

A Report on the Carbon Footprint of Plastic Bags

A review of the Life-Cycle Analysis on Common Plastic Bags

In February 2011, The UK Environment Agency published a report, **Life Cycle Analysis on Carrier Bags**.

An assessment across all types of carrier bags

- Conventional plastic
 - Hydro-biodegradable plastic
 - Oxo-biodegradable plastic
 - Cotton/Jute
 - Paper
- The UK Environment Agency study shows how plastic bags* are the most environmentally friendly.
 - **If these were banned, it would be worse for the environment as the alternatives to plastic bags have a higher Global Warming Potential.**



smart plastic

*Conventional HDPE plastic bag Source: UK Environmental Agency

²Based on: Return flight from London Heathrow to Hong Kong (1,750kg CO₂)

CO₂ impact of carrier bags

Everyday actions compared to bags



1 Average
daily car trip¹



781 bags



1 Long haul flight²



137,000 bags



¹Based on: 30-mile trip, 12,000 miles per year, 2008 Ford Focus 1.6 (10kg CO₂)

Global Warming Potential

The following shows the GWP of different carrier bags, made from a variety of materials

Bag type	Average bag weight (g)	CO ₂ equivalent per 1 kg of bags	CO ₂ equivalent per bag (kg)
HDPE vest carrier	8.12	1.578	0.0128
Oxo-degradable vest carrier	8.27	1.750	0.0145
Starch based biodegradable vest	16.49	4.184	0.0690
Paper bag	55.2	5.525	0.305
LDPE 'Bag for Life'	34.94	6.924	0.242
Non-woven PP bag	115.83	21.510	2.491
Woven PP Bag	120	23.088	2.770
Cotton bag	183.11	271.533	49.720
Jute bag	190	273.111	51.891



Global Warming Potential

Global Warming Potential (GWP) gives an indication of gas release which contributes to global warming

Examples of Global Warming Gas:

- **Water vapour**
- **Carbon dioxide**
- **Methane**
- **Nitrous oxide**
- **Others**



Global Warming Potential

Comparison: plastic bags and other bags
How many times do you need to re-use one of these bags to have the same GWP?



HDPE plastic bag 1



LDPE "Bag for Life" 4

Paper bag 5



Non-woven PP Bag 14



Cotton/jute bag 173



Global Warming Potential

Comparison: plastic bags and other bags

If carrier bags are re-used (as most of them are), the impact on the environment is greatly reduced.

Bag type	First use	40.28% Second use (UK average)	100% Second use (ideal)
HDPE bag	2.082	1.578	0.830
Oxo-biodegradable bag	2.254	1.750	1.003
Starch based biodegradable bag	4.691	4.184	n/a*

*Unlikely to be achievable due to the type of material used

Kg/CO₂ equivalency

The Environment Agency report was followed by two Intertek Reports based on a request by DEFRA, the UK government department for the environment. The second report added to both the E.A. and first DEFRA reports with the important additional data acknowledging the recyclability of oxo biodegradable technology bags in addition to their positive impact on littering. That improved oxo biodegradable technology carrier bags to the top of the table above conventional HDPE carrier bags.



Global Warming Potential

Total CO₂ impact of different carrier bags



HDPE plastic bag

oil extraction 7.68g

manufacture 3.584g

transport 0.896g

waste processes 0.65g

Carbon footprint per bag 12.8g



Global Warming Potential

Total CO₂ impact of different carrier bags

Oxo-biodegradable plastic bag

oil extraction	8.7g
manufacture	4.032g
transport	1.015g
Waste processes	0.725g
Carbon footprint per bag	14.5g



Global Warming Potential

Total CO₂ impact of different carrier bags

Starch based bag

Grown crops	0g*
Extraction/production of raw materials	34.5g
transport	13.8g
Waste processes	20.7g
Carbon footprint per bag	69g



Global Warming Potential

Total CO₂ impact of different carrier bags

Paper bag

Grown crops	0g*
Material production/manufacture	228.75g
transport	39.65g
Waste processes	36.6g
Carbon footprint per bag	305g



Global Warming Potential

Total CO₂ impact of different carrier bags

LDPE Flexi-loop bag

Grown crops	157.3g
Material production/manufacture	48.4g
transport	16.94g
Waste processes	19.36g
Carbon footprint per bag	242g



Global Warming Potential

Total CO₂ impact of different carrier bags

Non-woven PP bag

Oil extraction	1.868g
Manufacture	249.1g
transport	249.1g
Waste processes	124.55g
Carbon footprint per bag	2491g



Global Warming Potential

Total CO₂ impact of different carrier bags

Woven PP bag

Oil extraction	2.077g
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Manufacture	277g
transport	277g
Waste processes	138.5g
Carbon footprint per bag	2770g



Global Warming Potential

Total CO₂ impact of different carrier bags

Cotton bag

Grown crops 0g*

Manufacture	42.262g
transport	4.972g
Waste processes	2.486g

Carbon footprint per bag 49.720g



Global Warming Potential

Total CO₂ impact of different carrier bags

Jute bag

Grown crops 0g*

Manufacture	44.11g
transport	5.189g
Waste processes	2.595g
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Carbon footprint per bag	51.891g



Other comparisons

Other ways to consider the impact

Paper vs Plastic

Paper bags have a much higher level of impact on the environment compared to plastic bags.

Height of 1000 bags	117 cm	10.16 cm
Weight of 1000 bags	63.50 kg	7.26 kg
Shipping/Energy	100%	18%
Fresh water usage	100%	3%
Waste generation	100%	20%
Recyclability	100%	9%

Source: Peer Reviewed Published data: Franklin Associates, David Cornell, et al.
 US Environmental Protection Agency. Questions about your Community Shopping Bags: Paper or Plastic
 DOE Energy Information Administration



True or False about bags

Myths and facts on plastic carrier bags

Plastic bags are a problem to the environment-both land and sea-if not recycled or disposed of correctly **✓ TRUE**

Conventional plastic shopping bags have the greatest environmental impact **✗ FALSE**

Conventional plastic shopping bags have the lowest Global Warming Potential (GWP) ✓ TRUE

Plastic used in carrier bag production requires a large amount of the world's oil reserves ✗ FALSE

Plastic used in carrier bag production is generated from a by-product of oil which used to be wasted ✓ TRUE

Heavy duty, hand finished shopping bags are better for the environment ✗ FALSE



Heavy duty, hand finished shopping bags require more resources to be produced ✓ TRUE

Bags made from “sustainable” material are better for the environment ✗ FALSE

Bags made from “sustainable” materials have to be reused an unrealistic number of times to achieve the equivalent GWP levels of conventional plastic shopping bags ✓ TRUE



The way forward

But to limit its impact on the environment, users can:

- **reuse plastic objects**
- **reduce the amount of plastic required**
- **recycle**
- **incinerate to recover the calorific value**
- **use a biodegrading additive**



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