MALAYSIAN PLASTICS FORUM

Collaborative Partners

Malaysian Plastics Manufacturers Association

MPA-PRPG

Malaysian Petrochemicals Association - Plastic Resins Producers Group

PLASTICS & SUSTAINABILITY

WWF Building Bridges for Sustainable Consumption and Production (BB4SCP)

1 to 4 August 2019

by

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Chairman, Education and Awareness

Malaysian Plastics Forum (MPF)

Contents:

- Introduction to MPMA
- Global Warming & Its Impact
- Sustainability & Plastics,..
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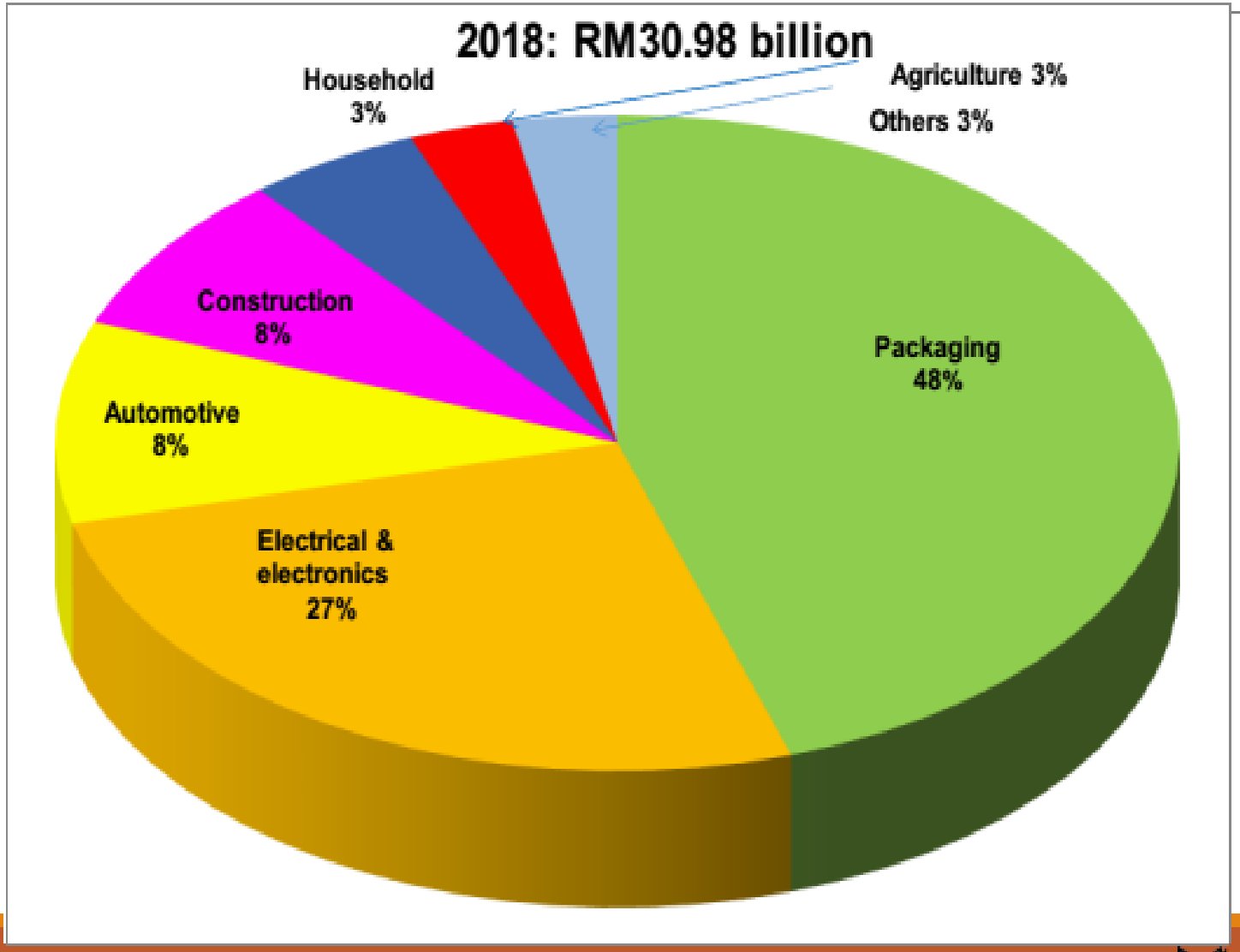
- Summary

About MPMA

- Established in 1967
- **Representing 60% of plastics manufacturers, accounting for 80% of the country's total production of plastic products.**
- **About 800 members across Peninsular and East Malaysia.**

Major Market Segments for Plastic Products



Key Data for the Malaysian Plastics Industry

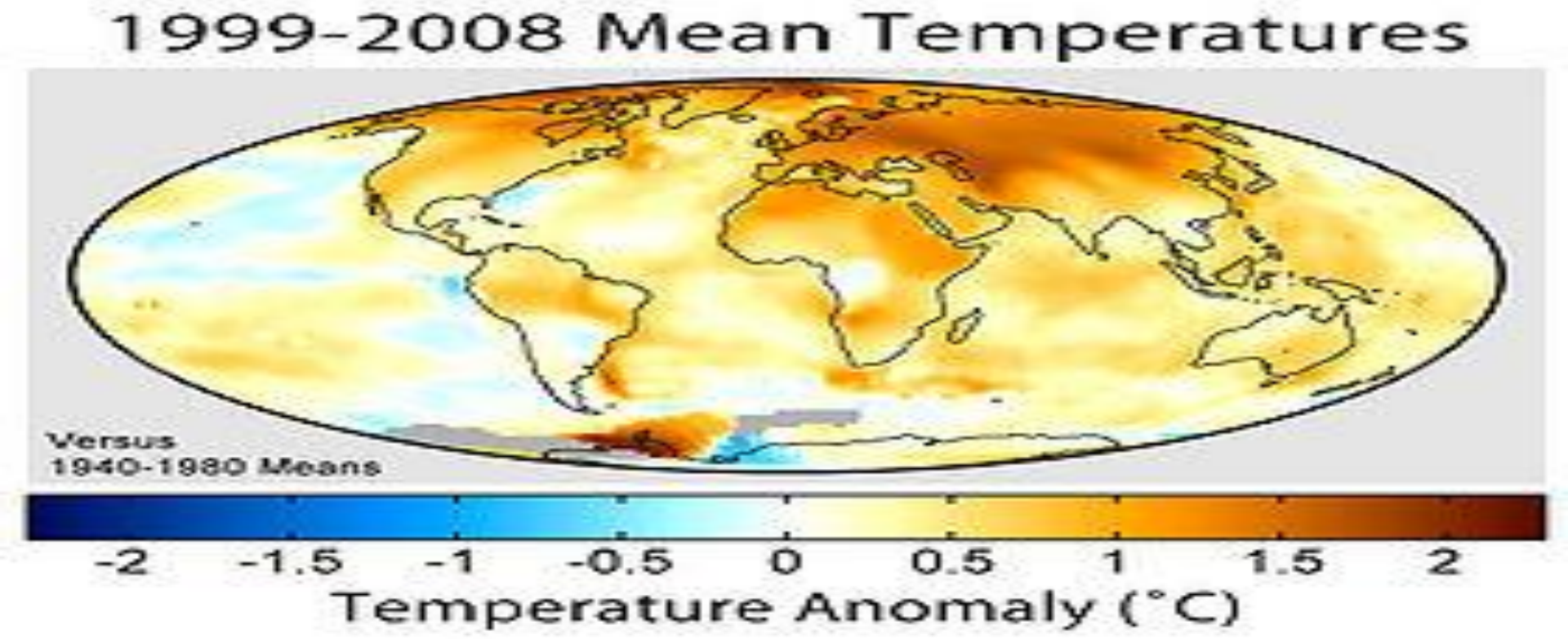
	2014	2015	2016	2017	2018
Malaysia's gross domestic product (GDP) growth	6.0%	5.0%	4.2%	5.9%	4.7%
Number of plastics manufacturers	1,300	1,300	1,300	1,300	1,300
Employment	82,000	80,000	79,000	84,000	81,500
Turnover	RM19.46b (+7.3%)	*RM24.77b (+27.3%)	*RM27.32b (+10.3%)	RM29.80b (+9.1%)	RM30.98b (+4.0%)
Export	RM11.94b (+11.5%)	RM12.96b (+8.5%)	RM13.11b (+1.2%)	RM14.58b (+11.2%)	RM14.60b (+0.14%)
% of export against turnover	62%	52%	48%	49%	47%
Resin consumption	2.15m MT (+2.5%)	2.22m MT (+3%)	2.26m MT (+2%)	2.35m MT (+5%)	2.42m MT (+3%)
Per capita consumption of resin	71kg	72kg	72kg	74kg	75kg

Note: Revised basis of data compilation by the DOS

"DON'T MISS THE FOREST FOR THE TREES"

GLOBAL WARMING IS THE KEY ISSUE & CONCERN !!!

(Wikipedia) Global warming is the increase in the average temperature of the Earth's surface air and the oceans since the mid-twentieth century and its projected continuation due to increase in greenhouse gases (GHG) such as Carbon Dioxide(CO2) , Methane(CH4),…



Climate change resulted in extreme and unpredictable weather, driving up food prices.

Oxfam International

Oxfam, founded in Oxford in 1942, is an international confederation of 15 organisations working in 98 countries worldwide to find lasting solutions to poverty and injustice. It predicted that:

- **Climate change will help double food prices by 2030.**
- **"We are turning abundance to scarcity."**
- **By 2030, we will have 8 billion people to feed.**

It appears we are on the brink of a major catastrophe.

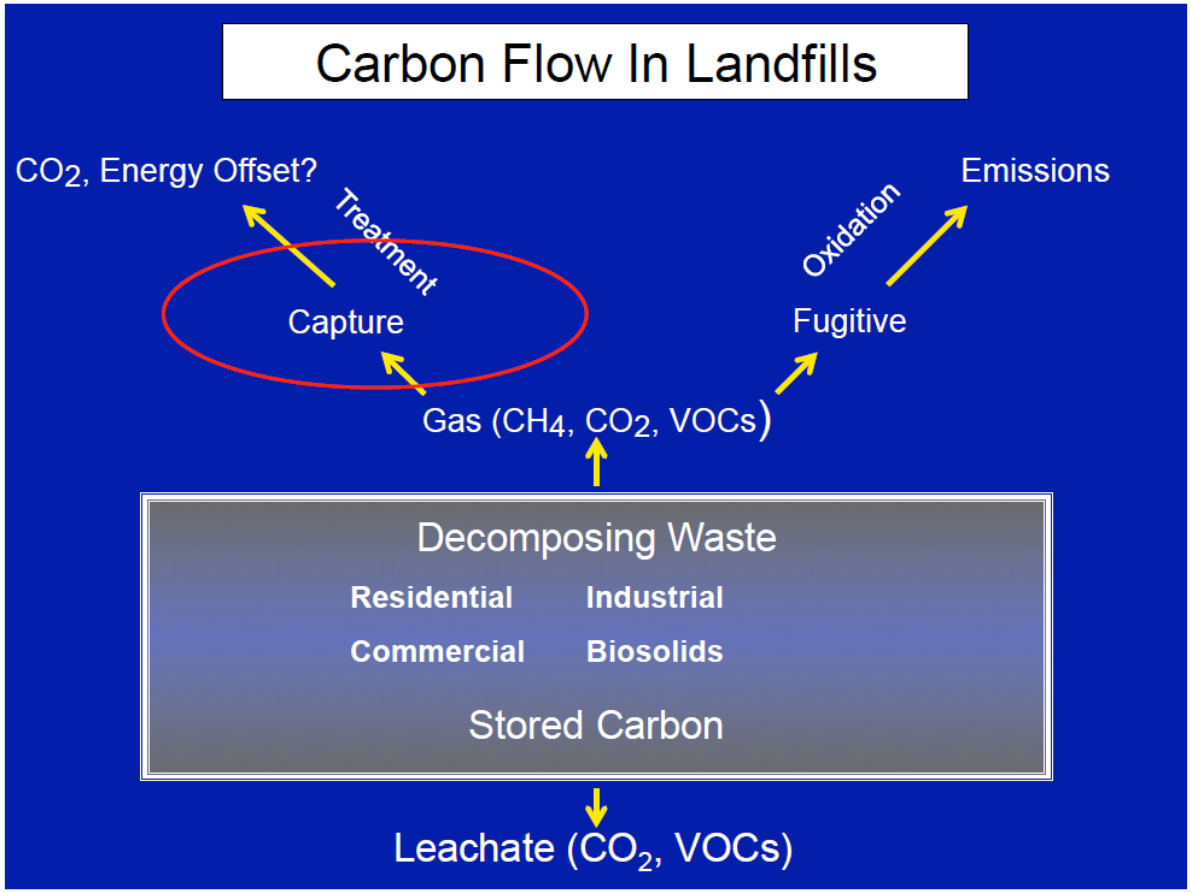
WIKIPEDIA

WHAT IS CAUSING THE EXTREME WEATHER CHANGES?

- **An increase in greenhouse gas (GHG) in the upper atmosphere that traps the heat from the sun from being dissipated into space.**
- **The effect is that the retained heat causes violent air movements that has completely changed the global weather pattern.**
- **GHG - carbon dioxide and methane, which is 22 times more harmful than carbon dioxide as a GHG.**

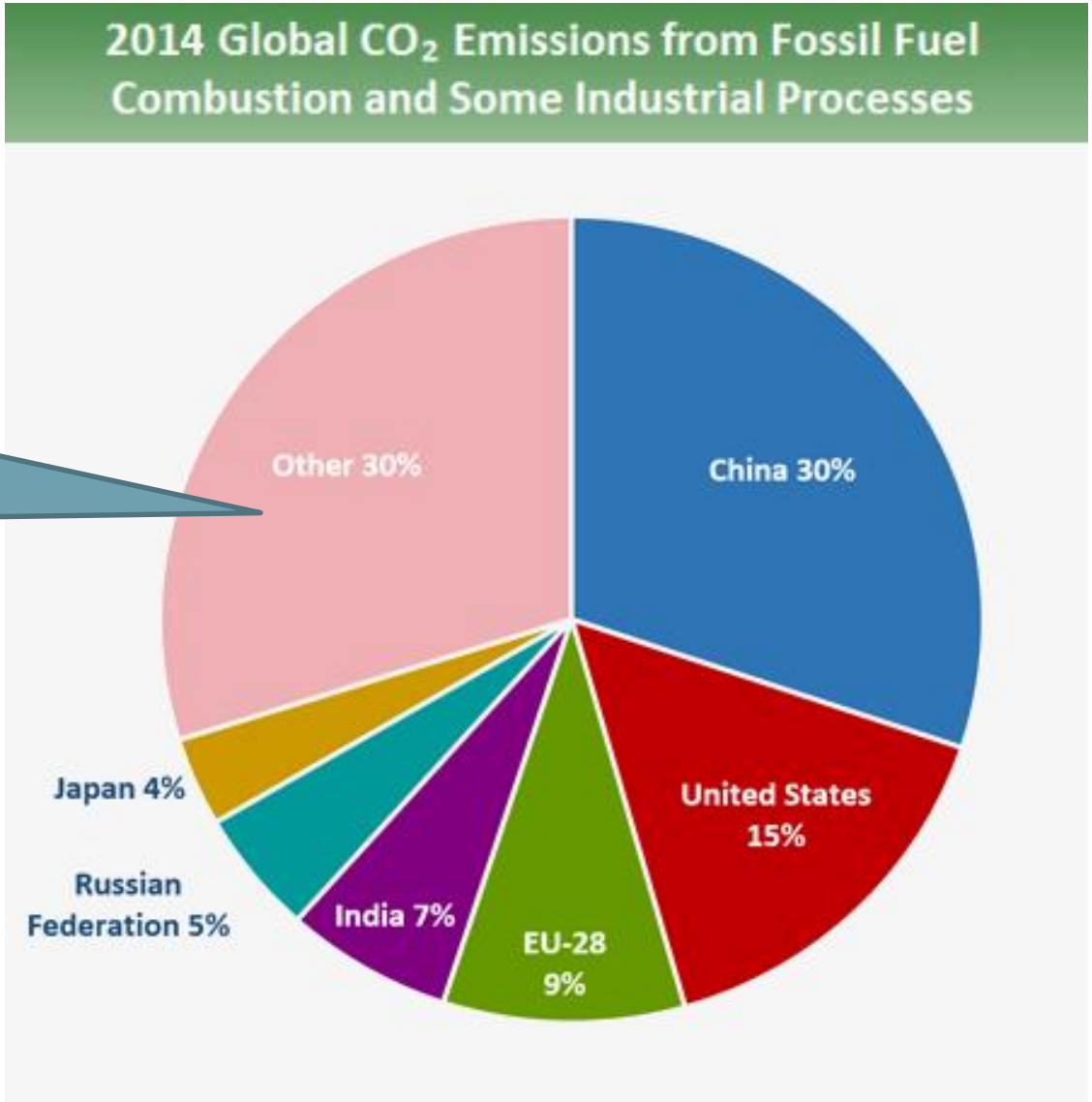
WHAT CAUSES the EMISSION of CARBON DIOXIDE and METHANE?

- The **burning** of any thing that is **organic**, for example, petrol and gas used for transport, coal for electricity, firewood for heat, etc .
- The **degradation** of anything that is **organic**, for example, paper, plants, animals.
- **Degradation** in the presence of oxygen causes the **emission of carbon dioxide** and degradation in the absence of oxygen causes the **emission of methane**, which is 22 times more harmful than carbon dioxide as a GHG.



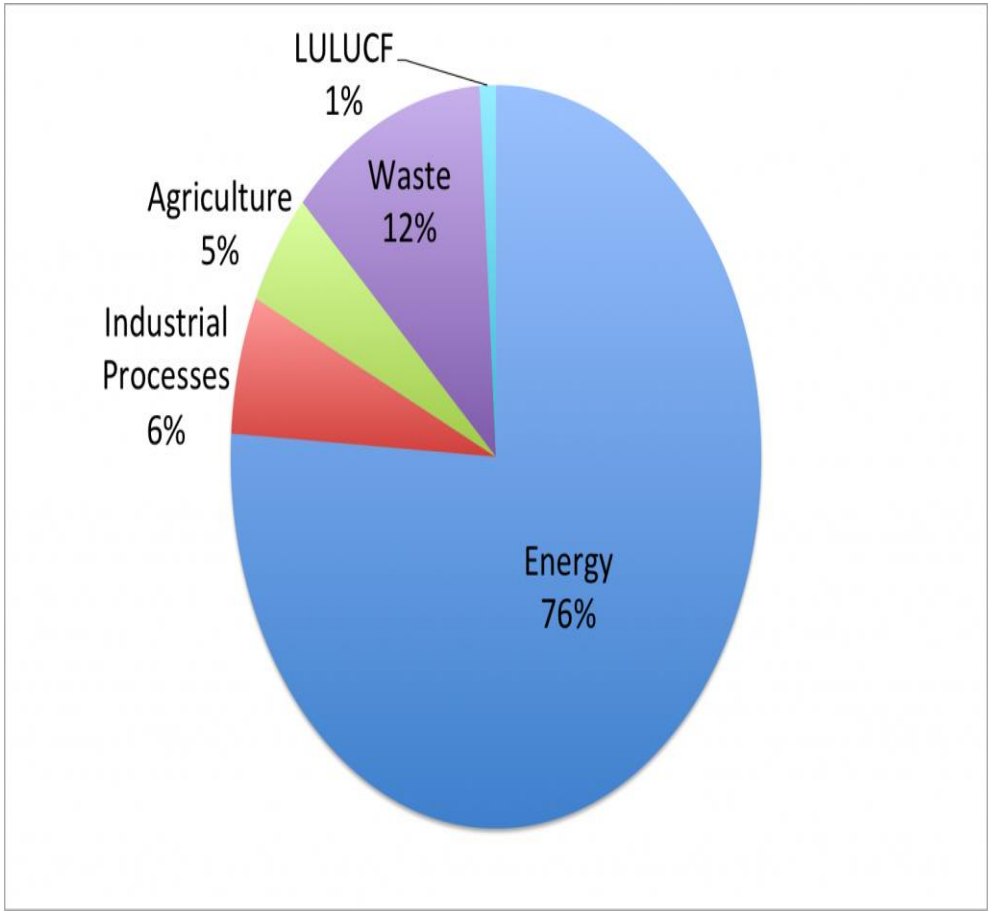
Source: Biodegradation in Landfills: Why It Happens and Implications for Packaging Design, North Carolina State University

Malaysia's Carbon Emission per capita 0.7% or 8.0 tons per capita. Ranking 23rd



Source: IPCC (Intergovernmental Panel on Climate Change) assessment report 2015

Malaysia's GHG Emissions & Inventory by Sector for 2011



Sector	Emissions (Mt CO_2eq)	Sink (Mt CO_2eq)
Energy	218.914	
Industrial Processes	18.166	
Agriculture	15.775	
Land Use, Land-Use Change and Forestry (LULUCF)	2.490	-262.946
Waste	**34.885**	
Total	290.230	-262.946
Net Total (after subtracting sink)	27.284	

Source: Ministry of Natural Resources and Environment (MNRE) 2015.

Climate Change in Malaysia

- ***At a Glance:***

Climate change is an unequivocal fact and many of the observed changes are unprecedented. More than half of the observed increase in global average surface temperature was caused by the increases in greenhouse gas (GHG) concentrations due to human activity. Malaysia is also experiencing a warming trend with an increase of mean surface temperature from 0.6°C to 1.2°C and facing an increase of rainfall intensity and sea level rise. To tackle climate change, Malaysia has voluntarily pledged to cut its emission intensity (per unit of GDP) by up to 40% by 2020 and 45% by 2030 compared to the levels in 2005, with some conditions applied. How is Malaysia doing to achieve this emission reduction target?

Environmental risks & impacts on key economic sectors

- **Agriculture – food shortage**
- **Water Resources – waste shortage**
- **Forestry and Biodiversity - disruption of terrestrial ecosystem**
- **Coastal and marine areas - disruption of marine ecosystem**
- **Energy and transport**
- **Public health**
- **Heavy rain – flood**
- **Sea level rise – high tides**
- **Outrage of infrastructure**
- **Heat stroke**

Some of these impacts include:

- **reduced crop yields (especially for economically important crops such as oil palm, rubber and paddy)**
- **water consumption and irrigation shortages**
- **land erosion**
- **encroachment on sensitive habitats with resulting impacts on biodiversity**
- **coral bleaching**
- **damage to infrastructure**
- **impacts on equipment efficiency**
- **increased transmission of diseases like dengue, malaria and cholera.**

All these impacts of climate change may cause negative socio-economic change, including deterioration in economic growth, livelihood opportunities, actual incomes, workforce capacity and human health.

WHAT CAN WE DO TO REDUCE the EMISSION of CARBON DIOXIDE and METHANE?

- Use something that is more energy efficient.
- Use something that is more lightweight/smaller.
- Avoid the degradation of organic matter that leads to CO2 and methane emission.
- Reduce , Reuse , Recycle – the 3Rs

- How can we achieve the above?

SUSTAINABILITY

- **Sustainability or " Sustainable Development** is **development** that meets the needs of the present without compromising the ability of future generations to meet their own needs." UN Brundtland Commission, 1987

- **Sustainability is the potential for long-term maintenance of well being, which has environmental, social & economic dimensions ….**

  (i.e. Planet, People, Prosperity..3Ps)

Consumer needs to make wise choices by:

- **Making green decisions based on Science & Facts from reputable sources , and NOT on perception!!**

- **Evaluating solutions using a holistic and integrated Life Cycle Assessment (LCA).**

Life Cycle Assessment (LCA): Cradle to Grave

- **Energy (and other resources like water) consumption during production, processing, transportation and in use**
- **Green house gas emission**
- **Total material quantity (volume, weight)**
- **End Of Life, Waste Management (recycle, compostability, energy recovery….)**
- **Others….**

British report says PE bags have low carbon footprint
PLASTICS & RUBBER WEEKLY Posted March 2, 2011

LONDON (March 2, 1:50 p.m. ET) -- The British Environment Agency has released a report that says single-use polyethylene grocery bags have a lower carbon footprint than alternative paper or reusable bags.

"Lightweight single-use carrier bags have the lowest carbon footprint per bag based primarily on resource use and production," the agency said. "Paper, heavyweight plastic and cotton bags all use more resources and energy in their production. A key issue, however, is how many times bags are reused."

In order to equal an HDPE bag used just once, the report states that:

- **A paper bag would need to be reused three times;**
- **A low density PE "bag-for-life" would need to be reused four times;**
- **A non-woven polypropylene bag would need to be reused 11 times;**
- **A cotton bag would need to be reused 131 times.**

If the HDPE bag is reused once, for example as a trash bag, the numbers increase:

- **paper bag would need to be reused seven times;**
- **the LDPE bag nine times;**
- **the PP bag 26 times**
- **and the cotton bag a staggering 327 times.**

DOCUMENT OVERVIEW

- The Environmental Agency report **SC030148**, a **Life Cycle Analysis on Carrier Bags** was undertaken by environmental experts, packaging and academia between 2006 and 2009

- It was published in the media **February 2011**

- Much of this presentation is taken from this report

CO2 IMPACT OF A CARRIER BAG VS EVERYDAY ACTIONS

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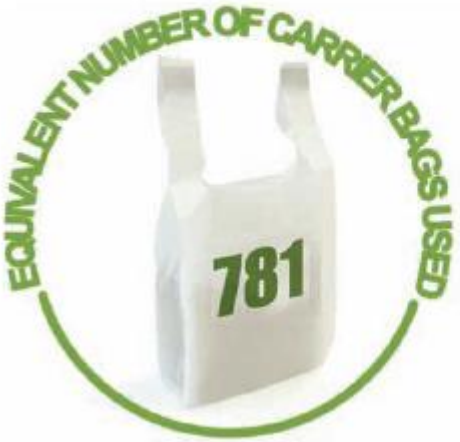
ONE AVERAGE DAILY CAR TRIP*



One **30 mile trip** has the same CO2 impact as **781** Vest Type Carriers*

ONE LONG HAUL (LH) RETURN FLIGHT*

One **LH return flight** has the same CO2 impact as **137,000** Vest Type Carriers*

DATA SOURCE: WWW.ASK.COM / WWW.CARBONFOOTPRINT.COM

WHAT DO THESE FIGURES ILLUSTRATE?

UK ANNUAL CONSUMPTION OF CARRIER BAGS **= 13 BILLION BAGS**

TO **MATCH** THE **ENVIRONMENTAL IMPACT** OF THIS CONSUMPTION **ON OUR ROADS…**

=

JUST **ONE 16 MILE** TRIP PER UK REGISTERED CAR

(BASED UPON 31 MILLION REGISTERED CARS IN THE UK)

DATA SOURCE: WWW.GREENBOXDAY.CO.UK / WWW.GREENMOTOR.CO.UK / THE TIMES ONLINE

OR...

UK ANNUAL CONSUMPTION OF CARRIER BAGS **= 13 BILLION BAGS**

TO **MATCH** THE **ENVIRONMENTAL IMPACT** OF THIS CONSUMPTION **IN THE SKIES...**

=

JUST **4.5 HOURS OF FLIGHT ACTIVITY** AT A MAJOR UK AIRPORT

(BASED UPON 228 PLANES TAKING OFF / LANDING AT LONDON HEATHROW)

DATA SOURCE: WWW.GREENBOXDAY.CO.UK / WWW.ASK.COM / WWW.WIKIPEDIA.ORG / WWW.ANSWERS.YAHOO.COM

DEMONSTRATING THIS SUMMARY

ACROSS AN **EXTENSIVE BAG RANGE** INCLUDING:

- HDPE and Oxo Degradable Vest Carriers
- Starch based Biodegradable Carriers
- Paper Bags
- LDPE 'Bag for Life'
- Non Woven PP and Woven PP Shopping Bags
- Cotton and Jute Shopping Bags

GLOBAL WARMING POTENTIAL PER BAG

Total Global Warming Potential shown in KG/CO2 equivalency

BAG TYPE	AVERAGE BAG WEIGHT (g)	CO2 EQUIVALENT PER 1KG OF BAGS	CO2 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

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

WHAT DO THESE FIGURES ILLUSTRATE?

A Paper Bag
has to be reused 4 times

An LDPE 'Bag for Life'
has to be reused 5 times

A Non Woven PP Bag
has to be reused 14 times

A Cotton / Jute Bag
has to be reused 173 times

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

GWP VARIATIONS ASSOCIATED WITH SINGLE USE BAG REUSE

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BAG TYPE	KG/CO2 EQUIVALENCY		
HDPE Vest Carrier	2.082	1.578	0.830
Oxo Degradable Vest Carrier	2.254	1.750	1.003
Starch Based Biodegradable Vest Carrier	4.691	4.184	NOT LIKELY TO BE ACHIEVABLE DUE TO BIODEGRADABILITY OF THE MATERIAL

ENVIRONMENTAL IMPACT MINIMISES WITH INCREASED BAG REUSE

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

HDPE VEST CARRIERS

FROM OIL WELL

TO CRACKING PLANT

CO^2 Impact from total oil extraction = 7.68g (60%)

TO BAG MANUFACTURER

BAG PRODUCTION

CO^2 Impact from total manufacture = 3.584g (28%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 0.896g (7%)

IMPACT FROM WASTE PROCESSES = 0.64g (5%)

*BASED UPON A BAG WEIGHT 8.12g

CARBON FOOTPRINT PER BAG* = 12.8g

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

OXO DEGRADABLE VEST CARRIERS

FROM OIL WELL

TO CRACKING PLANT

CO^2 Impact from total oil extraction = 8.7g (60%)

TO BAG MANUFACTURER

ADD METAL SALTS

BAG PRODUCTION

CO^2 Impact from total manufacture = 4.032g (28%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 1.015g (7%)

IMPACT FROM WASTE PROCESSES = 0.725g (5%)

*BASED UPON A BAG WEIGHT 8.27g

CARBON FOOTPRINT PER BAG* = **14.5g**

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

STARCH BASED BIODEGRADABLE BAGS

FROM CROP

COMPOSTING (END OF LIFE)

CO^2 Impact from grown crops = End of Life
(The Carbon Dioxide absorbed during the crop's life is given off during bio degradation of the bag at composting)

HARVESTING OF CROP

FROM OIL WELL

+

BIODEGRADABLE RESIN BLEND

CO^2 Impact from extraction / production of raw materials = 34.5g (50%)

AS BAG PRODUCTION USES THE NORWEGIAN GRID ELECTRICITY, THE IMPACT OF PRODUCTION OF THESE BAGS IN THE PROCESS IS VERY LOW.

DELIVERED TO WAREHOUSE & STORE

CO^2 Impact from total transport = 13.8g (20%)

IMPACT FROM WASTE PROCESSES = 20.7g (30%)

*BASED UPON A BAG WEIGHT 16.49g

CARBON FOOTPRINT PER BAG* = 69g

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY / WRAP

PAPER BAGS

FROM TREES

COMPOSTING (END OF LIFE)

CO^2 Impact from grown crops = End of Life
(The Carbon Dioxide absorbed during the crop's life is given off during bio degradation of the bag at composting)

FELLED (REPLANTED)

PULPED

BAG PRODUCTION

CO^2 Impact from material production & manufacture = 228.75g (75%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 39.65g (13%)

IMPACT FROM WASTE PROCESSES = 36.6g (12%)

*BASED UPON A BAG WEIGHT 55.2g

CARBON FOOTPRINT PER BAG* = 305g

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY / WRAP

LDPE FLEXI-LOOP BAGS

FROM OIL WELL

TO CRACKING PLANT

CO^2 Impact from total oil extraction = 157.3g (65%)

TO BAG MANUFACTURER

BAG PRODUCTION

CO^2 Impact from total manufacture = 48.4g (20%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 16.94g (7%)

IMPACT FROM WASTE PROCESSES = 19.36g (8%)

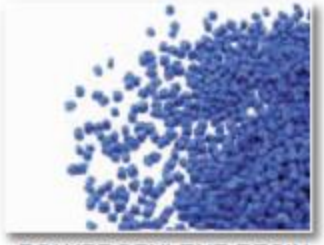
*BASED UPON A BAG WEIGHT 34.94g

CARBON FOOTPRINT PER BAG* = 242g

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

NON WOVEN PP BAGS

FROM OIL WELL



POLYPROPYLENE RESIN

CO^2 Impact from total oil extraction = 1.868KG (75%)

SPUN BOND INTO FABRIC

FABRIC TO FACTORY

STITCHED INTO BAG

CO^2 Impact from total manufacture = 249.1g (10%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 249.1g (10%)

IMPACT FROM WASTE PROCESSES = 124.55g (5%)

*BASED UPON A BAG WEIGHT 115.83g

CARBON FOOTPRINT PER BAG* = **2.491KG**

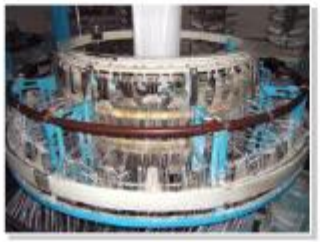
DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

WOVEN PP BAGS

FROM OIL WELL

POLYPROPYLENE RESIN

CO^2 Impact from total oil extraction = 2.0775KG (75%)



PP WOVEN INTO FABRIC

FABRIC PRODUCTION

STITCHED INTO BAG

CO^2 Impact from total manufacture = 277g (10%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 277g (10%)

IMPACT FROM WASTE PROCESSES = 138.5g (5%)

*BASED UPON A BAG WEIGHT 120g

CARBON FOOTPRINT PER BAG* = **2.770KG**

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY

COTTON BAGS

FROM COTTON PLANT

COMPOSTING (END OF LIFE)

CO^2 Impact from grown crops = End of Life
(The Carbon Dioxide absorbed during the crop's life is given off during bio degradation of the bag at composting)

HARVESTING & MATERIAL PRODUCTION

FABRIC WEAVE

STITCHED INTO BAG

CO^2 Impact from material production & manufacture = 42.262g (85%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 4.972KG (10%)

IMPACT FROM WASTE PROCESSES = 2.486KG (5%)

*BASED UPON A BAG WEIGHT 183.11g

CARBON FOOTPRINT PER BAG* = 49.720KG

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY / WRAP

JUTE BAGS

FROM JUTE CROP

COMPOSTING (END OF LIFE)

CO^2 Impact from grown crops = End of Life
(The Carbon Dioxide absorbed during the crop's life is given off during bio degradation of the bag at composting)

HARVESTING & CULTIVATION

FABRIC WEAVE

STITCHED INTO BAG

CO^2 Impact from material production & manufacture = 44.11g (85%)

SHIPPED TO WAREHOUSE

DELIVERED TO STORE

CO^2 Impact from total transport = 5.189KG (10%)

IMPACT FROM WASTE PROCESSES = 2.595KG (5%)

*BASED UPON A BAG WEIGHT 190g

CARBON FOOTPRINT PER BAG* = 51.891KG

DATA SOURCE: LIFE CYCLE ASSESSMENT OF SUPERMARKET CARRIER BAGS REPORT SC030148, PUBLISHED BY THE ENVIRONMENT AGENCY / WRAP

MYTHS AND FACTS ASSOCIATED WITH CARRIER BAGS

- Plastic bags (including oxo degradables, biodegradables & bags for life) are a marine hazard and litter problem if not recycled or disposed of responsibly… **FACT**

- Conventional plastic shopping bags have the greatest environmental impact… **MYTH**
- Conventional plastic shopping bags have the Lowest Global Warming Potential (GWP)… **FACT**

- Plastic used in bag production has a significant impact on the earth's oil reserves…**MYTH**
- Plastic used in carrier bag production is generated from a 'Bi Product' of oil… **FACT**

MYTHS AND FACTS ASSOCIATED WITH CARRIER BAGS

- Heavy duty, hand finished shopping bags are better for the environment… **MYTH**
- Heavy duty bags, designed to last longer, require more resource in their production and therefore have a greater negative environmental impact… **FACT**

- Bags made from sustainable material (ie Cotton / Jute) are better for the environment… **MYTH**
- Bags made from sustainable materials (ie Cotton / Jute) have to be reused an unrealistic number of times to achieve the equivalent GWP levels of conventional plastic shopping bags… **FACT**

- Biodegradable 'plastics' are better for the environment… **MYTH**
- Biodegradable 'plastics' are rarely accepted in recycling facilities and give off methane in landfill and are not as reusable as conventional plastic carriers… **FACT**

SOLUTIONS TO

Improve the environmental impact of carrier bags

Our aim should be to **PROACTIVELY PARTNER WITH RETAILERS** to:

- **Reduce bag usage.**
- **Encourage bag reuse,** including secondary reuse education.
- **Encourage bag recycling,** ideally improving bag collection and return at store to enhance waste control and develop closed loop initiatives.

- **Improve litter awareness,** especially in specialist areas (coastal, nature spots)
- **Encourage responsible bag disposal.**

EXECUTIVE SUMMARY

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The HDPE vest carrier is the

MOST ENVIRONMENTALLY EFFICIENT with the **LOWEST CARBON FOOTPRINT**

IF THESE BAGS WERE BANNED…

IT WOULD BE WORSE FOR THE ENVIRONMENT

Ministry of Environment and Food of Denmark
Environmental Protection Agency

Life Cycle Assessment of grocery carrier bags

Environmental Project no. 1985

February 2018

Table IV. Calculated number of primary reuse times for the carrier bags in the rows, for their most preferable disposal option, necessary to provide the same environmental performance of the average LDPE carrier bag, reused as a waste bin bag before incineration. The results refer to the reference flow provided in Table I.

	LDPE average, reused as waste bin bag	
	Climate Change	All indicators
LDPE simple, reused as waste bag	0	1
LDPE rigid handle, reused as waste bag	0	0
Recycled LDPE, reused as waste bag	1	2
PP, non-woven, recycled	6	52
PP, woven, recycled	5	45
Recycled PET, recycled	8	84
Polyester PET, recycled	2	35
Biopolymer, reused as waste bag or incinerated	0	42
Unbleached paper, reused as waste bag or incinerated	0	43
Bleached paper, reused as waste bag or incinerated	1	43[4]
Organic cotton, reused as waste bag or incinerated	149	20000

[4] The highest value for bleached paper is set to as minimum be equal to the value for unbleached paper.

Table III. Carrier bags providing the lowest environmental impacts for all the environmental indicators considered. The order in which the bags are listed corresponds to the raking of their LCA results starting from the lowest impact. Only the three lowest scoring bags are listed. The results refer to the reference flow provided in Table I.

Environmental indicator	Carrier bags providing lowest impacts
Climate change	Paper unbleached, biopolymer, LDPE
Ozone depletion	LDPE
Human toxicity, cancer effects	Paper unbleached, LDPE
Human toxicity, non-cancer effects	Composite, PP, LDPE
Photochemical ozone formation	LDPE
Ionizing radiation	LDPE
Particulate matter	LDPE
Terrestrial acidification	LDPE
Terrestrial eutrophication	LDPE
Freshwater eutrophication	LDPE
Marine eutrophication	PP, LDPE
Ecosystem toxicity	LDPE
Resource depletion, fossil	Paper unbleached, LDPE
Resource depletion, abiotic	PP, LDPE
Water resource depletion	LDPE, biopolymer

Eutrohication - excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life.
Abiotic - physical rather than biological; not derived from living organisms.
Terrestial - relating to the earth or dry land.
Fossil - the remains or impression of a prehistoric plant or animal embedded in rock and preserved in petrified form.

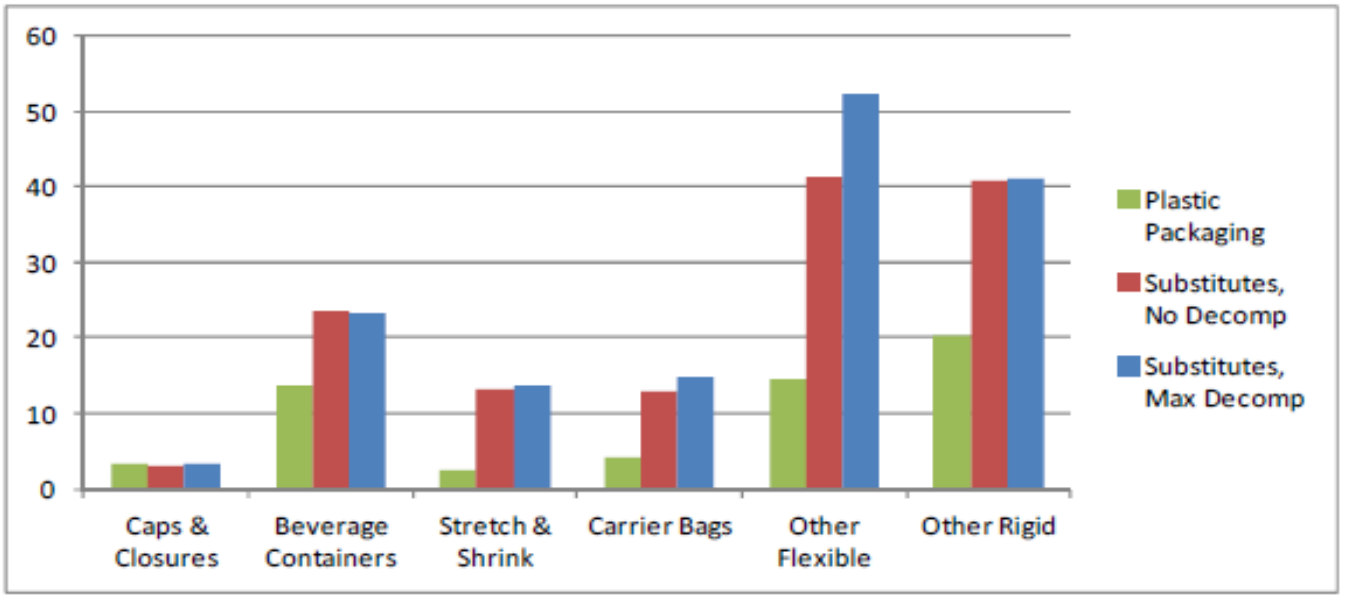


Figure ES–3. GWP Results by Category for US Plastic Packaging and Substitutes (million metric tonnes CO_2 eq)

Source: Impact Of Plastics Packaging On Life Cycle Energy Consumption & Greenhouse Gas Emissions In The United States And Canada - Substitution Analysis, by Franklin Associates, 2014

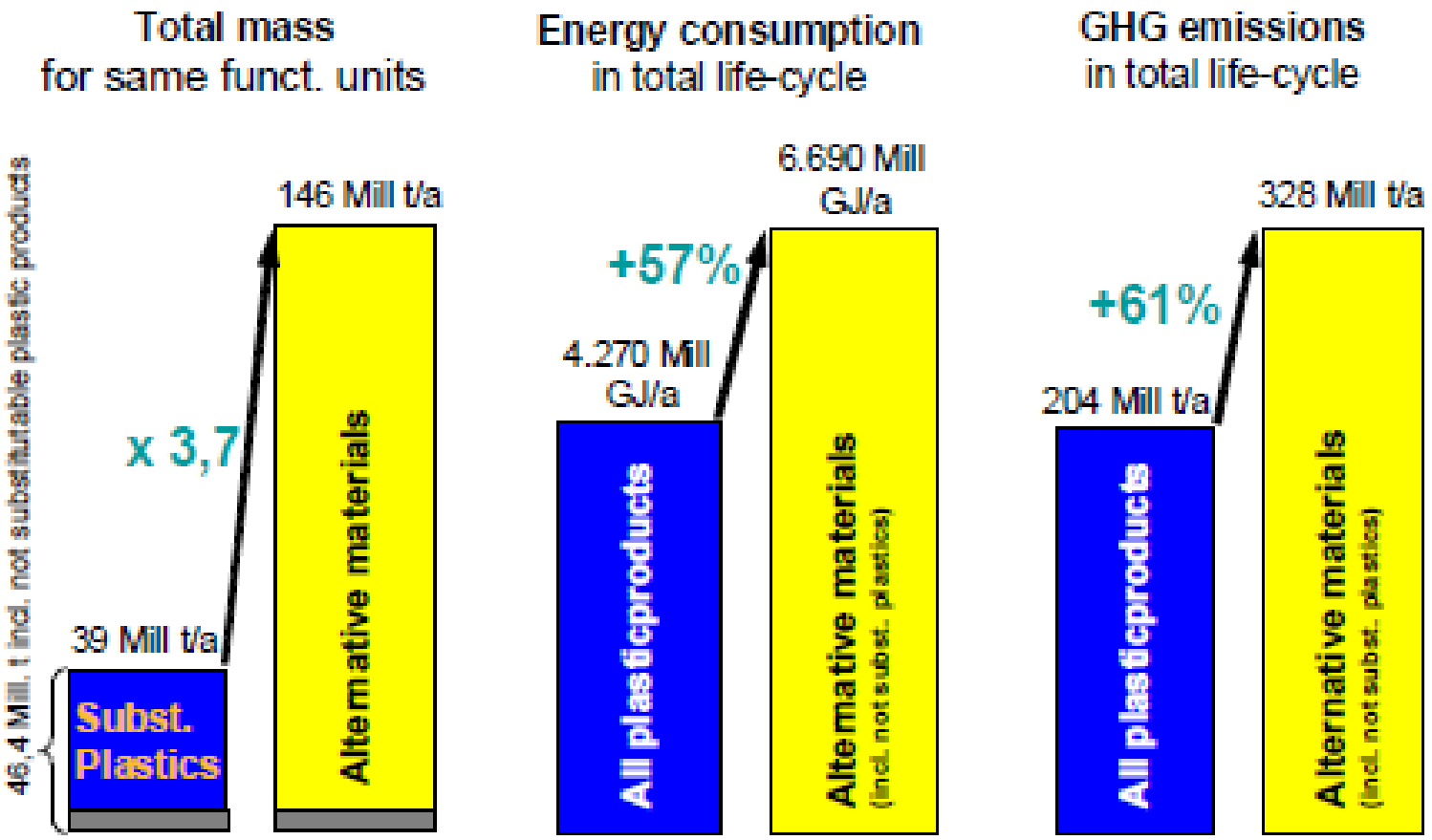


Figure 2: Changes in product mass, energy consumption and GHG emissions, if plastic products would theoretically be substituted by alternative materials.

Source: The impact of plastics on life cycle energy consumption and greenhouse gas emissions in Europe, by Denkstatt, 2010

- **Food packaging: about 40% of plastics produced are used in food packaging. Helps preserve food, reduce food waste and reduce weight of packaging. Energy efficiency of plastics packaging is unrivalled compared to other materials. 1% increase in packaging efficiency reduces food waste by about 1.6%**

- **50% of all of Europe's food are packed in plastics, accounting for only 17% by weight for all packaging. Food waste is only 2-3% compared to 50% in developing countries (Tampere University, Finland)**

- **Without plastics packaging:**
  - **Overall packaging by weight would increase by 291%**
  - **Increase in manufacturing energy by 108%**
  - **Waste volume increased by 158%**

Introduction: Definitions

FOOD LOSS AND WASTE

FOOD LOSS

- **Food that is:**
  - Spilled, spoilt, lost
  - incurs reduction in quality
- **Unintended result** of the process or the institutional/ legal framework

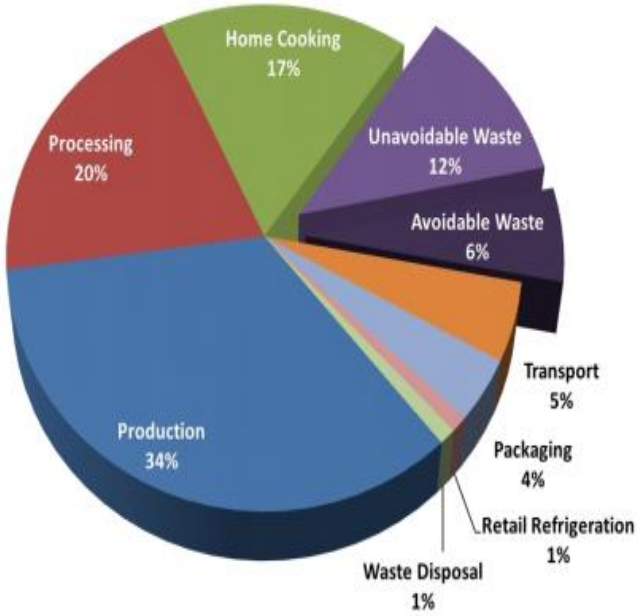
FOOD WASTE

- **Food that:**
  - Moves through the FSC & becomes fit for human consumption
  - Not consumed –discarded
  - Results from negligence or conscious decision

Packaging Impacts in the Supply Chain

Estimates of Waste in U.S. Poultry Supply Chain

Greenhouse Gas Contributions U.S. Poultry Supply Chain



Packaging facilitates distribution of products but can also help reduce/prevent food waste

Source: AMERIPEN Value of Packaging (2013)

Flexible Packaging

Manufacturing, distribution, and use

- Consumes less energy and fewer natural resources
- Generates less CO_2 emissions
- Results in higher product to package ratio
- Requires fewer trucks for transportation, using less fuel and creating less emissions
- Provides many consumer conveniences:
  - Extended shelf life
  - Easy storage
  - Microwaveability
  - Recloseability

Flexible Packaging

Creates Less Footprint

Energy consumption and environmental impact during transportation is greatly reduced.

Truckloads needed to transport packaging for equal amounts of product[4]

26 truckloads of unfilled glass jars

1 truckload of unfilled flexible pouches

Flexible Packaging

Uses Less Resources

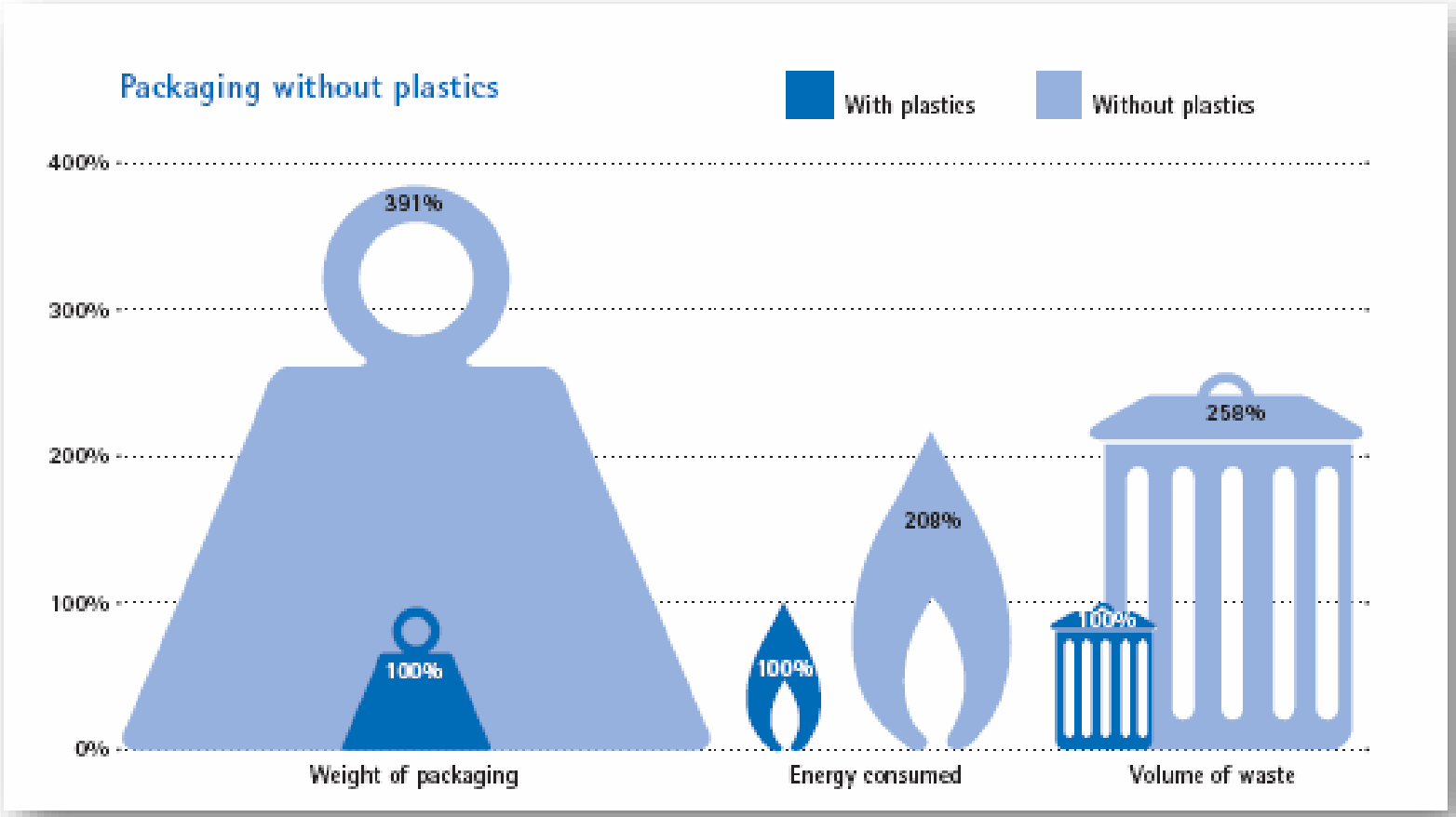
Examples of packaging needed to package 60 pounds of beverage[4,5]

50 pounds of glass

6 pounds of Rigid PET

3 pounds of aluminum

1.5 pounds of flexible plastic



[Source: PlasticsEurope]

When it is Littered !!!

- **A plastic bag or bottle, when littered, will get washed into a drain …. then a river, and then into the ocean … causing the huge problem of marine litter ….**

- **But will a biodegradable plastics product solve the marine litter issue ?**

Australian Government
Department of the Environment, Water, Heritage and the Arts

➢ Extracted from Australian DEWHA website :-

- **"The degradable versus conventional plastic bag argument is very complex. Some question whether there is any benefit in using degradable plastic bags if they are just going straight to landfill, as they may not break down in the dry and anaerobic conditions found in most Australian landfills. Alternatively, if they break down they may contribute to generation of methane, which is a potent greenhouse gas"**

- **"Our consultancy report, The Impact of Degradable Plastic Bags in Australia, found that there is probably little benefit obtained by using biodegradable plastics if you dispose them to landfill. This is because microorganisms cannot survive the dry, oxygen-deprived conditions normally found in landfills. All sorts of biodegradable materials, including food and paper, have been found "mummified" and preserved in such conditions. Even if the degradable materials degrade, the low oxygen level means that they release methane as they break-down – a potent greenhouse gas"**

- **"Plastic bags that are commonly replaced by degradable plastics actually make up a small (by volume) of the waste going into landfill, and most plastics are inert and do not contribute to toxic emissions or leaching."**

"Often **'biodegradable' plastic items** (**including single-use plastic bags** and containers) **break down completely only if exposed to prolonged high temperatures above 50°C**. **Such conditions are met in industry composting plants but very rarely in the environment**."

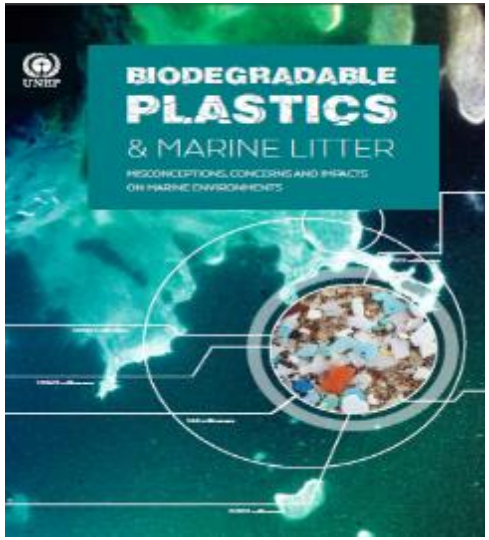
"…even **bioplastics derived from renewable sources** (such as corn starch, cassava roots, or sugarcane) **or from bacterial fermentation of sugar or lipids (PHA) do not automatically degrade in the environment and especially not in the ocean**."

Box 4. Biodegradable plastic: The unintended consequences

In an effort to reduce plastic pollution, many governments have outlawed conventional plastic bags, allowing only the use and production of "biodegradable" bags.[32] Nonetheless, to limit leakage and damage to the environment, the presence of sound waste management systems are as relevant for the so-called bio-degradable options as for fossil fuel-based plastics. Often "biodegradable" plastic items (including single-use plastic bags and containers) break down completely only if exposed to prolonged high temperatures above 50°C (122°F). Such conditions are met in incineration plants, but very rarely in the environment. Therefore, even **bioplastics** derived from renewable sources (such as corn starch, cassava roots, or sugarcane[33]) or from bacterial fermentation of sugar or lipids (PHA[34]) **do not automatically degrade in the environment** and especially not in the ocean.[35]

Source: Single-Use Plastics – A Roadmap for Sustainability, UNEP 2018

- A further disadvantage of the more widespread adoption of 'biodegradable' plastics is the need to separate them from the non-biodegradable waste streams for plastic recycling to avoid compromising the quality of the final product. In addition, there is some albeit limited evidence to suggest that labelling a product as 'biodegradable' will result in a greater inclination to litter on the part of the public (GESAMP 2015).
- In conclusion, the adoption of plastic products labelled as 'biodegradable' will not bring about a significant decrease either in the quantity of plastic entering the ocean or the risk of physical and chemical impacts on the marine environment, on the balance of current scientific evidence.



Source: Biodegradable Plastics and Marine Litter, **UNEP** 2015

"…labelling a product as "biodegradable" will **result in a greater inclination to litter**…"

"…adoption of biodegradable plastics **will not bring significant decrease either in quantity of plastic entering the ocean or the risk of physical and chemical impacts on the marine environment**"

Biodegradable Plastics Are Not the Answer to Reducing Marine Litter, Says UN

Tue, Nov 17, 2015

Report Launched on 20th anniversary of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)

- ***Polymers, which biodegrade under favourable conditions on land, are much slower to break up in the ocean and their widespread adoption is likely to contribute to marine litter and consequent undesirable consequences for marine ecosystems.***
- ***The report also cites research that suggested some people are attracted by 'technological solutions' as an alternative to changing behaviour. Labelling a product as biodegradable may be seen as a technical fix that removes responsibility from the individual, resulting in a reluctance to take action.***

See more at: http://www.unep.org/newscentre/Default.aspx?DocumentID=26854&ArticleID=35564#sthash.j2Ekg2Ys.dpuf

The Guardian Monday 23 May 2016

Biodegradable plastic **'false solution'** for ocean waste problem

UN's top environmental scientist warns bottles and bags do not break down easily and sink, as report highlights the ubiquity of plastic debris in oceans

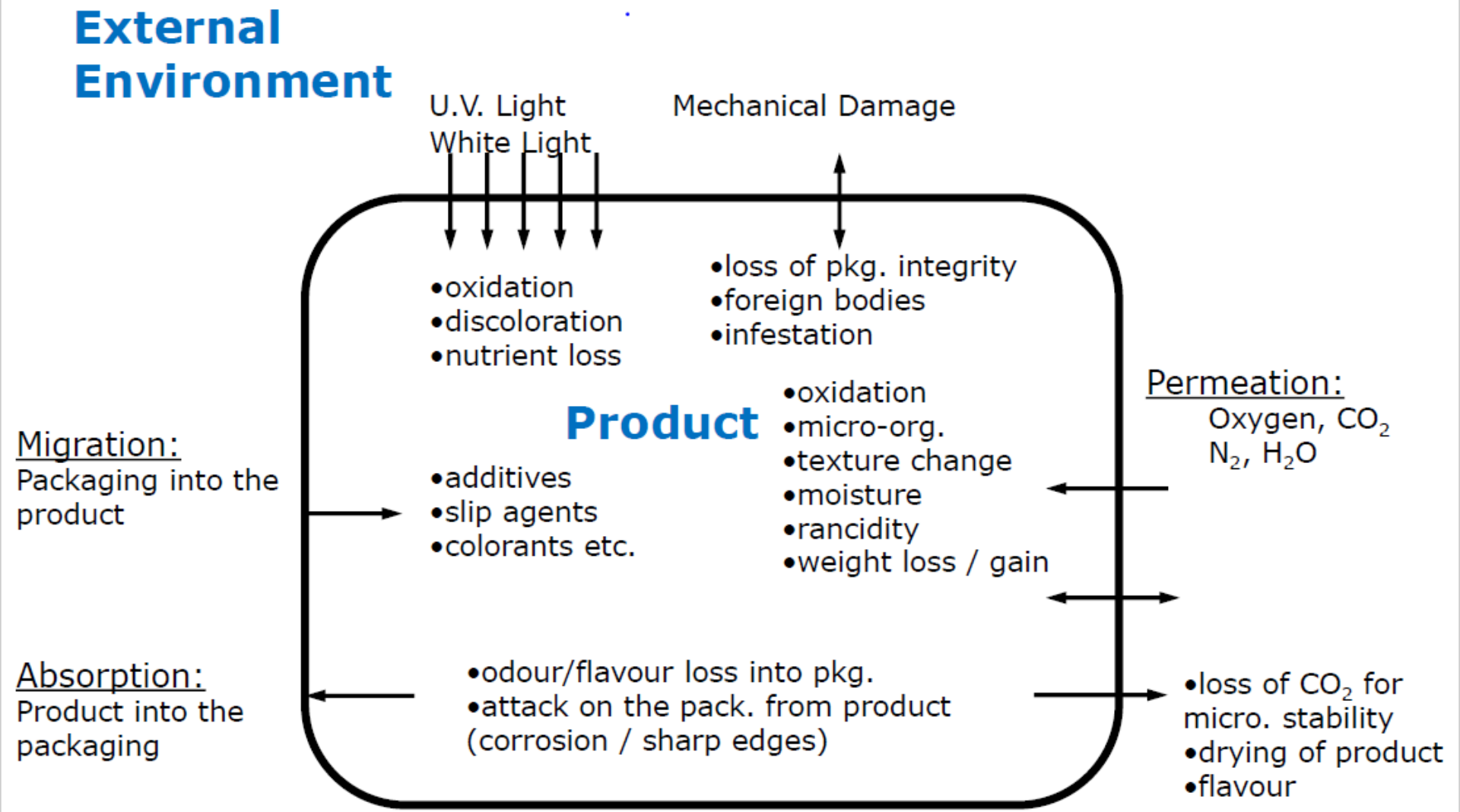
Biodegradable **plastic water bottles** and shopping bags are a false solution to the ubiquitous problem of litter in the oceans, the UN's top environmental scientist has warned.

Most plastic is extremely durable, leading to large plastic debris and "microplastics" to spread via currents to oceans from the Arctic to the Antarctic, a UN report published on Monday found.

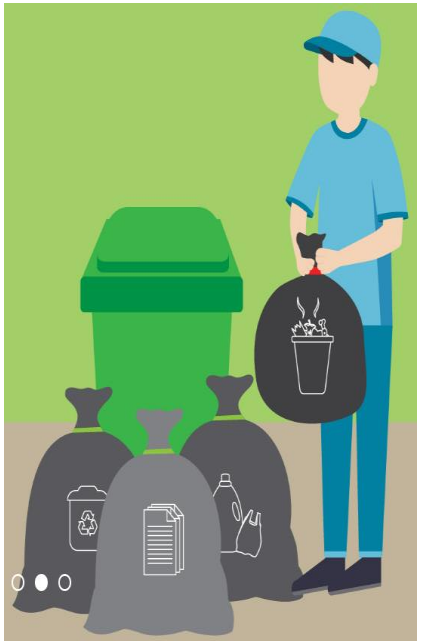
Greener plastics that breakdown in the environment have been marketed as a sustainable alternative that could reduce the vast amount of plastic waste that ends up in the sea after being dumped. But **Jacqueline McGlade, chief scientist at the UN Environment Programme**, told the Guardian that these biodegradable plastics were not a simple solution.

"**It's well-intentioned but wrong**. **A lot of plastics labelled biodegradable, like shopping bags, will only break down in temperatures of 50C and that is not in the ocean.** They are also not buoyant, so they're going to sink, so they're not going to be exposed to UV and break down," she said.

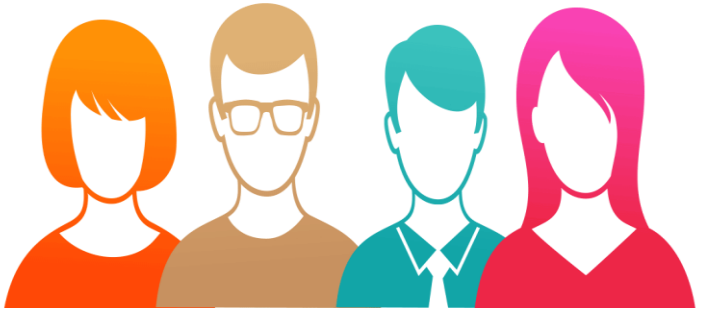
Product Protection



DON'T BE A LITTERBUG!
(JANGAN JADI KUTU SAMPAH!)



Use the Trash Can and Separate your Waste - Separate At Source ie S.A.S.)
(Gunakan tong sampah dan asingkan sampah anda)



Share what You have Learnt
(Kongsikan apa yang telah anda pelajari)


TERIMA KASIH
DANKSCHEEN
BİYAN
SHUKRIA
TINGKI
YAQHANYELAY
TASHAKKUR ATU
GRACIAS
SUKSAMA
EKHMET
THANK
ARIGATO
MEHRBANI
GRAZIE
YOU
SHUKURIA
MAAKE
KOMAPSUMNIDA
GOZAIMASHITA
EFCHARISTO
PALDIES
JUSPAXAR
BOLZÏN
MERCI