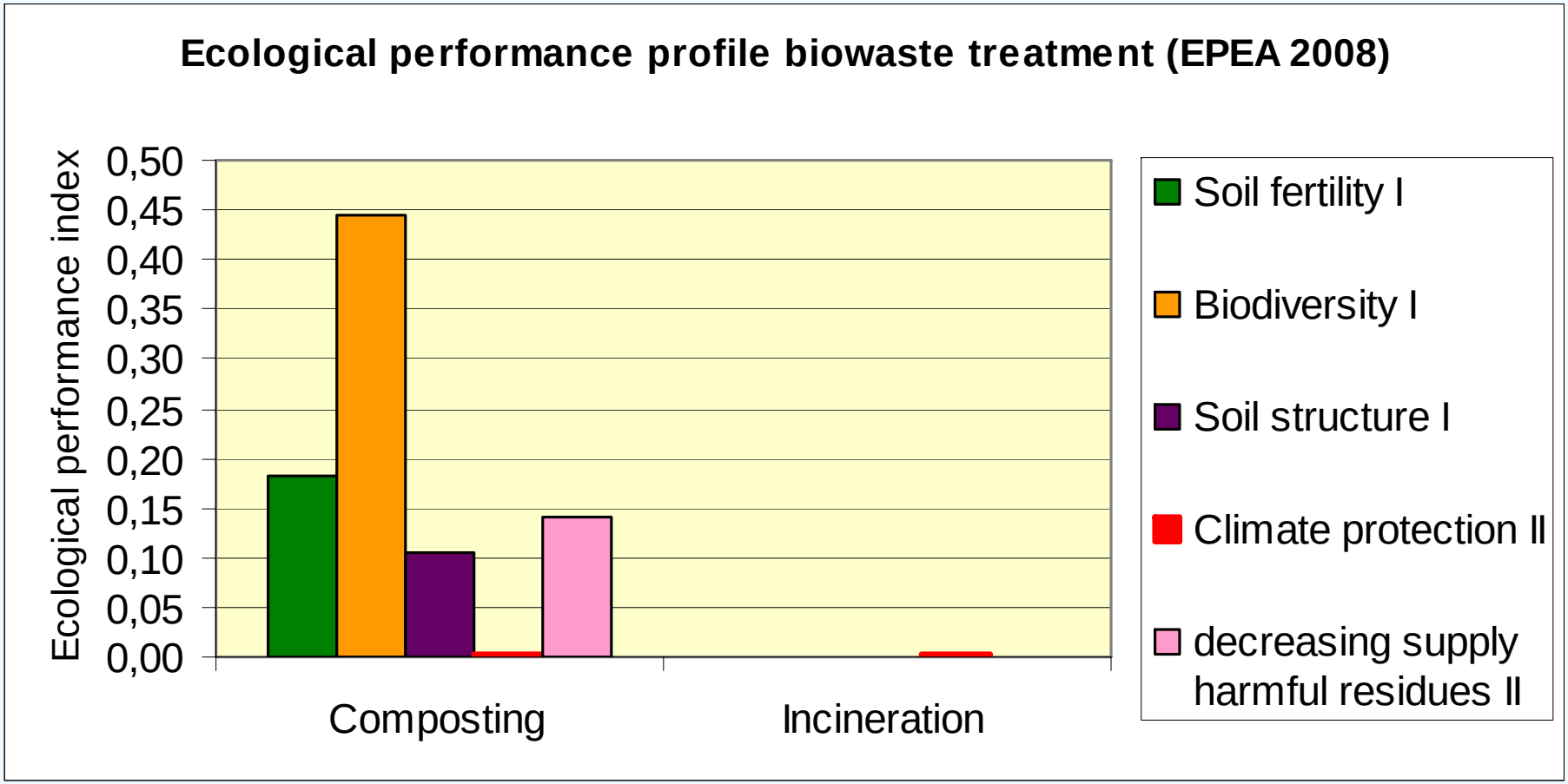
Waste = food

Life Cycle Analysis show that main benefits are related to the application of compost

Dutch vision on bio-based economy & energy-transition underlines importance of compost

Dutch NGO's document on 'green biomass' :
Energy production should not harm compost production

1. CO_2 reductions should not harm compost production



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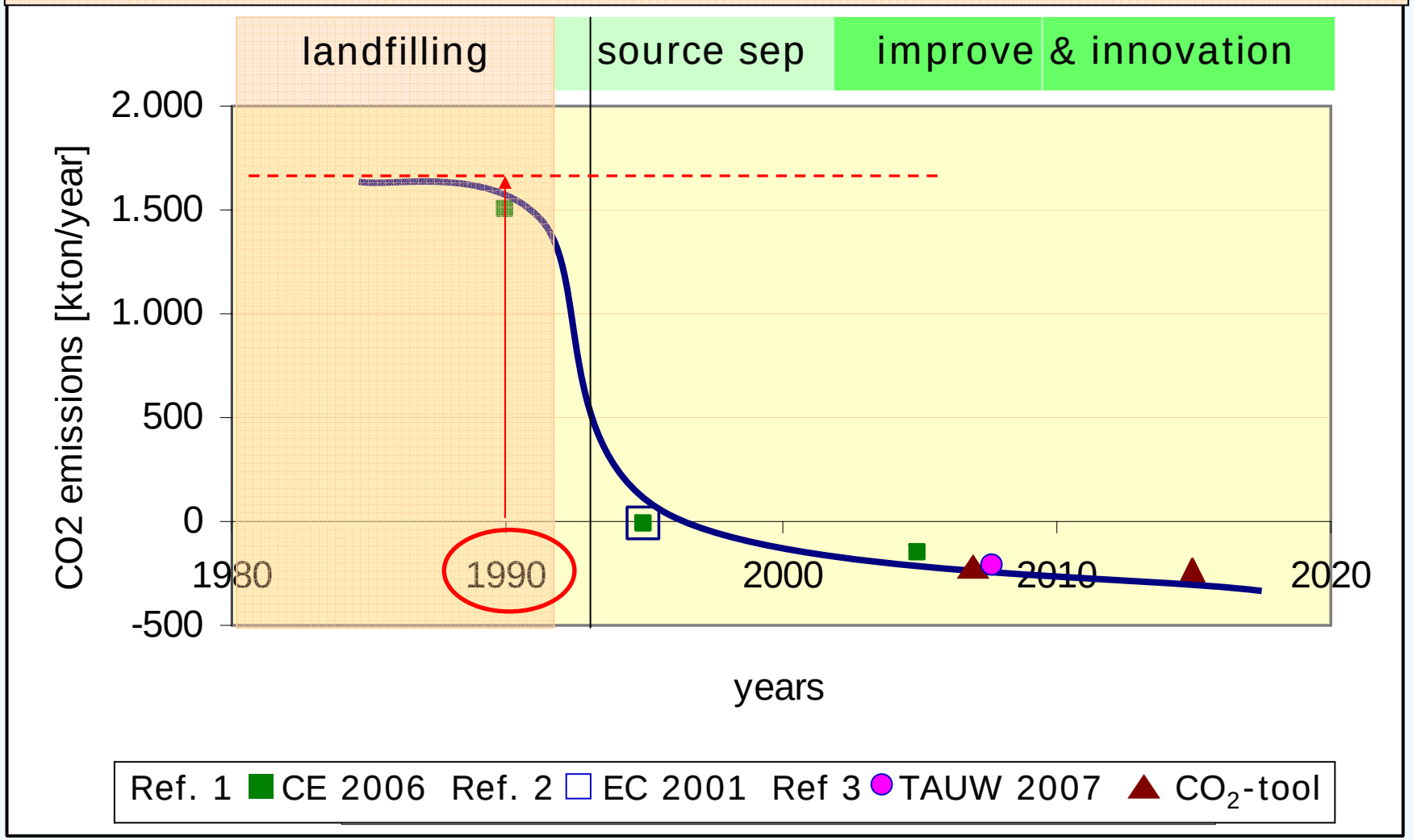
Incineration destroys the compost related benefits

1. CO_2 reductions should not harm compost production

Aim 2015

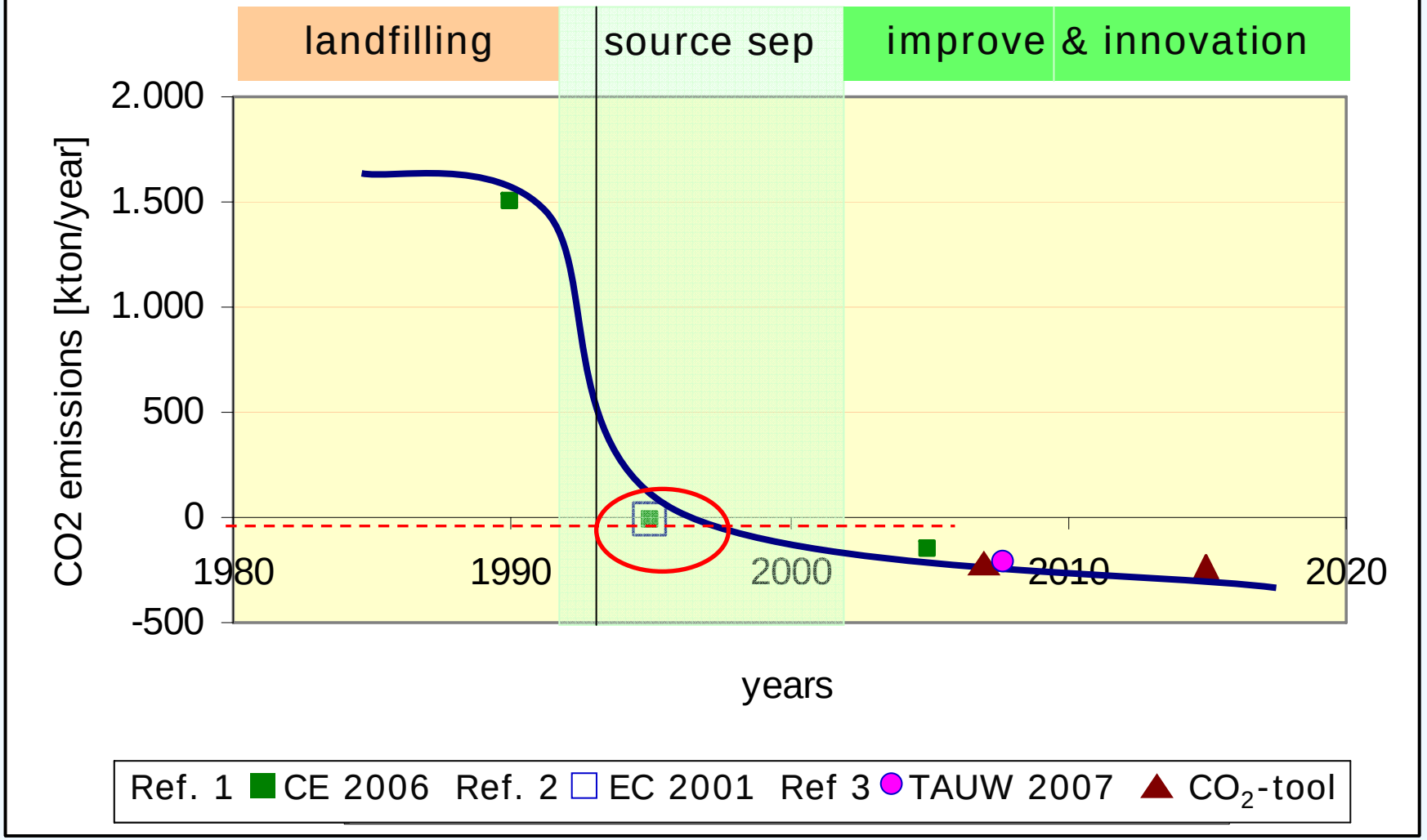
Waste
=
food
+
energy

1990: Source separation of the present 1.500 kton municipal biowaste was not yet implemented (not yet diverted from landfilling). Landfilling of municipal waste under 1990 conditions caused emissions of ±1 ton $CO_{2\text{-eq}}$ /ton waste, 1.500 kton $CO_{2\text{-eq}}$ /year, mainly as methane (reference: CE[1])



2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste

1994: Source separation of the present 1.500 kton municipal biowaste became mandatory (implemented by law). So 1.500 kton waste was diverted from the landfill, avoiding the emission of 1.500 $CO_{2\text{-eq}}$ /year. Closed composting[2] results in a small negative flux (capture) of -10 kg $CO_{2\text{-eq}}$ /ton waste, saving -17 kton $CO_{2\text{-eq}}$ /year[1,2]



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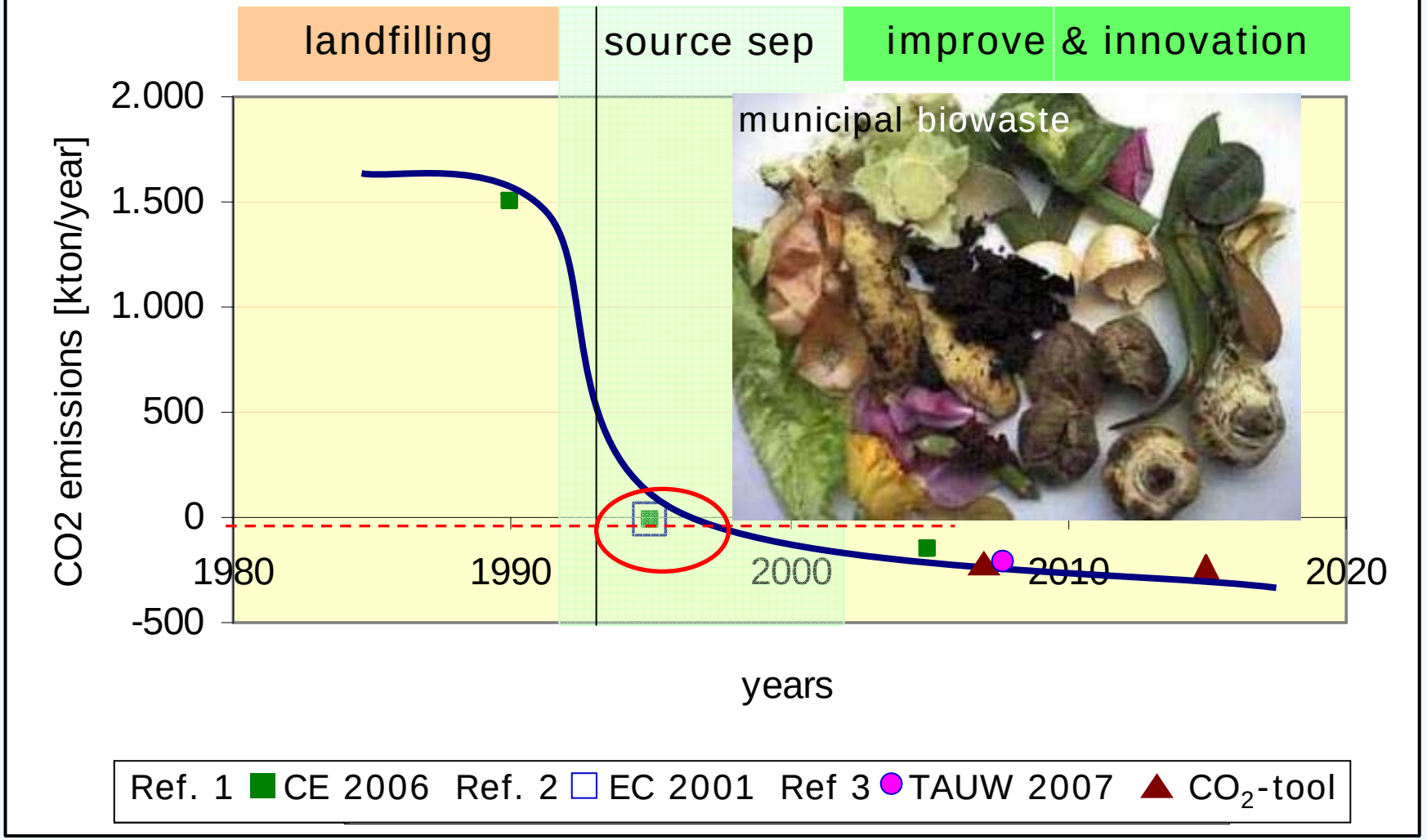

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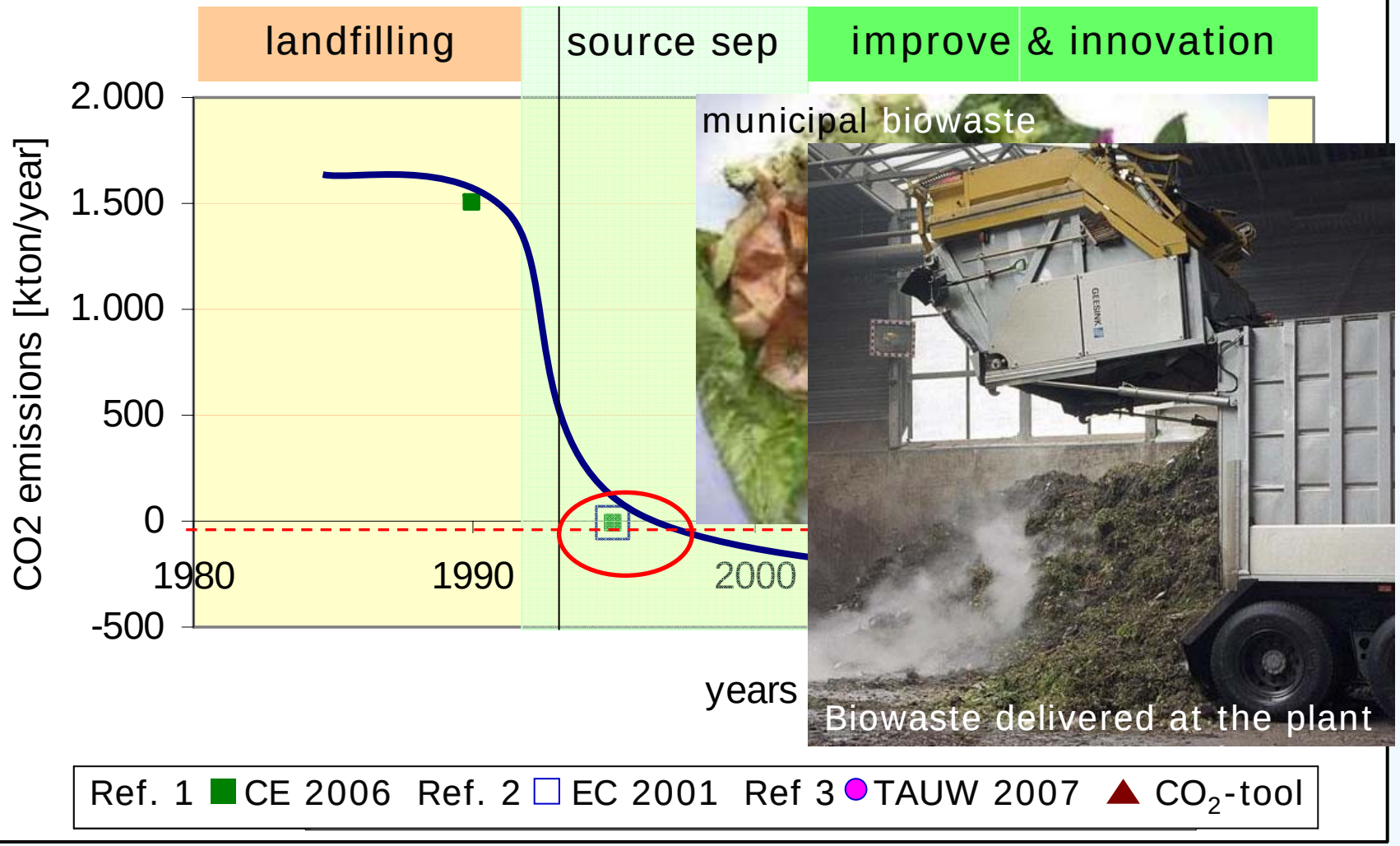
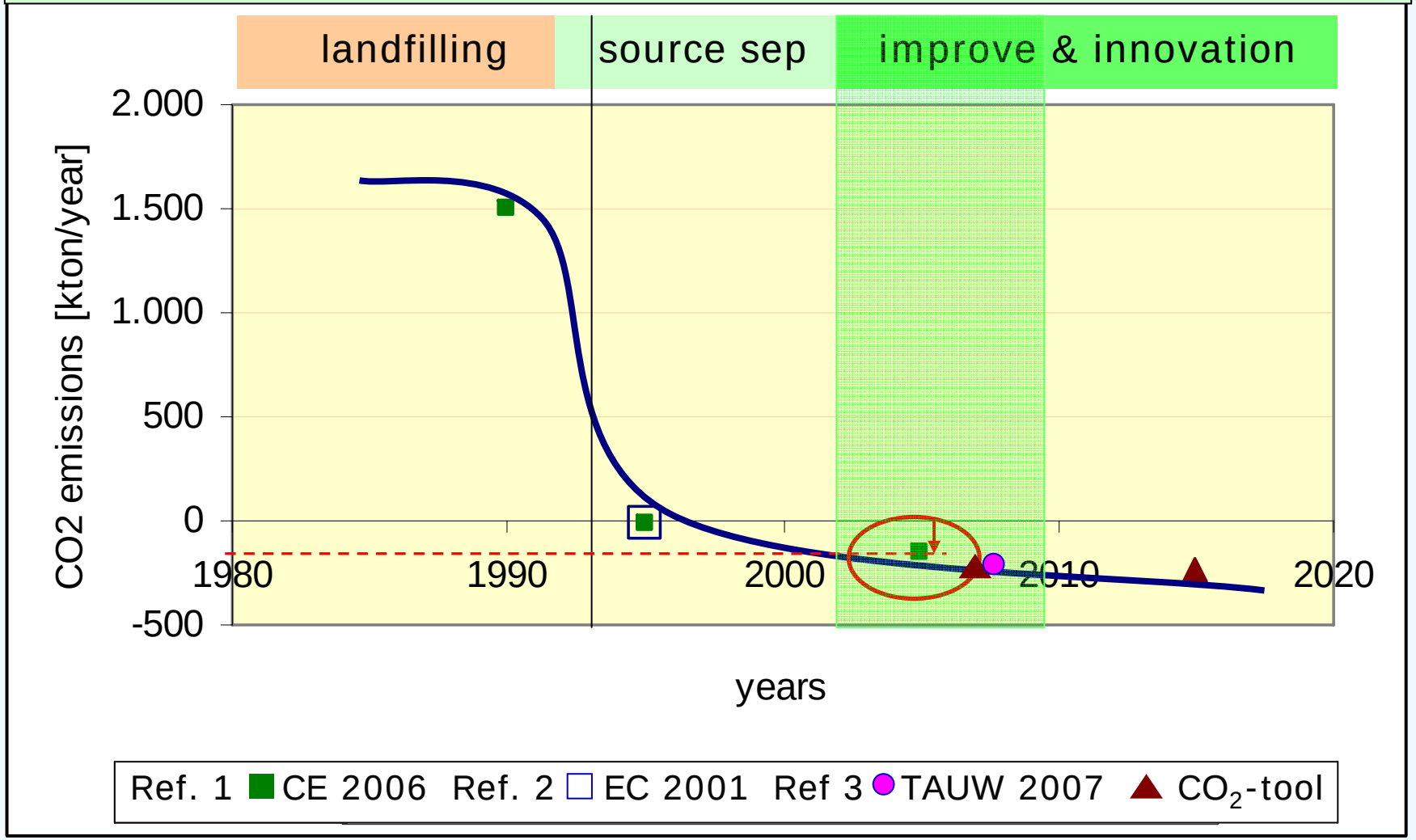


2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste

2007: Composting processes and energy-efficiency are strongly improved, producing high quality compost. A quick scan at four representative plants indicated lower process emissions (more data will be published this year). The negative flux (capture) of $CO_{2\text{-eq}}$ improved to -155 kton $CO_{2\text{-eq}}$ /year[1]



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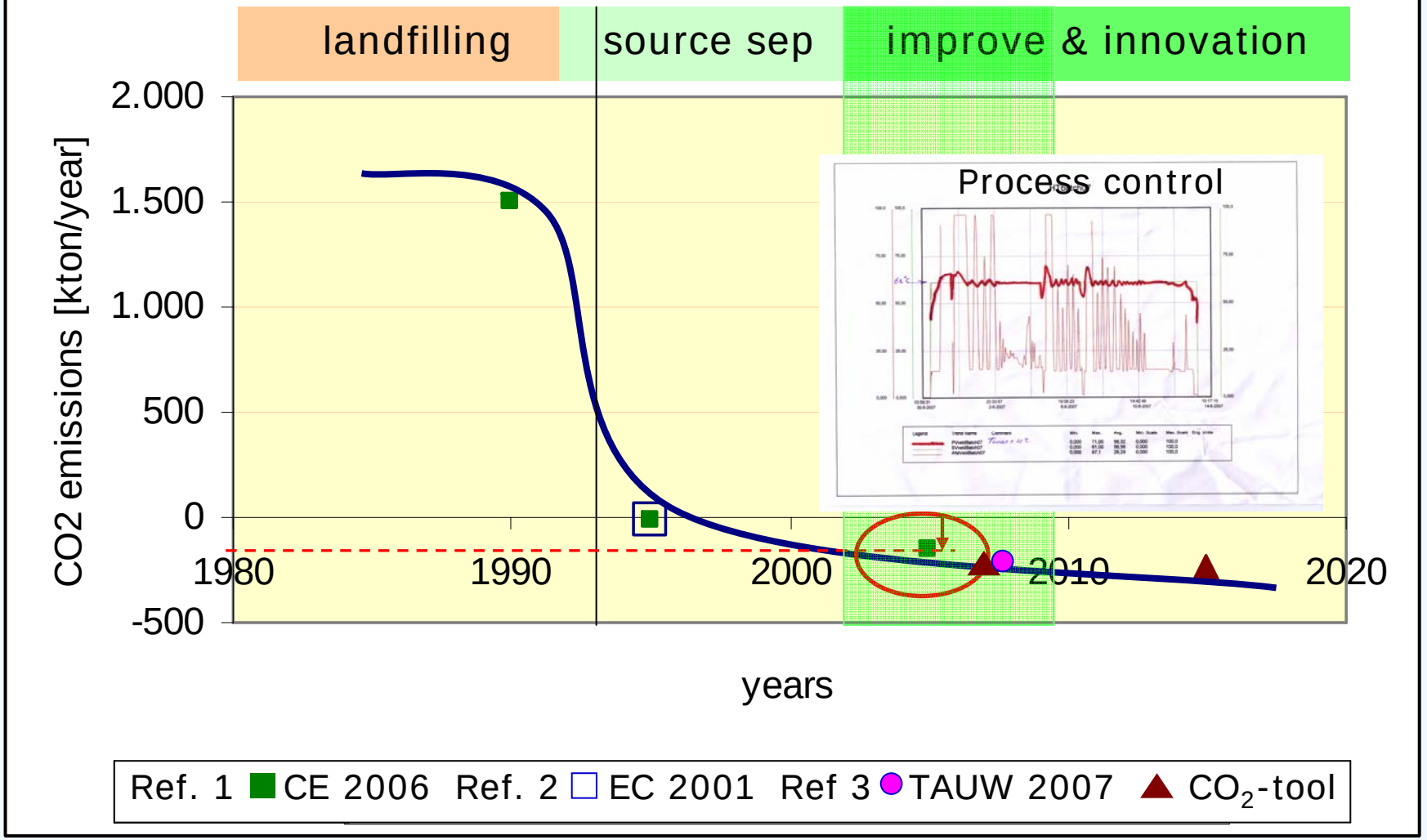

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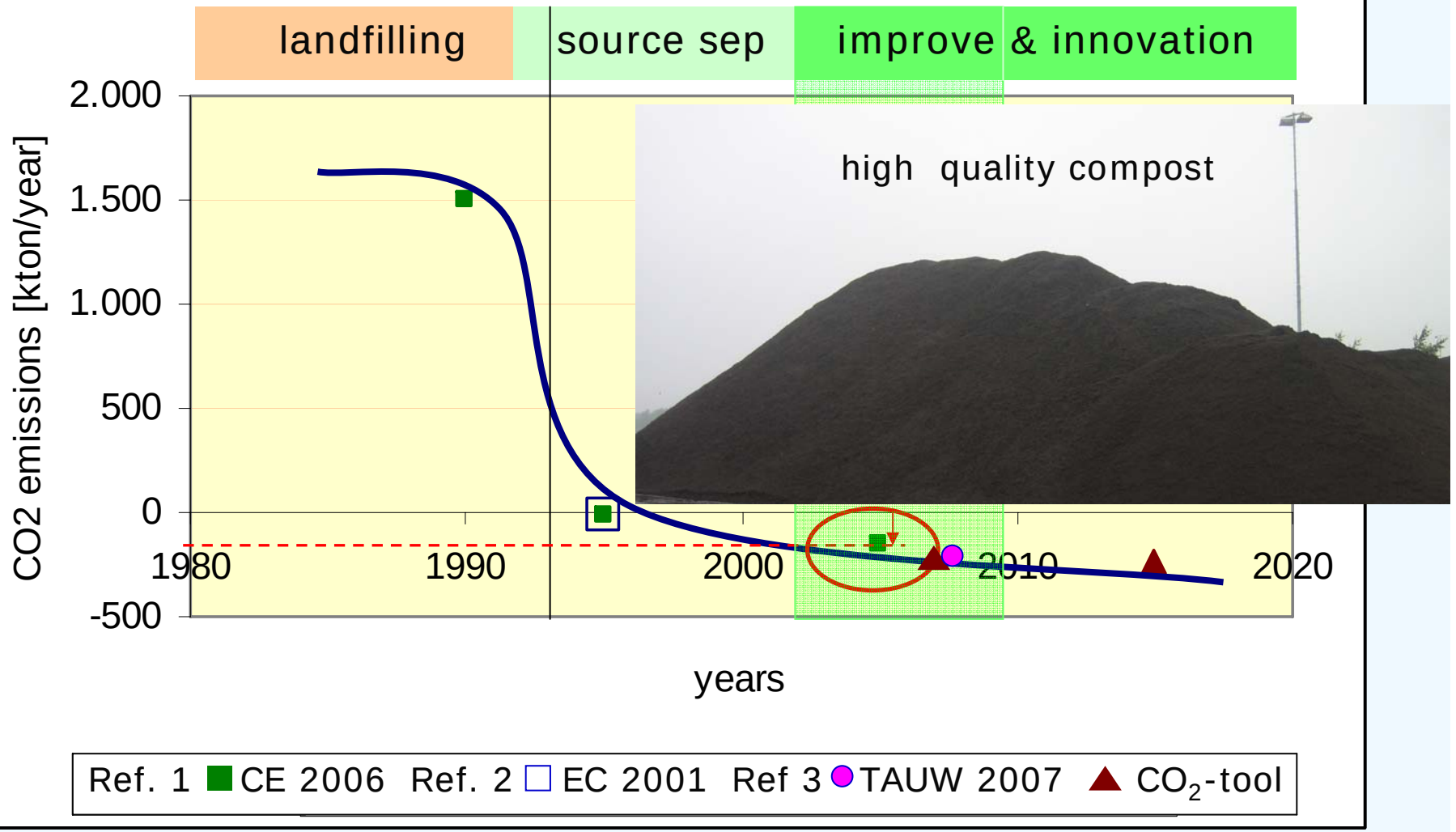

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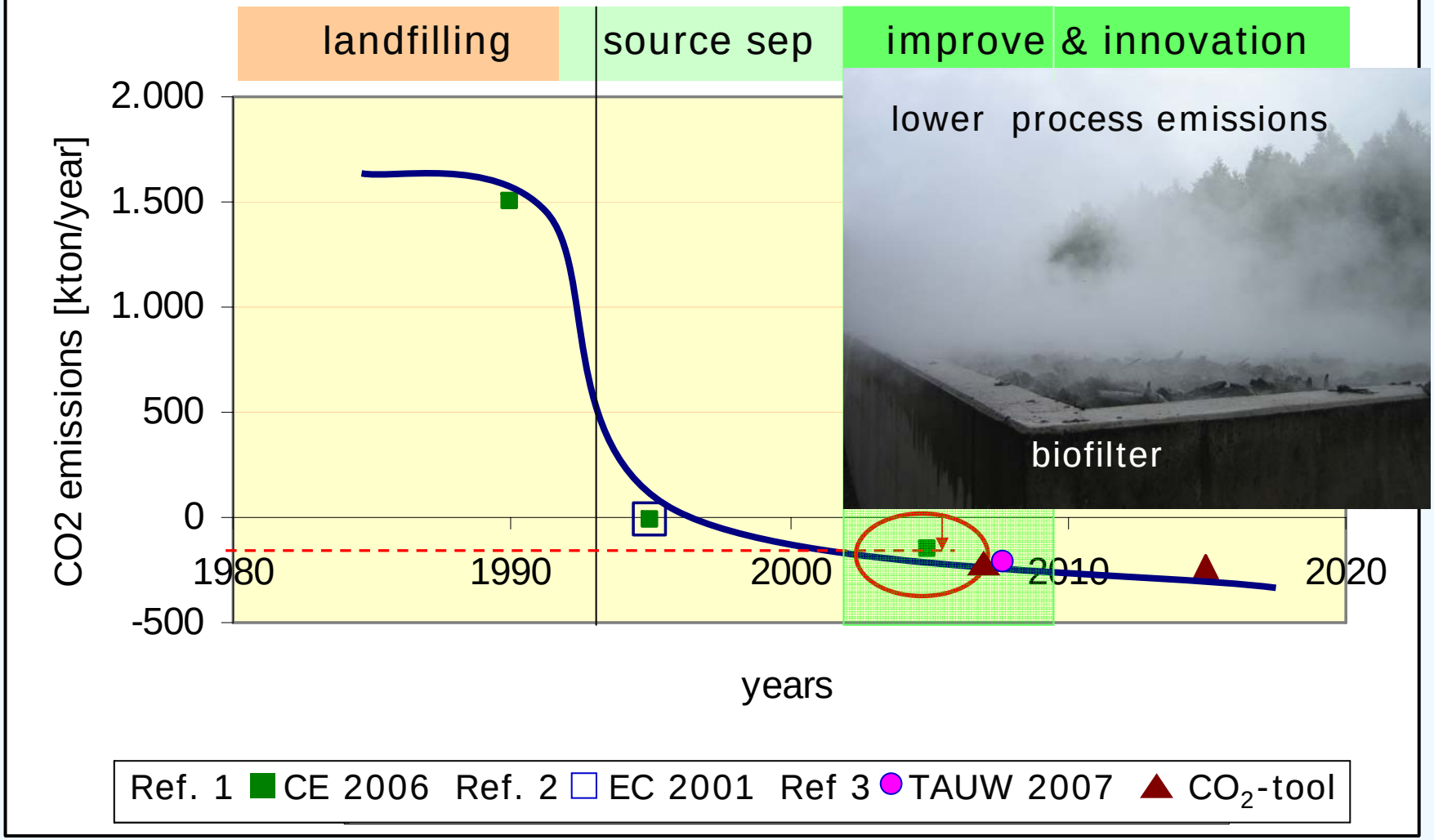
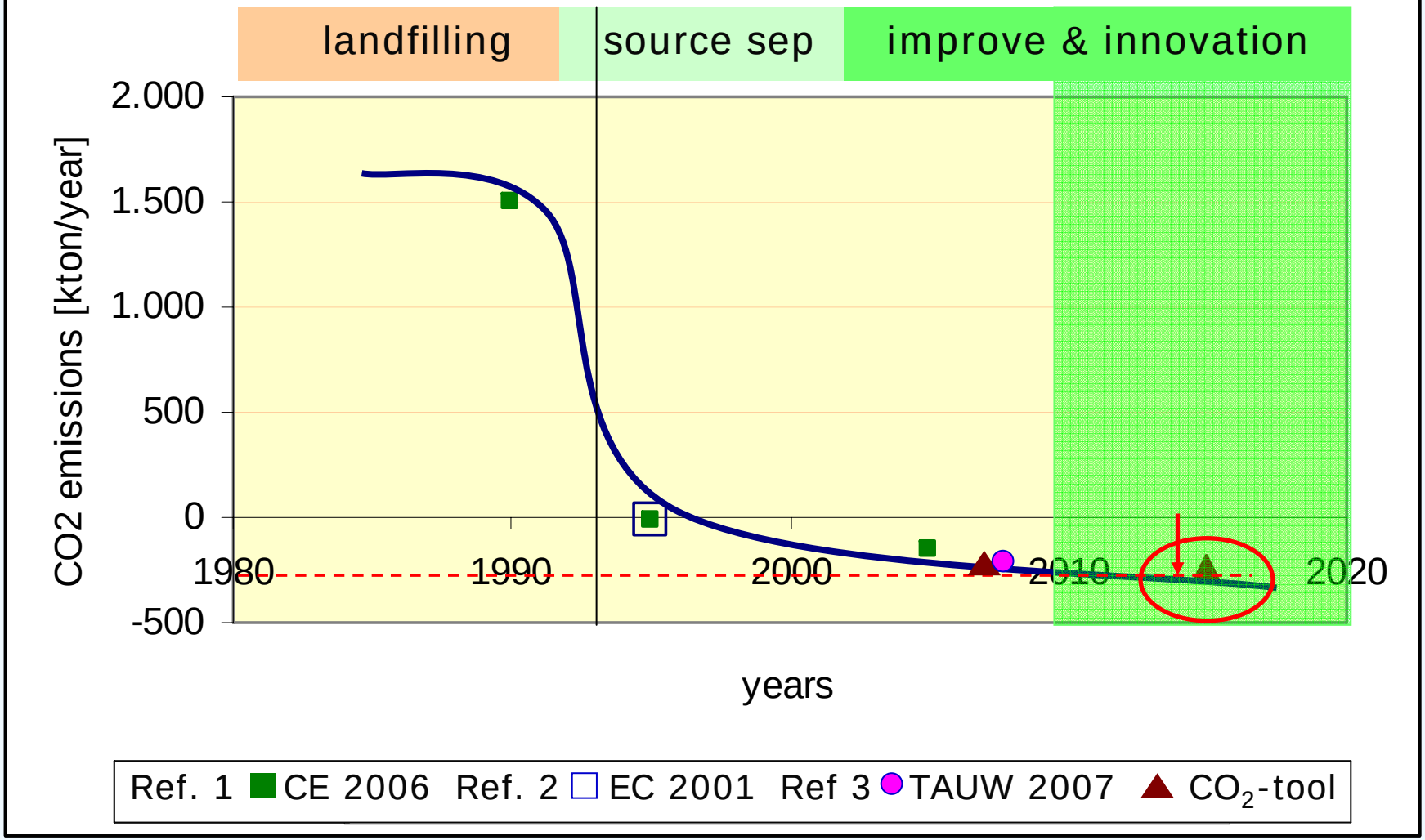


2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste

2015: Ongoing innovation is leading in the composting sector. An increasing share of peat in potting soils and gardening is replaced by compost. Composters produce upgraded biomass, ready for use in biomass power plants The share of anaerobic digestion is growing and listed projects implement CHP. As a result, capture of CO_2 will increase, saving about -238 kton $CO_{2\text{-eq}}$ /year[2]



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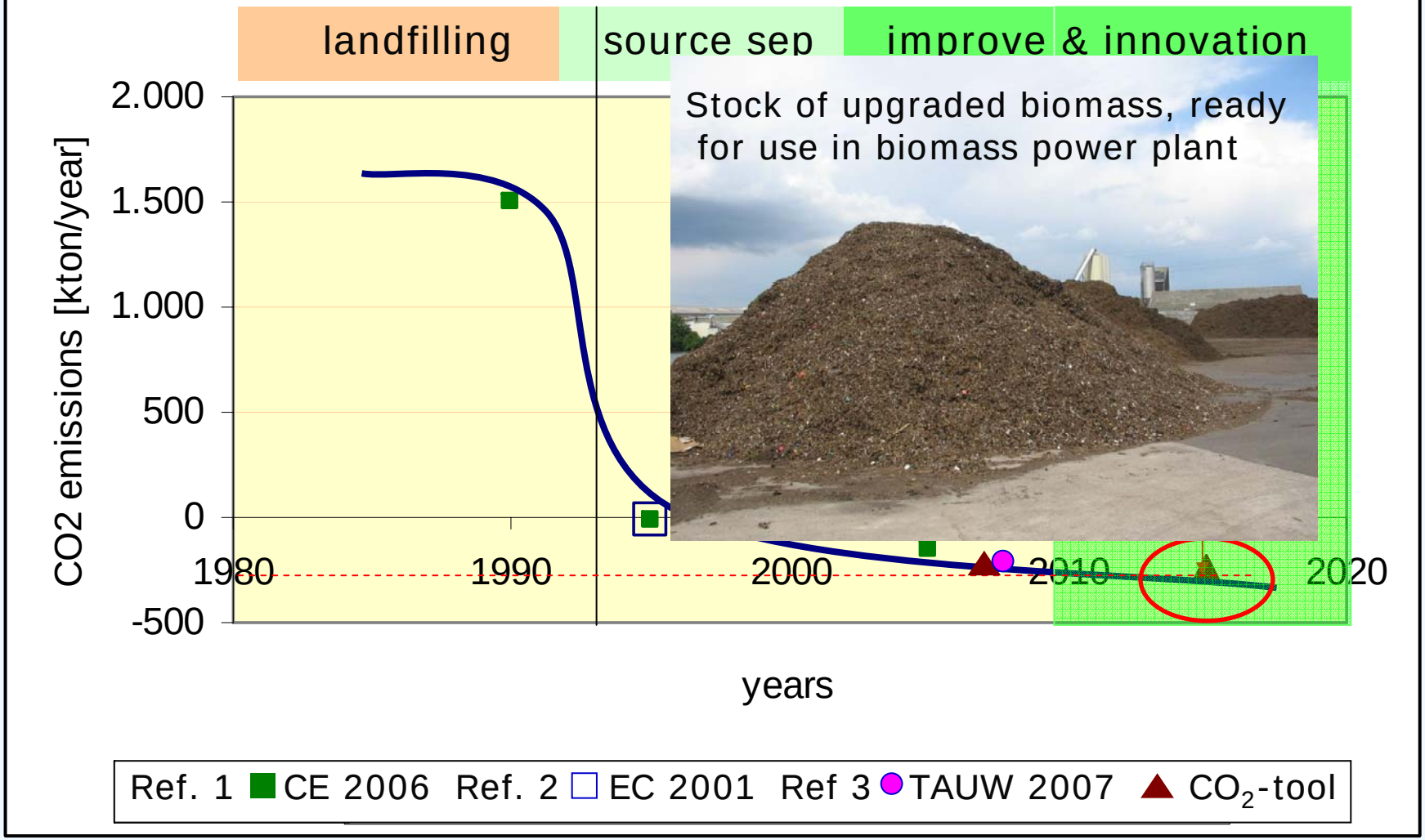

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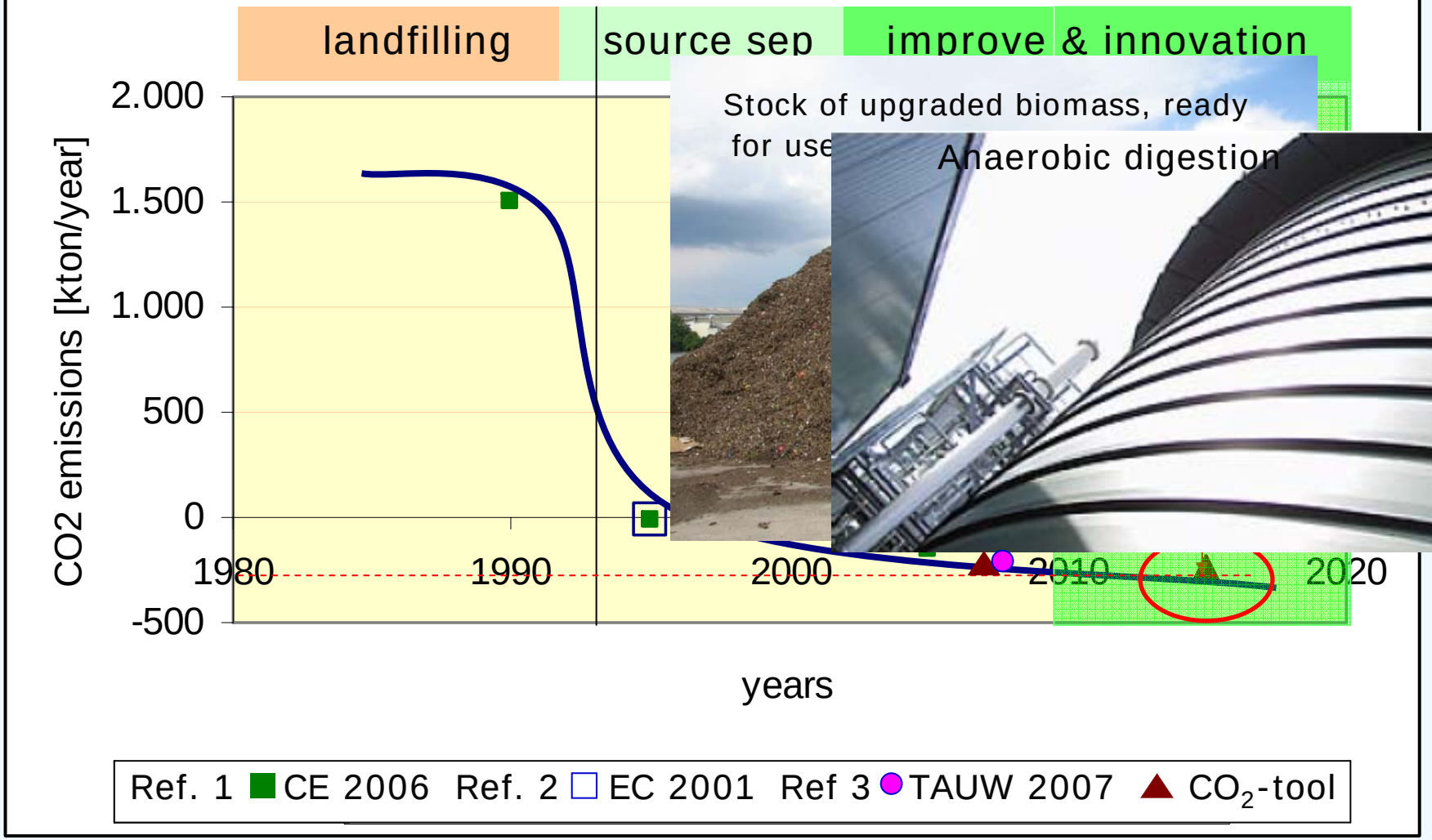
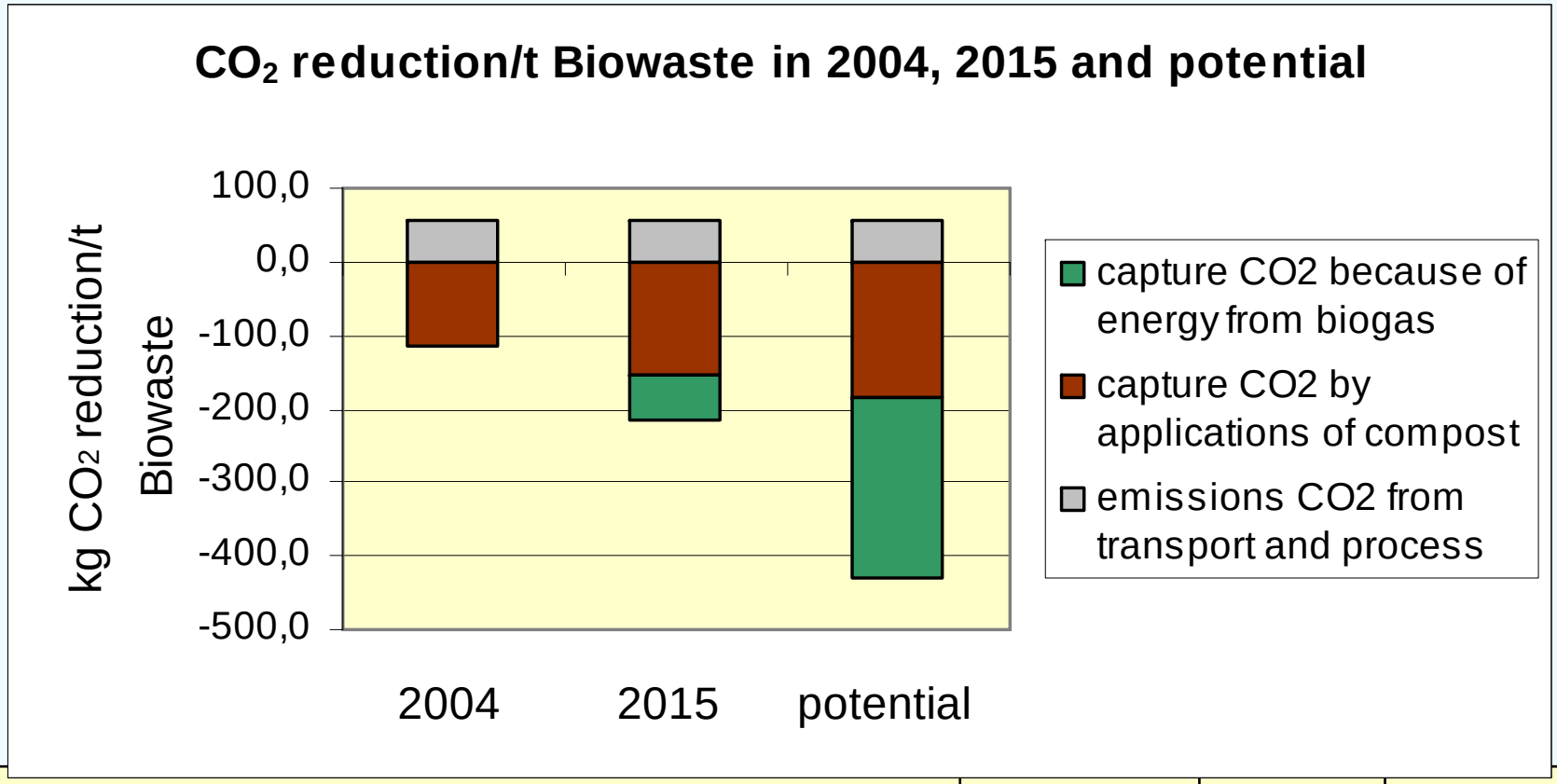


2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste

3. CO_2-tool to compare options	unit	value	factor	kg CO_2
Return distance Biowaste-supply (truck)	km	75	0,13	9,75
Return distance Biowaste-supply (rail)	km	0	0,038	0,00
Return distance Biowaste-supply (ship)	km	0	0,034	0,00
Total use electricity	kWh/t Biowaste	32	0,73	23,36
methane emission (biowaste-processing)	kg/t Biowaste	0,170	21,0	3,57
N_2O emission (biowaste-processing)	kg/t Biowaste	0,069	296	20,42
biogas (55% CH_4) delivered to the grid	Nm^3/t Biowaste	50	-1,27	-63,50
Electricity delivered to the grid	kWh/t Biowaste	0	-0,73	0,00
Heat delivered to third parties	MJ/t Biowaste	0	-0,075	0,00
biogas (55% CH_4) replacing diesel oil	Nm3/t Biowaste	0	-1,42	0,00
residue incinerated mass burn	%	2,2	-4,2	-9,24
residue to land fill	%	0,0	2,6	0,00
Upgraded biomass to biomass power plant	%	0	-5,2	0,00
Compost production/t Biowaste	kg/t Biowaste	400		
agriculture (50% replacement art. fertilizer)	%	54	-0,635	-34,29
greenhouses (100% replacement peat & art fert)	%	7	-2,98	-20,86
Potting soil (100% replacement peat & art fert)	%	28	-2,75	-77,00
Gardening (100% replacement peat & art fert)	%	2	-2,55	-5,10
other (100% replacement art. fertilizer)	%	9	-0,80	-7,20
Total net CO_2 capture in kg/ton Biowaste				-160,1

3. CO_2 tool to compare options for municipal biowaste, used in RFP's



CO_2 reduction/t Biowaste in 2004, 2015 and potential	2004	2015	potential
emissions CO_2 from transport and process	57,1	57,1	57,1
capture CO2 by applications of compost	-113,9	-153,7	-183,5
capture CO2 because of energy from biogas	0,0	-63,5	-248,4
total	-56,8	-160,1	-374,8

Increasing CO_2 reductions related to source separation of Municipal Biowaste in The Netherlands

1. CO_2 reductions should not harm compost production, main benefits are related to the application of compost

2. CO_2 reductions 1985-2015 related to Dutch municipal biowaste improved from 1.500 kton/year emissions in 1990 to -155 kton/ year capture. -238 kton/year is expected in 2015.

3. CO_2 tool to compare options for municipal biowaste, used in RFP's shows the importance of compost application and biogas production. The feasible net potential savings calculated with the tool are -375 kg CO_2/ton municipal Biowaste

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