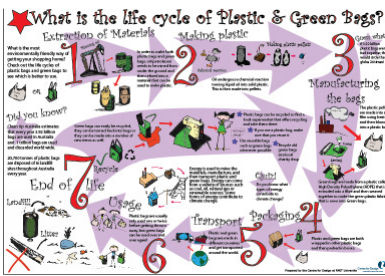


What is the life cycle of plastic & green bags Teachers' Resource



Use this resource in conjunction with the “What is the life cycle of plastic & green bags” poster available on the ResourceSmart Schools: AuSSI Vic Waste Module CD and the CERES Sustainability Hub:

<http://sustainability.ceres.org.au>

The plastic making process

1. Extraction of Materials

In order to make both plastic bags and green bags, oil (petroleum) needs to be mined from under the ground and then refined into a material that can be used to make plastic. There are many different types of plastic available.



Crude Oil

- Crude oil is formed under the earth from the remains of plants and tiny animals that lived in the oceans hundreds of millions of years ago. These remains were covered with layers of mud and sand over a long time and combined with extreme pressure and high temperatures over millions of years, turning the remains into a liquid form which is known as crude oil.
- In order to extract oil a hole is drilled into the ground called a bore. A pump (see picture) is then used to draw up the oil from under the ground to the surface.



Activity: Make a list of the things in your class room that are made from plastics.

Note on activity: Most products have some form of plastic in them! Even fabrics have synthetic fibres that are derived from plastic. This would also be a good computer research project, finding out what plastics are in the class room.

2. Making Plastic

- After being mined the crude oil travels to a refinery where it is broken down and ‘refined’ into different products such as petrol, gasoline, diesel fuel, heating oil, jet fuel, liquefied petroleum gases, and many other products which are used to heat our houses and power our transport.
- **Propylene** is one of the refined products that comes from a refinery and originates from crude oil. It is also known as propane. Propylene is one of the key ingredients for a variety of chemical and plastic products.
- **Benzene** also comes from crude oil just like propylene. It is a colourless liquid, which evaporates quickly into the air. In nature, benzene can be emitted from a volcano and forest fires. Benzene can be made into a chemical which is then used to make plastics, resins, synthetic fibres, nylon as well as detergents and dyes.
- **Ethylene** is a colourless gas that comes from nature and is also created by man-made sources. In nature, ethylene gas comes from plant products such as fruits, vegetables and flowers.
- Both propylene and benzene undergo a chemical process which turns them into man made materials. Benzene is turned into Nylon and propylene turns into Polypropylene.

Materials for Plastic Bags

- Plastic bags are made from a plastic called **High Density Polyethylene (HDPE)** in the form of a thin plastic film.
- HDPE is classified as a number '2' plastic which means it can be recycled. However, because the plastic used for bags is so thin, it needs to be recycled separately from your normal kerbside recycling. So always put them in the special bins at your supermarket for recycling.
- HDPE is used to make lots of other products such as milk containers, folding chairs, bottles, water pipes and even hula hoops.
- There is another type of plastic used to make the thicker plastic bags that some shops have, this is called Low Density Polyethylene (LDPE).



Quick fact: It takes 1.75 kilograms of petroleum (in terms of energy and raw materials) to make one kilogram of HDPE.

Question: If a HDPE bag weighs about 6 grams, how many HDPE bags can you make from 1.75 kg of petroleum (= 1kg of HDPE)?

Answer: $1000g \div 6 = 167$ bags.

Quick fact: 8.7 normal checkout bags from the supermarket contain enough embodied petroleum energy to drive a car 1km (Environment Australia).

Question: If a family uses 8.5 bags a week, how many kilometres could they drive using the energy embodied in all the plastic bags they would use in a year?

Answer: $8.5 \times 52 \text{ weeks} \times 1\text{km} = 442\text{km}$

Materials for Green Bags

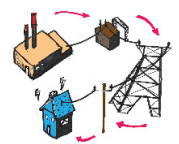
- Green bags are made from a plastic called **polypropylene** which is made by the chemical industry.
- Polypropylene is used in many applications, including packaging, textiles (e.g. ropes and carpets), stationery, plastic parts and reusable containers.
- Polypropylene can be injection molded to make cups and containers or polypropylene fibres can be spun into a yarn which is woven to make different fabrics such as upholstery fabrics to cover sofas, mattress covers, clothes and disposable nappies.
- In order to make green bags, the polypropylene fabric is dyed a variety of colours. Dyes can come from things in nature such as plants, insects and wood as well as from man made sources such as petroleum, just like benzene.



3. Manufacturing the Bags

Making Plastic Bags

- The HDPE used for plastic bags begins as a very small tube, which is then blown just like a balloon.
- The speed and the amount of air will determine the size and thickness of the plastic bag.



Making Green Bags

- Once the fabric has been woven and dyed, it is cut into pieces and the pieces are sewn together with cotton thread using an industrial sewing machine. This process uses electricity.
- The bags are then printed with graphics such as a store name.



Activity: Make your own bags using scrap material and old cloths. A square bag is easy to make and can be hand sewn by the students using a basic blanket stitch. These could make a great mother's or father's day gift.

4. Packaging

- Both Green and Plastic bags need to be packaged for the long journey to the supermarket.
- Firstly the bags are bundled into small lots of between 10 and 100 and then covered in plastic film or tied together with plastic string.
- Then lots of these bundles are packed into cardboard boxes (see the 'what is the life cycle of paper' poster to learn more about paper).
- All the boxes are then placed on wooden pallets ready to be transported.



5. Transport

- The pallets of boxes that are filled with bags are loaded into a container for transport from overseas to Australia by cargo ship
- Once they arrive in Australia they will be transported all over Australia by trucks on roads or by trains.
- Trucks contribute to climate change as they use a lot of fuel that contributes CO² into the atmosphere.



6. Use

Plastic bags

- Both plastic and green bags are used to carry things.
- Plastic bags are popular because they are functional, lightweight, strong and cheap.
- The average Australian household uses 504 plastic bags every year.
- Half of the plastic bags Australian's use come from supermarkets. The other half come from take-away restaurants, petrol stations and other shops.



Quick fact: In 2005, Australians used 3.92 billion plastic bags. If these bags were tied together they would circle the earth 24 times.

Green bags

- Green bags are available at most supermarkets today. Green bags are used to carry groceries and just about anything else.
- A green bag can last an estimated 104 shopping trips which is equal to two years if you go shopping once a week.
- Green bags can hold 1.2 times more stuff than a plastic bag because they are stronger as well as bigger, so you need less of them to carry your shopping home each week.
- Green bags can be recycled through Coles and Bi-Lo supermarkets.



Quick fact: If each Australian family used one less plastic shopping bag each week, Australians would save 253 million plastic bags a year (<http://www.abc.net.au/science/features/bags/default.htm>)

Activity: What can you make out of used plastic bags to stop them from going to landfill? Check out this great website that has lots of craft projects with old plastic bags

www.greenlivingtips.com/articles/138/1/Recycled-plastic-bag-crafts

7. End of life



Plastic bags

- After they have been used, most plastic bags go in the bin and end up in landfill.
- The ones that don't, usually end up in the environment where they threaten marine life such as dolphins and turtles who choke or starve when they eat the plastic bags because they think that they are jellyfish.
- In 2002, around 50-80 million bags ended up as litter in our environment polluting our neighbourhoods, streets, parks, rivers and oceans.
- Plastic bags can be recycled, but not in the normal household or school recycling bins. They need to go to a special facility and so they need to be returned to the supermarket and plastic in the bins provided.
- Currently only about 3% of plastic bags used in Australia are recycled.
- When plastic bags do go to landfill, its best for them to have served a useful purpose, so use them as garbage bags instead of the thick black ones.

What can you do to reduce the impacts of plastic bags?

- **Refuse:** Don't use plastic bags unless you absolutely have to. Take reusable bags to the supermarket with you or ask for a box at the checkout.
- **Reduce:** Try to minimise the amount of bags that your family uses. Swap to reusable bags such as green bags and carry a spare bag around with you for an emergency.
- **Reuse:** plastic bags at home for freezing, school lunches or even as a bin liner instead of a garbage bag!
- **Recycle:** Find a local supermarket that collects plastic bags for recycling and always recycle bags at the end of their life. Remember to remove the shopping docket from the bag before placing it in the recycling bin. .DON'T put normal plastic bags in your recycling bin at home as these contaminate the recycling stream. Source: <http://www.cleanup.com.au/PDF/au/plastic-bags---revised-household-version.pdf>

Quick Fact: only 10% of Australian households take their plastic bags to a central collection point for recycling.

(<http://www.abc.net.au/science/features/bags/default.htm>)

Activity: Get each student to count how many plastic bags their family uses in one week. Get the students to set targets for reducing the amount of bags used in their household.

Green bags

- Green bags can be recycled, but the cotton stitching that holds them together can't so they have to be unpicked by hand before they can be sewn into something new.
- Green bags are recycled 'off-shore' (overseas) in countries like China because it is cheaper to get them recycled there than in Australia.



Helpful resources

- Life Cycle Assessment (LCA) of plastic and green bags conducted by the Centre for Design is available at:
www.cfd.rmit.edu.au/programs/life_cycle_assessment/lca_of_degradable_plastic_bags
- Clean Up Australia: <http://www.cleanup.com.au/au/LivingGreener/plastic-bag-facts.html>
- Worldwide Home Environmentalists Network home.vicnet.net.au/~when/plastic.htm
- Environment Australia, Plastic Shopping Bags - Analysis of Levies and Environmental Impacts (Nolan ITU, 2002) www.deh.gov.au/industry/waste/plastic-bags/bags-analysis.html
- ABC.net plastic bag information: <http://www.abc.net.au/science/features/bags/default.htm>

Discussion points

- Australians use 3.92 billion plastic bags a year, that's over 10 million new bags being used every day. An estimated 3.76 billion bags or 20,700 tonnes of plastic bags are disposed of in landfill sites throughout Australia every year. Australians dump 7,150 recyclable plastic bags into landfills every minute or 429,000 bags every hour (Clean Up Australia).
- High Density Polyethylene (HDPE) bags - These are the thin singlet-style bags used by over 80% of retailers, including supermarkets. These can be recycled at most supermarkets. Generally they are not collected through your local curbside recycling, however one or two local councils are currently trialing their collection - contact your local council first to see if they collect plastic bags (Clean Up Australia).
- Low Density Polyethylene (LDPE) bags - These are the thicker bags used by less than 20% of retailers, usually for luxury goods. While they can be recycled there are few collection points. Check with your local council to see if they collect LDPE plastic bags.
- 8.7 normal checkout bags from the supermarket contain enough embodied petroleum energy to drive a car 1km (Environment Australia).
- Australians contribute 7,150 recyclable plastic bags into landfill every minute or 429,000 every hour (Clean Up Australia).
- If 3.92 billion plastic bags were tied together, they would circle the globe 24 times (Clean Up Australia).

Questions to ask the students

Q. What are thin plastic bags made from?
A. High Density Polyethylene (HDPE)

Q. What are green bags made from?
A. Polypropylene

Q. Which bags can be recycled at the end of their life and how do you make sure they get recycled?
A. Both thin plastic and green bags can be recycled at the end of their life. Take empty, clean plastic bags to supermarkets with collection bins to make sure the bags are recycled. Do not put them in your kerbside recycling bin.

Q. How can your family reduce the number of plastic bags they use?
A. By using reusable bags, such as green bags or cloth bags, instead of plastic bags when you go shopping. Keep reusable bags in the car and a spare one in your bag so you will always have them handy when you need them. Reuse plastic bags around the home to freeze food, pack lunches for school or as bin liners for rubbish.